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CLIMATEACTION
Assisting business towards carbon neutrality

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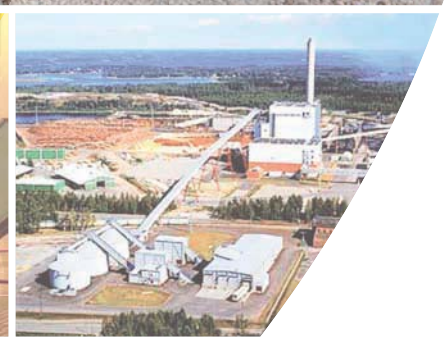

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Metso is a global supplier of sustainable technology and services for the mining, construction, energy, recycling and pulp and paper industries.

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Contents

POWER cluster – First results from an EU-Project working in the Northern European competence network for offshore wind energy

Objectives and work streams

1. Social acceptance:
Communicating the benefits of offshore wind energy to the public

- ✓ Until now more than 20.000 visitors attended the touring exhibition “FASCINATION Offshore” on the ship MS Greundiek.
- ✓ POWER cluster gets member of the regional networks “POWER Väst” in Sweden and “Rogaland in the Wind” in Norway

2. Business:
Creating a business platform to foster offshore wind energy development in the North Sea Region

- ✓ Catalogue of Energy Industry Classifications 2009 by Douglas Westwood
- ✓ a transnational study about “offshore wind challenges and learning from the oil and gas industry” has been assigned

3. Skills:
Adapting and preparing the North Sea Region work force to the needs of offshore wind energy

- ✓ a setup for an offshore wind energy technology BSc minor has been developed
- ✓ wind energy colloquia for pupils have been organized

4. Cluster Development:
Developing an offshore wind power cluster in the North Sea Region

- ✓ POWER cluster attended the ONS 2008 in Stavanger, HUSUM WindEnergy 2008, DEWEK 2008 in Bremen, SNS09 in Norwich and the All-Energy 09 in Aberdeen
- ✓ European Technology Platform for Wind Energy, Mid Term UpWind Workshop and “working group for offshore and onshore grid development in Northern Europe“ organised by European Coordinator in Brussels

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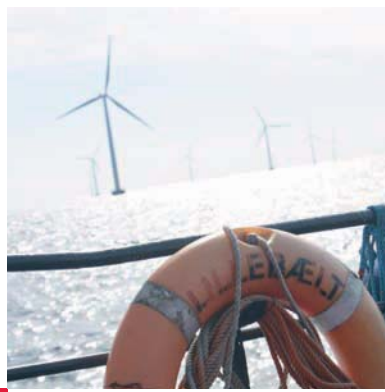

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ADVERTISERS INDEX

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ArcelorMittal	84	www.arcelormittal.com
Arauco	170	www.arauco.cl
Bayer Environmental Science SAS	164	www.bayercropscience.com
BICEP Project of CERES	OBC	www.ceres.org/bicep
BP p.l.c	132	www.bp.com
Braskem	23	www.braskem.com
Companhia Energética de Minas Gerais (CEMIG)	24	www.cemig.com.br
EcoEnergy Scandinavia AB	210	www.ecoenergy.se
EDF	126	www.edf.fr
Emission & Power solutions, Inc.	135	www.epsaves.com
Enablon	92	www.enablon.com
Envion	211	www.environ.com
ESRI	116	www.esri.com
European Aeronautic Defence and Space Company (EADS) N.V.	IFC, 148	www.eads.com
Evonik Industries AG	90, 103	www.evonik.com
Freshfields Bruckhaus Deringer LLP	138	www.freshfields.com
Geoenergi AS	26	www.geoenergi.no
Geogreen	210	www.geogreen.fr
Green Palm Ltd.	174	www.greenpalm.org
Grupo Bimbo	17	www.grupobimbo.com
Grupo Hunosa	196	www.hunosa.es
International Paint	155	www.akzonobel.com/international
Kimberly-Clark	10, 166	www.kcprofessional.com
Lloyd's Register	64	www.lr.org
Metro de Madrid	156	www.metromadrid.es
Metso	2	www.metso.com
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Nickel Institute	212	www.nickelinstitute.org/investment
Nokia Siemens Network	98	www.nokiasiemensnetworks.com
Ontario Power Authority	203	www.powerauthority.on.ca
Orange Business	104	www.orange-ftgroup.com
Pratt & Whitney	150	www.pratt-whitney.com
Power Cluster	4	www.power-cluster.net
Shipping Emissions Abatement & Trading (SEAat)	151	www.seaat.org
Sustainabile Asset Management (SAM)	97	www.samgroup.com
Sustainable Consumption Institute, The University of Manchester (SCI)	70	www.sci.manchester.ac.uk
T&D Europe	121	www.tdeurope.eu
Tata Chemicals Ltd.	60	www.tatachemicals.com
Tennant Europe NV	191	www.tennantco.com
Tomra	30	www.tomra.com
UniCredit S.p.A.	76	www.unicreditgroup.eu
University of Regina	208, 209	www.uregina.ca
University of Wisconsin	48	www.learn.wisconsin.edu
URENCO UK Limited (UUK)	142	www.urenco.com
Vectus PRT	210	www.vectusprt.com
Veolia Water	184, 186	www.veolia.com
Verizon Business	109	www.verizonbusiness.com
Wilmar International Limited	172	www.wilmar-international.com.sg
Yara International ASA	158	www.yara.com

CLIMATE ACTION WISHES TO THANK OUR PARTNERS:

Ceres is a US-based network of investors, environmental organisations and other public interest groups working with companies and investors to address environmental and social challenges such as global climate change. Its mission is to integrate sustainability into company practices and the capital markets to protect the health of the planet and its people. Ceres directs the Investor Network on Climate Risk, a network of more than 60 institutional investors managing more than US$4 trillion in assets focused on the business impacts from climate change.

The Climate Group is an independent, not-for-profit organisation that works internationally to advance climate change solutions and accelerate a low-carbon economy. Its coalition of proactive leaders – from government, business and civil society – has demonstrated that emissions reductions, essential to slow climate change, can be achieved while boosting profitability and competitiveness.

Bright Green, the largest parallel event at the COP15 in Copenhagen, takes place 12-13 December 2009 at the venue called Forum. It features innovative climate tech companies who will display the huge variety of already existing technological answers to the Climate Change Challenge. It will showcase the business response to the climate change challenge – as a traditional trade fair but also as a live statement aimed towards the ongoing climate negotiations.

The **Investor Network on Climate Risk** (INCR) is a network of institutional investors and financial institutions that promotes better understanding of the financial risks and investment opportunities posed by climate change. Much of INCR's focus is aimed at improving corporate disclosure and governance practices on climate change. The four-year-old network, coordinated by Ceres, includes more than 60 investor members with collective assets totalling more than US$4 trillion.

ICC (International Chamber of Commerce) is the voice of world business championing the global economy as a force for economic growth, job creation and prosperity. ICC activities cover a broad spectrum, from arbitration and dispute resolution to making the case for open trade and the market economy system, business self-regulation, fighting corruption and combating commercial crime.

Sustainable Asset Management (SAM) was founded in 1995 as the world's first asset management company for sustainability investments. Today, the company ranks among the globally leading managers of sustainability investments and theme based funds such as water, climate, clean energy, new materials and healthy living. Its clientele includes banks, insurance companies, pension funds, family offices and private clients.

The Global Compact is the world's largest voluntary corporate responsibility initiative offering a framework for businesses that are committed to aligning their operations and strategies with ten universally accepted principles. Its "Caring for Climate" platform provides a framework for business leaders to advance practical solutions and help shape public policy as well as public attitudes on the issue of climate change.

The **World Business Council for Sustainable Development** (WBCSD) is a CEO-led, global association of some 200 companies dealing exclusively with business and sustainable development. The WBCSD's Energy and Climate project helps companies reduce the impact of their operations and prepare for a carbon-constrained future by exploring energy frameworks, sources, and technologies while also devising practical mechanisms, measurement tools, and market-based solutions.

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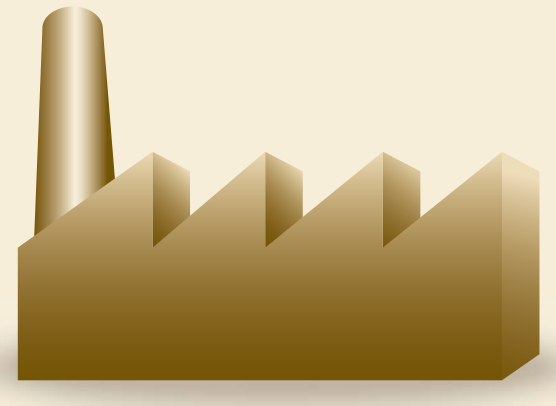

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Foreword

BAN KI-MOON
SECRETARY-GENERAL OF THE UNITED NATIONS

CLIMATEACTION
Assisting business towards carbon neutrality

This third annual edition of *Climate Action* focuses on some of the major issues for resolution in Copenhagen and the actors who can help to implement the solutions. Progress will require commitment and cooperation. Partnerships will be central, both in Copenhagen and beyond.
Climate Action is produced by Sustainable Development International in partnership with the United Nations Environment Programme to encourage and assist governments and business to lower greenhouse gas (GHG) emissions. This book and supporting website feature a range of articles that encourage the sharing of best practice and the development of new technologies and initiatives and illustrates the opportunities for business and governments to reduce costs and increase profits while tackling climate change.

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Climate change has been among my main priorities since the moment I took office. The most immediate challenge in the first year of my tenure was to inject a sense of resolve and urgency into negotiations at the Bali meeting of the Conference of Parties to the UN Framework Convention on Climate Change. The Bali Roadmap that emerged charted a course directly to Copenhagen. Every day since then, Copenhagen has been in my thoughts.

> **"Put simply, climate change will rewrite the global equation for development, peace and prosperity in the 21st century"**

We have seen considerable progress in the past two years. Climate change is now at the top of the international agenda. This is where it belongs. Put simply, climate change will rewrite the global equation for development, peace and prosperity in the 21st century.
On 22 September this year, I convened a Climate Change Summit at the United Nations. It was history's largest gathering of world leaders on climate change, attended by 101 Heads of State and Government and involving 163 countries. The goal was to increase political momentum further still. I asked the assembled leaders to make clear to their negotiators that a deal in Copenhagen is not only a global imperative, but also in their direct strategic national interest.
All present recognised that a deal in Copenhagen was possible. Leaders showed a keen willingness to work hard to achieve this goal. We heard from Japan, the Maldives, China, the United States and others on what they are already doing, and what they would be prepared to do under an international agreement.
The Summit generated a strong collective political vision. All concurred that we need a global agreement. Leaders voiced broad support for setting a long-term goal to limit global temperature increase to a maximum of 2°C, and they acknowledged the science-driven need to cut global greenhouse gas emissions by at least 50 per cent below 1990 levels by 2050. Many leaders also rallied around a proposal for supporting $100 billion a year for mitigation and adaptation over the next decade. They agreed that,

> We share one planet, one home. As people, as nations, as a species, we sink or swim together

in principle, funding should derive from both public and private sources, and should not come at the expense of official development assistance.

The task now is to translate political vision into political reality. Copenhagen does not need to resolve all the details, but it must succeed in establishing a framework for progress on fundamental issues. It must provide a deal that involves all countries, consistent with their capabilities, working toward a common, long-term goal.

I have four benchmarks for success in Copenhagen.

First, every country must do its utmost to reduce emissions from all major sources, including from deforestation and emissions from shipping and aviation. Industrialised countries have to strengthen their mid-term mitigation targets, which are currently nowhere close to the cuts that the Intergovernmental Panel on Climate Change says are needed. Developing countries, too, must slow the rise in their emissions and accelerate green growth as part of their strategies to reduce poverty.

Second, a successful deal must strengthen the world's ability to cope with the many changes that are already unfolding throughout the world as a result of decades of increasing greenhouse gas emissions, unsustainable development and environmental mismanagement. In particular, it must provide comprehensive support to the most vulnerable – those who are on the frontlines of climate impacts. Support for adaptation is not just ethically necessary, it is a smart investment in a more stable, secure world.

Third, a deal needs to be backed by money and the means to deliver it. Developing countries need funding and technology so they can move more quickly toward low-emissions green growth. The solutions we discuss cannot be realised without proper financing and without unlocking private investment, including through carbon markets.

Fourth, a deal must include an equitable global governance structure that addresses the needs of developing countries. All countries must have a voice in how resources are deployed and managed.

A comprehensive, equitable and ambitious deal in Copenhagen can reduce greenhouse gas emissions and limit global temperature rise to a scientifically safe level. It can catalyse clean energy growth. Furthermore, it can – and it must – help to protect the most vulnerable nations and communities from the impacts of climate change.

If there is one lesson to be learned from the climate crisis and the multiple global crises of the past year – food, fuel, flu, financial – it is this: we share one planet, one home. As people, as nations, as a species, we sink or swim together.

Across the globe, governments, businesses and civil society increasingly recognise that we have the knowledge and the means to tackle the climate challenge. Let us seize the opportunity that today's confluence of crises is giving us, so that tomorrow's generations can look back and say: "Our leaders rose to the challenge. They did what was right."

Author

Ban Ki-moon, of the Republic of Korea, is the eighth Secretary-General of the United Nations, bringing 37 years of service, both in government and on the global stage.

At the time of his election as Secretary-General, Mr Ban was his country's Minister of Foreign Affairs and Trade. His long tenure with the ministry included postings in New Delhi, Washington DC and Vienna, and responsibility for a variety of portfolios, including Foreign Policy Advisor to the President, Chief National Security Advisor to the President, Deputy Minister for Policy Planning and Director-General of American Affairs. Throughout this service, his guiding vision was that of a peaceful Korean peninsula, playing an expanding role for peace and prosperity in the region and the wider world.

Organisation

In 1945, representatives of 50 countries met in San Francisco at the United Nations Conference on International Organization to draw up the United Nations Charter. The UN officially came into existence on 24 October 1945, when the Charter had been ratified by China, France, the Soviet Union, the UK, the US and a majority of other signatories.

The purposes of the United Nations, as set forth in the Charter, are to maintain international peace and security; to develop friendly relations among nations; to cooperate in solving international economic, social, cultural and humanitarian problems and in promoting respect for human rights and fundamental freedoms; and to be a centre for harmonising the actions of nations in attaining these ends.

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Website: www.un.org/sg/


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Introduction

ACHIM STEINER
UN UNDER-SECRETARY-GENERAL AND
EXECUTIVE DIRECTOR,
UNITED NATIONS ENVIRONMENT PROGRAMME (UNEP)

Over the past two years, all roads have been leading to Copenhagen and the crucial UN climate convention meeting. In a matter of days, the world will know whether this will prove to be a dead end, a delay, a detour or a gear-changing moment in human affairs.

The meeting in Copenhagen has brought the world together in a way perhaps not witnessed in half a century – it has also brought the UN together.

Ban Ki-Moon, the UN Secretary General has worked tirelessly to make a new, scientifically-credible agreement in 2009 a possibility.

He has realised from the start that, in the 21st century, climate change represents the most extraordinary threat and disruption to security, development and human well-being.

But there is also an inordinate opportunity to catalyse a low-carbon, resource-efficient Green Economy able to meet the needs and aspirations of six billion people, rising to nine billion by 2050, if swiftly and comprehensively addressed.

The mobilisation of the UN system including colleagues at the UN Framework Convention on Climate Change (UNFCCC) towards this end has been unprecedented, and UNEP and its staff have been part of that change and challenge.

We have striven with institutions and individuals in the UN and across fields such as science, business, energy and natural resource management to illuminate the wealth of options and choices available to governments to unleash markets and trigger innovation.

The Intergovernmental Panel on Climate Change, co-hosted by UNEP and the World Meteorological Organisation, is the benchmark underpinning the reality of rising greenhouse gas emissions.

Its 2007 landmark report put a full stop behind the science, outlined the sobering impacts but also calculated the costs of action – along with Lord Stern on behalf of the UK government, these underlined that it will not cost the Earth to combat climate change, far from it.

Through the UNEP Finance Initiative and fora such as the UN Global Compact there has been mobilisation of insurers, banks, pension funds and others on fostering investments that move markets in favour of low-carbon companies and ones that are embracing more resource-efficient paths.

Industry-wide collaboration has also accelerated. For example, a new global initiative to accelerate the penetration of energy saving light bulbs is underway with market leaders Osram and Phillips, with funding from the Global Environment Facility.

Through partnerships with the construction sector and sectors such as tourism, more opportunities have been spotlighted from energy-efficient building to low-footprint leisure.

The mobilisation of public opinion through initiatives such as the Billion Tree campaign and the Seal the Deal campaign have played their part in giving a voice to millions who felt unable to speak.

The Global Green New Deal/Green Economy initiative, launched last year as a way of dealing with multiple crises including climate change, has achieved resonance in capital cities from Seoul to Beijing and from Canberra to London, Paris, Berlin, Brasilia and Washington.

The central but often overlooked role of ecosystems in mitigating and assisting economies to adapt to climate change has also been brought centre stage through assessments such as the Blue Carbon report.

Carried out in collaboration with UNESCO, the Food and Agricultural Organization of the UN and a global team of scientists, it estimates that carbon emissions – equal to half the annual emissions of the global transport sector – are being captured and stored by marine ecosystems such as mangroves, salt marshes and seagrasses.

A combination of reducing deforestation on land, allied to restoring the coverage and health of these marine ecosystems could deliver up to 25 per cent of the emissions reductions needed to avoid 'dangerous' climate change.

However the report also estimates that up to seven per cent of these 'blue carbon sinks' are being lost annually; seven times the rate of loss of 50 years ago.

"If more action is not taken to sustain these vital ecosystems, most may be lost within two decades," says the report, *Blue Carbon: the Role of Healthy Oceans in Binding Carbon*.

One idea to tip the balance in favour of conservation and 'marine ecosystem renovation', is a Blue Carbon fund which the countries of the North could use to pay countries and communities in the South.

The idea is not so far fetched. It is likely that nations will agree to pay developing economies to maintain the 'green carbon' in forests under a partnership – Reduced Emissions from Deforestation and forest Degradation (REDD).

UNEP is hosting the secretariat for UN REDD which includes UNDP and FAO, and whose work – funded by Norway and others – is preparing nine pilot countries in Africa, Asia and Latin America for this unfolding opportunity.

By some estimates a country such as Indonesia could stand to earn a $1 billion a year if it halves its rate of forest loss.

Paying developing economies to maintain the carbon stock of ecosystems is leading to new and transformative avenues with similar multiple, Green Economy benefits.

UNEP, in partnership with the World Agroforestry Centre and with funding from the Global Environment Facility, has launched a Carbon Benefits Project with farmers and landowners in Western Kenya, China, Niger and Nigeria.

It aims to rapidly develop the land use standard or calculator that will allow investors to know how much carbon is being sequestered under different land management regimes.

On World Environment Day 2009 we also launched The Natural Fix, again looking at the carbon capture and storage potential of other terrestrial ecosystems including peatlands.

Some developed economies are preparing to put billions of dollars into carbon capture and storage (CCS) at power stations – why not invest some of this in nature-based CCS?

The natural method is tried and tested over millennia and could prove to be far more cost effective if rapidly enhanced.

UNEP has also been working with leading scientists on other opportunities.

While the international community's over-arching aim in terms of cutting emissions focuses CO_2, there are other non-CO_2 gases and pollutants of growing concern.

Many of these need also to be curbed because of their wider environmental impacts such as those on public health, agriculture and the planet's multi-trillion dollar ecosystems including forests.

Black carbon, a component of the soot emissions from diesel engines and the inefficient burning of biomass cooking stoves is a case in point.

It is a key component of air pollution linked to 1.6 million to 1.8 million premature deaths annually as a result of indoor exposure and 800,000 as a result of outdoor exposure.

Black carbon, which absorbs heat from the sun, is also contributing to global warming – with its contribution ranging from ten per cent to over 45 per cent of the current contribution.

It is also linked to accelerated losses of glaciers in Asia – the soot deposits darken, ice making it more vulnerable to melting.

One study estimates that 26 per cent of black carbon emissions are from stoves for heating and cooking with over 40 per cent of this from wood burning, over 20 per cent from coal, 19 per cent from crop residues, and 10 per cent from dung.

Some companies have developed stoves that cut black carbon emissions by around 70 per cent using passive air flows and better insulation while using 60 per cent less wood – perhaps a mass introduction of such stoves could deliver multiple Green Economy benefits.

Scientists estimate that some 50 per cent of current global warming may now be due to substances such as a black carbon and nitrogen compounds but also to methane and low level ozone – it may be more, it may be less.

While carbon dioxide can remain in the atmosphere for centuries, some of these other pollutants such as black carbon and ozone have relatively short lives in terms of days, weeks, months or years, offering almost immediate climate benefits; the message here is that everyone has an opportunity to do something.

Climate change is not going to simply go away like a bad nightmare in the morning if governments walk away from Copenhagen without a serious deal.

You can stop the clocks, but you cannot stop the climate clock ticking without transformative and committed action.

And the longer the world waits, the more difficult, costly and damaging climate change will become.

Copenhagen represents the opportunity to plan the future in a managed and considered way; otherwise the future will plan itself.

And this may well overwhelm the coping capacities of our national and global institutions, forcing societies to react and to scramble to deal with events that are already unfolding and challenging the very foundations upon which modern civilization, as it has evolved today, depends.

Achim Steiner

Achim Steiner is UN Under-Secretary-General and Executive Director of the United Nations Environment Programme (UNEP). He has worked both at the grassroots level and the highest levels of international policymaking to address the interface between environmental sustainability, social equity, and economic development.

His professional career has included assignments with governmental and non-governmental, as well as international organisations in different parts of the world. In 2001, he was appointed Director-General of the World Conservation Union (IUCN), widely regarded as one of the most influential and highly respected organisations in the field of conservation, environment and natural resources management.

Mr Steiner serves on a number of international advisory boards, including the China Council for International Cooperation on Environment and Development (CCICED), and Planet Green, an initiative of the Discovery Channel.

The human cost of climate change

© Argaw Ashine/OXFAM

Boran women in Ethiopia fetch water during the low and erratic rainy season.

BARBARA STOCKING
CEO, OXFAM

The UN climate change conference set to take place in Copenhagen this December is being cited as the single most important meeting in the history of humankind. This is no overstatement. If global temperatures continue to rise at the current rate, our world will be as much as five degrees Celsius warmer within the next century, a scenario that not only represents an environmental catastrophe, but also an economic, social and humanitarian one. At Copenhagen, world leaders will have the opportunity to prevent this doomsday scenario. The question is whether they are willing to make a real and lasting commitment and whether they do it in time. What, then, must we demand from them?

There are two key components to a successful global climate treaty. The first is to cut emissions so that rises in global temperatures do not exceed two degrees Celsius. Above a few degrees of warming, nightmare scenarios start to build up – with the death of the rainforests and loss of almost all the glaciers. Above five degrees, human life as we know it would cease to exist.
The second key component is to help poor countries adapt to the inevitable impacts of climate change that we are already seeing – and which will get worse as a result of the emissions already in the earth's atmosphere. It is the responsibility of rich countries – because of their greater wealth and overwhelming contribution to climate change – to lead in both these aspects.

THE RICH COUNTRIES' RESPONSIBILITY

In essence, rich countries have a double duty. They must lead by significantly reducing their own emissions by at least 40 per cent below 1990 levels by 2020, but they must also be responsible for providing the economic support necessary to help poor countries both reduce their own emissions and protect themselves against

> "It is the responsibility of rich countries – because of their greater wealth and overwhelming contribution to climate change – to lead"

the impact of climate change. Oxfam estimates that at least $150 billion of finance will be required each year in order to make this possible. This must be new money, not raided from existing aid commitments as is being suggested by the majority of rich nations. Stealing money from tomorrow's schools and hospitals to pay the climate burden makes no sense. Oxfam's recent

report *Beyond Aid* exposed the true human cost of 'aid raiding'. It found that the paying for adaptation from aid budgets could mean 4.5 million extra child deaths, 75 million fewer children in school and 8.6 million fewer people with access to HIV/AIDS treatment than would otherwise be the case.

Climate change is an additional burden that consequently requires additional funding. The failure of most rich countries to acknowledge this has proven to be an obstacle in the international negotiations so far. A shift in current thinking is crucial if world leaders are to deliver a treaty that is genuinely going to make a difference to those millions of people in poor countries living with the impacts of climate change every day.

CLIMATE CHANGE IS ALREADY HERE

In its work across the globe, Oxfam witnesses daily how climate change is impacting on every issue linked to poverty and development. From health to hunger, disasters to displacement, climate change is happening here and now and affecting millions of people.

Recent Oxfam research based on interviews with farmers in fifteen countries across the world revealed how once-distinct seasons are shifting and rains are now disappearing. Farmers from Nicaragua in South America, to Bangladesh in South Asia, and Uganda in East Africa are no longer able to rely on generations of farming experience and are facing multiple and recurring failed harvests. This new unpredictability in the seasons is leading to serious food scarcity, in some countries forcing families to survive on just one meal a day.

Even under milder climate change scenarios, two of the world's most important crops – rice and maize – on which hundreds of millions of people depend, particularly in Asia, the Americas and Africa, face s ignificant drops in yields. In fact, maize yields are predicted to fall by at least 15 per cent in the next decade in much of sub-Saharan Africa and in most of India, inevitably leading to widespread hunger.

Disasters such as huge fires and storms are also on the rise, and could triple in the next two decades, not only causing massive loss of life – in Haiti, for example, more than 3,500 people were killed in two storms that hit localised communities in 2004 – but also having a drastic effect on the economy. The cost of climate change for the world economy is going to be huge, although grossly unbalanced. It is estimated that while US agricultural profits are set to rise by $1.3 billion each year because of climate change, sub-Saharan Africa alone will lose $2 billion per year as the viability of just one crop, maize, declines.

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This flood-damaged maize crop in Liyoyela Village is one of the effects of the flooding of the Zambezi River in Zambia's Western Province.

THE HUMAN COST

Rising temperatures are also making it difficult for people to work at the same rate on hot summer days without serious consequences for their health. This has ramifications for labourers' pay and will only get worse as temperatures rise further. It is estimated that cities such as Delhi could see a drop in worker productivity by as much as 30 per cent.

> "It is estimated that while US agricultural profits are set to rise by $1.3 billion each year because of climate change, sub-Saharan Africa alone will lose $2 billion per year as the viability of just one crop, maize, declines"

The impact of climate change on health is a worrying development. Diseases such as malaria and dengue fever that were once geographically bound are creeping to new areas where populations lack the immunity, knowledge or healthcare infrastructure to cope with them. For example, Jakarta in Indonesia has witnessed a rapid onset of dengue fever over the last ten years, killing 22 people and infecting a colossal 10,471 people from January to April 2009 alone. In addition to bereavement and stress, this onset of illness financially cripples families who must pay for medical treatment or suffer the consequences. It is estimated that climate change has contributed to an average of 150,000 more deaths from disease per year since the 1970s, with over half of those happening in Asia, and 85 per cent of them children.

The affect of climate change on water supplies is also impacting poor people. Several major cities such as La Paz and Kathmandu – fed by water from glaciers whose remaining lifespan may be just a few decades – will cease to exist in their current form, just as drought was key to the collapse of the great Mayan cities of Central America. All over the world these ice rivers are in retreat – their higher melt rates are disrupting fresh water supplies and causing floods. Eventually, of course, the supply will run out. What may be the oldest surviving culture in the Andes, that of the Uru Chipaya tribe, faces oblivion simply because the glacier-fed river that has sustained it for 4,000 years is drying up. Lack of water

Because of climate change, the Mururata glacier has been decreasing in area, greatly affecting villages and cities that depend on glacier water.

destroys livelihoods, communities, and families, as well as the social structures that are so important in the way that poor people cope with change and disaster.

An estimated 26 million people have already been displaced because of climate change and, by 2050, this figure may have risen to 200 million as people are forced to leave their homes owing to hunger, environmental degradation and loss of land. In 2007, nearly two years after Hurricane Katrina hit the Gulf Coast, 1.7 million people were still displaced. Today the population of New Orleans is still only 74 per cent of its pre-Katrina levels. In May 2009, Cyclone Aila hit Bangladesh and East India, causing the displacement of 750,000 people.

A financial commitment of $150 billion a year to help the developing world adapt to the devastating consequences of climate change and to curb their future emissions is not an unreasonable price to ask when we consider that roughly the same sum was spent bailing out just one company, AIG, during the financial crisis in late 2008. We must recognise our responsibility in aiding developing countries, as the problems they now face due to climate change are largely caused by wealthier nations, whose carbon emissions dwarf that of poorer nations. Indeed, in Malawi, a country now suffering from increasingly frequent and severe droughts, a government official told Oxfam staff that Malawi is paying the price for the activities of rich nations like the USA, China and the EU. Quoting American statistics, he pointed out that, in one year, the USA emitted six thousand times as many tons of carbon as Malawi.

> **“Hundreds of millions of people are already suffering damage from a rapidly changing climate, which is frustrating their efforts to escape poverty”**

It seems bitterly ironic that the countries that made themselves wealthy by burning fossil fuels over the last century are largely those that will, at least initially, suffer least from the effects of climate change. Of course, when we speak of a rise in global temperature, it is in reference to a rise in average temperatures, and this rise is playing out differently over the poles, the tropics, the seas and the big land masses. At the moment, it is in the tropics where climate change is having the most drastic impact, changing the lives of many people who are already living in poverty and who do not have the means to rebuild their homes when floods destroy them, or to feed their families when their crops fail because of drought. For those of us in the more temperate zones, the impact of climate change may for a brief period of time actually lead to beneficial and milder weather conditions – and, in any case, richer nations are better placed to protect themselves from the affects of climate change with their wealth.

Climate change is a reality and its effects are apparent right now. The scientific predictions are shifting continually and are almost always looking bleaker, but Oxfam's experience in over 70 countries is that hundreds of millions of people are already suffering damage from a rapidly changing climate, which is frustrating their efforts to escape poverty. Oxfam predicts that the number of people affected by climate-related disasters will rise to 375 million by 2015, a figure which we can reduce significantly if world leaders are willing to agree on a comprehensive global climate treaty in which rich countries commit to cutting their emissions now, and to give developing countries the means to pursue low-carbon futures and to cope with the harmful effects of climate change. What is needed is political will on a global scale, and there is no time to lose.

Author

Barbara Stocking is CEO of Oxfam Great Britain, and has led the aid organisation since May 2001. She regularly attends meetings with leaders of the G8, IMF/World Bank, UN and World Economic Forum and sits on a variety of UN committees overseeing humanitarian and development work. Stocking is chair of an alliance of nine major international humanitarian organisations and is a board member of Kofi Annan's Global Humanitarian Forum.

Organisation

Oxfam Great Britain is a leading international NGO dedicated to overcoming poverty and suffering. Oxfam is campaigning for a fair and safe climate deal because poor people across the globe are being hit first and worst by climate change. From hunger to health, disasters to displacement, climate change is affecting every issue linked to poverty and development today.

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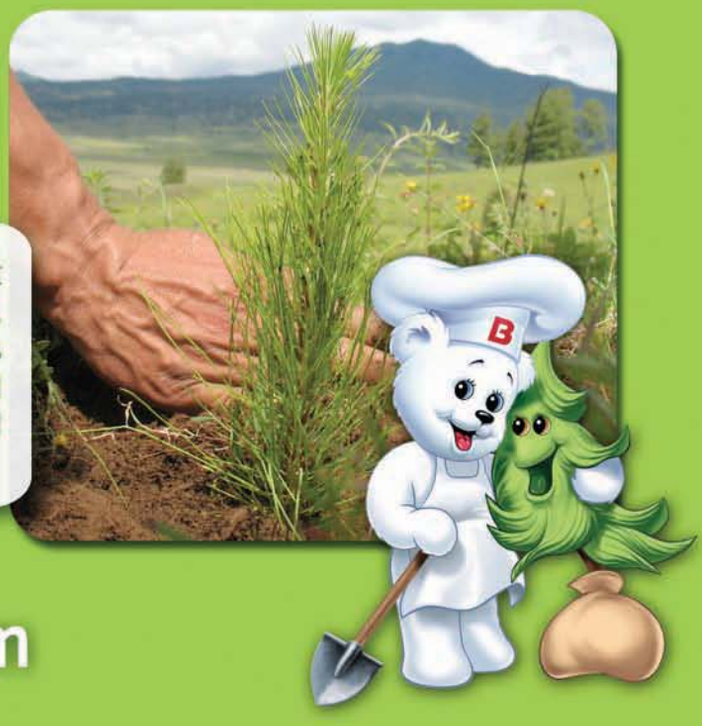
Grupo Bimbo

Committed to the environment

Grupo Bimbo, the leading company in the world for baked goods, with a $7.4 billion dollar net sales in 2008, is committed to eco-friendly solutions and sustainability in all it´s projects.

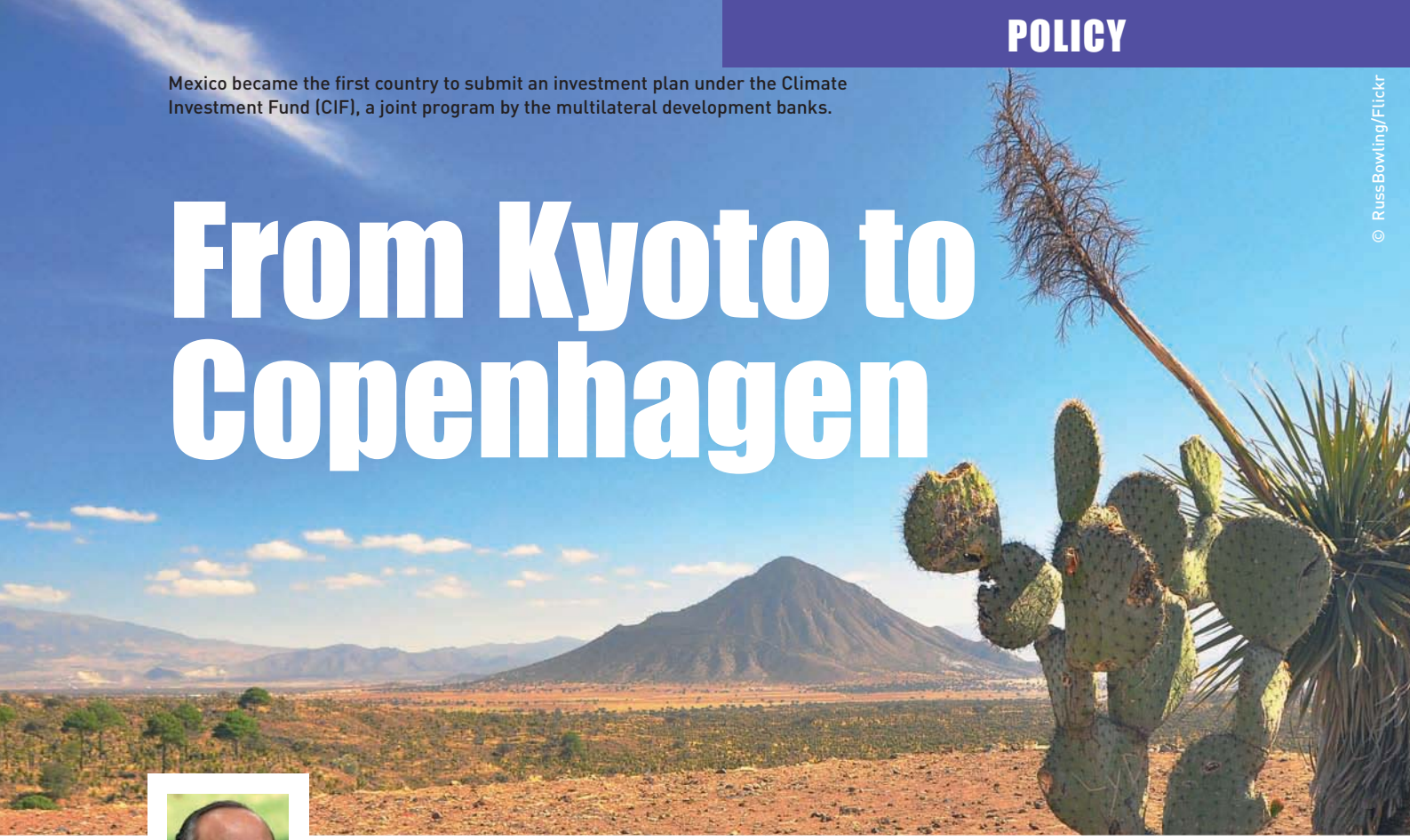
In most of **our 99 plants**, we are using different **energy saving systems that care for the environment**, such as solar energy for lighting and to heat water for our production processes. We are also exploring other cleaner energy sources such as wind to generate electricity.

In our commitment to the environment, we researched and implemented the **oxo bio-degradable packaging materials** for our products.



Reforestamos México is the non-profit organization of Grupo Bimbo. Since 2002, it has helped put nearly 40,000 hectares of forest under conservation, planted nearly **7 million trees** and reforested 5,000 hectares.

www.grupobimbo.com



Mexico became the first country to submit an investment plan under the Climate Investment Fund (CIF), a joint program by the multilateral development banks.

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From Kyoto to Copenhagen

FELIPE CALDERÓN HINOJOSA
PRESIDENT OF MEXICO

Climate change is the greatest current threat to a prosperous and equitable future for all of humanity, and to fight it we need a consensus that leads to concrete actions powered by clear and fair mechanisms. To overcome our differences and provide economic incentives and resources for change, Mexico is proposing a Green Fund as a source of multilateral funding for projects that reduce global carbon emissions.

It is a time for arguments to end and agreements to begin. Developed and developing countries must come together under a new paradigm of common but differentiated responsibilities, each assuming their roles as sovereign nations. The unshakeable truth is that we are all contributing to global warming, and must all contribute to the solution with energetic willingness and firm commitment.

Albert Einstein and Bertrand Russell wrote in their 1955 Manifesto that speaking, "not as members of this or that nation, continent, or creed, but as human beings, members of the species Man, whose continued existence is in doubt", we have to "learn to think in a new way". Their words resonate as strongly today as they did then because our very survival is at stake.

LESSONS LEARNED

One of the lessons from our recent efforts is that good intentions are not enough unless we back them with concrete measures and financing. We must embrace the concept that no matter which country reduces the emissions, we all benefit thus we are all responsible for making it happen.

Creating a new paradigm that embraces rich and poor, north and south, east and west will allow us to move beyond the old donor-recipient model and build a new model based on mutual respect and cooperation. Together we can change the way we produce and consume in order to protect our greatest asset – this planet. Separately we can achieve next to nothing.

> "It is a time for arguments to end and agreements to begin"

As a catalyst for change and a means for providing resources to back concrete actions, the Green Fund will provide financial incentives to reduce output of greenhouse gases while stimulating the faltering global economy. It will also encourage businesses, governments and non-profit organisations to come up with creative solutions by offering a financial stimulus. In this way we can replace dirty old technologies with clean new ones in even the poorest countries and facilitate the spread of new ideas and technologies throughout the world.

How will it work? The financing will come from all world governments based on the aforementioned principle of common but differentiated responsibilities. All countries, except the very poorest (the least developed African nations), would contribute to the fund based on the size of their economy measured by per capita Gross Domestic Product (capacity to pay), total historical emissions (responsibility), per capita emissions as a

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proportion of global per capita emissions (equity), and emissions per unit of Gross Domestic Product as a proportion of global emissions per unit of Global Gross Domestic Product (efficiency).

KICK-STARTING THE PROCESS

How much is needed to make a difference? Of course, an enormous amount of resources is needed but to start off, Mexico is suggesting at least $10 billion as a target for the first year with annual contributions thereafter. This amount would kick-start the process and provide strong results, which would act as an incentive to increase efforts in subsequent periods by creating momentum.

> "Reject the old thinking that only rich countries can lead the way"

Mexico sees the fund as a catalyst to show the world what can be done and to provide a mechanism that works and is trusted by all. It will enable even the poorest countries to set an example and encourage developed nations to do likewise. However, it could even be a smaller amount if necessary; what is important is to start the contribution process and agree on the mechanisms for paying out.

Consistent with their historical responsibility and their capacity to pay, developed countries would provide the majority of the Fund's resources, while being permitted to withdraw less than they contribute, such as two thirds or half. Developing countries, on the other hand, would contribute according to their capacity to pay and their total per capita emissions (which generally are low), and could withdraw more than they contribute to finance their actions against climate change. The more action they take, the more they will be able to withdraw from the Green Fund.

This preserves the principle of equity, which would be further reinforced by our proposal to give a greater voice to developing countries in the fund than we currently enjoy in other multilateral initiatives. To succeed, we need everyone invested.

CLEAR AND TRANSPARENT

The rules for funding should also be strict and transparent to maintain the credibility of the fund, which would again ensure its long-term future and make consensus easier to achieve. Countries will only be able to access funds for projects that can prove they reduce emissions or contribute through carbon capture and sequestration to lowering the amount of carbon dioxide in the atmosphere.

The mechanism is aimed primarily at reduction of emissions as opposed to projects that deal with the effects of climate change. It is a transparent transaction that will pay cash in exchange for proof that the project has avoided or captured carbon emissions by a specified amount. This will enable many projects to access private financing using the expected payments from the fund as collateral.

In concrete terms, each participating country would make withdrawals from the fund according to the number of tons of emissions either avoided or captured by a specific project. The amount could be determined either by the existing market price of carbon bonds, or at a set price in dollars, euros or yen agreed upon by all parties.

ACTIONS NOT PROMISES

This can be done quickly. There is no need to set up new bureaucracies to manage the fund; institutions such as the World Bank are capable of absorbing the work.

Mexico is already backing this proposal with deeds, not just words. We are showing what a developing country can do as part of our commitment to the new paradigm. Today, in the 21st century, we reject the old thinking that only rich countries can lead the way. Thus we have unilaterally set a target to reduce annual carbon emissions by 50 million tons by 2012 through cleaner energy generation, widespread reforestation and better waste management, among other initiatives.

Of course, our commitment would be much greater if we had a financial mechanism like the Green Fund to propel a group of projects.

We understand that the current global economic situation makes it hard for governments to agree to bold action, but if we are to revolutionise the way we treat a generous planet, now is the time to do it. The Green Fund will contribute not only to fight climate change but also to increase our natural resource efficiency and give the global economy a much-needed push.

Furthermore, the cost now is trivial compared with the costs future generations would pay for our failure to act. As the world begins to emerge from the current economic crisis, what better path to take to sustainable prosperity than the green one?

Author

President Felipe Calderón Hinojosa holds a bachelor's degree in Law from the Escuela Libre de Derecho, a master's in Economics from the Instituto Tecnológico Autónomo de México (ITAM) and a master's in public administration from the John F. Kennedy School at Harvard University. During his professional career, President Felipe Calderón worked in the areas of civil and labour law, at the firms of Goodrich, Riquelme and Partners and at Multibanco Comermex, respectively. In September 2003, he was appointed Secretary of Energy by then President Vicente Fox. As the head of Mexico's energy sector, he promoted the modernization of state-owned companies as president of the Board of Directors of PEMEX, the Federal Commission of Electricity (CFE) and the electricity company Luz y Fuerza del Centro (LyFC). In 2005, he was elected as the PAN's presidential candidate, and, on July 2, 2006, he obtained the majority of the votes in one of Mexico's closest elections. On December 1, he was sworn in as President of the United States of Mexico for the 2006-2012 term.

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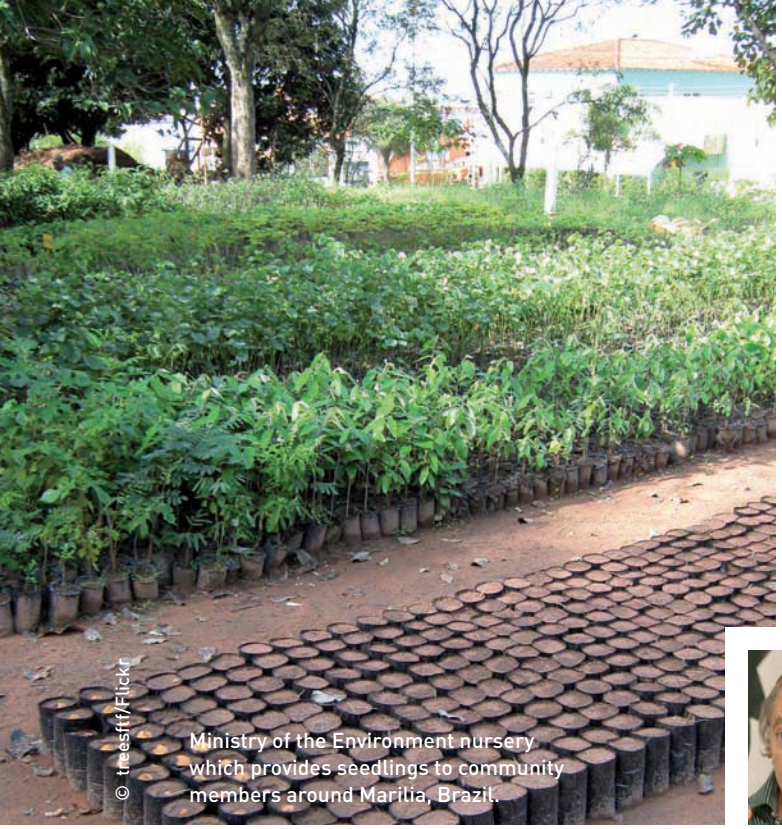

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Ministry of the Environment nursery which provides seedlings to community members around Marilia, Brazil.

Brazil: for life and for the planet

CARLOS MINC
MINISTER OF ENVIRONMENT,
BRAZIL

In 2009, Brazil had the lowest deforestation in the Amazon region ever recorded in history, which shows the world that the country is doing its homework. Brazil has presented bolder targets to reduce emissions forecast for 2020 by 39 per cent, the strongest target among developing countries. We shall demand more and fight against frustrating a deal in Copenhagen. This article explains how.

Brazil is already acting to fight climate change, and the country will attend the UN Conference in Copenhagen with a viable proposal to reduce greenhouse gas emissions. The world leaders who will gather at COP15 might not be willing to wait for the conclusion of a consistent agreement with significant reduction targets for after 2012 at COP15, thus postponing this important decision for at least another year. Despite this fact, we must co-ordinate all our efforts to maximize the opportunity that Copenhagen presents, for the sake of the future of the planet and for the sake of ensuring quality of life for future generations.
Industrialised countries have a historical responsibility regarding the increase in global warming. But the planet is one, and all nations must make their contribution towards fighting the greatest environmental challenge humankind has ever faced. The Brazilian proposal demonstrates that Brazil is doing its part, despite being a developing country that needs to grow responsibly, while fighting poverty and preserving the environment.

THE WORLD IS WATCHING

The amount of information circulating in the media gives some dimension to the problem of worsening global warming. With a responsible contribution from all, including differentiated contributions from countries that are not required by the Kyoto Protocol to present targets for reducing greenhouse gas emissions (GHGs), Copenhagen shall become the stage for decision-making that will allow us to address the ongoing serious effects of global warming.
The world has created and further developed technology solutions to change the pattern solidified over the centuries whereby economic models are based on an energy mix driven by fossil fuels, especially oil. Policies need to be developed with a global interest while incorporating the focus on the sustainable development of each nation. We have the challenge of considering the interests of each country while bearing in mind the greater needs of the collective. The leaders of every nation will bear the responsibility for decisions or omissions adopted at COP15. We cannot postpone this any longer; otherwise life on the planet will become impracticable. We do not have any more means to avoid the rise in temperatures around the globe.

RESPONDING TO AN URGENT SCENARIO

Therefore, we need to make hard, transparent and urgent decisions to make the rise in temperatures as mild as possible. The most optimistic forecast by the IPCC is that in 2100, we will reach a temperature rise of at least two degrees Celsius. But an increase of up to four degrees Celsius is already being considered, which would be catastrophic for humankind. We then have to calmly put our cards on the negotiating table as clearly and as responsibly as possible to progressively minimise the destructive effects of global warming. The urgency of these actions requires that new commitments are made both by the countries listed in Annex I of the Kyoto Protocol, and also by those not listed. Of course there should be differentiated commitments on the part of developed nations due to their greater responsibility for the issue, but that does not imply that commitments should not be made by all.
In this urgent scenario posed by fighting the effects of global warming, the conservation of tropical forests plays a fundamental role in climate balance. Therefore, the Brazilian proposal that was defined by President Luiz Ignacio Lula da Silva, which will be presented at COP15, establishes the target of reducing deforestation in the Amazon region by 80 per cent by 2020.
This strong reduction, based on 10-year average deforestation rates in the region calculated between 1996 and 2005, represents about 21 per cent less CO_2 emissions than Brazil would be releasing into the atmosphere in

2020 if nothing was done, within a framework known as "business as usual". But no nation with carbon stocks on a scale as large as Brazil with the Amazon Rainforest can carry out the preservation of their heritage of biodiversity without financial support from developed countries. Sustainable development has a cost that needs the contribution of the wealthiest countries, generally devoid of large green nature reserves, destroyed during the course of their development. The financial support for the conservation of the forest, such as the Amazon Fund created by President Lula, is crucial to leverage green enterprises that help to keep forests standing.

OUR PROGRESS TO DATE

We are doing our part effectively, fighting against deforestation by taking repressive measures. In 2009, we halted deforestation over about 7,000 km^2 of the region – a significant figure and the lowest rate of deforestation of the Amazon in the last 21 years, but we are not satisfied yet.Without sustainable development efforts that provide acceptable living conditions for the 24 million people living in the Amazon, we cannot achieve the ultimate goal of zero deforestation in the future. Without alternative methods of making a living, there will always be those who have to clear the forest to survive. Therefore, support from richer nations is fundamental to leverage the true green entrepreneurship that we need to stimulate the region. Actions such as sustainable forest management, eco-tourism, fish breeding and modern extractivism with support to production chains and forest product trade all contribute to the green efforts.

But Brazil will not limit discussion to the issue of deforestation in the Amazon region and other major biomes, such as the Cerrado, the Caatinga and the Atlantic Rainforest. The proposal to be officially presented in Copenhagen includes a series of actions to reduce CO_2 emissions.

EMISSIONS REDUCTION IN BRAZIL

The 20 per cent of avoided emissions in 2020 obtained in view of reduced deforestation in the Amazon area represent about half of the 39 per cent that we are no longer going to emit that year, as shown in the plan presented at COP15. Moreover, we will intensify investments in clean energy, boost agricultural production technologies with low carbon emissions, reduce vehicle emissions and promote wind-powered energy. Our steel industries will produce what we call "green steel". For these sectors (agriculture and cattle raising, energy and steel industry), we are proposing a reduction of between 16.1 and 18.9 per cent of our projected emissions for 2020. In agriculture and cattle raising for example, the estimated emission reduction reaches 6.1 per cent, a rate that should be achieved by actions such as the recovery of pastures and the integration between plantation and cattle raising. The commitment Brazil will present at COP15 is not only a commitment from the government, but from the Brazilian population as a whole – everybody and every sector must be involved in reducing greenhouse gas emissions.

The measures listed in our proposal are viable because we are going to intensify programs that have been on course for several years. We have a vigorous ethanol biofuel production program whose balance of carbon emissions is close to zero; we produce clean electric energy, thanks to our hydroelectric power plants; and we have significant results in the reduction of deforestation, as well as significant agricultural technology. We are about to close to a deal with the steel sector that will ensure that the charcoal used to produce "green steel" comes solely from reforested areas, without cutting native trees. In connection with repressive policies that reduced deforestation in the Amazon region, we have created the Green Arc Operation, which has begun to lead sustainable development alternatives to predatory activities in forests. In 43 municipalities where deforestation rates are higher, we have offered services from 22 public bodies, in order to supply alternative employment for those who earn their living from logging. Medium-term results will provide sustainability and security to meet our objective of reducing deforestation.

WHAT NEXT FOR BRAZIL?

Brazil has a legal framework, the National Program on Climate Change, which was submitted to Congress by the Executive, has already been approved by the Lower Chamber of Congress and will soon be approved by the Senate. Along with the National Program on Climate Change, we are initiating a new fund supported by part of the profits from the Brazilian oil sector, which will be spent exclusively on actions to reduce emissions and for adaptation to climate change. The fund, which will inject about $800 million per year into actions to fight climate change, is the first of its kind.

A few years ago, Brazil was seen as part of the problem; today we are recognised worldwide as a key part of the solution. The United States and China, which generate half of all CO_2 emissions in the plane int, cannot postpone their decisions. It is not acceptable that richer countries allocate fewer resources for the Global Fund than those they made available for their financial system during the recent economic crisis. We cannot frustrate the world population, whose eyes and hopes are in Copenhagen. We want to be part of a global solution, involving at least the major economies of the planet, rich and emerging countries, which could provide, from now, a major contribution to effectively avoid the ecological disaster that is approaching. We are optimistic. We still have time to rewrite the environmental history of the world, in a unified and sustainable way, with the participation of all. But we can no longer delay the definition of our common strategy for growth stimulus measures towards a global low carbon economy. For the sake of the planet and for the sake of life!

Author

Carlos Minc was one of the founding members of the Green Party. He was elected Member state for the first time in 1986, in coalition with the Workers' Party. As a new member of the Workers' Party, and was re-elected in 1994, 1998, 2002, and 2006. On November, 2006, Sérgio Cabral Filho, elected governor of the state of Rio de Janeiro, appointed Minc to the post of secretary of environment. Minc replaced him on May 14, 2008.

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Our flag for sustainability carries the white from the stars, the blue from the sky, the yellow from the sun, and the green from the plastic.

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Cemig, the world's most sustainable utility company,
is included for the 10th consecutive year in the Dow Jones Sustainability Index – DJSI.

10 principles that led Cemig to 10 years at the DJSI:

1 Financial strength
2 Strategic management
3 Commitment to clients
4 Profitable investments
5 Technological innovation
6 Commitment to stakeholders
7 Dedication towards the environment
8 Focus on renewables
9 Care for human capital
10 Social responsibility

This year, Cemig accomplished what no other Latin America energy company could and was selected as the World Utilities Leader in Sustainability within the Dow Jones Sustainability World Index – the "DJSI World". Cemig has been in the Index for 10 consecutive years.

Leading 55 companies and 11 consortia that focus on electricity generation, transmission and distribution, gas distribution and telecoms, Cemig is one of the most solid energy groups in Brazil, with over 118,000 shareholders in 46 countries, and trading at the New York, Madrid and São Paulo's stock exchanges.

Cemig's success derives from following these values – added to its strategic focus on profitability and preserving the interests of investors and society –, which have earned the Company recognition and admiration in Brazil and worldwide.

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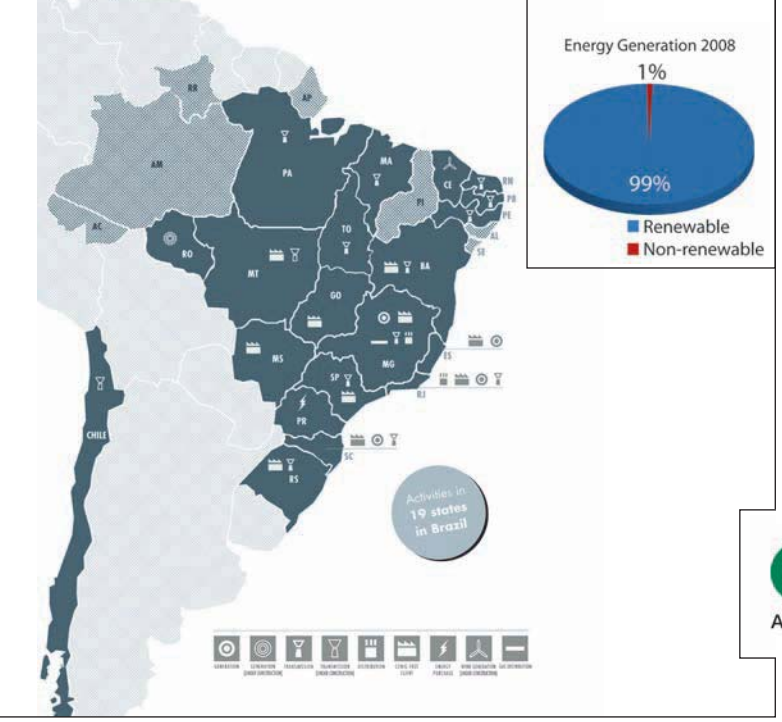

Clean energy initiatives

CEMIG
A Melhor Energia do Brasil.

Active in the market for 56 years, Cemig is one of the largest and most important electric energy utilities in Brazil. Leading a conglomerate of 55 companies and 11 consortia, Cemig manages an asset portfolio comprising initiatives in the generation, transmission and distribution of electric energy, besides the distribution of natural gas and data transmission.

Cemig is the largest electric energy distributor in Brazil – Market share: 12 per cent, and the third largest electric energy generation and transmission group – Market share: 7 per cent and 19 per cent, respectively. The long-term goal is to attain a 20 per cent market share in the power sector. Cemig shares are traded on stock markets in Brazil, New York and Madrid.
Cemig differentiates itself in the electric energy market as it supplies energy with low levels of carbon emissions. The generation of electric energy at Cemig depends on the utilisation of minimal fossil fuels, as in its majority the energy is provided by hydroelectric power plants.
In 2008, 99 per cent of the electric energy generated originated from renewable energy sources: 98 per cent from hydroelectric power plants and one per cent from wind energy and cogeneration plants. The total amount of CO_2 emissions represented 207,657 tons with an emission intensity level of 6.20 $kgCO_2$ eq/MWh.

INVESTMENTS IN SUSTAINABLE ENERGY

Solar energy
Cemig has installed many photovoltaic systems in residences located in remote regions of the State and the Company has installed solar water heating systems, in housing projects, which have allowed for remarkable reductions in electric energy consumption and improved efficiency in the use of energy.

Wind energy
Cemig was the very first Brazilian electric energy utility to operate wind farms, starting with the construction of the Morro do Camelinho Wind Power Plant in 1994. Just recently, the Company acquired a 49 per cent equity stake in three Energimp S.A. Wind farms, which are installed with an energy generation capacity of 99.6 MW in the State of Ceará – Brazil.

Co-generation
The Barreiro and Ipatinga are thermal plants which have co-generation projects using furnace gases, tar and other waste gases generated in industrial processes, in partnership with two integrated steel companies: Usiminas and Vallourec&Mannesman. These plants use gases from industrial processes to generate electricity and steam.
Cemig is also prospecting partnerships with the sugar and alcohol industry to put in place co-generation systems using sugarcane biomass.

Energy efficiency
Through initiatives undertaken by the energy efficiency programmes developed by Cemig in 2008, the energy consumption was reduced by 56,278 MWh/year and the GHG gas emissions were reduced by 2,723 ton CO_2 eq. Of note among other projects is Project Conviver, which began in 2006 and is aimed at teaching energy efficiency actions to low income clients. Within this project 2,000 refrigerators and 2,000 electric-shower heat recuperating kits were donated to low-income communities located in the Greater Metropolitan Belo Horizonte Area.
Other projects undertake the replacement and modernisation of public lighting in municipalities, and they have, since 2001, replaced 215,000 public lighting fixtures in 290 different municipalities.
The service company Efficientia S.A. operates in the field of energy solutions, undertaking energy efficiency projects in industrial facilities, public entities and companies. In 2008, these projects enabled energy savings on the order of 40,000 MWh/year and a reduction in emissions of approximately 2,000 tonnes CO_2 eq.

Research into alternative sources
The research projects include: production of biodiesel; production of electricity from urban garbage and planted forest products; technologies for producing gas from biomass; hydrogen and fuel cell technology.

The electric vehicle
Cemig is testing electric vehicle prototypes in its automobile fleet. The goal is to assess the operational and maintenance qualities of this domestic technology.

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Energy efficiency is essential for the survival of future generations.

Geoenergi AS –

"PUTTING ENVIRONMENT FIRST" IT IS ABOUT OUR CHILDREN!

Geoenergi AS, from Norway, is among Europe's leading companies in the commercial utilisation of energy from the ground (geoenergy) and from the sea. The company and its partners have demonstrated unique technologies to tackle both environmental and economical issues using a heat pump.

By exploiting energy saved in the bedrock or sea, huge quantities of energy can be utilised for both heating & cooling. Geoenergy as a solution is often overlooked in international debates, but has been scientifically proven to be emission free. Geoenergy solutions do not consume anything other than the energy generated from nature itself and has the capability to produce between three and six kilowatts out of one kilowatt purchased from an electricity supplier. From an economical perspective, it is equivalent to an unstoppable cash machine.

Geoenergi pump ground water at a low temperature and circulate it to the ventilation system in the building to cool it. The only energy required for this cooling system is a pump. Additionally, the heat taken out of the building is put back into the ground, maintaining the balance of energy. The heat pump will start up in the autumn using re-heated ground water to produce heat at low cost. And the loop is complete!

When a building is heated by electricity alone, the units you use are the units you pay for. If however, you use geoenergy and a heat pump, those same units can produce up to six times as much energy, while oil burners operate at only 0.6 usable units from one purchased unit of energy. Authorities all over the world seem to be overlooking the opportunity geoenergy offers. While private organisations and individuals are attracted by the potential for cost reductions, governments are often not as careful with public funds.

HOW TO MAKEUP TO SIX KILOWATT-HOURS OUT OF ONE?

There are no comparable alternatives to this solution. Bedrock can be looked upon as a sort of rechargeable battery. Geoenergy systems should never extract more energy than replaced and vice versa. Heating and cooling energy from the sea will follow similar principles.

Systems designed in this fashion are practically unlimited regarding capacity.

References	Papirbredden	Avantor	Kvartal 10
Heated/cooled	20,000 m^2	200,000 m^2	36,000 m^2
Power	650 kW	9,5 MW	600 kW
Cooling	1 MW	7 MW	350 kW
Heating output	750,000 kWh	15 GWh	1,8 GWh
Cooling output	820,000 kWh	10 GWh	350,000 kWh
Annual saving	710,000 kWh	1.2 GWh	–
Pay back	4.7 years	4.5 years	4.1 years

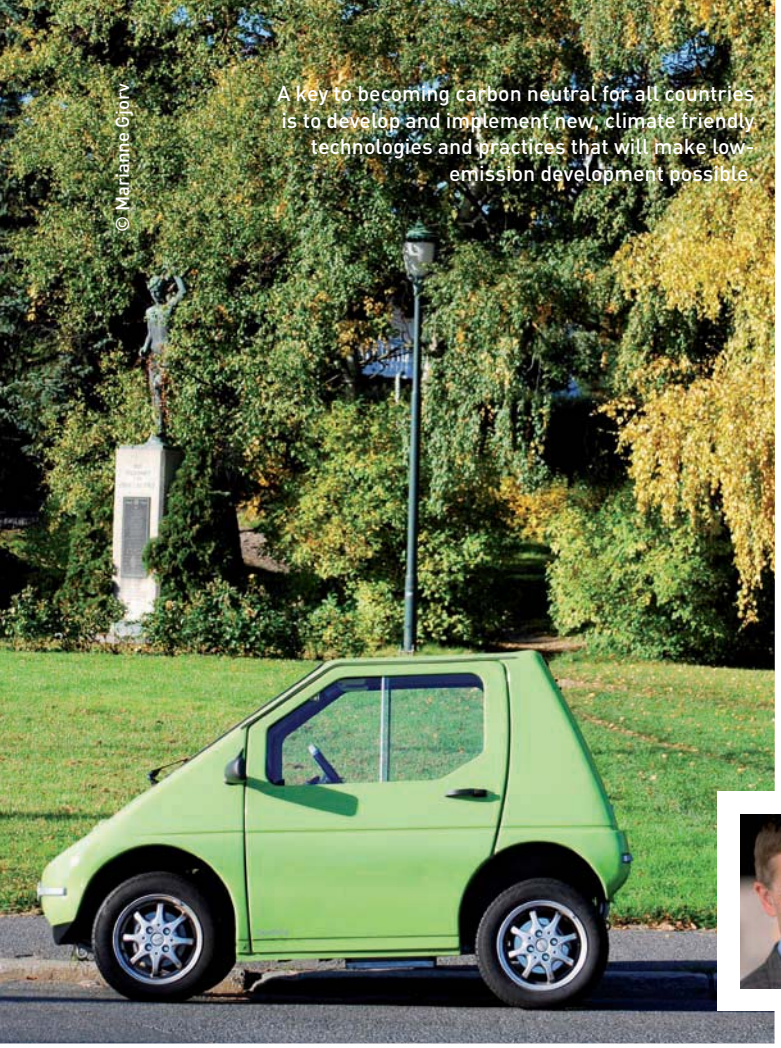
The solution is flexible, versatile and robust. With proper maintenance, the operating time will be 15 to 25 years or more. Overall energy savings vary between 50–80 per cent as compared with traditional heating/cooling systems, with an additional investment in excess of 60 per cent. Payback time is therefore between three to eight years.

Geoenergi's customers comprise private and public real estate owners, consultants, contractors and architects who are offered support to pave the way for environment friendly and cost-effective energy solutions.

We proudly mention our partners and preferred suppliers:

- **EM Teknikk**: HVAC consultants, engineering. Website: www.emteknikk.no
- **Geoclima Italy**: Air conditioning, chillers and heat pumps. Website: www.geoclima.com
- **Green Business Norway**: Member-driven organisation, providing an industrial platform for development and inetrnationalisation of cleantech opportunities. Website: www.greenbusiness.no
- **Bygg-Automasjon**: Automation, control, recording and web-reporting. Websites: www.bygg-automasjon.no and www.trend-controls.com
- **Geoenergi**: Website: www.geoenergi.no

Enquiries
www.geoenergi.no


© Marianne Gjorv

A key to becoming carbon neutral for all countries, is to develop and implement new, climate friendly technologies and practices that will make low-emission development possible.

The principle of carbon neutrality

ERIK SOLHEIM
MINISTER OF THE ENVIRONMENT AND INTERNATIONAL DEVELOPMENT, NORWAY

Becoming carbon neutral means that our emissions of greenhouse gases are balanced by the amount that we reduce or offset globally. The principle of carbon neutrality underpins the ambitious Norwegian climate policy, and will contribute to the total reduction of greenhouse gas emissions. In addition to Norway, Costa Rica, New Zealand, Iceland and Monaco have pledged to become carbon neutral. This article sets out to challenge other developed countries to join Norway in using this principle as a basis for their national climate policy. The goal of carbon neutrality can effectively steer our transition to a low emission world.

Global warming caused by human activity threatens human life and biodiversity on a scale we have never experienced before, and will lead to increased poverty for millions of people and a rise in the number of armed conflicts if nothing is done. Dealing with global warming requires international cooperation and solidarity like never before.

I believe that the increase in global mean temperature should not exceed two degrees in order to avoid the most serious damage to the climate. According to the Intergovernmental Panel on Climate Change (IPCC), this means that global emissions have to be reduced by 50-85 per cent from 2000 to 2050, most likely as much as 85 per cent, and to peak no later than 2015.

We know that this means deep cuts in emissions in the short term, and in practice almost zero emissions in the longer term. Norway intends to be carbon neutral by 2030. This does not mean that all Norwegians have to park their cars and stop travelling by air, or that all Norwegian industry has to close its production. But Norway, like all other countries, must strive to transform into to a low-emission society. Changes must take place, and they must be done in a smart manner.

Greenhouse gases have the same effect on global warming regardless of where they are emitted. We know that early action is essential in order to have a peak in emissions by 2015. It therefore makes sense to make emission cuts where they can be undertaken most easily and quickly first. While Norway has scope for early domestic action, the potential is much greater when we look at the world at large.

Norway's efforts to become carbon neutral will therefore include both domestic action to reduce emissions as well as financing emission reductions elsewhere, in developing countries. This will be a cost effective way of cutting global emissions early and a contribution to green economic growth in developing countries.

Developed countries like Norway must take the lead in emissions reductions. We have the economic resources and the technological expertise to undertake both substantial emission cuts at home, and to fund emission reductions in developing countries and emerging economies.

Historically, we have seen close links between levels of greenhouse gas emissions and economic growth. To be able to meet the needs of the poor populations of the world without ruining our common climate, this link must be broken once and for all. The good news is that this seems to be possible – countries and enterprises regularly show evidence of sustaining growth and improving welfare, without rising emissions.

A key to becoming carbon neutral for all countries is to develop and implement new, climate friendly technologies and practices that will make low-emission development

Ensuring reliable supplies of affordable and climate friendly energy must be part of any solution.

possible. All such technologies will become increasingly attractive as the price of emissions starts to rise.

What we do in the energy sector will be decisive with respect to climate change. The use of fossil fuels for energy production dominates the world's emissions, and access to energy is key to increasing the welfare and standard of living for millions of poor people across the globe. Ensuring reliable supplies of affordable and climate friendly energy must be part of the solution.

Many climate friendly technologies already exist, but are too expensive for ordinary people or for investment decisions in industry. Meanwhile, prices will not fall before demand rises. Market interventions are therefore needed to make climate friendly technology cheaper and emission intensive technology and activities more expensive. Establishing a global emissions trading system, where a global carbon price will emerge should be a clear long-term goal.

Norway has a fairly long history of pricing carbon. It introduced a CO_2 tax in the petroleum sector as early as 1991. The emissions trading scheme and the CO_2 tax regime cover above 70 per cent of our emissions. Without the CO_2 tax and other political efforts, our emissions would have been about 20 per cent higher than they are today.

Many developing countries lack the resources or incentives for introducing climate friendly technologies. Developed countries must contribute in an efficient manner, to enable developing countries to follow a more environmentally friendly path of growth than the one we have followed since the industrial revolution.

By paying for emission reductions in developing countries, developed countries not only improve the balance of their own climate accounts, they also facilitate transfers of technology and capital. Such systems also increase awareness and understanding of clean technologies, emissions trading and the importance of mitigating climate change in countries that do not have quantitative emission reduction targets.

Norway aims to become carbon neutral by 2030. By this time, and towards 2050, we hope that a lot more countries have become or are striving to become, carbon neutral. In the longer run, we all need to make a transition to a low emission world. In reality, there is a global cap on greenhouse gas emissions from all. Broad participation in a global carbon market will give a basis for faster development and diffusion of the best technologies and solutions to become carbon neutral.

CARBON CAPTURE AND STORAGE

One of the reasons behind the Government's decision to balance all domestic emissions by 2030 with global reductions is the fact that we are currently one of the world's largest exporters of these fossil fuels, which produce greenhouse gas emissions wherever they are used. Export of oil and gas is the backbone of Norway's economy. As a result of the early implementation of a carbon tax, the Norwegian oil and gas production is one of the world's most efficient.

It is crucial that the future climate regime creates a framework that welcomes, promotes and provides incentives for research, innovation and implementation of all technologies that contribute to reducing emissions. This requires increased efforts on renewable energy and energy efficiency.

However, increased efficiency is not enough to become carbon neutral. In the short and medium term, fossil fuels will still be used to a large extent. We must therefore meet the challenge of securing a sustainable future energy supply by reducing emissions from the continued production and use of fossil fuels.

Carbon capture and storage is one of the most promising technologies to achieve this.

This technology will complement other climate change mitigation actions by reducing emissions from use of fossil fuels, including coal, during the transition to a low-carbon economy. I see carbon capture and storage as an integrated part of a strategy for carbon neutrality.

Since 1996, Norway has gained extensive experience in storing CO_2 in geological structures. Monitoring data show the precise subsurface location of the CO_2 plume and confirms that the CO_2 is confined securely within the storage reservoir.

The Norwegian Government cooperates with industry on realising carbon capture and storage at two gas fired power plants and will contribute financially to these projects. In addition, the European CO_2 Technology Centre Mongstad will test, verify and demonstrate different concepts and technologies capable of reducing costs and risks related to carbon capture and storage.

There are still challenges in making these technologies commercially viable on a global scale. At the same time, there are emissions that can be easily captured and stored if financial and other conditions are in place. We need to develop mechanisms to meet these challenges. To mobilise the financial resources needed to enable and disseminate such climate friendly technologies, we must create a framework that creates appropriate incentives for investments in both developed and developing countries.

REDUCED EMISSIONS FROM DEFORESTATION

Globally, halting emissions from deforestation and forest degradation is particularly important because this can have a significant effect on global emissions within a short period of time. The mighty rain forests in developing countries are important sinks and storage places for carbon, and thus tropical forests can be the key to restrict global warming.

Today, emissions from deforestation and forest degradation in developing countries amount to about 17 per cent of the global greenhouse gas emissions. Efforts to reduce these emissions must be additional to and not replace efforts by developed countries to reduce their emissions.

In order to promote early action on reduced emissions from deforestation, Norway has launched a comprehensive Forest and Climate Initiative. The annual budget is about three billion NOK (500 million USD).

Nevertheless, forests are more than carbon. Forests are the home of unique and often rare animals, trees and flowers, and the home of millions of people using the resources to earn a living.

A global mechanism for reduced deforestation therefore should also promote sustainable forest management, contribute to the protection of biodiversity and secure the rights, involvement and livelihood of local communities and indigenous peoples.

The main focus must be on deforestation and forest degradation due to the high rate of emissions from

these activities. However, Norway supports a future regime that also promotes incentives for conservation, stock enhancement and sustainable management of existing forests. Such a broad scope will reduce the risk of carbon leakage within countries.

There are large differences between countries with regard to capacity for monitoring and reporting, institutional arrangements and governance. A differentiated use of incentives and policy approaches between countries would therefore be necessary. A combination of market and fund based mechanisms will be the best way to respond to such differences.

Crediting of reduced emissions should only take place after reliable national systems for monitoring, reporting and verification have been established. We need national approaches in order to reduce the risk of carbon leakage within the country. International leakage will only be fully addressed through global participation.

FINANCIAL RESOURCES

In addition to emissions reductions there is one major issue facing us, and that is the provision of the necessary financial resources. In order to finance sustainable use and conservation of rain forest, technological transfer and adaptation to climate changes in the poor countries, we need to establish a coherent financial mechanism.

Norway has proposed to establish a new and innovative mechanism to generate the necessary means to finance climate needs; a mechanism that is predictable and independent of annual national budget decisions. I believe that the best source for supplying sufficient resources is the carbon market. Therefore, Norway has made a proposal that a certain percentage or amount of the allowances in the global carbon market should be auctioned. A lot of this money should be earmarked for adaptation in poor countries.

The Norwegian proposal is meant as an invitation to a dialogue on how we can move forwards, and can be combined with other financial mechanisms.

If two per cent is used to determine the amount to be auctioned, the annual income is estimated to be 20-30 billion dollars. This figure is based on assumptions that all developed countries take on quantified economy-wide commitments corresponding to the lowest emission scenarios of the IPCC, including a 2° centigrade scenario. Holding back a share of allowances from distribution implies a cost for countries with emissions covered by international emission trading. Indirectly, countries with large emissions will contribute more than countries with more limited emissions. Our proposal thus differentiates between developed countries in accordance with the polluter pays principle.

Ensuring adequate, predictable and sustainable financial resources for developing countries should be a cornerstone in a new deal on climate change. Our proposal has the potential of meeting these requirements under the premise that existing financial contributions from parties are not reduced proportionally.

Most important of all is to achieve a new, global climate treaty that is broad, ambitious, fair, and cost effective. The main challenge is to bridge the gap between the rich and the poor world, and the rich countries must take a leading role. Offsetting all domestic emissions by 2030 is one of Norway's contributions to this end.

© Nils Hermann Ranum

In order to promote early action on reduced emissions from deforestation in developing countries, Norway has launched a comprehensive Forest and Climate Initiative.

Author

Erik Solheim, born 18th of January 1955 in Oslo, is current Minister of the Environment and International Development. As Minister of the Environment, he is responsible for Norway's national and international climate policy and head of the Norwegian delegation at the high level segments of the Conference of the Parties to the UNFCCC. Mr Solheim is an experienced politician both nationally and internationally. Before being appointed Minister in 2005, Solheim served as special advisor to the Norwegian Ministry of Foreign Affairs in the peace process in Sri Lanka. Mr Solheim has been a long-standing member of the Norwegian parliament, representing the Socialist Left Party. He was the leader of the Party from 1987 to 1997. Solheim holds a degree in history and political studies from the University of Oslo.

Organisation

The Ministry of the Environment has a particular responsibility for carrying out the environmental policies of the Government. In addition to initiating, developing and carrying out its own measures through its own instruments, the Ministry of the Environment has an important role in influencing sectoral Ministries at the national level. The Ministry is responsible for coordinating the environmental policy objectives of the Government, and ensuring follow-up and monitoring results of environmental policies.

International cooperation is indispensable in order to meet the regional and global environmental challenges. The environmental administration contributes in a number of arenas in order to ensure that international cooperation at all levels is expanded and strengthened.

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The challenge of the century

Combating climate change must be viewed as the defining challenge of the 21st century.

We maintain that automated recycling and waste management solutions have to be a key component in the global effort to combat climate change.

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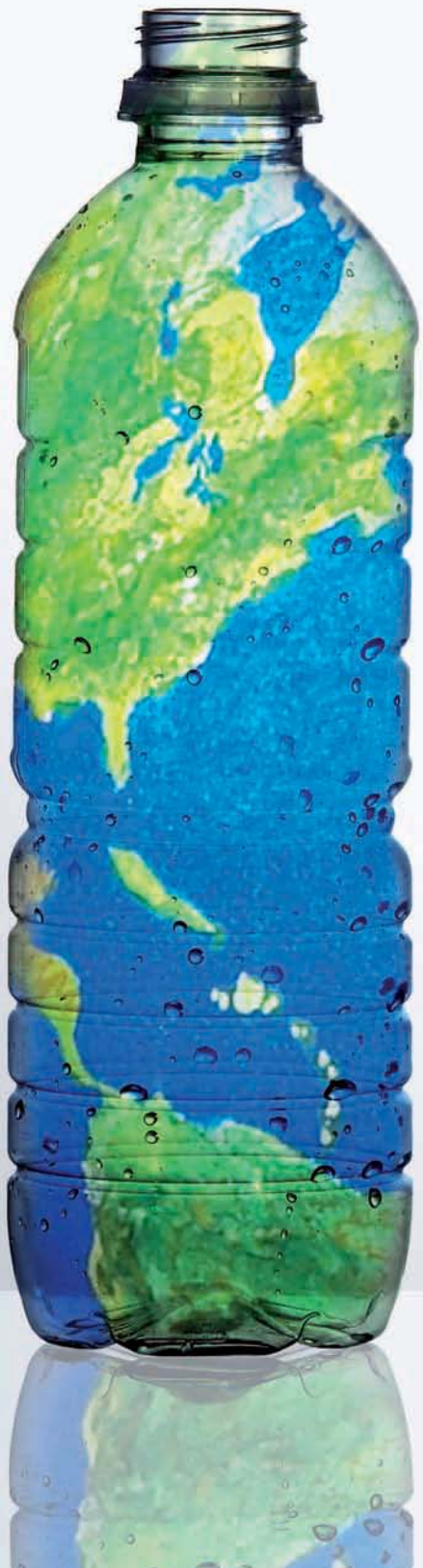
Each year the advanced material recognition, sorting and processing solutions provided by TOMRA help to efficiently recover tens of billions of waste items and avoid approximately 10 million metric tons of CO_2 emissions. This savings represents about 20% of the total emissions of Norway, the country in which TOMRA is headquartered.



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Without decisive action, there will be an increase in water shortages, heat stress and floods.

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Copenhagen – from planet to people and policy

ROBERT T. WATSON
CHIEF SCIENTIFIC ADVISER, DEFRA

The past three decades have seen the scientific community significantly increase our understanding of human-induced climate change. The situation today is simple. We know that our current energy and agricultural practices, while providing cost-effective energy, food and fibre, are degrading the environment, not only locally, but also regionally and globally. The scientific evidence is overwhelming and the world's policy-makers, when they meet in Copenhagen in December 2009, have a clear need to take action to limit change – and to prepare for the change that we cannot now avoid.

We know that continuing on our current trajectory of carbon emissions will have far-reaching and potentially devastating consequences. In the UK, we recently launched the UK Climate Projections 2009. Based on Meteorological Office science, these projections illustrate the extent of the changes the UK might face in the absence of global action to cut emissions: warmer and wetter winters; hotter and drier summers; increased risk of coastal erosion; and more severe weather.

UK PROJECTIONS

Across the UK, the Projections show a range of climate changes up until the end of the century based on three possible greenhouse gas emissions pathways – high, medium and low. Broadly speaking, the world's emissions are currently equivalent to the medium pathway, although there is a risk we could still be heading for the high scenario. While we cannot be absolutely certain what will happen in the future, these projections – for the first time – show the probabilities of potential climatic changes for the UK.

The Projections show us a future that we must avoid. The medium emissions scenario shows that within the lifetimes of our children and grandchildren – by the 2080s – in the UK, we could be faced with an increase in average summer temperatures of between two and six degrees Celsius in the south-east with a central estimate of four degrees; a 22 per cent decrease in average summer rainfall in the south-east – which is already water stressed; an increase of 16 per cent in average winter rainfall in the north-west, with increases in the amount of rain on the wettest days leading to a higher risk of flooding; and a sea-level rise of 36 centimetres. Temperatures would rise even more under a high emissions scenario and could be up to 12 degrees Celsius warmer on the hottest summer days, with peak summer temperatures in London regularly hitting over 40 degrees.

> **"Without decisive action, there will be an increase in water shortages, heat stress and floods"**

These findings are sobering. Without decisive action, there will be an increase in water shortages, heat stress and floods. All of these would have a severe impact on people's health and quality of life, the economy and the natural environment.

VISIT: WWW.CLIMATEACTIONPROGRAMME.ORG

At the same time the Projections show that some climate change is now inevitable whatever we do. Past emissions are likely to make summers over two degrees hotter in southern England by the 2040s (compared with the 1961–1990 average). It is therefore vital that we plan and prepare for those changes alongside international action to reduce global emissions. Even at a two degree global temperature increase we will need to adapt the way we live and work – for example the 2003 heatwave saw average daily temperatures of two degrees above average, and caused 35,000 deaths across northern Europe.

THE GLOBAL PICTURE

Globally, the picture could be much more serious. We already know that, unjustly, the effects of climate change will be most strongly felt in the countries that are already the poorest. And a double blow comes with this – being poor also means that these countries will be less able to adapt and will, as a result, face a greater risk of violent conflict as they compete for increasingly limited resources. This could have a destabilising effect on parts of the world such as some of the currently peaceful parts of the Middle East, for instance, where five per cent of the world's population now lives on one per cent of the world's water. In Egypt, a small sea level rise that is well within current predictions could displace two million people from the Nile delta and destroy Egypt's agricultural heartland. While conflicts about resources are not new, climate change adds a new factor that could contribute to a disastrous downwards spiral for some of the poorest and worst-hit countries.

> **"We need a strong deal in Copenhagen to restrict global temperature rises to below the projections of our current path"**

Mitigating climate change will take a concerted global effort to design and implement new policies and to develop and adopt new technologies aimed at reducing greenhouse gas (GHG) emissions so that the costly or even irreversible consequences for human well-being may be avoided. Mitigation of GHG emissions must be seen as prudent investment. Significant reductions in net GHG emissions are technically feasible due to an existing array of technologies and practices in energy supply and demand, waste and land management, and industrial sectors. Individuals will be key to making the difference too, and schemes, such as the cross government Act on CO_2 campaign, which aims to highlight how individuals can act to make a difference, helping them save money while they save energy and reduce their CO_2 emissions, will be vital.

The message is clear then. We know enough to act. Any remaining scientific uncertainties and lack of complete knowledge are not reasons for inaction. Science will help us to further our scientific and technical knowledge to ensure that the most effective policies, practices and technologies are developed for an economically, environmentally and socially sustainable world. But to avoid these dangerous levels of climatic change in the second half of this century, there is an urgent need for the international community to develop a long-term global equitable regulatory framework, with differentiated responsibilities, and intermediate targets, coupled with market-based mechanisms to achieve reductions in the most cost-efficient manner and that simultaneously promotes sustainable development in developing countries. More specifically, as the UK government has outlined in their Copenhagen Manifesto, we need a strong deal in Copenhagen to restrict global temperature rises to below the projections of our current path, to less than two degrees (above pre-industrial levels). Science has provided the evidence. It's now down to the policy-makers to provide the leadership and action.

Author

Professor Robert T Watson is Chief Scientific Adviser, Defra. Watson's career has evolved from research scientist at the Jet Propulsion Laboratory: California Institute of Technology, to a US Federal Government program manager/director at the National Aeronautics and Space Administration (NASA), to a scientific/policy advisor in the US Office of Science and Technology Policy (OSTP), White House, to a Scientific Advisor, Manager and Chief Scientist at the World Bank, to a Chair of Environmental Sciences at the University of East Anglia, the Director for Strategic Direction for the Tyndall centre, and Chief Scientific Advisor to the UK Department of Environment, Food and Rural Affairs. In parallel to his formal positions he has chaired, co-chaired or directed international scientific, technical and economic assessments of stratospheric ozone depletion, biodiversity/ecosystems (the GBA and MA), climate change (IPCC) and agricultural S&T (IAASTD).

Organisation

The Department for Environment, Food and Rural Affairs (Defra) is a UK Government Department. The overarching challenge for Defra is to secure a healthy environment in which we and future generations can prosper. As we build a low-carbon, resource efficient economy, Defra helps people to adapt to changes, deals with environmental risks and makes the most of the opportunity we have to secure a sustainable society and a healthy environment.

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Green recovery policies:

BENEFITTING THE CLIMATE AND THE ECONOMY

Germany as a major industrialised country and the world's export leader has successfully decoupled continuous economic growth and greenhouse gas emissions.

SIGMAR GABRIEL, FORMER FEDERAL MINISTER FOR THE ENVIRONMENT, NATURE CONSERVATION AND NUCLEAR SAFETY, GERMANY

As our new century begins, we face crucial challenges to humanity: climate change is advancing in strides; the global appetite for energy is continuously growing; and the financial crisis and its aftermath are drawing more and more people into their wake. Climate policies will play a pivotal role in how we overcome those challenges. Investing in climate protection is a sustainable programme for growth and, in the light of the current economic situation, it is indispensable. With an ambitious strategy for climate protection, industrialised countries such as Germany can achieve their greenhouse gas (GHG) reduction targets, dramatically reduce their dependence on energy imports, and provide a powerful boost to the economy.

CLIMATE CHANGE IS HERE

Climate change is a reality. Observations from all continents of the Earth are providing an increasingly precise picture of dramatic change. Global temperatures have increased by 0.8 degrees Celsius since the beginning of industrialisation. Sea levels rose twice as much in the period 1993 to 2003 than in the three previous decades. Icebergs and glaciers are melting at a record pace and permafrosts that have been stable for centuries are thawing.

All the signs point to the anthropogenic greenhouse effect as the main cause of climate change. The Intergovernmental Panel on Climate Change (IPCC) substantiated this at the beginning of 2007 with an abundance of scientific data. And it warns us that the speed of global warming has increased – it is advancing even more rapidly than previously assumed. Mankind only has 10 to 15 years to prevent the worst impacts and to respond adequately to this huge challenge. This means we have a responsibility to act. If climate change remains unchecked, by the year 2100 the global temperature could increase by six degrees – with disastrous consequences.

Germany's goal is therefore to limit the global temperature rise to two degrees. Climatologists believe that this represents a just-about manageable level.

The good news is that we have the means, the technology and the political instruments to keep climate change at a manageable level. We have to set common targets for reducing CO_2 in a clearly defined timeframe and we have to continuously review whether these targets are actually being met or whether our CO_2 emissions are in fact rising rather than falling.

INACTION IS NOT AFFORDABLE

The question is no longer whether or not we can afford climate *policy*. The question is actually: can we afford climate *change*? As Sir Nicholas Stern, former chief economist of the World Bank, clearly calculated in his economic review, neglected climate protection could quickly lead to devastating consequences. He placed the global costs of climate change at an annual five to 20 per cent of the gross world product. The scale of the economic damage would therefore be greater

than the impacts of both world wars and the Great Depression combined.
In relation to this massive damage potential, effective climate protection – and this is the second piece of good news – is much cheaper. According to Stern's review, the costs of climate protection equal only one per cent of the gross world product while the EU Commission estimates 0.5 per cent between 2013 and 2030.

GERMAN CLIMATE PROTECTION PHILOSOPHY

Germany is a pioneer in climate protection. In the framework of the Kyoto Protocol, between 2008 and 2012 greenhouse gas emissions in Germany will be reduced by 21 per cent below their 1990 level. As a 2020 target, Germany will go further and achieve 10 percentage points more than Europe: Germany aims to reduce its emissions by 40 per cent by 2020.

> "Moving away from coal, oil and gas towards solar power, wind power, biomass and efficiency – that is the motto for the future"

Implementing European and national climate protection targets up to and beyond 2020 requires nothing less than the fundamental modernisation of our industrial society. It is a question of a third industrial revolution: we must organise the transition from the old, fossil-based energy industry with a high energy consumption to a modern, low-carbon society based on renewable energies and high energy efficiency. Moving away from coal, oil and gas towards solar power, wind power, biomass and efficiency – that is the motto for the future. Economic growth must be decoupled from the emission of greenhouse gases. For this, we need state-of-the-art technology, clearly defined measures and targets and binding timeframes. Accelerating technological progress and the development and dissemination of sustainable technologies is an important component of our climate protection strategy. However, we will not be able to stop climate change through the promotion of technological progress alone.

SETTING THE FRAMEWORK

The role of the federal government is to lead the way in setting the frameworks for climate policy. We cannot rely on appeals, voluntary agreements or pure research funding to trigger the necessary innovations and modernisation drive in energy supply, transport and building remediation. We have to create economic incentives and use regulatory law. Success will only be achieved through a combination of clear regulatory and fiscal measures, support programmes and intelligent economic instruments such as emissions trading. In addition to this, we need independent monitoring which enables strategies to be reassessed. Every year in Germany, a balance of greenhouse gas emissions is drawn up, the success of measures is evaluated and new measures are taken if necessary. Climate policy is able to 'learn' and react appropriately to the needs of the economy.
However, the basic prerequisite is that environmental policy must no longer be perceived as a hindrance for the economy. These days the best economic policy is a smart environmental policy. Germany as a major industrialised country and the world's export leader has successfully decoupled continuous economic growth and greenhouse gas emissions. It combines the protection of the natural foundations of life, the efficient use of finite resources and the preservation of nature's regenerative capacity with the modernisation of the economy. It is a helper, an inspiration and a driving force for innovation.
Framework conditions which enable markets to develop their strength are our first choice. Where price signals from the market are not enough, we choose additional instruments.

BENEFITS FOR THE GERMAN ECONOMY

Its ambitious climate policy makes Germany fit and competitive for the future. Our approach is to increase energy efficiency and expand the use of renewable energies. These are the export technologies for the lead markets of the future and will generate employment and economic growth in Germany. An economy based on efficiency and renewables is less vulnerable when the oil price rises well above the 100 dollar per barrel mark. German companies are proving this time and time again – now more than ever.
Experts of the Fraunhofer Institute for Systems and Innovation Research and the Potsdam Institute for Climate Impact Research have calculated what a programme for reducing greenhouse gases by 40 per cent by 2020 compared to 1990 can mean for the economy. They based their study on the German 'Integrated Energy and Climate Programme' (IECP) and other national and European measures. The figures show that climate protection is good for growth and employment in Germany.

- In total, the measures will reduce energy imports by nearly €20 billion per year in 2020, and by €35 billion per year in 2030.
- The climate protection programme will raise net investments in Germany by over €30 billion per year. By 2030, average annual gross domestic product will be more than €50 billion higher than the reference case. Thus, in macroeconomic terms, the IECP and other measures will lead to more growth.
- By 2020 at least 500,000 additional jobs will be created in Germany; in 2030 it could be more than 800,000.
- In 2020 the specific avoidance costs of the -40 per cent climate protection strategy will be minus €40/t CO_2 as an overall average. That is to say, the climate programme has an economic benefit in the form of long-term cost relief of €40 per avoided tonne of CO_2.

Figure 1: Increases in investments (left) and reduction in energy imports (right), 2010 to 2030.

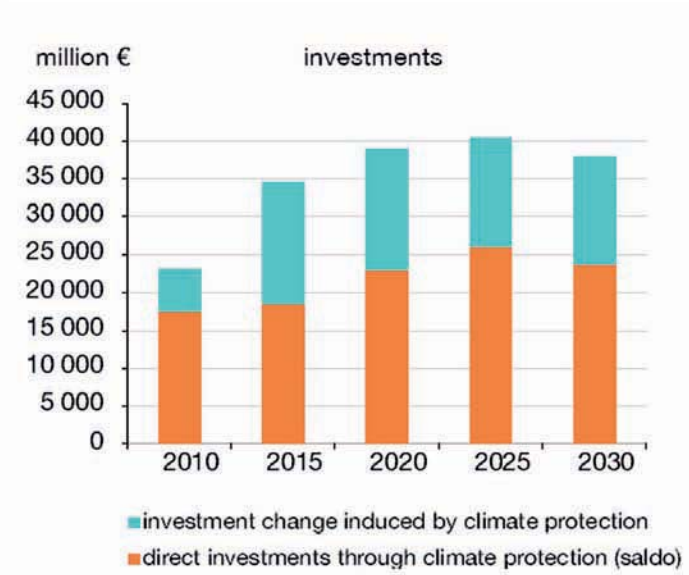


Figure 1a.

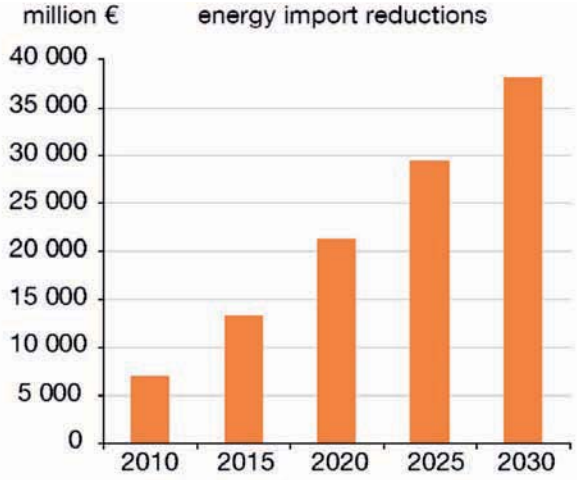


Figure 1b.

Source: Pl.K et al (2008): Investments into a Climate-Friendly Germany.

GLOBAL GREEN RECOVERY

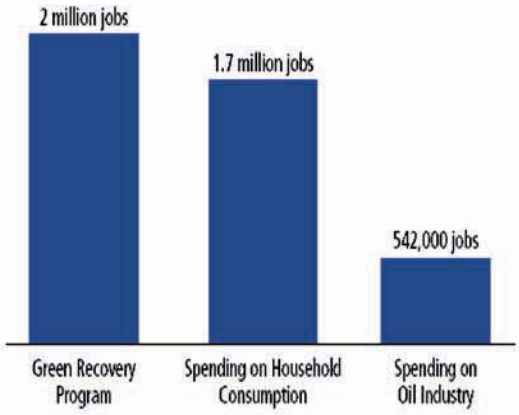
The current world economic crisis leads governments globally to introduce economic stimulus packages. These packages create massive, short-term investment flows, which will determine the global capital stock for the next decades. The intention of these stimulus packages is to create employment, strengthen domestic industries and increase domestic demand, overcome the current economic crisis, and lead economies on a sound and sustainable growth path.

At the same time, production and consumption patterns in all industrialised countries are heavily dependent on the availability of imported fossil fuels, the prices of which have proved highly volatile during the past decades and have led to a massive capital outflow to oil and gas exporters.

Investments in energy efficiency measures and renewable energies are an answer to both challenges. They:

- Strengthen domestic and employment-intensive sectors.

Figure 2: Spending in Energy Efficiency and Renewable Energies creates 4-8 times more jobs than spending on oil and gas.



Source: Centre for American Progress (2008): Green Recovery. A Programme to create good jobs and start building a low carbon society.

Figure 2a: Total job creation through $100 billion in spending (USA).

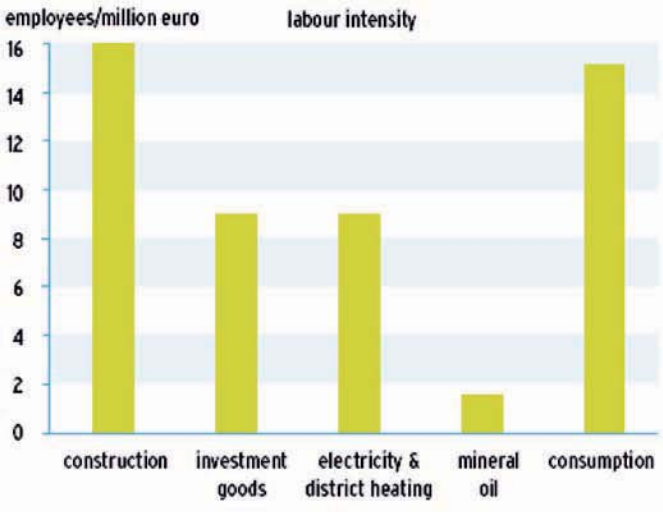


Figure 2b: Labour intensity levels of different value-added chains in Germany (cumulative direct and indirect effects).

Source: Pl.K et al (2008): Investments into a Climate-Friendly Germany.

- Reduce oil, gas and coal imports and leave more capital in the country.
- Develop skills for emerging market and enforce innovation in these sectors; and
- Lower carbon emissions and therefore protect the climate and domestic industries from costs resulting from ongoing climate change or a global carbon market.

The G20 have acknowledged this by agreeing on the summit in London, 2 April: "We agreed to make the best possible use of investment funded by fiscal stimulus programmes towards the goal of building a resilient, sustainable and green recovery...We will identify and work together to build sustainable economies."

> "Environmental policy must no longer be perceived as a hindrance for the economy"

Several studies have argued that at least 20-25 per cent of the fiscal stimuli packages should therefore be assigned to green measures. Building refurbishment, renewable energies (like wind, solar), smart metering and battery development are short-term measures with high job intensity and moderate-to-high long-term cost and CO_2 reduction, and are ideal strategies to answer both crises.

CONCLUSIONS

The world currently faces not only one, but several significant problems. Climate change is advancing much faster than we believed some years ago, and we only have very limited time left to drastically cut global greenhouse gas emissions. The global population is set to expand from 6.5 billion today to 9 billion in just 50 years. That will mean a huge increase in demand for finite resources, combined with the associated price rises and price fluctuations. Last but not least, the current financial and economic crisis is shaking the global economy to its very foundations.

If one is confronted with several small problems simultaneously, it may be wise to approach them one after the other. However, if several big problems arise at the same time, they need to be tackled together. This is the case for the climate and the economic crisis, and the situation we face today.

Therefore, we now should invest in the expansion of climate technologies in the field of renewable energies and energy efficiency. The reasons for this are clear:

- Instead of money being channelled into the increasingly expensive coal, oil and gas imports, it is being used for energy efficiency measures and renewables. This secures jobs and leads to sustainable economic growth.
- Efficiency measures, such as building modernisation or installing solar thermal systems, are labour-intensive. They create local jobs, e.g. in crafts and trades, thus generating employment.
- This policy establishes new, future-oriented industries. Renewable energies and efficiency technologies are now in demand throughout the world. The export demand is also adding to the number of new jobs.

Global climate policy should not be seen as an issue of burden sharing, but rather as an issue of intelligent economic policy that creates growth and employment.

Author

Sigmar Gabriel was the Federal Minister for the Environment, Nature Conservation and Nuclear Safety from 2007 to 2009. Previous to this he was the Chair of the SPD parliamentary group in the Landtag and the Minister-President of Lower Saxony.

Organisation

The German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, known by the initials BMU from the German name, Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, is a ministry of the German federal government. Its headquarters are in Bonn, with a branch in Berlin. The current minister of the environment is Norbert Röttgen, who assumed office on October 28, 2009. The ministry was established on June 6, 1986 in response to the Chernobyl disaster and formed from departments of the Ministries of the Interior, of Agriculture and of Health.

Enquiries

Website: www.bmu.de

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Set your targets high

THE SOLUTIONS ARE ALREADY PRESENT

Solar panels for recharging electrical cars used within the Tivoli Gardens in Copenhagen, Denmark.

ANDERS STOUGE
DIRECTOR, DANISH ENERGY INDUSTRIES FEDERATION,
COPENHAGEN, DENMARK

A BRIGHT GREEN STRATEGY IS NEEDED

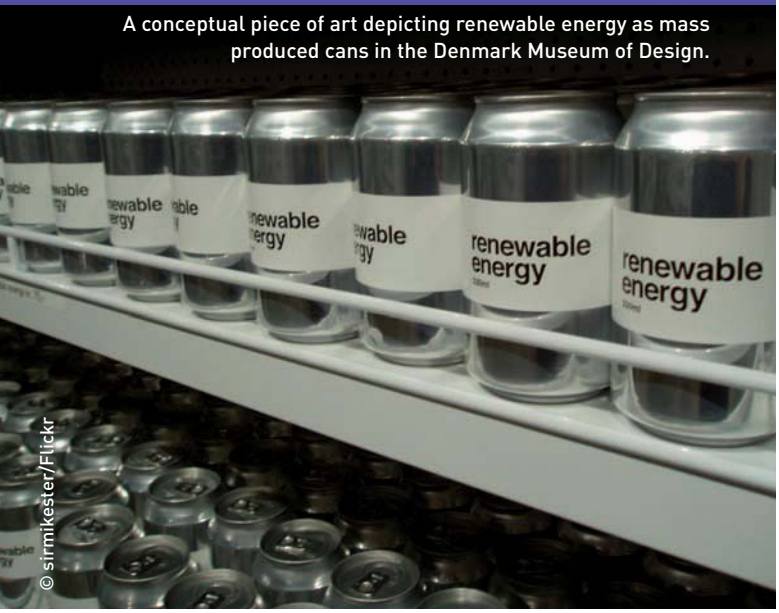
Climate change is real. And it's happening much faster than was predicted just a few years ago. The good news is that there is a good chance that we really can do something about the problem. And we don't need to compromise the well-being of our global economy.

All that is needed is to follow a 'bright green' strategy where we get the most out of the energy we produce and where we deploy the clean energy technologies we already know can work. Doing so would deliver the affordability, stability and confidence our economies need, as well as help solve the climate crisis.
Although our reliance on fossil fuels has been the basis for the fastest economic growth in the history of man, we now have the opportunity and the obligation to begin a transformation towards a robust clean energy economy without causing environmental harm. This is the opportunity of our generation.
But there won't be a single, "silver bullet" solution. We will need to address energy production, carbon mitigation and efficient consumption of energy. A new approach is needed that both avoids dangerous climate change and is advantageous for the economy – a 'bright green' strategy with a strong focus on deploying and investing in climate friendly technologies.
Denmark has done this for several decades and is a clear example that it is possible to both grow the economy and at the same time take care of the environment and especially the global environment.

> "We now have the opportunity and the obligation to begin a transformation towards a robust clean energy economy without causing environmental harm. This is the opportunity of our generation"

IT CAN BE DONE AND IT'S GOOD FOR BUSINESS

Traditionally Denmark has depended exclusively on imported fossil fuels, but the country is now energy self-sufficient. Helped by the right mix of incentives, regulation and public support to develop new and cleaner technologies Danish companies very early on started to focus on a broad range of renewable, energy saving innovations, initiatives, and rethinking products and processes.
It has paid off. Danish companies are among the world leaders in developing and commercialising new energy efficient and renewable energy technologies, and for many years Denmark has been focusing on new ways to reduce energy consumption, CO_2 emissions and other types of emissions.
This has been done without compromising economic development and the welfare of the Danish population.



A conceptual piece of art depicting renewable energy as mass produced cans in the Denmark Museum of Design.

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It is possible to curb emissions while at the same time having economic growth.

© Tessa06/Flickr

As an example, our economy has grown by more than 80 per cent since 1980 more or less without increasing our consumption of energy.
Our ability to develop, deploy and use more such 'bright green' technologies has been an important billboard for customers abroad. Danish exports of energy technologies is now a major contributor to the welfare of the Danish economy. The growth of these exports has by far outpaced the growth of total Danish exports of good and energy technologies. Today, they constitute 11 per cent of the total value of Danish goods exports.

A NEW GLOBAL DEAL ON CLIMATE

The COP15 climate summit in December 2009 will be a turning point for the world's governments to show a much needed political leadership. A substantial political leadership will also pave the way for global business gaining yet more momentum.
Currently from 2008 to 2012 the Kyoto protocol is only a first, but insufficient, step towards a low-carbon reality. The next step must involve all major economies and emitters of green house gasses – it is simple mathematics. In order to reduce the global emissions by 50 per cent by 2050, full scale political solutions are essential. A critical mass of sectors and countries must be covered by the next international climate agreement. Global business has already signaled a readiness to take action on many occasions. Through a robust and broad global post 2012 climate agreement, global market mechanisms must be established. A shared and sufficient price on CO_2 will be a strong signal to business to develop yet more efficient solutions and technologies.
The developed regions like the EU and the US must commit themselves to reduction targets for 2020. The most advanced developing countries must be ready to commit to binding emission targets before 2020 based on common but differentiated responsibilities. And all countries must sign up to long-term cooperative action consistent with science.
Measures to facilitate sufficient finance and technology transfer must be created. Already known flexible instruments like the JI/CDM must be further developed. Technology dissemination and deployment must be promoted through creation of enhanced national environments involving the private sector whilst maintaining intellectual property rights.

This is not an easy task and some may be tempted to turn down a new global deal on climate with reference to the cost of a new deal. However, in light of the experiences in Denmark it is possible to curb emissions while at the same time having economic growth and prosperity. So the message to the negotiators is: Set your targets high. Don't worry. We have the solutions.
During COP15, delegates and visitors to Denmark may explore the different Danish solutions and technologies in real life at the Bright Green exhibition. Bright Green (www.brightgreen.dk) takes place 12-13 December 2009 in Copenhagen, Denmark, in parallel with the United Nations Climate Change Conference (COP15). Furthermore, all the solutions and technologies can also be found on the webpage Energymap.dk.

Author

Mr Anders Stouge holds a Masters degree in Economics and is in charge of the Danish Energy Industries Federation, part of the Confederations of Danish Industries, which is entirely owned and managed by 11,000 companies. Mr Stouge has been with the Confederation of Danish Industries since 1997. Previously he worked as a consultant helping companies and organisations around the world developing their business and investment strategies.

Organisation

The Danish Energy Industries Federation consists of approximately 300 member companies whose primary area of activity is energy. This sector is one of the fastest growing export sectors in the Danish economy. The Danish Energy Industries Federation facilitates interaction between these companies in order to enhance their business possibilities.

Enquiries

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http://brightgreen.dk
http://energymap.dk

Melting 'people' ice sculptures for Oxfam's UN Climate conference campaign in Poznan 2008.

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Lights, camera, inaction!

THE POLITICAL CLIMATE CHANGE IMPASSE

COLIN CHALLEN MP, CHAIR, ALL PARTY PARLIAMENTARY CLIMATE CHANGE GROUP IN THE UK PARLIAMENT AND LABOUR MP FOR MORLEY AND ROTHWELL, UK

If dramatised, the road to Copenhagen might resemble the early parts of a war film, where the audience sees an endless column of refugees carrying what few possessions they have left to an unknown destination, not knowing where they will find safe haven, if at all. But the global audience of this horror movie seem to be as bewildered as the refugees. Their – our – response, catechised in Lord Stern's report of 2006 is to say 'it costs less to deal with this problem than letting it fester.' But to date little has happened. The response has been pitiful. Along this winding road in Poznan last year minister after minister told COP 14 delegates that the recession should be turned on its head and transformed into an opportunity for low carbon investment. It is curious how green investment has been seen as a salvation in the economic trough when it was thought more of a distraction at the top of the economic curve. One suspects the real game in town is simply to get back to old fashioned growth ASAP, albeit with a greenish tinge.

A GREEN STIMULUS

What has happened following the ministerial rhetoric? HSBC's Green Rebound analysis of national green stimulus packages shows a woeful lack of determination to fulfil the Poznan promise. With the exception of South Korea, no country sought to devote more than half of its fiscal stimulus package to green investment; Korea tops the list with 69 per cent; next up is China with 34 per cent. The EU average is a lamentable 14 per cent, whilst the US commitment is an execrable two per cent. Annex I countries once again have shown that their commitments are hollow, with one or two narrow exceptions.

How is this dichotomy between green rhetoric and green action justified? The dry text of the UK government's response to the House of Commons Environmental Audit Committee's (EAC) inquiry into the 2008 Pre-Budget Report (Pre-Budget Report 2008: Green fiscal policy in a recession: Government Response to the Committee's Third Report of Session 2008-2009, TSO, London, June 2009) provides an answer. The EAC said "The Government now has a controlling interest in a number of banks. We recommend that the Treasury examine and report on how some form of environmental criteria for the investment strategies pursued by these banks might be imposed, and what impacts this might have on sustainable development objectives."

The UK Government's response was: "Government interventions to support the financial services sector are designed to assist the banking system, to support the whole economy to get lending going again. Government intervention to support the financial services sector will support the whole economy and *is not intended to single out specific sectors* or companies for support. The Government's interest is managed on a commercial basis by the UK Financial Investments Ltd., (UKFI), a company that is wholly owned by the Government. Its *overarching objectives are to protect and create value for the taxpayer as a shareholder*, with due regard to financial stability and acting in a way that promotes competition" (emphasis added). In other words, let's return to business as usual, and with the usual businesses.

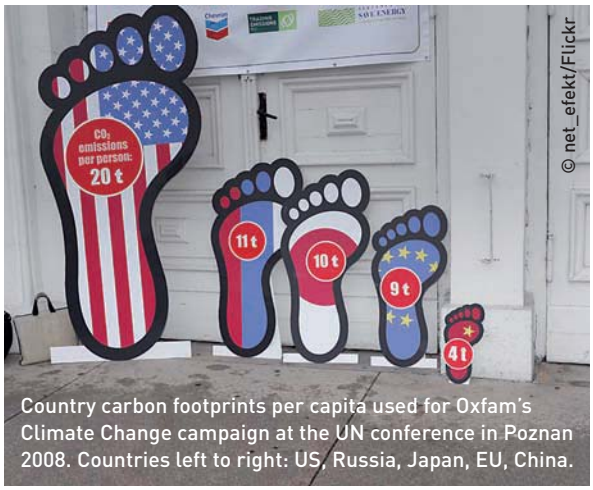
VOLATILITY IN THE CARBON PRICE

In other parts of the Government's response to this report, it Government repeatedly insists that in any case it is not public finance inputs that really matter, it is the outcomes, whether public or private. Thus we may be urged to gaze upon the sunny uplands of the European Union's Emissions Trading Scheme (ETS), which has become something of a panacea for all our climate change ills. Yet the ETS has struggled to maintain credibility, having failed to deliver significant cuts in carbon emissions. The ETS has failed to establish a sufficient carbon price that not only delivers real domestic reductions, but can bring the necessary transformative investments to developing countries. Its caps are far too loose to achieve both objectives, and the recession has made matters worse for the scheme since unintended carbon emissions reductions have occurred on a great scale without its assistance due to the downturn in economic activity, another downward pressure on the carbon price. Anyone planning a CDM project will in the immediate future have to look at their costs again.

All this could change and indeed will have to, especially if developing countries are to take the developed world's word at face value. We want developing countries to 'leapfrog' the fossil fuel model and undoubtedly this would be the sustainable development route. But how to do it? How to finance it? Be it direct tax-funded interventionism or the market, we need to review every approach to force them into a state of sufficiency and clarity of purpose. Take World Bank and other international subsidy regimes for a start – these are massively weighted towards supporting fossil fuel developments, with support for renewable energy projects a poor relation. 'Stop the carbon subsidies' sounds a simplistic slogan, but it is stunningly coherent. Any support for the fossil fuel sectors has to be conditional upon the transformation ministers say are necessary as a matter of urgency. The many highly skilled engineering talents in the oil and gas industry must be rapidly turned towards the demands of the renewable sector if targets are to be met. Not forgetting that the Intergovernmental Panel on Climate Change (IPCC) has called for a peak and then decline in greenhouse gas emissions from 2015. Achieving this will call upon existing skills bases, as well as a long-term shift in energy related employment. Such skills need to be urgently shared with developing countries.

GREEN REBOUND – OR GREEN REDOUBT?

The ending of subsidies to fossil fuel sectors must be matched with the withdrawal of subsidies to other carbon intensive sectors. In the UK 2009 Budget, £1.4 billion of support for the low carbon economy was hailed as a triumph, but support to the car industry *alone* of £2.3 billion rather puts that in the shade (as well as hefty dollops of cash for the North Sea oil sector). The freeing up of such state aid (which we are not allowed to call protectionism but it looks very much like it in another guise) might better be used supporting joint ventures with developing countries to speed up their deployment of renewable energy and other climate change mitigating technologies. This would help accelerate clean development that should boost markets for these products more quickly. If developing countries – as was made very clear at the Bali COP meeting – want more technology transfer, then the use of joint ventures would be one route which may escape the usual intellectual property suspicions. But they need more than just seed funding.



Country carbon footprints per capita used for Oxfam's Climate Change campaign at the UN conference in Poznan 2008. Countries left to right: US, Russia, Japan, EU, China.

The *Green Rebound* identified $3,170 trillion worth of fiscal stimulus in 2008, with a mere 14 per cent going to green investment. I have no doubt that this represents a big improvement on what might have happened ordinarily, but what is the other 86 per cent being spent on?

> "What is stopping a similar gold rush with renewable technology, especially in those countries which have such vast resources today?"

Reports in 2009 suggest that financial flows for what I can only describe as 'discretional altruist objectives' such as overseas development were predictably slimmed down. Whilst the global economy shrank by about 3 per cent, it was reported that "net private capital inflows to poor countries tumbled to $707 billion in 2008 from a peak of $1.2 trillion in 2007. And [the World Bank] forecasts that the inflows will halve again this year to just $363 billion." (*Guardian*, London 22/6/09). I suspect this reduction in financial flows will impact more on high cost start-ups, already hit by a low carbon price. The technological transformation which we know we need will be delayed still further. It has already been scandalously delayed by the rearguard lobbying in Brussels, Washington, etc. by the carbon lobby. One only has to see the battles fought over the Waxman/Markey Bill in the US Congress to see the familiar trails left by these fossil fuel slugs.

WHY NOT A SOLAR GOLD RUSH?

Choosing the right balance between state intervention and the market is difficult. I remain impressed by the Victorian railway manias that gripped Britain. The first

Solar panels in the desert.

of these saw the laying of 6,000 miles of track between 1844 and 1852, at a cost which exceeded our GDP. The money came from private hands, everyone seeking to make a fast buck. But even though the mania blew itself out – perhaps from sheer exhaustion – it transformed society for ever, leaving a legacy rather more substantial than the South Sea Bubble. Some investors were burned on no-hope prospectuses, but the taxpayer was not – there was no government cash for this remarkable transformation (government was a lot smaller in those days, but I wouldn't necessarily conclude that that in itself is a virtue we should replicate today). So there is an example of markets delivering rapid change, almost from scratch. What is stopping a similar gold rush with renewable technology, especially in those countries which have such vast resources today? Why not a Saharan or sub-Saharan solar gold rush? If the incentives were there it would happen; the market would take care of the rest. I suspect the incentives are limited precisely because the traditional energy players, like the canal owners of yore, are sticking the boot in wherever possible and they are too powerful for some political elites to handle. In the UK, energy company CEOs act with the lordly assumptions of our once mighty press barons. The renewable energy constituency by contrast is a fledgling and bears all the uncertain characteristics of any new entrant. Thus the politics of energy remain seriously warped.

> **"A global climate change deal will not happen nor be effective without a technological revolution in developing countries"**

The CDM helps this process along by introducing a singular degree of 'projectitis' to the game, where winning piecemeal funding trumps an overarching strategy. Politicians in poor regions are forced to play this game to prove their worth to their local electorates. Winning crumbs off the rich man's table can still make a big difference to a deprived community, and if that is all that is on offer, you would be a fool not take it.

ENERGY, DRIVE AND PURPOSE

What should be the role of government? It is a balance between saying what the direction of travel is and getting out of the way. Three words sum it up: energy, drive and purpose. Energy is motivation, enthusiasm, ambition, an embrace of possibilities, drive is putting the energy into gear – stripping out the encumbrances – the rules and regulations designed for the pre-climate change era which slow down development alongside the demur diplomacy and obfuscation which underpins the hype of G8 summitry etc and purpose is a clear-sighted vision of where we need to be and when – a vision, that is, which understands why we need to solve the problem faster than we are creating it. The approach of governments so far has been *'sotto voce'*, to say the least.

A global climate change deal will not happen nor be effective without a technological revolution in developing countries. Such a revolution can happen – Korea once again provides an example of rapid transformation from an agrarian to a technological society. The mistake developed countries are making is in believing that because they are responsible for most of the problem, the solution lies largely in their hands. Indeed, they want to keep control of the process in order to maintain control of the purse strings and to dictate the outcomes which they hope will remain on their terms and not profoundly affect them. This is protectionism of a sophisticated variety, irresistibly brought into sharp focus in the debates over technology transfer made possible at the insistence of the G77/China group.

There exists, I have to say, a nervous inactivity in the developed world's stance. It is why there has been such an intellectual dalliance with the Contraction and Convergence framework, nevertheless fastened to a political abhorrence of the idea. This continues even after everybody accepts that one day, global *per capita* emissions will equalise as the only arithmetical outcome of a drive towards a zero carbon society. What is missing is the rational conceptualisation of the practical steps necessary to achieve it and, if truth be told, a desire to achieve it.

Author

Colin Challen MP is Chair of the All Party Parliamentary Climate Change Group in the UK Parliament and Labour MP for Morley and Rothwell. His book 'Too Little Too Late: the politics of climate change' was published in February, 2009 (Picnic Publishing).

Organisation

The All Party Parliamentary Climate Change Group brings MPs and Peers together with businesses, NGOs, and climate experts, and hosts regular events to raise awareness about climate change and to formulate policies for mitigation and adaptation. The APPCCG is currently conducting a parliamentary inquiry on climate change and global equality.

Enquiries

For further information about the APPCCG's work, please visit the website at www.carbonneutral.com/features/appg.asp or contact Catherine Martin at catherine.martin@carbonneutral.com or telephone 020 7833 6035.

Photo 1. Rural Energisation in San Antonio de Lipez, Bolivia.

Sustainable development in Latin America and the Caribbean

CARLOS A. FLÓREZ P.
EXECUTIVE SECRETARY,
LATIN AMERICAN ENERGY ORGANIZATION (OLADE)

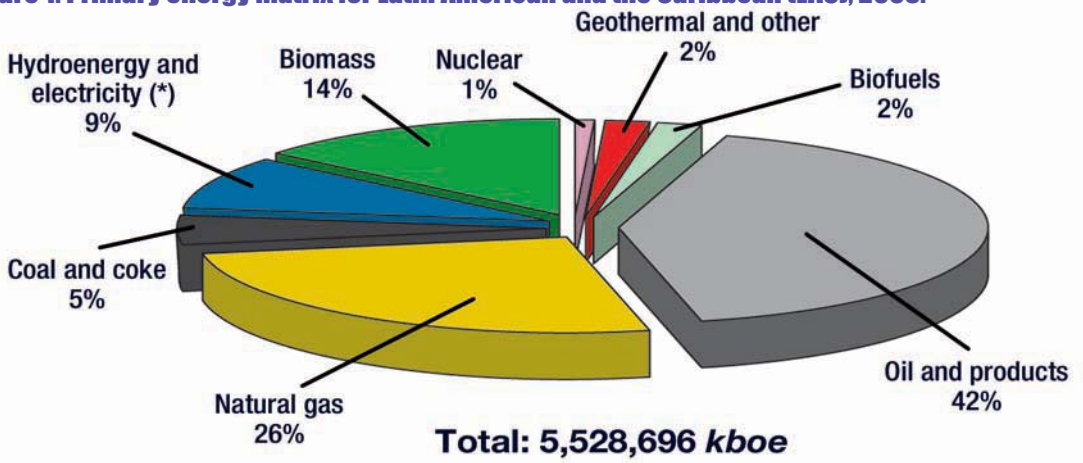
In 2008, renewable energy sources in Latin America and the Caribbean (LAC) represented 26 per cent of the region's energy demand supply matrix, causing this region to contribute only five per cent of the total global CO_2 emissions, as shown in Figure 1.

The Latin American and Caribbean region has significant reserves of oil, natural gas and coal, in addition to renewable resources, especially hydropower and bio-fuels. However, these resources are not uniformly distributed, and fossil fuel production is primarily for export. Dependency on non-renewable commercial fuels has grown over recent years, especially for transportation and to some extent for power generation.

In response, the countries of the region are developing initiatives to reduce greenhouse gas emissions as part of their climate change policies, which reward energy efficiency and renewable energy sources.

Given this situation, over the past three years the meetings of Energy Ministers within the region have instructed OLADE, an inter-governmental technical assistance entity comprising 26 Member Countries of Latin America and the Caribbean and one Participant Country (Algeria), to support the work of its member countries towards sustainable development of its energy resources, with an emphasis on energy efficiency and renewable sources. In 2007 the Energy Ministers decided to "consolidate and institutionalise

Figure 1. Primary energy matrix for Latin American and the Caribbean (LAC), 2008.



Source: SIEE-OLADE, 2008

energy efficiency in national, sub–regional and regional policies"; in 2008 they aimed to "promote a raise in sustainable use of clean, renewable energy," and in 2009 they decided to "design a South-South energy cooperation mechanism for the region, especially to develop renewable energy and rational & efficient energy use".

In this context, OLADE considered the successful experiences with energy efficiency in certain countries of the region, which led to a transfer of lessons learned on an inter-governmental level. The institutional frameworks that served as a basis for obtaining positive outcomes are being disseminated in the region to achieve the necessary sustainability, which has been lacking in country-level efforts and even in international cooperation programmes.

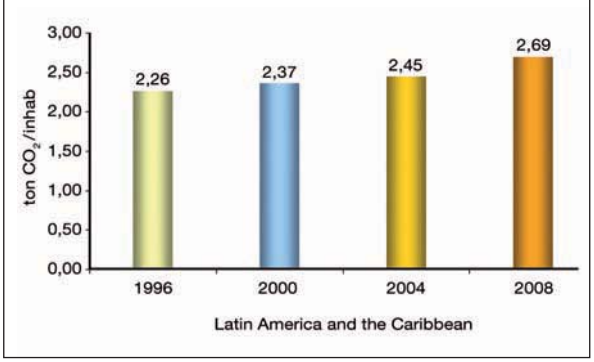
Of special note are the experiences of Brazil, Cuba and Mexico, as detailed overleaf. In Brazil, the Procel Programs (estd. 1985) centred on the power sector and Conpet (estd. 1991) on the hydrocarbons sector. In 2007, Procel had an investment of $30 million, and was able to save 3.93 TWh and postpone $1.57 billion in new investments in the power sector. In Cuba, activities to substitute nine million incandescent bulbs with compact fluorescent lamps and to implement efficient appliances resulted in saving one million tones of oil equivalent for power generation (between 2006 and 2008). In Mexico the activities carried out in 2007 the CONUEE ('National Commission for Efficient Use of Energy' – formerly CONAE), saved 21 million barrels of oil with a yearly budget of US$5.5 million, thereby demonstrating how productive it is for the State to have a governing body for energy efficiency.

A similar strategy for the regional dissemination of experiences is being applied with technological developments and technical applications for bio–fuel use, taking advantage of LAC's leadership in using ethanol–gasoline and biodiesel–diesel mixes to diversify liquid fuel supplies, in strict compliance with environmental, food security and appropriate land–use considerations.

In the case of Brazil, a 25 per cent mixture of ethanol with gasoline or 100 per cent ethanol is mandatory throughout the country, which produces 27.1 billion litres of which 5.1 billion litres is exported. A device is now available to vary automobile fuel mixes automatically from 100 per cent gasoline to 100 per cent ethanol ('flex-fuel' cars). The alcohol that is used comes from sugar cane, a crop that has varieties with high yields and reports no conflicts with food production. In addition, all heavy transportation uses diesel with a four per cent mixture of biodiesel (five per cent from January 2010) obtained from several crops, soy in particular. Crop production for energy is carried out under sustainable development parameters and provides employment alternatives for broad sectors of society throughout the production chain.

Climate change is affecting the region, and the energy sector in the LAC countries is making use of the Clean Development Mechanism (CDM) to execute more projects that help reduce harmful emissions. As of September 2009, 429 certified projects were reported (24 per cent of the world total), with a reduction of 358 millions of metric tones of CO_2, (or 15 per cent on a global scale). Likewise, activities are being carried out to help minimise the impact of climate change, particularly in the water basins of LAC, which are used for power generation. As shown in Figure 2, the per-capita CO_2 emissions in the region are on the rise.

Figure 2. Evolution of per capita CO_2 emissions.



Source: SIEE-OLADE, 2008

Beginning in the 1990s, structural reforms in the energy sector made some economic resources available to provide energy access for part of 40 million people, or the seven per cent of the entire LAC population, that lacks modern energy service. Rural electrification/energisation initiatives are being developed for this purpose, which in several cases include uses that could be classed as productive for poor populations in remote areas, thereby helping to meet the Millennium Development Goals. A few examples are the Argentine Rural Market Renewable Energy Project (PERMER from the Spanish), the 'Luz para Todos' Program in Brazil, the Rural Electrification Program in Bolivia, among others. Photo 1 shows the photovoltaic energy fence in San Antonio de Lipez, Potosi, Bolivia, for camelid grazing and quinoa growing.

Despite the fact that the Latin American and Caribbean contribution to global CO_2 emissions is only five per cent, the change in climate is already affecting the region. The LAC region does not enforce a reduction in greenhouse gas emissions, but is aware of the rising emissions caused by economic and industrial development and has strategies to support climate change mitigation through renewable resources use and energy efficiency programs development.

Author

Carlos A. Flórez P. has been the Executive Secretary of the Latin American Energy Organization (OLADE) since 2008. He is a Colombian citizen and a professional in Administrative Sciences, with 26 years of experience in the Colombian public and private sector, 10 of which were in the energy sector.

Organisation

OLADE is an inter-governmental technical assistance entity composing of 26 Member Countries of Latin America and the Caribbean and one Participant Country (Algeria). Its maximum authority is the annual Meeting of Ministers of Energy, and its Energy–Economic Information System (SIEE from the Spanish) serves as a reference in the global context.

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Costa Rica's commitment to climate:

BECOMING CARBON NEUTRAL BY 2021

JORGE RODRIGUEZ QUIROS, MINISTER OF ENVIRONMENT, ENERGY, AND TELECOMMUNICATIONS OF COSTA RICA

The world has fallen too far behind in the fight against global warming. Even though developed countries and the rapid growth economies of large developing countries have an important responsibility in addressing climate change and should act as soon as possible, this is no excuse for smaller countries not to play a part. Costa Rica has decided to act now and unilaterally by declaring a goal to become a climate neutral country by the year 2021, when it celebrates its bicentennial of its independence.

WHY CLIMATE NEUTRALITY?

Appropriate action has not yet been taken to tackle climate change, despite its devastating social, economic, and environmental consequences. Policies should be modified at the country and global levels in order to reverse the current carbon-intensive trends. To achieve different results, we must stop pursuing the same courses of action and become more than simple spectators. Business as usual and the status quo are not alternatives.

Both at the national and international levels, the Costa Rican government has announced its commitment to transform Costa Rica into a leader in the battle against climate change. Climate change has been placed at the top of the government agenda by including it as a priority in instruments such as the National Development Plan, the Peace with Nature Presidential Initiative, and other specific guidelines that seek to enable and systemise actions oriented to face its threats and mitigate its impacts.

THE NATIONAL CLIMATE CHANGE STRATEGY (NCCS)

The National Climate Change Strategy was designed after a careful analysis of economic, social, environmental, and political factors and their complex interactions. The NCCS, integrated into the Sustainable Development Strategy, develops two complimentary and equally important agendas: the National Agenda and the International Agenda.

The National Agenda, with a clear orientation towards action, has been defined around six strategic axes or components, the main of which are Mitigation and Adaptation. The other four transversal components are: Metrics, Capacity Building and Technology Transfer, Education, Culture and Public Awareness and Financing. The International Agenda is also structured around six strategic components, of which the key message is: Exert international influence and attract foreign resources, Leadership, Legitimacy, Presence in multilateral and binational forums, and International capacity building are the other four components which, similar to the National Agenda, are transversal and complimentary within the Strategy.

NATIONAL AGENDA

From a mitigation standpoint, Costa Rica is taking action to become carbon neutral (C-Neutral) while integrating the complex environmental, economic, human, social, moral, cultural, educational, and political issues involved in climate change, as well as enhancing national competitiveness. Cost reductions are being brought about through efficiency gains and technology as well as increased differentiation based on growing consumers' awareness on global warming and preferences on goods and services with low carbon footprints (and eventually carbon neutral). Mitigation actions will include emissions reduction by source, carbon sinks enhancement through reforestation and natural forest regeneration, as well as avoided deforestation, and the development of carbon markets and the C-Neutral brand. The birth of C-Neutral products and services, companies, regions and communities, among other stakeholders, will provide incentives for action and an additional differentiation factor for the country and businesses' competitive strategies.

> "'Climate quality' will become an important differentiator in the marketplace"

Costa Rica has historically devoted its electricity generation to clean, renewable sources such as hydro, geothermal, and wind power. In fact, 93 per cent of Costa Rica's electricity generation comes from these sources. Thus, Costa Rica has a unique energy situation, as the larger share of greenhouse gas emissions come from the transportation sector.

In order to set the necessary frameworks to secure the transition towards cleaner, more efficient transportation mechanisms, the government is currently establishing various incentives for the acquisition of clean technology vehicles, such as a decree to reduce taxes on clean technology vehicles and batteries. However, policies may only be well implemented by jointly promoting the use of cleaner transportation mechanisms through the construction of large-scale projects such as an urban electric passenger train, which will save enough money through avoided oil importation to build one new hospital every two years. Financial tools will be created to cover the higher initial costs of cleaner technologies in order to ensure future savings, while an appropriate services platform, including battery recharge stations and adequate electric distribution facilities, will be built in order to support the success of such an ambitious project.

In the agriculture and livestock sector, Costa Rica is currently working on various projects to calculate more tropicalised emissions indexes in crops, derived from IPCC standards, according to the country's own climate conditions and crop management practices, in order to obtain more precise estimates for the National Greenhouse Gas Inventory submitted in compliance with the UNFCCC mandates. Methodologies are being developed to detect nitrous oxide emissions levels in coffee and banana plantations, as well as to directly measure methane emissions in livestock, in a measurable, reportable, and verifiable manner, in order to maintain international credibility with the results. These experiments are also designed to identify the best mitigation options, as various new generation low-emission fertilisation options are being handled and measured.

From the carbon capture and carbon sinks enhancement perspective within the mitigation axis, Costa Rica is implementing a new tree planting campaign ("...A que sembrás un árbol", a Spanish phrase which translates into English as "We dare you to plant a tree"). In 2007, Costa Rica planted more than five million trees, and in 2008, the figure rose to seven million, which translates into approximately 1.5 trees per capita. This turns Costa Rica into the nation with the highest percentage of planted trees per person in the world.

Costa Rica has effectively managed to reverse the process of deforestation, allowing for a forest cover today that more than doubles that during the 1980s. Thus, Costa Rica today has more than 25 per cent of our national territory covered with protected forest areas, enhanced in part through conservation and sustainable forest management practices. Furthermore, we are currently developing and putting in practice a legal and institutional framework that promotes the protection and recovery of private forests through the payment for environmental services program (more than 700 thousand hectares), with which the conservation of biodiversity, scenic beauty, water resources, and carbon fixation are being recognised. This framework is based on the 'polluter pays' principle, by taxing fossil fuels and though an enormous fiscal sacrifice.

Trends indicate that in the future, many consumers will prefer products and services that have a reduced carbon footprint and preferably zero climate impact (C-Neutral). 'Climate quality' will become an important differentiator in the marketplace. The Government is making joint efforts with various institutions, organisations, business and regions that have committed themselves to contributing towards a low carbon society, and has established the C-Neutral brand to officially encourage actions to reduce the carbon footprint in different socio-economic sectors.

Tourists will be able to fly to Costa Rica by compensating all emissions through a clean trip initiative, and companies will be able to promote their products, goods, and services, as 'Made C-Neutral in Costa Rica'. For example, Expotur 2009, Central America's main tourism trade market, became the country's first carbon neutral fair by monitoring energy use, using climate friendly materials, compensating all emissions, and promoting the clean trip initiative among attendees.

Furthermore, Costa Rica is participating in the National Economic, Environment and Development Studies (NEEDS) for Climate Change Project, which will allow us to identify, based on the evolution of greenhouse gas emissions determined through the Second National Communication, the necessary sectoral mitigation actions, associated costs and financial and investment fluxes, and institutional arrangements required to reach zero net emissions by the year 2021.

In spite of these efforts, we recognise that our development, based on renewable sources, is very vulnerable to climate change. Costa Rica considers the


Minister Jorge Rodriguez.

link between mitigation and adaptation as fundamental, as both aspects are critical to the socio-economic development of developing countries. It is clear to the Costa Rican Government that mitigation must deal with global emission reductions in order to avoid facing greater adaptation costs. It is for this reason that the strengthening of a resilient society must be a key element of the new climate agreement at Copenhagen.

Costa Rica is in the process of developing a National Climate Change Adaptation Strategy which will serve as a guiding beacon for decision making, definition of priorities, and determination of mechanisms to monitor adaptation actions. The objective is to identify the economic, social and environmental risks of climate change by geographic zone and sector (energy, transportation, water resources, agriculture, health, biodiversity, etc.). Based on this information, the adaptation measures can be prioritized and an action plan developed to reduce the effects of climate change.

Costa Rica has actively advanced within this framework in developing ecosystem-based adaptation strategies, reflected not only within our national climate change plan but also in concrete projects such as 'Costa Rica Forever', which seeks, among other strategies, the consolidation of marine protected areas in order to increase the resilience of ecosystems and diminish its coastal and marine vulnerability.

In compliance with this commitment, the Ministry of Environment, Energy and Telecommunications developed a project to assess the adaptation to climate change of the water resources system in Costa Rica's northwestern Greater Metropolitan Area. This project was characterised by being a participative process by a group of actors who saw their knowledge and investigation capacities strengthened through the initiative. This capacity building has allowed the stakeholders to obtain an integral vision of the water resources system and the problems it faces, and has enabled them to propose a series of adaptation measures that interlink various sectors in the social, environmental, and economic axes. We are currently extending the water resources vulnerability and adaptation metrics and actions developed during this project from the Greater Metropolitan Area to the whole territory.

Furthermore, Costa Rica believes in the principle that finance, technology and capacity building are indivisible and should be addressed together, as all three are transversal and fundamental for the successful application of mitigation and adaptation actions, all while promoting education, culture, and public awareness. No strategy can ever be well implemented without proper education and public awareness efforts; it is the people, after all, who will determine the outcome and success of our climate neutrality efforts.

INTERNATIONAL AGENDA

Just as greenhouse gases generated within our territory will have a negative impact not only within our borders but across the rest of the world as well, so too will global actions (or inactions) directly impact us. In other words, we are facing local actions with global consequences.

It is our responsibility to contribute further to all dialogues, within negotiations and processes that will eventually lead to a post-2012 international climate regime. Our strategy answers to an integrated view of climate change and also endeavors to be replicable in other countries with similar national circumstances. It is a joint effort by the different sectors of society, and seeks to act under the principles of equality, urgency, transparency and cost-effectiveness.

Costa Rica has historically dedicated considerable efforts towards the protection and conservation of natural resources, evidenced at the United Nation's Framework Convention on Climate Change (UNFCCC) Conference of Parties 13 (CoP13) in Bali (2007). At this Convention Costa Rica insisted, along with Papua New Guinea and various other countries, on the importance of the topic of forest conservation through the inclusion of market incentives for Reducing Emissions by Deforestation and Degradation (REDD), as well as the conservation and sustainable management of forests for carbon fixation.

During the 10th Special Session of the UNEP Governing Council/Global Ministerial Environment Forum, which took place in Monaco from 20 to 22 February 2008, and in response to the world's emerging interest in combating climate change, Costa Rica successfully proposed the launching of the new Climate Neutral Network (CN Net). The network intends to be a guide to the ever-growing wave of nations, local authorities, and companies committed to reduce their carbon footprint on the route towards a zero emissions society. The aim is a truly global information exchange network open to all sectors of society.

The pioneering countries to have joined Costa Rica in this network at the time of writing are Ethiopia, Iceland, Maldives, Monaco, New Zealand, Niue, Norway, Pakistan, and Portugal. The network has over

one hundred participants including cities, companies, associations and organisations from around the world.
Costa Rica's goal is to enable a healthy, mutually benefiting dialogue between the country and universities, NGOs, think-tanks, government entities, businesses, and financial institutions, in order to analyse and put in practice the best ways to move from theory to implementation, while jointly developing the social, economic and environmental axis implied within our strategy. The final objective is to elaborate a road map to the carbon neutralisation of Costa Rica, while building, at the same time, an International Network of Allies Against Climate Change.

IMPLEMENTING THE STRATEGY

To achieve the goal of climate neutrality, Costa Rica is implementing a National Climate Change Strategy which is consistent with its local and global responsibilities. Since climate change will unfortunately continue deteriorating until a global agreement stabilises GHG in the atmosphere, mitigation and adaptation measures to reduce the vulnerability of systems, regions, communities, and ecosystems should have the highest priority. The Strategy is built around the four pillars of the Bali Action Plan: mitigation, adaptation, technology transfer, and financing, and under the umbrella of shared vision. Also, we are well aware that in order to develop these pillars, a methodological framework that allows our metrics to be measurable, reportable, and verifiable is needed, all under an environment of transparency, education, and public awareness. It is for this reason that these aspects have also been included within our National Climate Change Strategy.

> "It is time to diverge from business as usual when it comes to taking serious actions against climate change"

Costa Rica's initiative combats poverty and other societal issues through climate mitigation and the development of a clean, safe, and universally inclusive energy system. We actively seek new, stronger ways to protect our vulnerable population, while helping secure a cleaner tomorrow for the world. Here lies the importance of our strategy.
It is time to diverge from business as usual when it comes to taking serious actions against climate change. Shortsightedness must be avoided at all cost. A major-scale paradigm shift is the only solution to effectively tackle a problem as complex and interdisciplinary as global warming, while effectively protecting the social, economic and environmental pillars of sustainable development. The transition from mere words and promises to successful actions and results, in a nutshell, can wait no longer. We take advantage of this opportunity and invite you to travel this road of change-for-the-better jointly with us, for all of our sakes.

Cangreja National Park, Costa Rica.

Author

Jorge Rodriguez Quiros is the Minister of Environment, Energy, and Telecommunications of Costa Rica, also in charge of water resources and mining. He has also been Vice Minister of Environment, and holds part of the Executive Board of the National Forestry Financing Fund (FONAFIFO). He is a graduate of the Sustainable Management Program and the Executive Program for Project Assessment and Environmental Impact from INCAE Business School. Furthermore, Jorge Rodriguez has actively participated in the publication of documents such as the Regional Forest Management and Health Strategy, and the Central American Forestry Strategy.

Organisation

The Ministry of Environment, Energy, and Telecommunications (MINAET) is a pillar institution in Costa Rica, acting as policy-maker and guiding beacon on topics such as water resources, forestry, energy efficiency, biodiversity, climate quality, environmental education, and many other aspects related to climate change. The National Meteorological Institute, part of MINAET, is the leading institution that deals with the scientific aristae of climate variability and climate change, and is focal point to the Intergovernmental Panel of Climate Change (IPCC) and the United Nations Framework Convention on Climate Change (UNFCCC).

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In a world of resource constraints, it will become increasingly difficult to secure the needed ecological services from elsewhere, even for highly industrialised regions.

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Ecological creditors and debtors:

A NEW CONTEXT FOR INTERNATIONAL COOPERATION

MATHIS WACKERNAGEL, PH.D
PRESIDENT, GLOBAL FOOTPRINT NETWORK

We all know the concept of creditor countries as those that lend financial resources to distant countries and institutions. But there is another type of creditor nation that underwrites the economies and livelihoods of those off distant shores. By calculating a country's Ecological Footprint – the amount of resources required to produce all the resources the population consumes and absorb its carbon dioxide emissions – and comparing that to the amount of resources its ecosytems produce, we can determine how a country's demand on nature compares with what it can renew. So-called 'ecological creditors' are nations that have more biocapacity than they use for their own benefit. By providing ecological services – ranging from exporting resources in the form of wood products, for example, to removing CO_2 from the atmosphere – they maintain the resource base that the rest of the world relies upon.

Ecological creditors represent a rapidly dwindling minority of the globe, both by land area and population. Just five decades ago, the vast majority of the world's people lived in nations that had ecological reserves. Today, 80 per cent of the world's people live in countries that require more ecological services than their ecosystems produce. They run an ecological deficit, hence they are called ecological debtors.

As the number of ecological creditor nations diminishes, the resource pressures on those remaining surpluses increases and a clear challenge emerges: so long as we have one Earth, not everyone can be a net resource importer.

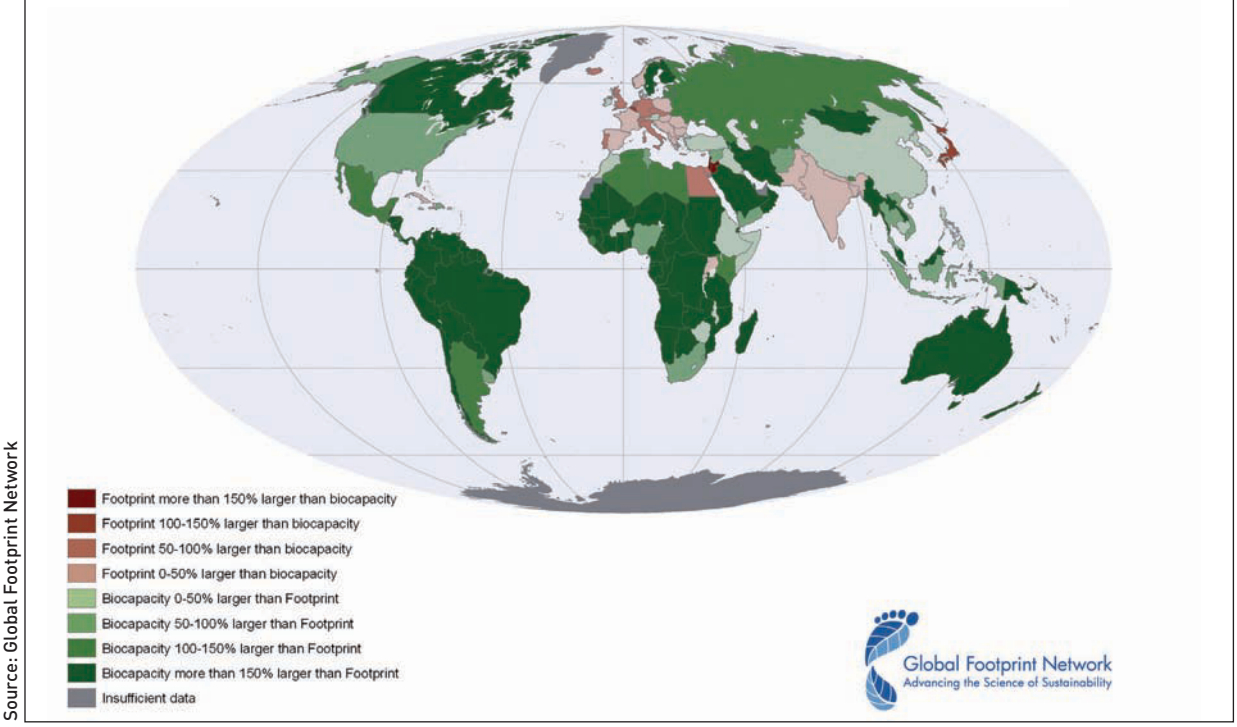
AVOIDING THE IMPENDING RESOURCE CRUNCH

This shift is part of a larger trend. In the early 1960s, humanity consumed only about half of what planet Earth could provide. But humanity's Footprint grew

> "In the mid-1980s, humanity began to demand resources and ecological services faster than Earth could renew them, a condition known as ecological overshoot"

VISIT: WWW.CLIMATEACTIONPROGRAMME.ORG

Figure 1. Percentage of earth's biocapacity consumed (1961): 54 per cent



Source: Global Footprint Network

steadily. In the mid-1980s, humanity began to demand resources and ecological services faster than Earth could renew them, a condition known as ecological overshoot. Since then, growing human population and per capita resource consumption have caused overshoot to escalate. Our accounts, which most likely underestimate overshoot, conclude that in 2006, the most recent year for which data are available, human demand exceeded by 35 per cent what Earth could renew. It took the biosphere over four months to regenerate what humanity used in one year.

The symptoms of overshoot are clear and pressing: rapid climate change, crop shortages, biodiversity loss, freshwater stress, shrinking forests and depleted fisheries.

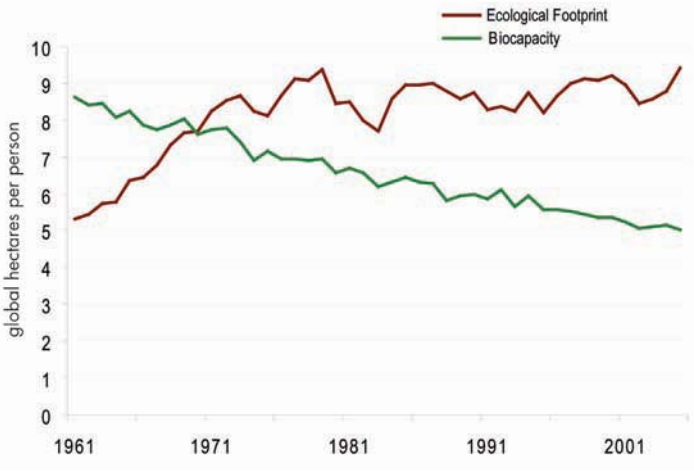
THE CARBON FOOTPRINT

Carbon is about half of humanity's total Ecological Footprint, accounting for more than any other single area of ecological demand the Footprint measures. Yet, it is but one competing demand on the biosphere, together with demands on fisheries, cropland, grazing land, forestland for wood and wood products and urban land.

For instance, in the European Union, the overall demand for ecological services, as measured by the Ecological Footprint, corresponds to two and a half times the biocapacity of the EU's ecosystems. The accounting for other highly industrialised regions, like China and the United States, shows similar results. In a world of resource constraints, it will become increasingly difficult to secure the needed ecological services from elsewhere, even for highly industrialised regions.

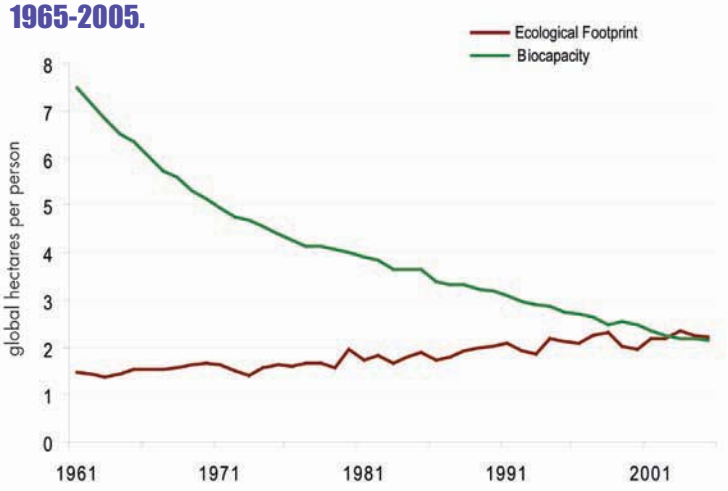
Putting carbon in this context helps identify when policies aimed at identifying alternatives to fossil fuel lead to burden shifting – in which the strain is simply shifted from one natural system to another, rather than to net solutions. Perhaps the clearest example of this is the recent demand for biofuels as a substitute for the use of fossil fuels, which represent a shift or even net increase of environmental pressure, not a reduction.

Figure 2. USA ecological footprint and biocapacity 1965-2005.



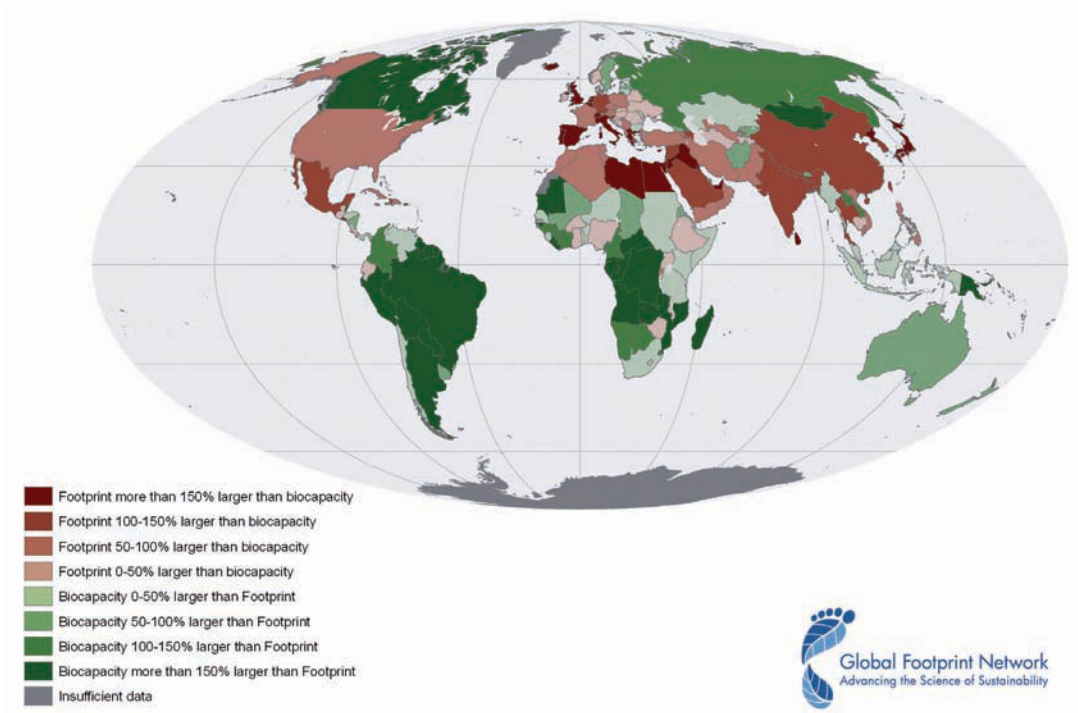
Source: Global Footprint Network

Figure 3. Ecuador ecological footprint and biocapacity 1965-2005.



Source: Global Footprint Network

Figure 4. Percentage of earth's biocapacity consumed (2005): 131 per cent.

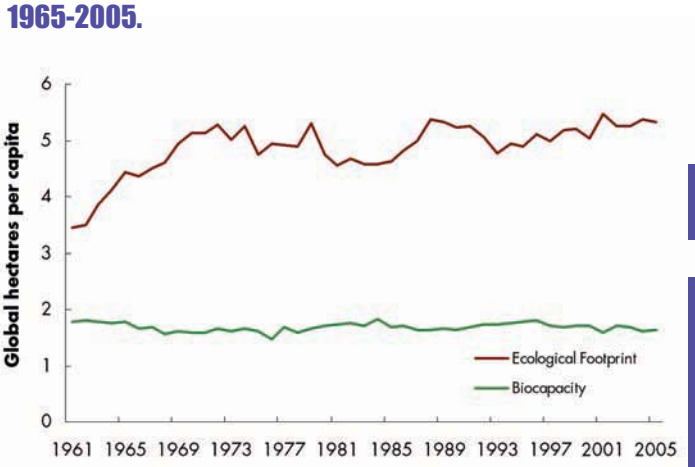


Source: Global Footprint Network

Most of the new pressure is not carbon impact, but demand on forests or cropland, often with significant effects on biodiversity or food prices.

Looking at carbon in the overall Ecological Footprint context also helps identify implications. Ecuador had about five times more per capita biocapacity than Footprint in 1961, but is now using about the same amount as they have available within their territory – and carbon is only one of the drivers behind this trend. This rapid shrinkage of Ecuador's ecological remainder will have a significant impact on Ecuador's development potential, particularly in a resource-constrained world. This is true in many low income countries with a small per capita biocapacity and insufficient financial means to import resources. As their population grows, their limited biocapacity forces them into smaller and smaller per capita Footprints. Uganda, Malawi, Zimbabwe and Burkina Faso, for example, are subject to these tragic trends. With increasing climate change, there will be greater downward pressure on those countries' biocapacity.

Figure 5. UK ecological footprint and biocapacity 1965-2005.



Source: Global Footprint Network

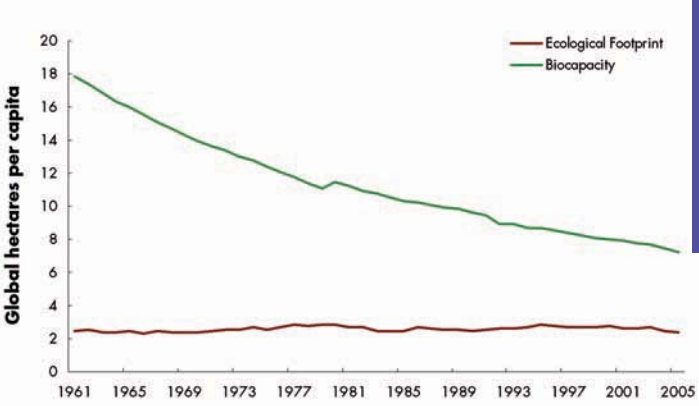
WHY ACTING IS IN A COUNTRY'S SELF INTEREST

So far, global negotiations around environmental crisis have been mired in dragged-out debates and deadlock, with many political leaders seeing little strategic upside to pioneering action and aggressive policy. The path to reaching global agreements has been extremely fragile. With the world's shaky economic situation, there is an especially high likelihood of monkey-wrenching.

What many leaders have not fully understood is that bold action is, in fact, in their country's most direct self interest. When we look at carbon in isolation, the problem appears as a 'tragedy of the commons' (we pollute our collective atmosphere in order to advance our individual/national wealth.) It suggests we need heroic efforts by some countries to carry a burden for all humanity.

The picture changes, however, when we see the carbon problem as part of an overall resource crunch – a

Figure 6. Brazil ecological footprint and biocapacity 1965-2005.



Source: Global Footprint Network

symptom of human pressure on resources reaching a critical tipping point. Viewed from that perspective, it becomes clear that countries that maintain large ecological deficits will face the greatest exposure to the risks, such as price and supply disruptions, of growing resource constraints, while those with ecological reserves will be best poised to provide for their citizens continued well-being.

A creditor/debtor view of the world injects into the discussion the invigorating element of national and regional self-interest. Creditor countries have the economic, political and strategic motive for preserving their ecological assets, while debtors have a direct interest in reducing their exposure by minimizing their resource dependence.

Recognizing that humanity is moving at great speed into resource constraints, and that reinventing our urban infrastructure so it can cope with these constraints takes time – possibly several decades – it becomes clear that there is no advantage in waiting. While collective agreements will certainly accelerate action, delaying action comes at growing cost and risk.

As ecological reserves become increasingly rare, it will become critical for creditor and debtor nations to forge new relationships and move toward policies that protect natural assets while improving health and well-being. In this game, all can win. Every single one will benefit from early action.

THE CHALLENGE FOR CREDITORS AND DEBTORS

Unlike with trade deficits, where a growing imbalance is understood to carry some risk, the same has not been true with ecological deficits. Consider the US, a country that in 1961 maintained an ecological reserve, but now uses 87 per cent more ecological services than the ecosystems within its border can renew. Another example is the United Kingdom, which in 1961 was one of the few ecological debtors. At that time, it used nearly twice what its ecosystems could renew. In the last four and a half decades, however, that spread has nearly doubled. The UK now demands resources of more than three times its biocapacity – and at the same time, the number of countries with ecological reserves able to provide the ecological services it needs is shrinking rapidly.

As for ecological creditors, the future doesn't give them an advantage if they don't prepare well.

Take Brazil, for example. As intact ecosystems become more and more rare, Brazil's ecological wealth will be an asset of growing value for both securing its people's well-being and keeping its economy strong and competitive. But as the world as a whole moves deeper into overshoot, the demands put on these assets – directly through trade or indirectly through phenomena like climate change – will grow.

The Ecological Creditor Initiative will help countries think through these various challenges and develop strategies that recognise nature as a core asset. In the long-term, these discussions could shift the way we value and negotiate resources in the 21st century, providing clear strategic and economic advantages for nations to become more resource-efficient and bolster their ecological reserves.

In April, Global Footprint Network met, under the auspices of the Community of Andean Nations, with policy experts and government representatives in Lima, Peru to begin a series of workshops on the growing significance of biocapacity and its potential for competitive advantage in a resource-constrained world. The organization will continue to hold meetings and convene international work sessions throughout the year, including hosting a side-event at Copenhagen. Next year, Global Footprint Network plans to present the results of the work session findings at a wide range of international forums and conferences.

Once leaders being to understand the inherent value of ecological assets, the perspective shifts from, 'the more we reduce resource consumption and waste emission, the more difficult it is for us to be competitive,' to 'the more we reduce resource consumption, the greater our well-being and the less our risk.'

It changes the equation from a negative sum game, where financial wealth is generated at the expense of the environment, to a positive sum game, where the economic objective becomes securing the best lives using the fewest resources.

Author

Dr Mathis Wackernagel, Founder and President of Global Footprint Network, has worked on sustainability issues for organisations on all continents but Antarctica. He has lectured at more than 100 universities, authored dozens of articles and won awards for his work including an honorary PhD from the University of Berne, the Skoll Award for Social Entrepreneurship, and the Herman Daly Award of the US Society for Ecological Economics. While completing his PhD at the University of British Columbia, he and Professor William Rees created the Ecological Footprint measure, now a sustainability tool in wide use around the world.

Organisation

Global Footprint Network, based in Oakland, California, is a charitable research organisation working to make ecological limits central to policy and decision-making everywhere by advancing the use of the Ecological Footprint, a resource accounting tool that measures how much nature we have, how much we use and who uses what. By developing transparent, scientifically robust measures to help leaders monitor and protect ecological assets, Global Footprint Network is committed to fostering a world where all people can live well within the means of one planet.

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Alternatives to carbon offsetting

Offsetting is part of the solution, not the silver bullet.

CHRISTINA WOOD
POLICY DEVELOPMENT,
PLANET POSITIVE

New types of carbon reduction projects are springing up as people and organisations look for alternatives to traditional carbon offsetting. Two organisations, Planet Positive and Cool Earth, have developed funding mechanisms to support community carbon reduction and rainforest protection. Planet Positive's Eco Streets and Cool Earth's rainforest programmes are reviewed here.

THE VIABILITY OF OFFSETTING

Emotions run high over carbon offsetting. There are those who believe it is fundamentally wrong to 'buy environmental indulgences' and there are those who believe that carbon offsetting provides an effective, efficient way to reduce carbon emissions and help the poorest nations develop sustainably.

Carbon offsetting is a young mechanism undeniably fraught with problems: inefficient value chains, spurious additionalities, highfalutin sustainability claims. Offsetting has experienced some bad press in the past, due to the sale of non-additional carbon credits.

Fundamentally, the necessity to substantiate a reduction against a counterfactual future reality weakens offsetting as a mechanism for GHG reduction. There truly is a range in the quality of the projects available on the market, and the best voluntary standards (VCS, Gold Standard, VER+) accordingly aim to bolster the additionality assurances associated with the credit.

In theory, offsetting is a way to achieve the deep emissions reductions required while also addressing the development needs of the poor, who are experiencing rising populations and greater demand for cheap energy. By facilitating lower prices for an emissions reduction, offsetting allows the developed world, which historically has contributed most to the climate change problem, to stimulate the growth of renewable infrastructure in the developing world and finance a transition to a low-carbon economy. Offsetting projects can also, in theory, stimulate innovation in technology development.

> "Offsetting is part of the solution, not the silver bullet"

Offsetting is important because it allows emitters the flexibility to support emission-reducing projects at a lower cost than at home. However, the mechanism has in reality had little impact on altering behaviour or significantly cutting emissions in the third world; reductions have thus far been fairly small (Kollmuss et al., 2008). But in a world ruled by free market capitalism, it is the central market efficiency tool. We must continue to improve it as one of the many methods of curbing runaway climate change, although it is not to be exchanged for genuine, absolute reduction in emissions and deep infrastructural and behavioural change in our societies. Simply put, offsetting is part of the solution, not the silver bullet.

Planet Positive

Planet Positive is an environmental mark and a campaign for a better way of living, founded by Guy Battle. Battle, a renowned environmental engineer, first developed the Planet Positive mark, backed by a best practice protocol in carbon management, to help companies reduce their emissions and communicate their efforts. The mark has been tried and proven with more than 50 companies over the past two years, and Planet Positive is now launching to people.

Planet Positive passionately believes that we must activate individuals on the ground to change their behaviour and together bring about a smarter, more sustainable, better way of living. We want to draw people into the dialogue, educate and empower, and inspire people to demand low-carbon products and services to create a greener way of life. Any person, product, company or service can be Planet Positive.

As the offset market matures, the standards are evolving and perceptions are changing. Variations on the offsetting theme are beginning to emerge. As a result, there are more alternatives to offsetting available.

Programmes have been developed by not-for-profit or charity organisations that can take the sting out of the profiteering image of the offsetting process. Two such organisations are Planet Positive and Cool Earth.

PLANET POSITIVE – COMMUNITY CARBON FUND

Planet Positive has been developing innovative ways to support carbon reduction in local communities, as a supplement to an investment in carbon credits.

Many people want to see local, immediate positive change resulting from their investment. Increasingly, companies want to invest in their own communities too through energy efficiency, renewables, or educational projects, as a CSR donation.

Planet Positive established the Community Carbon Fund to encourage investment into local community 'climate projects' that reduce the UK's energy needs and encourage a shift to more sustainable lifestyles. This structure can be replicated on a regional level around the world, so that Planet Positive businesses and people can support climate change mitigation in their own communities.

THE NEED FOR COMMUNITY-BASED SOLUTIONS

In the UK, domestic sector energy use alone accounts for almost 27 per cent of UK emissions (Office of Climate Change, 2007). In terms of the UK decarbonisation trajectory, energy efficiency improvement in buildings and industry (e.g. loft and cavity wall insulation, use of more efficient appliances, behaviour change) is crucial in the period up to 2020.

While many of the technologies that promote energy efficiency already exist and the small behavioural changes that need to be made are known, take-up remains low. What is needed as a catalyst is face-to-face knowledge exchange within the domestic sphere itself.

ECO STREETS

One solution that Planet Positive has developed out of the Community Carbon Fund is Eco Streets. It takes carbon reduction offline, away from the world of online

Planet Positive 4-step process.

carbon calculators, and establishes a human link between climate change and the lifestyle changes that are so urgently needed. But like the internet, it is designed to inspire its users to own and develop schemes specific to their local needs. This is a community-based programme to help and inspire people all over the world make carbon reductions in their homes by providing face-to-face coaching and advice on reducing household carbon emissions.

Eco Streets is a training and employment scheme, focused on addressing the current log-jam in domestic behavioural change, generating a green workforce with the essential skills for the low-carbon future and meeting fierce, urgently necessary reduction targets in the domestic sector. It is being piloted in UK cities and Planet Positive will be running a county-wide Eco Streets programme next year.

Partnering with local organisations, Eco Streets recruits students, the retired, unemployed and part-time workers to undergo a four-day training course. The course covers energy efficient behavioural change, technology, payback of capital measures (including installation of insulation and renewable energies), water and carbon footprinting and sustainable lifestyle coaching. The result is that each volunteer becomes a Climate Coach with a National Vocational Qualification (NVQ) accreditation in Energy Awareness and an improved CV, and has the skill set to catalyze change in their local community.

Climate Coaches are able to measure individual household carbon footprints, advise on energy and water efficiency and grant applications, and help households take practical steps towards low-carbon living. They establish an ongoing, trust-based relationship with the householders they look after, and are able to advise on anything from sustainable personal transport to food sourcing, composting or even 'green holidays.'

Eco Streets supports local communities and economies by providing crucial training and up-skilling for the low-carbon economy. It works to raise awareness throughout the community, leaves a sustainable legacy and helps households save money on energy bills.

MEASURING AND PROVING REDUCTIONS IN THE HOME

Eco Streets coaches visit homes a minimum of four times per year and consult on a variety of areas:

Energy use

- Connect with grants and funding

- Install insulation
- Heating systems and fuel types
- Energy saving bulbs
- Double glazing
- Energy efficient behaviour

Lifestyle choices

- Transport
- Food, drink and tobacco
- Household goods
- Leisure services
- Clothes and shoes
- Holidays

Measurement of the household footprint will follow the Planet Positive Person footprint measurement boundary as laid out in the Planet Positive Protocol. This includes:

- Heat and electricity use
- Personal transport by car, rail, bus, motorcycle and air
- Commuting by car, rail, bus, motorcycle and air
- Waste production

SMART METERING

As part of the UK Government's mandate on energy companies to visit 25 million homes and replace around 50 million meters by 2020, Eco Streets UK will also be installing smart meters in every home they visit.

Smart meters are essential for changing end user behaviour, saving customers money and allowing energy companies to load-balance the grid. Suppliers will be able to offer tariffs for off-peak energy, and customers will be able to connect microgeneration to the grid with greater ease.

The Government believes that strong positive engagement among local communities will be particularly powerful in generating the necessary awareness, enthusiasm and take-up of the benefits from smart meters. Planet Positive is seeking UK energy companies to partner with on smart meter training and installation as well as to provide wider advice in order to help energy companies achieve their CERT and in future CESP targets.

CUTTING CARBON IN UK HOUSEHOLDS

The purpose of Eco Streets is to provide constant and trusted community-based support for energy efficiency and sustainable living. Each household will receive a minimum of four visits during a 12-month period. The closer the relationship between coach and household the better we can encourage measurement and reduction of emissions.

Our target in the first phase of pilot projects is to realise at a minimum 0.5 tonne of savings in 50 per cent of households visited, just from behavioural change. Once capital measures are installed, the savings will be greater.

We are striving to create a sense of community and a common sense of mission among Eco Streets Coaches. Planet Positive believes that we have to create an attractive scheme that people will want to join, aside from the planet-saving motives. We will do this by encouraging local Climate Coaches to host events, holding Eco Streets annual awards, and using resourceful, street-level, creative marketing. Eco Streets will also focus on strengthening community spirit around a common cause, and hopefully aid integration in communities with marginalized populations.

Planet Positive recognizes that it is essential to provide incentive schemes for households to reduce energy usage in addition to advice and cost-saving results. To this end Planet Positive is working to create special offers on green products for householders and grants from energy companies and governments.

NATIONAL REACH

Eco Streets represents a single branded entity that draws each community-led scheme into a global network for knowledge sharing and momentum creation. The central organization communicates to potential recruits and households with the latest information on government grant schemes, green technology development, and sustainable living tips, and is establishing relationships with government bodies and energy companies to promote subsidized capital measure installation through Eco Streets.

Working with local delivery partners for volunteer recruitment, training, data handling and community marketing, Planet Positive is currently delivering a series of UK-based Eco Streets pilot schemes in preparation for a national and international roll-out in 2010. The aim is to create a network of Eco Streets Coaches in every city, town and village as part of a larger Eco Streets around the world that people can tap into and local businesses can support. The overall goal is to have engaged with one million home owners by 2015 and six million by 2020.

GREEN JOB CREATION

One 'by-product' of such a programme is the green up-skilling of people around the country. By engaging and training volunteers in the community, Eco Streets acts as a springboard into green employment.

Climate Coaches can be encouraged to take additional technical and/or strategic carbon consulting training with partner organisations. In future, Eco Streets will offer these training pathways. This leads to the creation of green collar workers able to install green technology and capital measures and carbon consultants who can advise local businesses on reducing their impacts.

For those Eco Streets members who have developed expertise, Planet Positive is liaising with employment partners to advertise jobs on the Green Job Exchange section of the Planet Positive website. Planet Positive is seeking local employability improvement partners for support services such as job coaching, practice interviews, trial days, work placements and CV workshops.

COOL EARTH

When organisations or individuals donate money, Cool Earth secures threatened rainforest that would otherwise be sold to loggers and ranchers. The money is put in a local trust, and Cool Earth employs local people to protect the forest, helping them to get income from the forest without cutting it down, and funding community-based livelihood and/or education services to ensure that the rainforest is worth more standing than cut down. Tropical deforestation is responsible for approximately 20 per cent of global GHG emissions, and

Stopping deforestation is crucial.

the tropical rainforest belt regulates the world's weather systems – so stopping deforestation is crucial.
Cool Earth currently has projects in Peru, Brazil and Ecuador – with new sites in development. The project areas have been specifically chosen because they are of high strategic value for a number of reasons:

1. They are located at the frontier of destruction, where rainforest is immediately threatened by human activities like logging and cattle ranching.
2. Either their location or their conservation acts as a protective blockade for tens of thousands of acres of forest behind them, ensuring our sponsors are protecting far more than their own acres.
3. They are mature rainforests with uniquely high levels of biodiversity reflecting thousands of years of undisturbed growth, wildlife and species.

Alternatives to carbon offsetting like the Community Carbon Fund and Cool Earth are becoming increasingly popular as catalysts for change. They also address areas that offsetting does not currently affect on a large scale – behavioural change and energy efficiency in local communities, and the protection of the rainforest.
Planet Positive hopes that a fair global deal based on climate change science is agreed at Copenhagen. But politicians and governments can only create the correct frameworks to harness and inspire the people's creativity and increase their knowledge – the rest is up to us in our own communities. Projects that aim to make a change by engaging people directly in climate change mitigation, whether it be through a donation for the protection of rainforest, or through volunteering to support your neighbours' carbon footprint reduction, have a major part to play in inspiring and empowering people around the world to build a better future.

FUNDING

Eco Streets is drawing together funding from government agencies, corporations and charitable organisations, as well as from users of the Planet Positive mark, who can donate funds to the development of their local Eco Streets. If you would like to start Eco Streets in your area, or know an organisation that would be interested partnering to develop a local scheme, please get in touch.

Eco Streets at a glance

- Job creation
- Green workforce development
- Behavioural change
- Carbon reduction
- Cost savings for households
- Knowledge transfer
- Sustainable legacy
- Community involvement

2020 Vision

Planet Positive's 2020 Vision campaign works hand-in hand with Eco Streets initiative to provide an inspiring view of a more sustainable world in 2020. Planet Positive is collecting positive visions of a low-carbon world from well-known environmentalists, politicians, corporate leaders and celebrities on the Planet Positive website. Anyone around the world can upload their own vision in words, images, or film. Please go to www.planet-positive.org to contribute yours!

Author

Christina Wood has an MSc in environmental policy and regulation from the London School of Economics and experience in developing protocols in carbon management. She liaises with the network of Planet Positive accredited consultancies, is developing a national network of carbon auditors and works with a Technical Committee to maintain the Planet Positive Protocol at best practice.

Organisation

The Planet Positive Foundation is a not-for-profit organisation focused on inspiring action on climate change and supporting people to reduce their environmental impact. The Planet Positive mark symbolizes a commitment to ongoing reduction in carbon emissions, and can be applied to a business, event, person or product. Backed up by a best practice protocol in carbon management, the mark has been tried and tested by over 50 companies in the UK. Planet Positive is also a movement for a better way of living. Through a series of campaigns and programmes such as the Eco Streets and the 2020 Vision Campaign, Planet Positive will be reaching out to the individuals to support them in living more sustainably and adopting an optimistic, active approach to climate change.

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Climate change presents a tremendous opportunity for business to create value.

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Climate change:

THE CASE FOR ENGAGEMENT

GEORG KELL, EXECUTIVE DIRECTOR,
UNITED NATIONS GLOBAL COMPACT

It has long been argued that business has a role to play in addressing climate change. This article explains how a low-carbon economy can provide opportunity, growth, innovation and increased efficiency within companies. While business engagement is indeed essential for the development of a green economy, a shift in focus is required, from short-term profit maximisation to long-term sustainability. This article points out that such a shift now comes at far less a cost than the results of a continued lack of action.

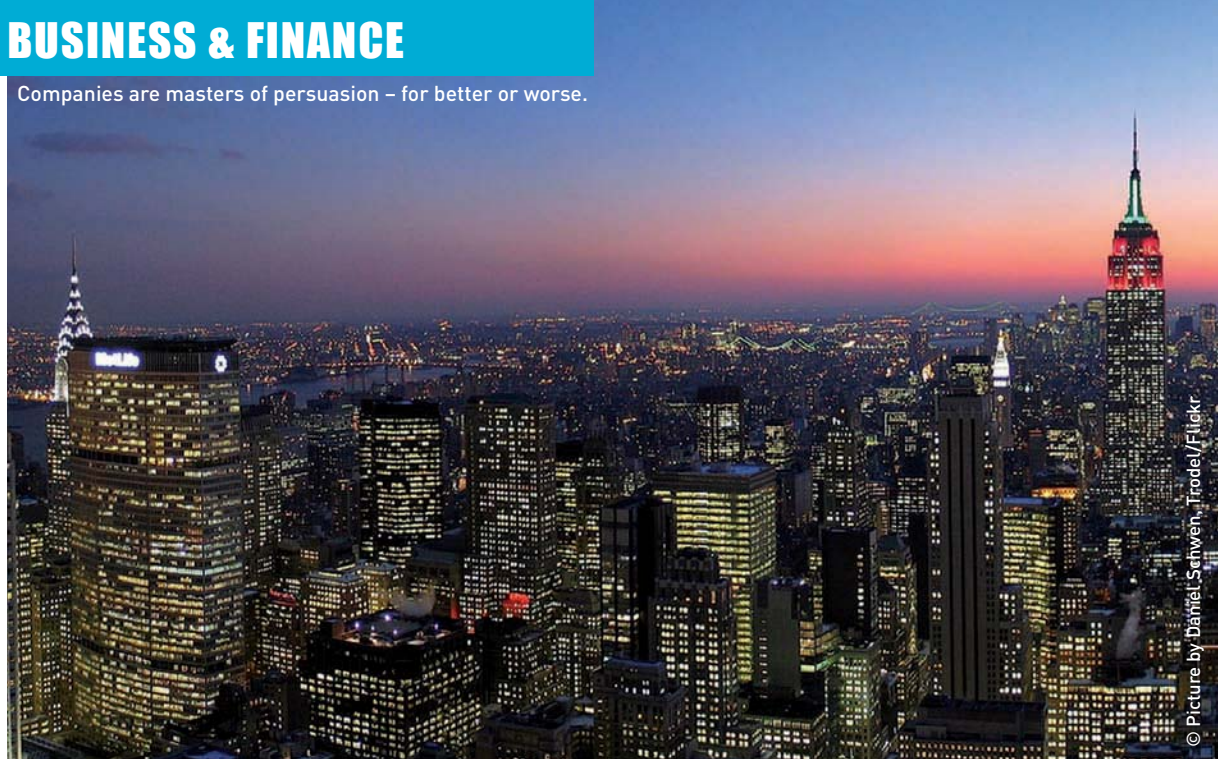
Arguably, most people today understand the urgency of climate change. But still, too few are prepared to act.
As the world economy is only slowly beginning to recover from the most severe recession since the 1930s, the climate challenge is once again moving into the center of attention. With the critical UN Climate Change Conference (COP 15) in Copenhagen fast approaching, it is worthwhile to recall what is at stake: any advances made and to be made in global integration, wealth creation, poverty reduction and peace building critically depend on our ability to address climate change now. In other words, the future of the global market as we know it hangs in the balance.
But amid the scenarios of climate doom, there lies hope. In fact, climate change presents a tremendous opportunity for business to create value. The critical question is whether the private sector can seize this opportunity to retool the global economy and lay the foundation for low-carbon growth that creates jobs, fosters innovation and advances economic efficiency.

> “It is only with the private sector that we will be able to turn the tide on climate change”

BUSINESS RESOURCES

Granted, business does not hold all the keys to a low-carbon future. Governments will have to muster up the political will needed to create the proper regulatory and enabling environment. Only regulatory certainty can rev up the engine of green growth which drives innovation, spurs massive global investments and enhances efficiencies, allowing climate mitigation and adaptation approaches to reach full scale.

VISIT: WWW.CLIMATEACTIONPROGRAMME.ORG


Companies are masters of persuasion – for better or worse.

© Picture by Daniel Schwen, Trodel/Flickr

But business has a vital stake in this process. In fact, it is only with the private sector that we will be able to turn the tide on climate change. How so? For one, companies are masters of persuasion – for better or worse. Business can create and shift demand for products and services (through marketing), shape public opinion (through advocacy and public relations), and influence policy makers (through lobbying). It is about time these capacities are put to good use in support of the fight against climate change.

> **"Roughly 40 per cent of future energy growth could be saved if existing technologies were to be applied"**

More importantly, the private sector has by far the most resources and know-how to innovate. And much progress has already been made. According to a recent McKinsey estimate, roughly 40 per cent of future energy growth could be saved if existing technologies were to be applied. For an added incentive, investors everywhere have been steadily building climate risks and opportunities into their decision-making processes. It doesn't take much to recognise that transformation is indeed possible and economically viable.

These are compelling arguments, for sure. As climate change is fundamentally transformative, taking early action appears to be in line with business logic. Also, given the long-term life cycles implied by many investment decisions, one would assume that many businesses have long begun repositioning themselves, already discounting for future costs and identifying new opportunities.

Moreover, global growth of the scale seen in the past three decades has been the result of widespread and massive economic integration. The long-term viability of this globally integrated economy is under threat. Without a successful new climate framework, there is a high likelihood of new trade barriers and competition-distorting fallouts, adding to the frightening specter of protectionism that has already been spotted in connection with the economic crisis.

CORPORATE RESPONSE

In sum, one would assume that businesses everywhere are fully aware of these stakes, eager to act in order to minimise risk and capitalise on new opportunities. And to be certain, many more companies than just six months ago have been making climate change a strategic and operational priority – setting emission reduction goals and publicly disclosing results, investing in clean technologies and innovating green solutions in critical areas – from energy through to transportation and buildings.

Yet, while the balance has been visibly shifting, too many continue to sit on the fence, and some are still using their lobbying power to undermine climate action. According to a 2008 study by the Ethical Investment Research Service (EIRIS), only 10 per cent of companies in high impact sectors like oil and gas have adopted a good or advanced response to climate change risk.


An increasing number of companies are leading by example, driving innovation in their sectors and sharing good practices.

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> “What we really need is new era of business statesmanship driven by the simple truth that the price tag of action now is small in comparison to the cost of future impacts caused by inaction”

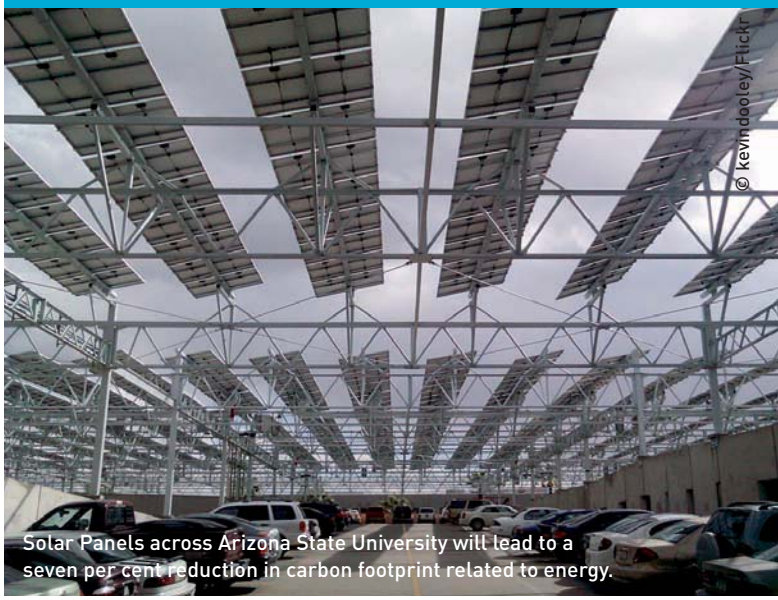
It is hard to pinpoint the exact causes of reluctance. Businesses often point to regulatory uncertainties or lack of clarity about carbon-pricing. A crucial factor appears to be that climate change is a long-term systemic challenge, and – lacking the cyclical nature of downturn and recession – is likely to stay with us for a long time. Much of the private sector, however, plans and operates in relatively short cycles, having to meet the quarterly or annual expectations of capital owners. Managing this paradigm shift from short-term profit maximisation to long-term sustainability will thus be one of the most important tasks to set the stage for the low-carbon global economy we have to build.

The good news is that an increasing number of companies – in all sectors, of all sizes and across all regions – are leading by example, driving innovation in their sectors and sharing good practices. Much of this has been taking place under the umbrella of Caring for Climate, the UN Global Compact's own climate engagement platform with more than 360 signatories from 65 countries.

However, capitalising on the core strengths outlined earlier, the climate leaders can and must do even more to push their peers to action – within their sectors, their markets, and down through their supply chains. Likewise, business should use its influence with policy makers to lobby for binding carbon reductions and workable technical standards. What we really need is new era of business statesmanship driven by the simple truth that the price tag of action now is small in comparison to the cost of future impacts caused by inaction.

On the technological side, we need to stimulate and encourage more innovation and support so that existing solutions are widely shared. This will also require a strong stand on open markets, free trade and global integration – and against protectionism and further barriers – as globally integrated supply chains are our best guarantee to quickly diffuse technological innovation across the globe.

Finally, while focusing on climate action and the reduction of carbon emissions, business will also need to tackle the consequences of climate change. Climate change is not a stand-alone issue. It affects all pillars of human prosperity, such as food security, water supplies, public health, security and stability. 45 million people are malnourished due to climate change. 60 per cent of the developing nations' workforce is linked to areas such as agriculture that are directly affected by climate change. These are alarming numbers likely to rise if we fail to act. We all – business leaders, investors, consumers and citizens – must adapt our value system to these realities. And we must do so now.



Solar Panels across Arizona State University will lead to a seven per cent reduction in carbon footprint related to energy.

Author

Georg Kell is the Executive Director of the United Nations Global Compact, the world's largest voluntary corporate responsibility initiative with more than 6,000 participants in over 130 countries. Spanning more than two decades, his career with the United Nations began in 1987 at the UN Conference on Trade and Development (UNCTAD) in Geneva. In 1997, Mr Kell joined the Office of the UN Secretary-General in New York, where he spearheaded the development of new strategies to enhance private sector engagement with the work of the United Nations. As one of the Global Compact's key architects, he has led the initiative since its launch in 2000, building the most widely recognised global business platform on human rights, labor, environment, and anti-corruption. Prior to joining the UN System, Mr Kell worked as a researcher at the Fraunhofer Institute in Germany and as a financial analyst evaluating multinational companies' investment portfolios in Asia and Africa. A native of Germany, he holds advanced degrees in economics and engineering from the Technical University of Berlin.

Organisation

Launched in 2000, the UN Global Compact brings business together with UN agencies, labour, civil society and governments to advance 10 universal principles in the areas of human rights, labour, environment and anti-corruption. Through the power of collective action, the Global Compact seeks to mainstream these ten principles in business activities around the world and to catalyse actions in support of broader UN goals. With over 5,200 participating companies and hundreds of other stakeholders from more than 130 countries, it is the world's largest voluntary corporate sustainability initiative.

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ICC is the primary business interlocutor in key intergovernmental negotiations and deliberations on a wide range of issues that affect trade, including environment and energy issues.

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Business seeks clarity, predictability and continuity in Copenhagen

JEAN ROZWADOWSKI
SECRETARY GENERAL,
INTERNATIONAL CHAMBER OF COMMERCE

We are at a decisive moment. In Copenhagen negotiators have an opportunity to respond to urgent scientific warnings and place the world on a durable path towards a low-carbon economy. Climate change is a global problem that requires collective actions by all nations. Copenhagen can provide a solid step on this journey.

The private sector is a critical partner in creating solutions to the climate change challenge and is already actively engaged on many fronts. All over the world, businesses large and small are addressing climate change at local, national and international levels, both as enterprises and through partnerships. Many have already made major changes in how they operate, and have seized opportunities for new processes, products and services to reduce greenhouse gas emissions.

BUSINESS HAS A LEADING ROLE TO PLAY IN FINDING SOLUTIONS TO CLIMATE CHANGE

According to the United Nations and the International Energy Agency (IEA), over 80 per cent of the estimated US$1 trillion annually required to fund global mitigation and adaptation activities needed to halve global emissions by 2050 will come from the private sector. In order to enable and enhance this contribution, governments in Copenhagen must provide the private sector with clarity, predictability and continuity. Business will respond to specific signals to mobilise the financial and technological resources needed to fight climate change both in developed and developing countries.

DEVELOPING AND DEPLOYING TECHNOLOGIES

Effectively addressing climate change requires the development and deployment of a wide array of low-carbon technologies, especially in developing countries. All energy options must be utilised, and the broader use of existing energy-efficient and low-carbon technologies must be stimulated.

This does not happen in a vacuum. Globally, the development and deployment of technologies to address climate change require appropriate institutional and enabling frameworks. These include intellectual property rights protection, market-based licensing of those rights, innovative funding mechanisms and the removal of trade and investment barriers.

Of course, technology needs and capabilities will be different in the contexts of mitigation and adaptation to climate change. The successful deployment of technologies will depend on the existence or strengthening of various factors, including enabling framework conditions, local conditions and the engagement of local business communities and public authorities, technology choices, infrastructure and capacity building measures.

A critical factor to combating climate change which cannot be overlooked is intellectual property rights protection. When governments consider potential mechanisms to foster transfer of technology in the context of the development of a post-2012 framework, they should avoid measures that would create additional burdens and legal uncertainty for intellectual property owners. This would compromise the essential role of patents and discourage innovation and disclosure of technological developments.

Governments can support technological innovation through enabling policies and frameworks. These policies should include developing national research programmes targeted at identifying local barriers and recognising and supporting opportunities. National technology development strategies must cover fundamental research in emerging and near commercial areas in order to ensure a pipeline of new technologies. Governments also play an essential role in replenishing and expanding the stream of qualified individuals with essential technical training.

> **"Technology needs and capabilities will be different in the contexts of mitigation and adaptation to climate change"**

The private sector is the prime conduit for developing and commercialising innovative energy production technologies. Yet sustainability challenges facing society are such that the private sector's efforts will probably not be adequate in themselves. New alliances and collaboration will be needed. Leveraging resources and partnerships to develop breakthrough technologies to fundamentally change our energy future is an urgent priority. This includes technologies that reduce carbon intensity, meet growing demand and provide affordable, universal access, reduce environmental impacts, improve efficiency and provide reliable infrastructure to underpin development.

FINANCING ADAPTATION AND MITIGATION

Alongside technology development, financing is an essential and much needed component to ensure a successful outcome in Copenhagen. Significant financing will be required to fund international actions to adapt to climate change and mitigate greenhouse gas emissions, particularly in developing countries.

Based on United Nations Framework Convention on Climate Change estimates, an additional $200 billion of the world's annual projected investment flows should be diverted to lower emitting technologies from other 'business as usual' opportunities, with roughly half of this investment required in the developing world. So how are these large amounts to be catalysed?

A combination of flexible financing and market mechanisms will be required to cover the broad and growing range of new investments needed. For markets to work efficiently and effectively, prices should give customers a clear basis for their decisions while ensuring optimal resource allocation.

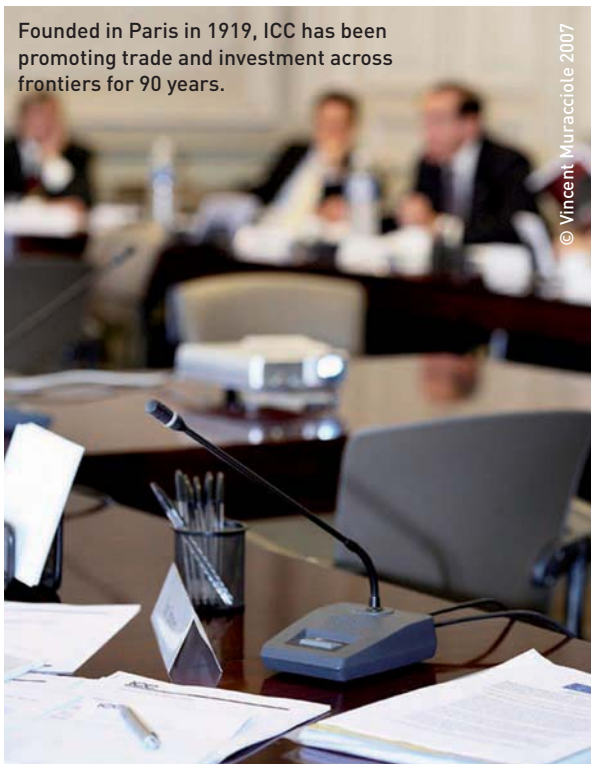
Many funding mechanisms, including carbon markets, exist and could be improved and leveraged if governments increased their transparency, efficiency and functionality, and made their funding more predictable.

Existing market mechanisms like the UNFCCC Clean Development Mechanism (CDM) should be improved and streamlined. The CDM has been more successful than many could have predicted. According to the World Bank 2009 State of the Market report, there are more than 4,500 projects in the CDM pipeline that have the theoretical potential of delivering about 2.9 billion Certified Emissions Reductions (CER) by 2012.

Another important contribution of the CDM has been the significant change of culture that it has generated by creating a price for a ton of carbon in developing countries. Business, governments and non-governmental organisations know that in any activity they undertake they must also look at the perspective of carbon reductions, otherwise they may forego significant potential revenues.

Going beyond the CDM, the development of new crediting mechanisms can provide an avenue that will take us closer to our shared climate change goals. There is a need for new mechanisms, but they must be designed to:

- Unleash the entrepreneurial spirit of the business community;
- Provide a clear market signal that will change behaviour and influence economic low carbon choices that will include all technologies;



Founded in Paris in 1919, ICC has been promoting trade and investment across frontiers for 90 years.

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The private sector is a critical partner in creating solutions to the climate change challenge and is already actively engaged on many fronts.

- Ensure that private funds, which are essential to finance the transformation to a low carbon economy, can participate, and ensure that they are appropriately articulated with national policies and measures.

Private sector innovation and investment will continue to provide most of the financing for cleaner technology; however, in order to further enhance these efforts, governments have recognised the need for targeted public financing mechanisms to encourage investment.
Despite the proliferation of specialised climate-related financing programmes, more needs to be done to effectively leverage private capital. In particular, public sector money could also play an important role to assure a steady base, especially in the first phase, when capacity building and the proper environment needs to be created.

> **“Despite the proliferation of specialised climate-related financing programmes, more needs to be done to effectively leverage private capital”**

LOOKING AHEAD

Making progress towards solving the linked challenges of climate change, energy for development and economic recovery requires long-term commitment, shared vision and actions between governments and the private sector.
The engagement of the private sector is crucial and public-private partnerships are essential, particularly for technology co-operation. Business has extensive expertise in this area, and is already working with governments and international bodies such as the United Nations Development Programme and the United Nations Environment Programme to develop collaborative solutions among various actors and key stakeholders in developing and developed countries.
As we move ahead to enact the outcomes reached in Copenhagen, governments should leverage and promote existing business activities in investment and innovation, and the development and deployment of effective technologies to mitigate and adapt to climate change. The post-Copenhagen elaboration and implementation process should engage business as much as possible.
Looking ahead, ICC hopes to see the creation of more effective ways for governments to benefit from business expertise and actions, through opportunities to collaboratively define mitigation and adaptation to climate change, and effective policies to promote them.
As a global, multi-sectoral business organisation, ICC stands ready to further engage with policy-makers to ensure a successful outcome in Copenhagen as well as to facilitate the transition to a low-carbon economy.

Author

Jean Rozwadowski is the Secretary General of the International Chamber of Commerce.

Organisation

The International Chamber of Commerce (ICC) is the voice of world business, championing the global economy as a force for economic growth, job creation and prosperity. ICC activities cover a broad spectrum, from arbitration and dispute resolution to making the case for open trade and the market economy system, business self-regulation, fighting corruption and combating commercial crime.

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Climate change insight

Lloyd's Register has been an official participant at the United Nations Conference of the Parties (COP) conferences since 1997's COP 3 in Kyoto. This is directly related to our mission of enhancing the safety of life and property, at sea, on land and in the air – for the benefit of the public and the environment.

To provide insight on the issues that industry and governments will be discussing, we have been running a series of podcasts in the weeks leading up to COP 15 and during the conference we will have a regular conference blog on our web site.

COMMENTS FROM OUR EXPERTS

Our series of six podcasts (www.lr.org/cop15podcasts) features our leading climate change experts and here are some of their comments.

Dr Anne-Marie Warris, our leading global climate change expert, who is also heading up the Lloyd's Register delegation in Copenhagen, talked about the key issues for the marine sector: "A lot of companies are doing quite substantial work in reducing CO_2 emissions. It's being driven by energy efficiency, and stakeholder demands to demonstrate that they're environmentally friendly, as well as the drive to transparently communicate their carbon footprint."

Anton van Himbergen, principal consultant in our Transportation business: "Rail will be a part of the discussions because it's one of the greenest modes of transportation. There is a need for discussions about two topics. One, the development and improvement of greener technologies but also we need to talk about political changes to force the transport market in a green, sustainable direction."

Sean Cuthbert, senior consultant in our Energy business: "Players in the energy sector are holding back investment in new technologies, in improving their supply chains, simply because they don't know what is going to happen with regards to regulation. By bringing all the key countries together around the table, agreeing on a definite direction, a definite time line within the energy sector, they're going to feel more comfortable with starting to make the significant investments in infrastructure that are needed to achieve the goals of 2050."

Madlen King, Global Climate Change Manager for our Management Systems business, LRQA: "One thing global organisations are most concerned about, with regard to the Copenhagen negotiations, is the potential extension to our present situation which is one of uncertainty. The negotiations have the potential to make dramatic changes to global commitments on climate change but also to the global carbon markets."

LLOYD'S REGISTER COPENHAGEN BLOG

From the start of COP15 a regular blog (www.lr.org/cop15blog), featuring insight and expertise from COP 15 delegates, will be run on our web site. It will cover some of the key open meetings, with attendees offering real-time insight throughout the conference. The debate on the inclusion of the shipping sector into a global deal, the status of adaptation and the future of the Kyoto Protocol's mechanisms and schemes are among the topics that will be addressed.

Organisation

Lloyd's Register provides independent assurance to companies operating high risk capital-intensive assets in energy and transportation to enhance the safety of life, property and the environment, so helping our clients ensure safe, responsible and sustainable supply chains.

Dr Anne-Marie Warris is the chairperson for the ISO 14001 Technical Committee, chairperson for the United Kingdom Emissions Trading Group (UK ETG) and is also the author of the Voluntary Carbon Standard (VCS) 2007.

Services are provided by members of the Lloyd's Register Group. The Group comprises charities and non-charitable companies, with the latter supporting the charities in their main goal. Lloyd's Register, Lloyd's Register EMEA and Lloyd's Register Asia are exempt charities under the UK Charities Act 1993.

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Solar panels in front of a tukul in compound of Doctors Without Borders, Waat, Jonglei Sudan.

© Still Pictures

Multiple global problems need integrated solutions:

APPLYING THE SUSTAINOMICS FRAMEWORK

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SUSTAINABLE CONSUMPTION INSTITUTE, UNIVERSITY OF MANCHESTER, UK
CHAIRMAN, MUNASINGHE INSTITUTE FOR DEVELOPMENT (MIND), SRI LANKA
CO-LAUREATE 2007 NOBEL PEACE PRIZE (VICE CHAIR, IPCC-AR4)

The world is facing multiple economic, social, and environmental threats. This is best characterised by a 'bubble' metaphor based on false expectations, where few enjoy immediate gains while the vast unsuspecting majority will pay huge 'hidden' costs in the future. These threats can interact catastrophically, unless they are addressed urgently and in an integrated fashion, by making development more sustainable. Piecemeal responses will be ineffective, since the problems are interlinked and feed on one another.

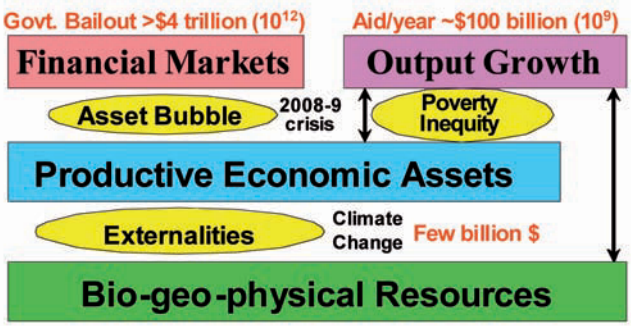
ECONOMIC, SOCIAL AND ENVIRONMENTAL BUBBLES

The most urgent and visible problem is the economic collapse. Figure 1 shows how a greed-driven asset bubble rapidly inflated the value of financial instruments well beyond the true value of the underlying economic resource base. The collapse of this bubble in 2008 caused the global recession. It is estimated to contain about 100 trillion dollars of 'toxic' assets (twice the annual global GDP).

Meanwhile, a social bubble based on poverty and inequity continues to undermine the benefits of rapid economic growth of recent decades, excluding billions of poor from access to productive resources and basic necessities like food, safe water and sanitation, energy, health care, shelter, and a clean environment. In 2000, the top 20 percentile of the world's population by income, consumed 60 times more than the poorest 20 percentile. Poverty is now exacerbated by the economic recession, which is worsening unemployment and access to survival needs. This bubble cannot be ignored indefinitely, without grave consequences for humanity.

Finally, mankind faces the bubble of environmental externalities, whereby myopic economic activities continue to severely damage the natural resource base on which human well being ultimately depends. Beyond degradation of local air, land and water resources,

Figure 1. Multiple global crises and human priorities.



Source: Munasinghe

climate change is the ultimate global manifestation of this threat, where carbon dioxide emissions that have driven growth since the industrial revolution will result in catastrophic impacts that will undermine progress for centuries to come. Ironically, the worst impacts of climate change will fall on the poor, who are not responsible for the problem.

> "Leaders need to invest a bigger share of the fiscal packages in key areas of green infrastructure"

What are our current priorities as we face these challenges? Governments have very quickly found over four trillion dollars for stimulus packages to bail out rich bankers and revive shaky economies. However, only about 100 billion dollars per year is devoted to help billions of poor people, and far less to combat climate change. Furthermore, the recession is further dampening enthusiasm to address more serious long term poverty and climate issues.

THE IMMEDIATE WAY FORWARD

The ongoing economic crisis has provided opportunities for world leaders to move in new directions as they implement unprecedented stimulus packages and seek to coordinate policies. Prompt action including appropriate investments, social safety nets, and price policies, can yield multiple dividends.

First, leaders need to invest a bigger share of the fiscal packages in key areas of green infrastructure (like energy, water, transport and agriculture) and social development (typically education and health), which will stimulate the economy, increase employment, and protect the environment. They must resist pressures to use the increased spending merely to protect current expenditures (especially wasteful subsidies and bailouts). Investments in green and carbon saving technologies will boost the development of renewable energy. Gains in energy efficiency are possible in major sectors like energy, industry, transport, construction and agriculture. Additionally, reversing global deforestation could boost sustainable livelihoods while absorbing atmospheric carbon and protecting the local environment.

Secondly, the developing world is too big to be allowed to fail – it contributes over 47 per cent to the $55 trillion world economy, produces more than half OECD imports, and contains three billion people living on less than $2.50 a day. Donors need to expand poverty reduction efforts, because hundreds of millions more people are likely to slip into poverty. Financial packages need to focus on investments with a high potential for job creation, sustainable livelihoods and access to assets for the poor. Sound social safety nets can protect the vulnerable. Mexico, Brazil and other countries have shown how conditional cash transfer programs could provide income to the poorest families, while encouraging them to invest in the health and education of children.

Figure 2. A vision for the future.

Levels	Indicators	Time	Human Interventions
Main Issues	Econ. Crises, Poverty, Inequity Exclusion, Resource Conflicts, Hunger, Envir. Harm & CC	Now ←	High risk from unrestrained, myopic market forces ("Washington consensus", globalisation etc.) – Reactive: piecemeal - mainly govt.
Immediate Drivers	Consumption Patterns Population Technology Governance	Transition ←	Making development more sustainable (MDMS) NOW with systematic policy reform to manage market forces (Sustainomics) – Proactive: integrated, harmonious approach - govt., business, civil soc.
Underlying Pressures	Basic Needs Social Power Structure Values, Perceptions, Choices Knowledge Base	Long Term ←	Fundamental global sustainable dev. transition catalysed through grass roots citizens movements, driven by social justice and equity, innovative leadership, policies, info. flows, tech. (new SD paradigm) – Proactive: civil soc., business, govt.

Source: Munasinghe (2007)

Devoting about one per cent of GDP for such efforts can make a huge difference.

Thirdly, pricing policies need to be reformed. Energy subsidies – a quarter trillion dollars in 2005 worldwide – represent energy wastage, a fiscal drain and harm to nature. Although they are aimed at the poor, the bulk of the gains do not reach their target. These subsidies need to be phased out, while targeted safety nets protect the basic needs of the poor (see Figure 2 below). Other areas for price reforms include water, fertilizer and chemicals where subsidies amount to several percentage points of GDP in many countries.

> **"Energy subsidies – a quarter trillion dollars in 2005 worldwide – represent energy wastage, a fiscal drain and harm to nature"**

Improvements in global governance should include market regulatory reforms, giving more weight to the developing world within the IMF/World Bank, making the UN system more responsive, and shifting emphasis from G7 to G20. It may be useful for the G20 to create two advisory bodies – B20 and C20, consisting respectively of business and civil society leaders nominated by the G20.

A LONG TERM VISION

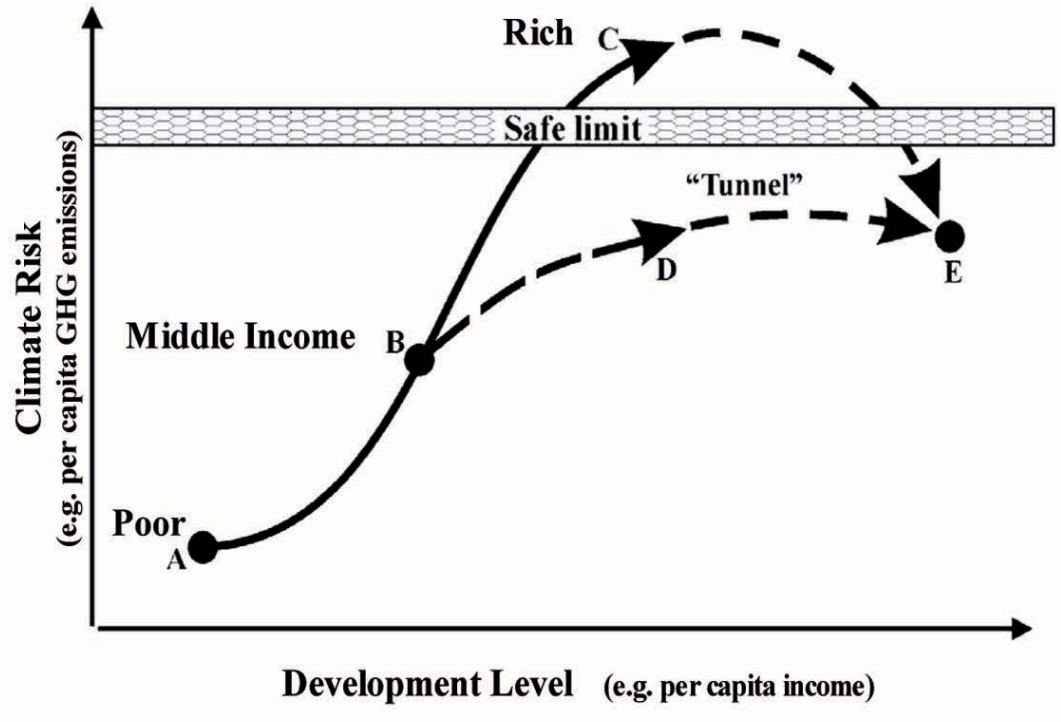
Based on the foregoing, a longer term vision for the future is summarised in Figure 2. The top row recognises that our current focus is on surface level issues like poverty, inequity, exclusion, resource scarcities and conflict, mis-governance and environmental harm. These problems are driven by powerful forces including globalisation and unconstrained market forces, based on the 'Washington Consensus'. Present trends could lead to a breakdown in global society, due to the ineffectiveness of governments seeking to cope with multiple, interlinked crises, using myopic, reactive and uncoordinated responses. A recent example is the futile attempt to alleviate oil scarcities by promoting corn-ethanol, which meanwhile worsened food security arising from a drought-driven worldwide grain shortage.

The second row shows that a transitional step forward is possible today, by influencing key common drivers of change, including consumption patterns, population, technology and governance. This will help address a broad range of issues in an integrated manner, shaping global trends and managing market forces. The immediate way forward, described earlier, is a key part of this transition.

More broadly speaking, using existing experience and tools that make development more sustainable today, business and civil society could help governments move proactively towards the ultimate goal of sustainable development. The emphasis is on early action, to overcome the huge inertia of 'supertanker earth', and begin steering it away from its risky current path towards safer waters.

The third row follows on from the successful implementation of the second (transition) row. Here, our children and grandchildren might pursue their long term goal of a truly global sustainable development paradigm.

Figure 3. Reconciling development aspirations with climate change responses.



Source: Munasinghe (2007)

They would need to work on deep underlying pressures linked to basic needs, social power structure, values, choices, and knowledge base. Fundamental changes are necessary, driven by social justice and equity concerns, through inspired leadership, a networked, multi-stakeholder, multi-level global citizens' movement, responsive governance structure, improved policy tools, advanced technologies and better communications (including the internet).

SUSTAINOMICS

To facilitate this transition, a comprehensive practical framework called 'sustainomics' was proposed by the author at the 1992 Rio Earth Summit, which has been widely applied since then (Munasinghe 1992, 2009). It involves three basic principles:

- First, making development more sustainable (MDMS) becomes the main goal. Sustainable development is defined as a process (rather than an end point) for improving the range of opportunities that will enable individuals and communities to achieve their aspirations and full potential over a sustained period of time, while maintaining the resilience of economic, social and environmental systems. MDMS is a step-by-step method that is more practical and permits us to address urgent priorities without delay, because many unsustainable activities are easier to recognise and eliminate (like conserving energy and reducing pollution).
- Second, balanced treatment needs to be given to the three elements of the sustainable development triangle – the social (focusing on equity, inclusion, empowerment and values), the economic (dealing with growth and efficiency), and the environmental (concerned with natural resource degradation and pollution).
- Third, the thinking should transcend traditional boundaries (involving disciplines, space, time, and stakeholders). Trans-disciplinary analysis is essential, since issues and solutions cut across conventional academic disciplines. Problems like climate change also span the whole planet, play out over centuries, and concern every human being on earth.

The sustainomics framework also provides policy makers with a variety of practical tools. They help to not only identify and implement the most desirable 'win-win' climate policies that simultaneously yield economically, environmentally and socially sustainable paths, but also resolve trade-offs among conflicting goals.
At the national level, tools include macro and sectoral modeling, environmentally adjusted national income accounts, poverty analysis, and the Action Impact Matrix (AIM – described on the following page). At the project level, other useful methods are available for sustainable development analysis – such as cost-benefit analysis, multicriteria analysis, and environmental and social assessment. At all levels, the choice of appropriate sustainable development indicators is also vital. The range of policy instruments includes pricing, taxes and charges, regulations and standards, quantity controls, tradable permits, financial incentives, voluntary agreements, information dissemination, and research and development. Ethical, moral and human rights considerations also play a key role.

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Problems like climate change also span the whole planet, play out over centuries, and concern every human being on earth.

GLOBAL LEVEL APPLICATION – CLIMATE CHANGE RESPONSES

Figure 3 shows how the sustainomics approach could be applied to reconcile long-term development aspirations and climate change responses. On this stylised curve of environmental risk against a country's development level, poor nations are at point A (low GHG emissions and low GNP per capita), rich nations are at point C, and intermediate countries are at point B. The following elements are essential for a workable global compact:

- Industrial countries (already exceeding safe limits) should mitigate and follow the future growth path CE, by restructuring their development patterns to make both production and consumption more sustainable and delink carbon emissions from economic growth.
- The poorest countries must be provided an adaptation safety net, to reduce vulnerability to climate change impacts.
- Middle income countries could adopt innovative policies to 'tunnel' through (along BDE – below the safe limit), by learning from past experiences of the industrialised world.
- Developing countries should receive technical and financial assistance, to simultaneously continue to develop (and grow) more sustainably, by following a less carbon-intensive growth path that also reduces climate vulnerability.

COUNTRY LEVEL APPLICATIONS

A recent example of macro-analysis shows the complex trade-offs involving economic, environmental and social goals, while using complementary measures to resolve problems. In West Africa, growth inducing macropolicies (including structural adjustment) interacted with imperfections in the economy to increase GHG emissions and worsen climate impact vulnerabilities. Such imperfections (policy distortions, market failures, and

institutional constraints) make private decisions deviate from socially optimal ones. Macro-modeling showed that rapid aggregate economic growth, promotion of timber exports, subsidies for land-clearing, and open access forests, have combined to cause accelerated deforestation, thereby exacerbating rural poverty, harming the local environment, increasing GHG emissions and undermining adaptation. Implementing complementary measures (eliminating land-clearing subsidies and enhancing forest protection) helped to address the problems and improve mitigation and adaptation prospects – most importantly, without reversing the growth-promoting macro-policies. In Figure 3, the highly peaked path ABCE could result from economic imperfections and environmental externalities. Corrective policies would help to reduce such distortions and permit movement through the sustainable tunnel BDE. Such a tunnel path is also more economically optimal (e.g., a 'turnpike' growth path).

Another sector-based example involves energy pricing. It would be *economically* efficient to set energy prices at marginal cost. Adding *environmental* externality costs (appropriately valued), including a carbon tax, would further reduce energy use and mitigate GHG emissions. From the *social* viewpoint, it would be equitable to earmark some of these tax revenues to help the poor who cannot afford to meet their basic energy needs, and to fund their adaptation efforts. Otherwise, simply raising prices could become a way of rationing energy in favour of the rich, while worsening the plight of the poor.

AGRICULTURE, FOOD AND WATER SECTOR ISSUES IN SRI LANKA

Among the various sustainomics tools mentioned above, the Action Impact Matrix (AIM) is a unique method that shows how to practically integrate climate change and sustainable development. This approach also has been used successfully in several other countries. It identifies and prioritises the two-way interaction: how (a) the main national development policies and goals affect (b) the key adaptation and mitigation options and vice versa. It determines the priority macro-strategies in economic, environmental, and social spheres that facilitate the implementation of climate change adaptation and mitigation policies. The AIM methodology uses a fully participative stakeholder exercise, including development and climate change experts from government, academia, civil society and business. This collaboration helps participants better understand opposing viewpoints, resolves conflicts, promotes cooperation and ownership, and facilitates implementation of agreed policy remedies. Application of the AIM approach in Sri Lanka showed major climate vulnerabilities arising from food security, agriculture and water. A more detailed agriculture model was applied to identify how past output changes in important crops like rice and tea had depended on natural variations in temperature and rainfall. Then, a downscaled regional climate model was used to make detailed temperature and precipitation predictions specific to Sri Lanka. The combined results of both models showed significant adverse impacts on future rice cultivation (almost 12 per cent yield loss by 2050) – affecting poor farmers in the dry zone, where incomes are lowest. Meanwhile, the wet zone, where tea is grown and incomes are higher, would experience gains (+3.5 per cent yield by 2050).

These findings raise important policy issues. Rice is the staple food and rice farming a major source of employment. Thus, adaptation measures are essential to protect national food security, protect livelihoods and reduce vulnerabilities of the rural poor in the dry zone. Meanwhile, the differential impacts of climate change on poor farmers and richer (wet zone) landowners have troubling income distributional and equity implications. Finally, potential population movements from dry to wet zones need to be considered.

CONCLUSIONS

Multiple, interlinked crises currently pose a serious challenge to humanity. Fortunately, we know enough to confront these problems together and take the first steps towards making development more sustainable this will transform the risky 'business-as-usual' scenario into a safer future. Humanity can and must plan, coordinate and implement the necessary responses on a global scale, with business and civil society supporting governments. This is a unique opportunity to progress on all fronts, to ensure future well being.

Further Reading

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Author

Prof. Munasinghe shared the 2007 Nobel Peace Prize (IPCC-AR4). He is Chairman, Munasinghe Institute for Development, Colombo; Director-General, Sustainable Consumption Institute, Manchester University, UK; and Honorary Senior Advisor to the Sri Lanka Govt. He has six post-graduate degrees and several honorary doctorates in engineering, physics and development economics. He has served as Senior Energy Advisor to the President of Sri Lanka, Advisor to the United States Presidents Council on Environmental Quality, and Senior Advisor/Manager, World Bank. He has authored 92 books and over 300 technical papers.

Organisation

The Munasinghe Institute for Development (MIND) is a non-profit organisation, seeking to make development more sustainable, worldwide. It provides scholarships, and promotes training, and research. MIND has projects in many countries and is a UN recognised Centre of Excellence.

The Sustainable Consumption Institute (SCI) at the University of Manchester, aims for world class research on sustainable consumption. It disseminates the latest thinking to academic, business and government leaders.

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Consumer power is crucial to tackling climate change – SCI

The Sustainable Consumption Institute (SCI), based at the University of Manchester in the UK, is a multi-disciplinary centre of global excellence researching major national and international issues associated with sustainability in the retail sector and encouraging consumers to adopt more sustainable lifestyles.

The SCI has been set up against the background of the global threat from climate change and the economic benefits of early action highlighted by the Stern Review. Its Director General is Professor Mohan Munasinghe, co-winner of the 2007 Nobel Prize for Peace with former US Vice President Al Gore and others and Vice Chair of the United Nations Intergovernmental Panel on Climate Change.

In October 2009 the SCI published its first major report, "Consumers, business and climate change". The report brings together findings of a range of recent ground-breaking research, with case studies from companies around the world, to explain the critical role that consumers can play in tackling climate change. This article draws out some of the report's key messages; the full report is available to download at www.sci.manchester.ac.uk/publications.

In Professor Munasinghe's words, "Consumers are often seen as part of the problem, but in reality are fundamental to the solution. Emissions are rising because of increasing rates of consumption combined with an expanding global population; and consumption is directly linked to greenhouse gas emissions through fossil fuel power generation, industrial processing and agriculture.

In addition, although they produce much lower emissions per person than developed countries, developing countries are seeking rising living and consumption standards. Of course they must be supported in that quest. The aim must therefore be to find routes to low-carbon improvements in living standards in both developed and developing countries as quickly as possible."

VISIT: WWW.CLIMATEACTIONPROGRAMME.ORG

As consumers, our lives are based on goods, services and activities that depend on the production of greenhouse gas emissions. Consumption transcends national boundaries. The businesses that serve consumers are often international in outlook and well-equipped to play their part. So the opportunity is there for consumers, helped by businesses, to lead a green revolution.

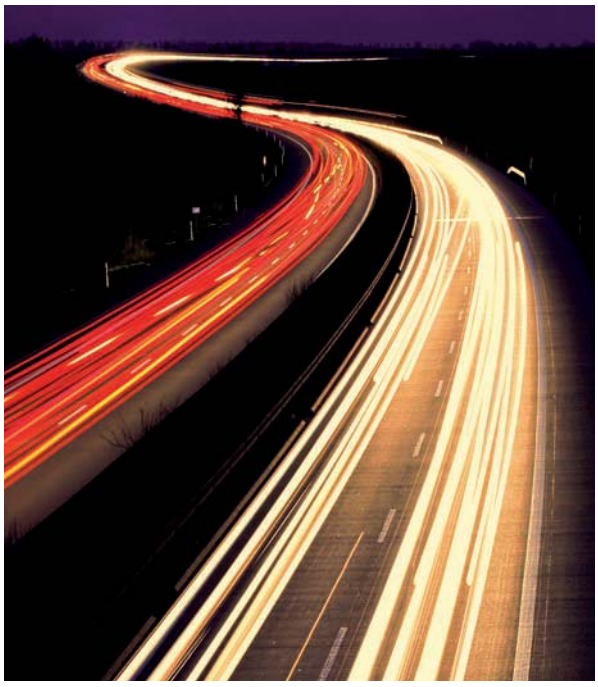
THE ROLE OF CONSUMERS

Emissions reduction strategies that are simply imposed on people cannot realistically achieve anything like the reductions required to avoid dangerous climate change. Consumers can play a crucial and powerful role in plugging the gap. With help and support to change their behaviour voluntarily and to seek low-carbon products and services, they can reduce emissions in the least expensive way, have an immediate and sustained impact, stimulate competition for low-carbon innovation by businesses, and empower governments to enact low-carbon policies.

MAKING LOW-CARBON PRODUCTS AVAILABLE: INNOVATION AND THE SUPPLY CHAIN

Sources of emissions are often linked across countries and continents. Calculating the carbon footprint for the whole lifecycle of a product can help identify low-carbon options for different supply chains and human activities. In particular, lifecycle analysis of products and services can lead to innovation for tackling emissions "hot spots". Given the urgency of the task, SCI will continue to examine ways to accelerate this business response, and to ensure it is international in its organisation and impact.

Applying international accountancy standards would also make the pursuit and adoption of universally agreed measures of the carbon content of products and services more efficient and accessible.



EMPOWERING CONSUMERS

The first step in empowering consumers is to remove the individual barriers they face when trying to make low-carbon choices. These barriers are: price – providing cheaper options and incentives; information – about the impact of consumer choices on climate change; and hopelessness – individuals are not acting alone. If products provide consumers with relevant and accurate information about the carbon footprint of the products they use. SCI research showed the next step in empowering consumers is to change the social context by making low-carbon behaviours fashionable and using consumer champions.

Retailers have an important part to play due to their understanding of the consumer and their influence over supply chains and the range of products and services available. Retailers can also contribute by reducing the carbon footprints of their own operations, such as the symbol below.

FSC
Recycled
Supporting responsible use of forest resources
www.fsc.org Cert no. TT-COC-002142
© 1996 Forest Stewardship Council
100%

CONCLUSION

Using the combination of strategies explored in the SCI report will put consumers at the heart of the fight against climate change. The prize is a powerful and well-directed movement for change – a consumer-driven revolution in low-carbon consumption.

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Institutional investors must embrace climate change:

THE DUTY AND OPPORTUNITY TO CHANGE THE INVESTMENT CLIMATE

STEPHANIE FEIGT, CHIEF INVESTMENT OFFICER, SAM, AND
MICHAEL RILEY, ANALYST, SAM

Institutional investors like pension funds should systematically integrate climate change-related risks in their investment strategies. Based on proprietary research, SAM, pioneer in Sustainability Investing, integrates sustainability trends like water scarcity or climate change in its proprietary equity valuation methodology. SAM is thus translating sustainability foresight into investment solutions with superior risk/return characteristics for clients. Given their fiduciary duty, institutional investors should expect their asset manager to incorporate climate change-related risks in their investment processes.

INTRODUCTION

Institutional investors have long had the responsibility to consider an array of relevant risks when making investment decisions on behalf of their beneficiaries. Failure to do so could even constitute a breach of fiduciary duty. But what happens when the relevant risks change or new risks are introduced into the investment environment? Certainly, an institutional investor's duty will have to shift to take these new risks into account in order to act in the best interests of their beneficiaries. Acting in the best interests of beneficiaries within institutional investing is, to a large extent, concerned with the financial interests of beneficiaries. If a new risk emerged that had critical financial and economic impacts to assets and reached every edge of the global economy, that risk would need to be actively managed by institutional investors.

> "Significant greenhouse gas emitters may have to cope with regulation strict enough to facilitate a reduction in emissions near 80 per cent by 2050, while the physical impacts of severe weather events and rising sea level will hit other sectors such as agriculture and insurance"

THE CLIMATE AS A GAME CHANGER

Climate change presents exactly such a risk that is changing the investment and business environment and should draw the attention of institutional investors.

Climate change has such expansive and global impacts that it affects every company and industry and, indeed, the world economy. The widespread influence of climate change differentiates it from other environmental issues that may be local, short term or only relevant for specific industries. Companies and assets will be affected in a variety of ways from regulatory and physical risk to reputational and litigation risk. Significant greenhouse gas emitters may have to cope with regulation strict enough to facilitate a reduction in emissions near 80 per cent by 2050, while the physical impacts of severe weather events and rising sea level will hit other sectors such as agriculture and insurance. Other impacts such as the likely strain on fresh water systems will affect entire economies and populations. In every case, the risk from climate change is real and can have a substantial financial impact on companies and assets making it a risk that institutional investors with a fiduciary duty should be taking into account. While some institutional investors may have been working with the misconception that considering climate change could violate their fiduciary duty because it might hurt financial returns, the clear connection between climate change and financial performance argues the opposite. Beneficiaries will profit from active risk management in the area as asset values are safeguarded and opportunities are identified that even add value.

> **"Climate change could represent a significant cost to the economy with one per cent of global GDP as the required yearly investment to mitigate the effects of climate change"**

CLIMATE CHANGE IMPACTS GDP

Lord Nicholas Stern and his 2006 Stern Review on the "Economics of Climate Change" make a clear link between global gross domestic product (GDP) and the impact of climate change. He concludes that climate change could represent a significant cost to the economy with one per cent of global GDP as the required yearly investment to mitigate the effects of climate change. More importantly perhaps, is that a failure to effectively mitigate climate change could mean that global GDP would be 20 per cent lower in 2050. Climate change will have a clear impact on global GDP one way or another with effective mitigation likely the less costly option. When we consider the strong connection between large asset holders, returns and the long-term health of the global economy (Box 1), it seems natural that institutional investors would want to structure their investment strategies in a way that maximises long-term global GDP growth. Beyond simply safeguarding portfolios against the adverse effects of climate change, asset owners stand to benefit from the message in Lord Stern's research by investing in a way that will help mitigate climate change and thereby minimise the adverse impact on the global economy over the long term.

Box 1. Institutional investors can be seen as universal owners.

The concept of universal ownership has emerged to refer to large institutional investors that, because of their size, own a 'slice' of the investable market. Large investors are holders of a broad selection of different companies and other assets, and are often therefore tied into the performance of markets or economies as a whole just as much as they are in the performance of individual companies. This is particularly visible with funds that employ index or passive investing strategies. Hence, as a result of their broad ownership, these investors have a vested interest in the long-term health of the economy as a whole, making cross-market issues like climate change particularly relevant.

INSTITUTIONAL INVESTORS EMBRACE CLIMATE CHANGE-RELATED RISKS

Some institutional investors are already active in the area of incorporating climate change risk into their investment strategies. The Fonds de Réserve pour les Retraites (FRR), which is part of the French pension system, views climate change as having major implications for the economy as well as their portfolio and is working to incorporate related risks into their strategic asset allocation. The FRR has done an in-depth scenario analysis for different climate change scenarios and what they might mean for strategic asset allocation. They realise that the set of risks that investors are facing has changed and that something needs to be done about incorporating these new risks into investment policies.

GOING BEYOND STRATEGIC ASSET ALLOCATION

Investors can also prepare for climate change risk by looking beyond strategic asset allocation and into individual asset classes. In many cases, it will be the exposure on a company level or individual asset level that will be critical to determining the ultimate exposure to climate change risk and asset returns. When considering investments within equities or corporate bond portfolios, allocation can be made to avoid climate change risk or to profit from opportunities with best-in-class companies or companies proactively positioning their products and services in the new business environment. Investors will need to analyse carbon footprints and determine if companies are factoring environmental and eco-efficiency concerns directly into their business strategy. Reporting can be reviewed to see which companies are actively assessing and disclosing their climate change risk. Investors will then need to decide how to incorporate the specific company or asset information into how capital is allocated to be sure that they are appropriately taking climate change risk into consideration.

CARBON EFFICIENCY BECOMES A COMPETITIVE ADVANTAGE

Reducing risk to carbon inefficient companies could be a first step for institutional investors to implement climate change-related risks in their investment processes. The cement industry offers a good example. Producing cement is a CO_2-intensive process, but some companies have been establishing themselves as carbon efficient leaders within the industry. Figure 1 illustrates the progress Holcim has made in its effort to reduce the amount of CO_2 produced per ton of cement product, which simultaneously reduces its relative risk to a high carbon cost, reputational risks or other CO_2-restrictive legislation.

> "Investors will need to analyse carbon footprints and determine if companies are factoring environmental and eco-efficiency concerns directly into their business strategy. Reporting can be reviewed to see which companies are actively assessing and disclosing their climate change risk"

Investors can develop an environmental overlay that could be applied to all asset classes or could handle implementation on a more class-by-class basis. Thematic funds that manage climate risk can be considered for equity exposure while private equity investments can be directed to the clean tech sector. Property and real estate investments should consider the environmental profiles of allocations and be tilted toward areas such as 'green buildings' that consider energy and water efficiency. Investors should also be sure that property or infrastructure is not overly exposed to the physical impacts of climate change such as flooding or coastal erosion. Adjusting proxy voting guidelines or working with information and service providers are also options that can be examined. These types of investment strategies can be effective ways of considering the best interests of beneficiaries by directly incorporating the increasing risks and uncertainties brought on by climate change into investment strategies. In the case of large asset owners, it may also be the best way to help mitigate climate change and maximise the long-term health of the global economy and the related asset returns.

Figure 1. Average gross CO_2 emissions per ton of cement product (kg CO_2/ton of cement).

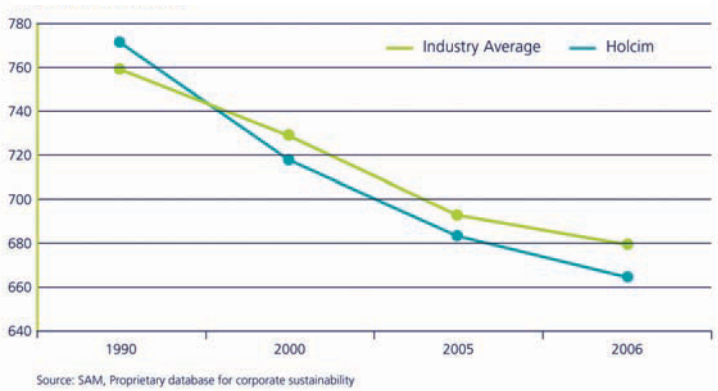

Figure 2. Geothermal heat pumps success versus housing failure (%).

DEMONSTRATING THE OPPORTUNITIES OF CLIMATE CHANGE

While policy changes and a materialising carbon cost have wreaked havoc on heavy CO_2-emitting sectors and companies, some products have been reaping the benefits of incorporating environmental and eco-efficiency concerns into their design. One such product is geothermal heat pumps for the heating and cooling of buildings, which use a system of underground tubing to harness the constant mild temperature of the earth for temperature control. Products that provide significant advances in energy efficiency will be first in line to benefit from greenhouse gas emission reduction targets, and geothermal systems are recognised by the US Department of Energy and the EPA as the most environmentally friendly, cost-effective and energy efficient heating and cooling technology available.

Carbon costs that make fossil fuel-based heating and cooling more expensive simultaneously make the economics of geothermal heat pumps more attractive as energy savings increase. A subsidy from the US government covering 30 per cent of installation and unit cost underlines support for these types of technologies. The clear financial impact of high energy costs and climate change mitigation policy can be seen (Figure 2) as North American sales of these products managed to buck the downward housing trend in the US. Growth in sales of these products is clearly demonstrated by the growing revenue of a near pure play in the area called WaterFurnace Renewable Energy (WFI).

Box 2: Proprietary research is key to manage climate change risks

In order to identify companies that will profit from climate change, SAM does proprietary research. In the pioneer study "Carbonising Valuation" from November 2006, SAM, together with the World Wildlife Fund, showed how the introduction of a cap and trade system will impact utilities. Additionally, SAM, together with the World Resources Institute, described in the study "Changing Drivers" how CO_2 pricing will affect the profitability of car manufacturers.

SAM's most recent study is called "Opportunities and Risks – Banking & Climate Change. An analysis of climate strategies in more than 100 banks worldwide."

The key question of the study is: How do banks manage the challenges of climate change and exploit the related opportunities? This question is answered based on data gathered from 114 listed banks surveyed by SAM in 2007. The enquiry was done in the context of SAM's annual Corporate Sustainability Assessment among over 1,000 listed companies to quantify their sustainability performance.

When it comes to managing thematic climate change portfolios, SAM considers companies that are active in the fields of climate mitigation, adaptation to climate change and response to global warming with their technologies and services. SAM therefore follows a broad-based approach to identify companies that will benefit from the challenges arising from climate change or that will better manage climate change-related risks.

> "Do you want the people managing your money to be ignoring climate change?"

Based on its ongoing research, SAM integrates climate change-related issues not only in thematic climate change strategies but in all of its equity portfolios (thus also taking into account industry sectors that normally are not considered to be climate change-relevant like banks). We believe that this is an effective approach to deal with climate change-related risks and opportunities – especially for institutional investors like pension funds.

IN THE BEST INTEREST OF US ALL

The mounting scientific and physical evidence has vaulted climate change to the top of global political agendas as possibly the greatest long-term challenge facing the world today. Climate change is also emerging as one of the key financial issues impacting the investment environment. The physical and policy risks that climate change brings permeate the entire global economy and demand an adaptation of both business and investment strategies. Institutional investors need to evaluate their portfolios to safeguard their beneficiaries' interests against the resulting change in the risk environment. Fiduciary duty or not, the link between climate change and long-term investment returns is clear, leaving investors to determine if the assets they invest in the interest of their beneficiaries are properly managed in terms of climate risk or not. Or perhaps the issue can be viewed from another perspective, and the question can be asked directly to the beneficiaries. Do you want the people managing your money to be ignoring climate change?

Authors

Stephanie Feigt is SAM's Chief Investment Officer and Member of the Executive Committee. Prior to joining SAM, she was Head of Investment Strategy and a member of the Investment Committee responsible for tactical asset allocation at a Swiss Private Bank. Feigt holds a degree in Economics from the University of Constance and the Humboldt University of Berlin with majors in Capital Markets Theory and Statistics. She is a CFA charterholder.

Michael Riley is a senior analyst at SAM in charge of climate change research and covers primarily construction and building material companies. Prior to joining SAM, he worked as an auditor in the US and held various financial controlling positions at ABB. He has an MBA from the Kelley School of Business in Indiana, is a Certified Public Accountant and CFA charterholder.

Organisation

SAM is a global investment boutique focused exclusively on Sustainability Investing. The firm's offering comprises asset management, indexes and clean tech private equity. SAM partners with Dow Jones Indexes and STOXX Ltd in the publication and development of the Dow Jones Sustainability Indexes. Founded in 1995, SAM today has more than 100 employees and is a member of Robeco, a subsidiary of the Dutch Rabobank Group. As of June 30th, 2009, SAM's total assets amount to €8.9 billion.

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UniCredit addressing the challenge of climate change

UniCredit Group has acknowledged fundamental value to developing a sustainability approach and to tackling climate change. In this context, it has recently signed with WWF, the leading conservation organisation, a strategic international partnership aimed at integrating these issues into the banking business in accordance with Group CEO Alessandro Profumo's vision of making the Group the European leader in sustainable development. The first ambitious goal set by UniCredit is to reduce its greenhouse gas (GHG) emissions by 30 per cent by 2020, thus supporting the EU energy goal defined in the 'Climate & Energy Package.'

INTRODUCTION

The Group's environmental commitment has a long history, being a member of the United Nation's Environment Programme Finance Initiative (UNEP FI) and having obtained Eco-Management and Audit Scheme (EMAS) registration back in 2002, but the launch of the Environmental Sustainability Programme clearly sets the stage for an advanced approach in the industry. In recent years, as with other banks, UniCredit acknowledged the relevance of public attention towards the role of the economic players and particularly the role of the banking industry in addressing environmental issues like biodiversity, fresh water supply and, obviously, climate change – currently in the spotlight after the Kyoto Protocol was ratified and entered into force, and ahead of the key COP15 in Copenhagen and the negotiations for the post-Kyoto agreement. In 2007, UniCredit was among the signatories of UNEP FI Declaration on Climate Change ahead of the G8 to call for strong support on abatement measures.

UNICREDIT'S ENVIRONMENTAL SUSTAINABILITY PROGRAMME

Our climate change strategy, developed with WWF, is based on the introduction of specific policies integrated into the banking business, as well as on the development of our *Environmental Sustainability Programme* along three main paths: the reduction in internal emissions resulting from the Group's banking activities, the reduction in financed emissions related to lending activities, and the implementation of specific initiatives and projects aimed at strengthening the environmental identity of all Group employees. In addition, we will also support sector initiatives and international protocols focused on the same goals. This is the programme that UniCredit Deputy CEO Paolo Fiorentino announced to the public in May, when the Environmental Sustainability Programme was launched. The Programme comprises several initiatives encompassing all the environmentally sensitive businesses in which the bank is involved. The formal commitment undertaken by UniCredit Group is facilitated by Group Environmental Governance involving

the top management through the establishment of an Environmental Steering Committee, composed by UniCredit and WWF Executives.

THE TWO-STEP ENVIRONMENTAL ROADMAP

UniCredit's 'environmental roadmap' includes activities to achieve a 30 per cent reduction in CO_2 emissions generated by the bank's offices and branches by 2020, with an intermediate goal of 15 per cent by 2012. Such internal emissions will be monitored and, if targets are not fully achieved, the Group will implement specific offsetting projects to close the gap to the announced target. This will be done using high-value credits; the 'Gold Standard.' The first step will be the assessment of the actual 'carbon footprint' of the Group, evaluating by means of a 'Carbon Inventory' the direct emissions resulting from the Group's banking activities. UniCredit has been a Carbon Disclosure Project respondent for three years now and is increasingly improving its carbon footprint measurement. Unlike other industries subject to regulatory provisions to disclose their GHG emissions, a banking group only measures and discloses its footprint on a voluntary basis. The verified result will be the basis of the commitment undertaken by the Group that may have, in case of large gaps, a significant financial outcome. UniCredit believes that, as responsible businesses, banking groups should report GHG emissions and encourage its peers to do so.

The second strategic and integrated pillar is a strong focus on financed emissions, closely linked to the above-mentioned commitment. The focus on financed emissions promotes, in particular, energy efficiency and renewable sources lending, as the Group is well aware of the key role a banking institution can play through financial leverage in the transition towards a low-carbon economy. For this reason, the Group, together with WWF is developing a model in the banking industry that will measure the actual environmental impact of the loan portfolio in terms of GHG emissions, and therefore make it possible to steer lending decisions according to these criteria, thus enabling the bank to contribute to the development of the Green Economy. This is clearly the most critical part of the programme and the one that has most relevance on reinforcing the bank's long-term financial performance. Integrating climate change considerations into the core business means assessing in a different way the probability of default and relevant pricing. As challenging as the abatement measures for direct emissions can be, this will remain ancillary when compared to the real action the larger public is demanding of the banking industry; namely, the use of the credit leverage to support businesses in the transition to a low carbon economy. The Kyoto Protocol, besides the effectiveness of its provisions, sets basic rules for the pricing of carbon and the inclusion of this price into the cost function. The banking industry should take this fact seriously into account and act accordingly.

UNICREDIT'S SUSTAINABILITY POLICY AND BUSINESS STRATEGY

The link between the control of financed emissions and the attempt to strengthen the environmental identity of the Group's employees is the launch of different initiatives. An innovative product promoting energy efficiency and


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developed in partnership with WWF is *House Efficiency*, a loan product supported by an energy desk as a consulting service and targeted, at this preliminary stage, at Group employees in Italy. At UniCredit, we believe that our people's identity and commitment is the basis for any successful story. No target can be achieved without the active participation of all employees. Web-based tools are made available to help employees understand how to reduce their carbon footprint, either at home or in the workplace and other solutions, like subsidising summer camps for employees' children have been launched for environmental educational purposes. The employee engagement activities are aimed at enhancing the environmental commitment and raising awareness of the business opportunity that environmental sustainability can offer. As a large corporation/corporate community, UniCredit has a responsibility stemming from its role in society, and satisfaction of all its stakeholders is part of its mission. At the same time, however, profit is a guarantee of freedom as well as the continuity of business and, consequently, the protection of jobs and revenues for several thousand households. UniCredit's approach to the green economy and the path towards sustainable development is our way of moving forward in modern times for the benefit of all.

Lastly, UniCredit wishes to take leadership in the industry and aims at cooperating with other international groups sharing the same approach by supporting specific industry initiatives and agreement. The challenge is significant, but there is no way back, and every economic organisation must play its role and contribute with its efforts to foster sustainable solutions for the planet. This is possible within the logic of the marketplace, engaging more in smart business solutions, rather than simply engaging in approaches that aim more at public relations than true business improvement. UniCredit believes that the sustainability policy must be a substantial part of its business strategy.

Organisation

UniCredit Group operates in 22 European countries, with more than 168,000 employees and approximately 10,000 branches. The Group benefits from a strong European identity, extensive international presence and broad customer base. Its strategic position in Western and Eastern Europe allows it to have one of the region's highest market shares

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How should developing countries adapt to climate change and how much will it cost?

Typhoon Ondoy (locally known as Ketsana) caused floods in low-lying areas near the Laguna bay area around 60kms south of Manila. The extreme weather brought a month's worth of rain in a short span of six hour's causing flash floods and overflowing lakes.

SERGIO MARGULIS
LEAD ENVIRONMENTAL ECONOMIST,
ENVIRONMENT DEPARTMENT, THE WORLD BANK

Even with drastic reductions in global emissions of greenhouse gases in the coming years, the global annual average temperature is expected to be two degrees Celsius above pre-industrial levels by 2050. Such a rise in temperature will bring about a world warmer by two degrees Celsius will experience more intense rainfall, and more frequent and intense droughts, floods, heat waves, and extreme weather events. Countries will need to adapt, and access to necessary financing will be critical in helping them implement measures that will make their populations better adapt to climate impacts. A clear understanding of these costs is necessary for policy-makers to better allocate resources.

Previous studies on adaptation costs provide a wide range of estimates, from $4 billion to $109 billion a year. Similarly, National Adaptation Programs of Action (prepared by Least Developed Countries under the United Nations Framework Convention on Climate Change, (UNFCCC)) identify and provide costing only for urgent and immediate adaptation needs.

To better understand adaptation costs and to inform international negotiations in Copenhagen, the World Bank initiated the *Economics of Adaptation to Climate Change* (EACC) study, which is funded by the governments of The Netherlands, Switzerland, and the United Kingdom.

The objectives of the study are to develop an estimate of adaptation costs for all developing countries, to help these countries understand and assess the risks posed by climate change, and to design better strategies to adapt to climate change. The initial study report launched in September 2009, focused on the first objective and estimated the costs of adapting to climate change for developing countries in the range of $75-100 billion per year from 2010–2050. A second report, due out in early 2010, will focus on the second objective and will be based on case studies in the following seven countries: Bangladesh, Plurinational State of Bolivia, Ethiopia, Ghana, Mozambique, Vietnam and Samoa.

INNOVATIVE RESEARCH APPROACHES

Although the estimate involves considerable uncertainty, the study gives policy-makers – for the first time – a carefully calculated number to work with that uses a unique approach to estimate the costs of adapting to climate change. This involves comparing a future world where there is no climate change and one where climate has affected daily life. The difference between these two worlds entails a series of actions to adapt to the new world conditions and the costs of these additional actions are the costs of adapting to climate change.

This study estimates the costs for major economic sectors under two alternative future climate scenarios – one wet, one dry. This is why there is such a range in the costs – $75 billion under the drier scenario and $100 billion under a wetter scenario. The costs were calculated across six regions – East Asia and the Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa – and eight economic sectors – infrastructure, coastal zones, water supply, agriculture, forestry, fisheries, health, and extreme weather events.

> "Estimated costs of adapting to climate change for developing countries in the range of $75-100 billion per year from 2010 – 2050"

PUTTING A PRICE TAG ON ADAPTATION

Three sectors – coastal zones, infrastructure, and water supply – face the highest adaptation costs. Costs of adaptation in the coastal zones vary from $29.6 billion per year under the drier climate scenario to $30.1 billion per year under the wet scenario. Costs in the infrastructure sector vary between $13.7 billion and $29.5 billion per year, and in the water supply sector between $18.8 billion to $13.7 billion.

The highest adaptation costs are found in the East Asia and Pacific region and the lowest in the Middle East and North Africa. Latin America and the Caribbean and Sub-Saharan Africa closely follow East Asia and the Pacific. The highest costs for East Asia and the Pacific are in the infrastructure and coastal zones; for Sub-Saharan Africa, water supply and flood protection and agriculture; for Latin America and the Caribbean, water supply and flood protection and coastal zones; and for South Asia, infrastructure and agriculture.

The study's analysis shows that the costs of adapting to climate change will increase over time, but will reduce as a percentage of a country's GDP. This suggests that countries become less vulnerable to climate change as their economies grow and they develop. However, adaptation costs as a percentage of GDP are higher in Sub-Saharan Africa due to the lower GDPs in this region.

PUTTING THE FINDINGS IN CONTEXT

Estimates from the EACC study are in the upper end of estimates provided by the UNFCCC study published in 2007, which is closest in approach to the EACC study. One of the reasons for this is that there is a significant six-fold increase in the cost of coastal zone management in the EACC study. This increase is due to the improvement in cost estimates, including maintenance costs, and the inclusion of the costs of upgrading ports and risks from both sea-level rise and storm surges. The costs of water supply adaptation are also higher in the EACC study, which is in turn due to the inclusion of riverine flood protection costs.

One of many elderly people queuing for relief rice from an organization in Quang Nam Province – Vietnam, after Ketsana typhoon or "typhoon #9" in Vietnamese.

The EACC's analysis of the infrastructure sector has been more detailed than previous studies, taking into account costs of services such as energy, transport, water and sanitation, communications and urban and social infrastructure. It also entails a detailed analysis of climate proofing including adjustments to design standards and maintenance costs.

> "Adaptation to a two degrees Celsius warmer world will be costly and is in the same order of magnitude as the foreign aid that developed countries now give developing countries each year"

Calculating the global cost of adaptation is a complex problem that requires projections of climate change, economic growth, structural change, human behaviour and government investments 40 years in the future. The EACC study has tried to establish a new benchmark for this type of research as it adopted a consistent approach across country sectors and over time. But in the process it had to make important assumptions and simplifications, to a degree biasing the estimates.

Climate change can bring about severe weather conditions such as drought.

For one, the EACC study provides a range of estimates assuming that there is a perfect understanding of future climate scenarios. In the real world, decision-makers hedge against a range of outcomes and real situations that end up driving the cost of their expenditures to make their populations more climate-resilient.
The study also only partially accounts for adaptation costs related to ecosystem services because of gaps in scientific understanding of the impact of climate change on ecosystems. It is still unclear how to quantify the impact of climate change on biodiversity and what adaptation measures are effective for preserving it.

> "Development makes countries less reliant on climate-sensitive sectors such as agriculture"

The study mostly estimated costs for 'hard' options involving engineering solutions over 'soft' options based on policy changes. But as a first-cut global study, it was not possible to know whether effective institutions and community-level collective action, which are preconditions for the implementation of soft actions, exist in a given setting. That said, including soft measures would potentially decrease adaptation costs.

LESSONS AND RECOMMENDATIONS

Four distinct messages stand out from the study.
First, adaptation to a warmer world will be costly and is in the same order of magnitude as the foreign aid that developed countries now give developing countries each year, though it is still very low as a percentage of the wealth of countries (measured by their GDP).
Second, the world cannot afford to neglect mitigation. Adapting to an even warmer world than the two degrees Celsius assumed for the study, say on the order of four degrees Celsius above pre-industrial levels by the end of the century, would be much more costly. Adaptation minimises the impact of climate change, but it does not tackle the causes. If we are to avoid living in a world that must cope with the extinction of half of the world's species, inundation of 30 per cent of coastal wetlands, and increases in malnutrition and other diseases, countries must take steps immediately to sharply reduce greenhouse gas emissions.
Third, the report finds that development is imperative, but it must take a new form. Development is the most powerful form of adaptation. It makes countries less reliant on climate-sensitive sectors such as agriculture and more able to cope by increasing the levels of income, health and education. Development also helps governments improve infrastructure and reduces the number of people killed by natural disasters. However, adapting to climate change means that we develop differently: breeding drought-resistant and flood-tolerant crops, climate-proofing infrastructure, reducing overcapacity in the fisheries industry and accounting for uncertainty in future climate projections in development planning.
Finally, the report underscores the importance of keeping development strategies flexible and robust to incorporate knowledge about climate change.

The full report can be accessed at www.worldbank.org/eacc

Author

Sergio Margulis is the task team leader for the Economics of Adaptation to Climate Change (EACC) study. He is a Lead Environmental Economist with the World Bank's Environment Department. He got his Ph.D. in Environmental Economics from the University of London and joined in the World Bank in 1990. At the Bank he has worked in many Bank regions and has mainly focused on environmental valuation, environmental strategies and institutions, and more recently on climate change.

Organisation

The World Bank is a vital source of financial and technical assistance to developing countries around the world. Not a bank in the common sense, it is made up of two unique development institutions owned by 186 member countries – the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA). Each institution plays a different but collaborative role to advance the vision of an inclusive and sustainable globalisation.

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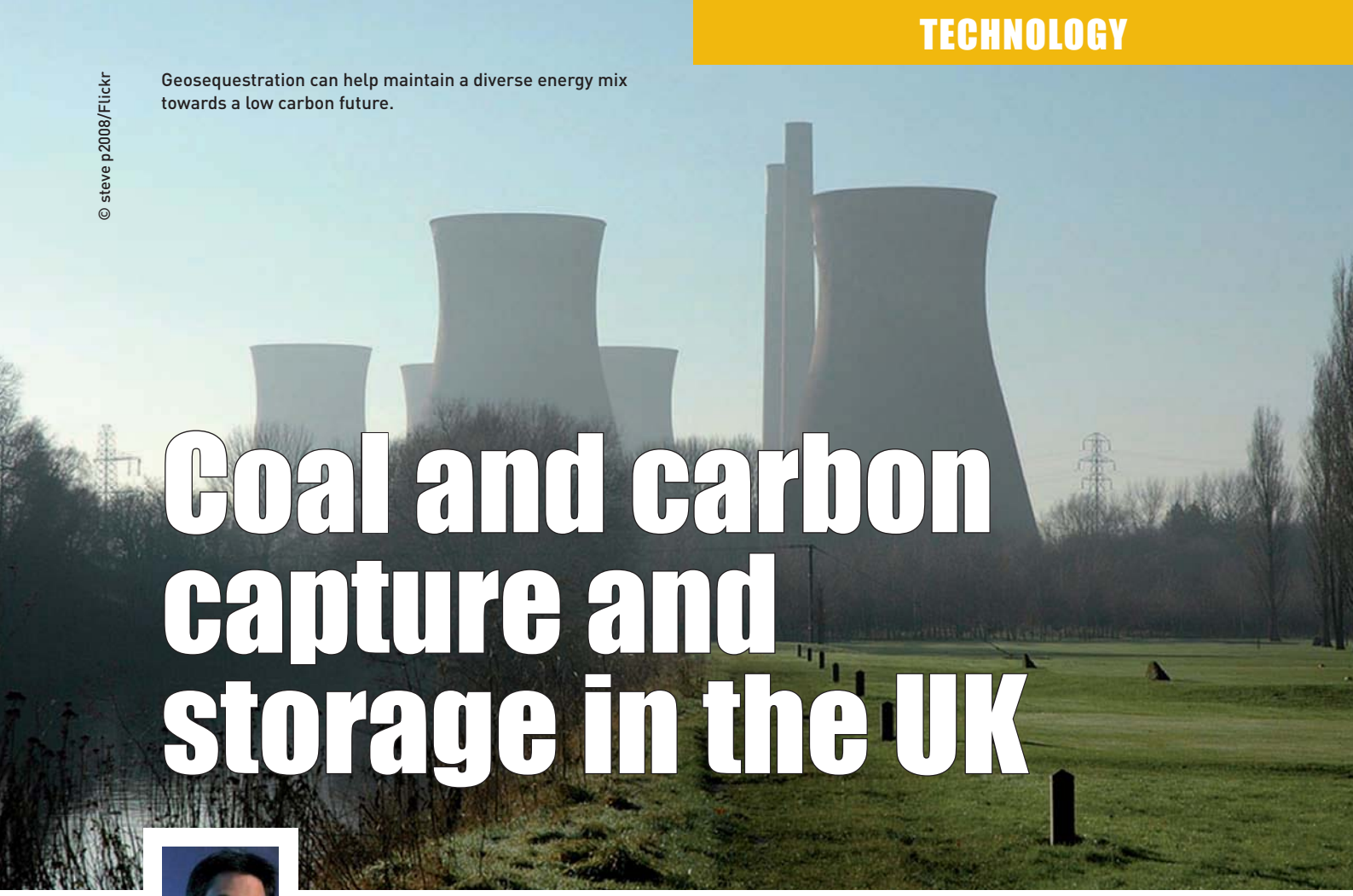

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Geosequestration can help maintain a diverse energy mix towards a low carbon future.

Coal and carbon capture and storage in the UK

ED MILIBAND, SECRETARY OF STATE FOR ENERGY AND CLIMATE CHANGE, THE DEPARTMENT OF ENERGY AND CLIMATE CHANGE (DECC)

In our energy policy, we face three challenges: to transform our energy to low carbon sources; to maintain security of supply; and to do so in a way that is right for the British economy and industry. And to meet that challenge will take all of the low-carbon technologies at our disposal.

WE NEED RENEWABLE ENERGY

In the last five years, we have tripled renewable electricity supplies. We have more offshore wind power than any country in the world, and on April 22nd, 2009, Chancellor Alistair Darling announced new support for offshore wind and new financial help for the wind industry to get through the credit crunch.

We need to facilitate nuclear energy too. In the face of climate change, with assurances on safety and cost, many who once opposed nuclear power now support it. Thanks to decisions made by my predecessor, Britain is on track for a renaissance in nuclear power, and I announced last week the nominations for eleven potential sites.

The future of coal in our energy mix poses the starkest dilemma we face: it is a polluting fuel, but is used across the world because it is low cost and it is flexible enough to meet fluctuations in demand for power.

In the UK, a third of our existing coal-fired power stations are due to close in the coming decade. In order to ensure that we maintain a diverse energy mix, including maximising our domestic fuel supply, we need new coal-fired power stations but only if they can be part of a low carbon future.

And across the world, we know the challenge that coal presents. With many countries reliant on coal and many building new coal-fired power stations at a rapid pace, there is an urgent international imperative for us to make coal clean.

With a solution to the problem of coal, we greatly increase our chances of stopping dangerous climate change. Without it, we will not succeed. And there is a solution to the challenge - through carbon capture and storage. Capturing the CO_2, transporting it and locking it permanently underground would reduce emissions by 90 per cent.

But while this has been demonstrated in its different parts and at small scale – capturing emissions from 30MW – it has never been tried at a commercial scale and never the complete process from start to finish on a power station.

So the first task is to urgently drive the technology at scale. We are already running a competition for one of the first end-to-end demonstrations in the world, covering capture, transport and storage. It will be one of the biggest CCS projects in the world, more than ten times bigger than the largest existing pilot.

On April 22nd, 2009 Alistair Darling announced the public funding for the next stage. We will now select bids to proceed to detailed designs. But we know we need to go further. And because of yesterday's Budget there

will also be funding for up to three more demonstration projects, and we want them to be a mix of pre-and post-combustion.
To support this, Chancellor Alistair Darling yesterday announced plans for a new incentive mechanism to support carbon capture and storage. This could be based around a feed-in tariff for CCS, so these projects would receive a fixed price for electricity, or around a fixed price for carbon abated. And we will consult on this alongside our new coal conditions by the summer.

> "Conventional coal-fired power generation should only be built on the expectation that it will be retro-fitted with CCS by the early 2020s"

We need to ally this reliable stream of funding for carbon capture and storage, which we now have, with a policy on coal-fired power stations to drive the demonstration and deployment of CCS. We consulted last year on carbon capture readiness as the condition for new coal-fired power stations. But I have concluded that while it is right to go ahead with this condition, it will not, on its own, drive the change we need.

I believe that we need to signal a move away from the building of unabated coal-fired power stations, because it is right for our country – to drive us towards low carbon as part of a progressive decarbonisation; It is an essential part of a new industrial strategy; And it is necessary, if we are to show international leadership on climate change.
So I am proposing two new conditions that any new coal-fired power station must meet to gain consent in England or Wales. We are now proceeding with a Strategic Environmental Assessment and will consult formally on these proposals in the summer. First, we must send a decisive signal that change starts now.
So I now propose a requirement to demonstrate CCS on a substantial proportion of any new coal-fired power station. We will propose for consultation a requirement to demonstrate at least 300 mega watts of net capacity, or around 400 mega watts of gross output, as a condition of any consent. The demonstration condition would mean that henceforth, unabated coal-fired power stations will not get government consent.
Second, alongside this, we must secure not just a commitment to demonstrate, but, when the technology is proven, a commitment that CCS will be fitted on the entire plant. As the Committee on Climate Change concluded, "conventional coal-fired power generation should only be built on the expectation that it will be retro-fitted with CCS by the early 2020s" – the earliest that they believe it will be feasible.
With the demonstrations in the UK and abroad, we will plan on the basis that CCS will be technically and economically proven by 2020.
There will be an independent judge of when the technology is proven, and I envisage the Environment

Developing sustainable carbon capture strategies alongside investment in clean, green, renewable energy can create long term employment opportunities nationwide.

© rpeschetz/Flickr

Agency playing that role. So every coal-fired power station built from now would have to commit to retrofitting CCS on the whole plant, 100 per cent, within five years of 2020, subject to the technology being ready.
It would also mean, once the technology has been judged as proven, every new coal-fired power station would have to commit to CCS not just on a portion but on the whole plant. I believe CCS will be effective and can be shown to work.
However, I also want to seek views on whether we need a safety net in the eventuality that it does not become proven as quickly as we expect. And we will also consult on whether it is possible through an emissions performance standard to implement the conditions I have outlined.

> "Research suggests that carbon abatement technologies could sustain 50,000 jobs by 2030"

The new conditions would come on top of the requirement of every power station to buy carbon permits, which under the EU emissions trading scheme are capped and falling.

I believe that the funding for demonstrations and the conditions I have proposed meet the criteria I set at the start. They set us on a decisive low-carbon path, with the UK doing more than any other country to demonstrate and deploy CCS, and they are the most environmentally-ambitious coal conditions of any country in the world.
They protect security of supply, by making possible the only sustainable long-term diversity there is, and that is low-carbon diversity.
I have had representations that from day one there should be one hundred per cent CCS on new coal, but I believe that this does not appreciate the need that still exists to demonstrate the technology before full-scale commercial deployment is possible.
Such a condition would reduce the range of technologies that could be affordably demonstrated, mean that demonstration of post-combustion CCS would be far less likely, and would fail to meet our international obligation to drive low-carbon technology. But under today's path to low-carbon coal, we will be able to both meet our climate change commitments and have up to four new coal power stations with CCS by 2020. And this route to low-carbon coal is right, too, for the British economy, and will enable us to lead the world in carbon capture and storage.
Instead, with a reliable stream of finance, we are investing in British skills so our industries can lead carbon capture and storage not just within Britain but at power stations around the world. And I hope our industry, universities, our scientists will respond to the challenge of creating a new industry in Britain.

Research suggests that carbon abatement technologies could sustain 50,000 jobs by 2030; And this is a massive regional opportunity for Britain, and I pay tribute to our Regional Development Agencies for what they have done, and look forward to working with them: Teesside, Thames Gateway, the Firth of Forth, the Humber could all be suitable for a new cluster, among other locations.
For our North Sea oil and gas industry, CCS can herald a new low carbon future.
Just as the 1960s and 1970s saw a new North Sea industry develop, so in the next decades, Britain can do the same again with CCS.
The proposals I have announced today seek to combine

- The drive towards low carbon at home and around the world
- The need for security of supply
- And the building of Britain's industrial future

The proposals signal the era of unabated coal is coming to an end,
But a new low carbon future for coal with CCS can begin.

This article is taken from the Statement by Ed Miliband on coal and carbon capture and storage, 23 April 2009.

Author
Ed Miliband was previously Minister for the Cabinet Office and Chancellor of the Duchy of Lancaster, where he was responsible for helping to coordinate work across Government, and leading the Government's efforts to tackle social exclusion, support the Third Sector and coordinate the improvement of public services. From 2006 to 2007, he was Minister for the Third Sector, supporting charities, social enterprises and community organisations.He was elected Labour MP for Doncaster North in May 2005.

Organisation
The Department of Energy and Climate Change (DECC) was created in October 2008, to bring together: energy policy (previously with BIS – the Department for Business, Innovation & Skills); and climate change mitigation policy (previously with Defra – the Department for Environment, Food and Rural Affairs). This new Department reflects the fact that climate change and energy policies are inextricably linked – two thirds of our emissions come from the energy we use. DECC's three overall objectives are to: ensure our energy is secure, affordable and efficient; bring about the transition to a low-carbon Britain; and achieve an international agreement on climate change at Copenhagen in December 2009.

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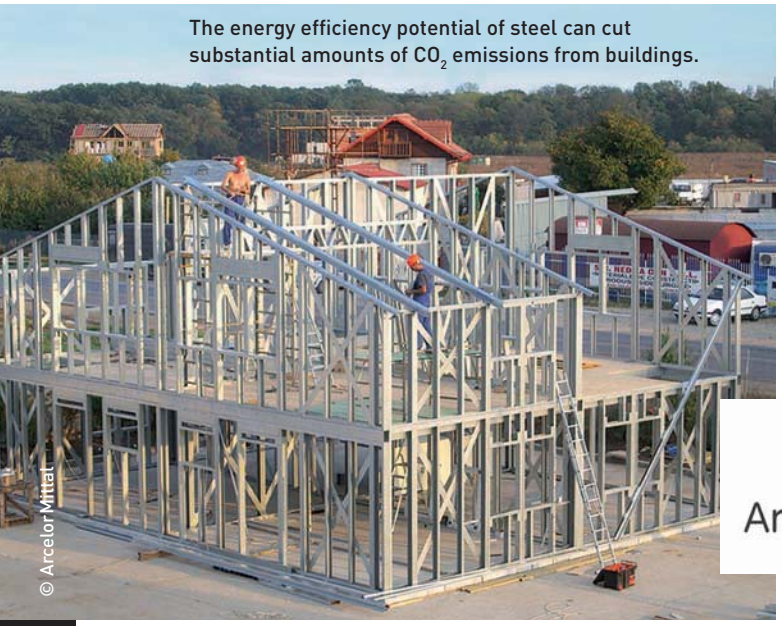
Achieving sustainable steel



The energy efficiency potential of steel can cut substantial amounts of CO_2 emissions from buildings.

ArcelorMittal

INTRODUCTION

Steel is a vital component of our buildings, transport systems, power stations, cars and household goods. Modern life simply could not function without it. But steelmaking also has a social and environmental footprint, and requires natural resources. So how do we produce the steel the world needs, in a way that minimises our social and environmental impacts, and tackles climate change?

Steelmaking is a carbon-intensive industry. Our operations account for around 0.6 per cent of the world's annual total of carbon dioxide (CO_2) emissions. This places responsibility on us to reduce carbon emissions to help move the world towards a lower carbon economy. We are working on technological solutions that could transform the carbon profile of our industry in the long term and in the interim we are focusing on immediate changes we can make. By promoting more recycling, we are also saving resources by being more efficient at what we do while investing in greener, cleaner technologies.

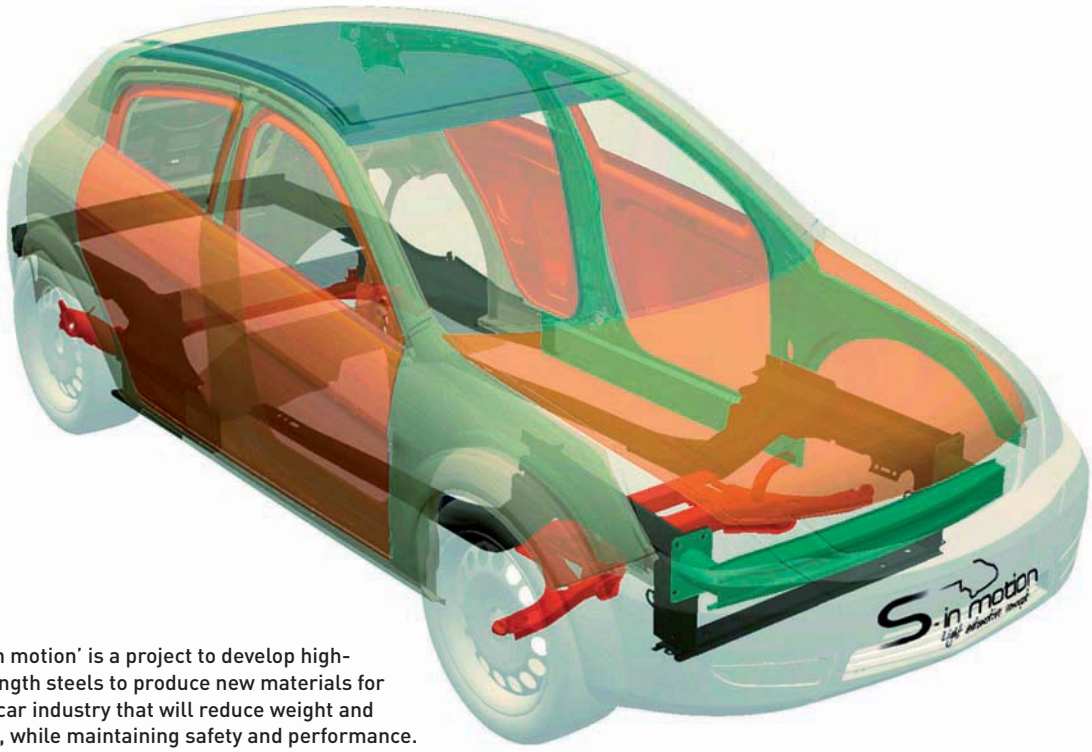
We are convinced that the climate change challenge needs to be tackled globally in order to create an international level playing field. Comparable and binding emission targets around the world, transitional compensation measures in the absence of such targets, and public funding for new technologies will ensure the continued competitiveness of industry while attaining the climate change objectives.

WHAT ARE WE DOING TO HELP TACKLE CLIMATE CHANGE?

Reducing our worldwide CO_2 emissions by 8 per cent by 2020

In total, our steelmaking operations emitted approximately 223 million tonnes of CO_2 in 2008. Owing largely to production cuts, this is 8.2 per cent less than the previous year. In addition, the steel industry has already cut its carbon footprint in Europe by more than 50 per cent in the last 30 years, but achieving significant further reductions is a tough challenge. Likewise, many of our European, North American and South American sites are close to the technical limit of what can currently be achieved in reducing CO_2, but there is still scope to bring our less-developed plants up to these standards. This is a major priority for us.

We have developed a detailed benchmarking system to quantify our total CO_2 emissions. The aim was to establish a baseline level of performance for the ArcelorMittal Group, and to determine what might realistically be achievable if we phase out older technologies and improve the efficiency and energy use of our operations. We then combined this assessment with detailed action plans from our major sites, to identify obvious gaps, set realistic targets, and – most important of all – accelerate the sharing of best practices across the world.



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'S-in motion' is a project to develop high-strength steels to produce new materials for the car industry that will reduce weight and cost, while maintaining safety and performance.

Following an analysis of our 2007 CO_2 performance, we have set ourselves the target of reducing emissions by 170 kg per tonne of steel produced by 2020, equivalent to an 8 per cent reduction in absolute emissions. This will be achieved through process and energy efficiency improvements, and by optimising recycling.

Breakthrough technologies of the future

ArcelorMittal is one of the key members of the EU Ultra-Low CO_2 Steelmaking project, or ULCOS. This is a €1.0 billion programme covering nearly 50 steel companies, suppliers and research centres across Europe, which aims to reduce the sector's carbon emissions by 50 per cent by the middle of the century. A number of possible technology options have already been assessed and the consortium is now piloting the Top Gas Recycling – Blast Furnace technology at our plant in Eisenhüttenstadt, Germany and through an industrial-scale demonstrator trial at our plant in Florange, France.

This technology combines carbon capture and storage with Top Gas Recycling. In other words, it uses pure oxygen instead of air and recycles gas at the top of the blast furnace, which results in a 25 per cent reduction in the amount of carbon used. Half of the CO_2 can then be potentially captured and stored at one of our sites. This is a first for the steel industry, and could be a major breakthrough in the fight to combat climate change, provided sufficient public funding can be secured both with EU Member States and through the EU's Carbon Capture and Storage (CCS) Demonstration projects.

Encouraging more recycling

Steel is one of the few materials that can be recycled indefinitely, which gives it huge potential as an environmentally-friendly construction and manufacturing material. Every year more than 25 million tonnes of our products are made from recovered scrap and are recycled, making us the world's largest recycler of scrap steel. This saves around 36 million tonnes of CO_2 on an annual basis. We also recycle the waste products from our own operations. For example, the electric furnaces at our former site at Isbergues, in northern France, are now being used to process residues from our Dunkerque plant in France and our Gent and Charleroi plants in Belgium into useful by-products like pig iron, road-building slag, and even zinc oxide dust, which we can sell to specialist producers who can use it to extract zinc.

Contributing to a sustainable society in cooperation with our customers

Our contribution to environmental protection is also exemplified through our products, such as the high-strength lightweight steels we develop in cooperation with our customers. This large variety of steel grades contributes to more energy efficient buildings and can reduce car weight by 20-30 per cent, thus raising the fuel efficiency of automobiles and reducing energy consumption and CO_2 emissions.

Organisation

ArcelorMittal is the world's leading steel company, with operations in more than 60 countries. ArcelorMittal is the leader in all major global steel markets, including automotive, construction, household appliances and packaging, with leading R&D and technology, as well as sizeable captive supplies of raw materials and outstanding distribution networks.

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Photovoltaics:

TOMORROW'S TECHNOLOGY AVAILABLE TODAY

A roof formed of optimally-inclined solar panels.

ADEL EL GAMMAL
SECRETARY GENERAL OF THE EUROPEAN PHOTOVOLTAIC INDUSTRY ASSOCIATION

With the window of opportunity closing fast for constructive agreement on climate change, there is one carbon-free energy system – photovoltaics – that is performing so well that it merits the name of tomorrow's technology, available today. In this article, Adel El Gammal summarises the advantages and advances in the techniques of harnessing the energy of sunshine, and shows how investment now can bring a positive yield in a very short time.

In the countdown to COP 15, a sense of urgency is soaring, while there is increasing doubt on the likelihood of reaching any ambitious binding agreement. To give it its full name, the 15th Conference of the Parties to the UN Framework Convention on Climate Change will take place in Copenhagen in early December 2009. Developed countries are relenting on their demands for developing countries to agree to long-term cuts in emissions, but major emerging economies led by China and India are refusing to sign up. Governments from both sides of the Atlantic are now attempting to build consensus on a less ambitious agreement, by softening their call for a global target of halving emissions by 2050.

Discussions are also intensifying on the crucial subject of the transfer of intellectual property from developed to developing economies. Equally critical are the discussions on agreeing the level of financial support that is needed from developed economies to support developing countries adapting to global climate change, and how this funding will be articulated.

> "To put global emissions on a trajectory that is compatible with respecting this temperature ceiling, industrialised countries need to cut their greenhouse gas emissions to 25-40 per cent below 1990 levels by 2020"

The EU is pressing for an ambitious and comprehensive agreement that will prevent global warming from reaching the dangerous levels – more than two degrees Celsius above the pre-industrial temperature – that are projected by the scientific community if the world continues with business as usual.

VISIT: WWW.CLIMATEACTIONPROGRAMME.ORG

Scientific evidence shows that, to put global emissions on a trajectory that is compatible with respecting this temperature ceiling, industrialised countries need to cut their greenhouse gas emissions to 25-40 per cent below 1990 levels by 2020, while developing countries should limit their rapid emissions growth to around 15–30 per cent below projected business as usual levels in 2020. Global emissions need to peak before 2020 and then be cut by at least 50 per cent of 1990 levels by 2050.
The EU has shown leadership by committing unconditionally to cut its emissions to at least 20 per cent below 1990 levels by 2020 and is implementing the climate and energy package. Moreover, it has committed to scaling up its emission cut to 30 per cent on condition that other industrialised countries agree to make comparable reductions and that economically more advanced developing countries contribute adequately to a global deal.

PHOTOVOLTAICS: THE FUTURE HERE AND NOW

Already massively available

We have the technology to begin the move to a sustainable energy economy, here and now. In fact, it is already happening; we have entered the renewable energy age, and investors have flocked to the sector. In 2008, total investment in the clean energy sector reached $150 billion, up from just $34 billion in 2004. Particularly in the electric power sector, traditional energy giants are staking more and more of their future on renewable energy.
In Europe last year, more than 4.5 GW of photovoltaics (PV) were installed, representing the third largest capacity installations after wind and gas, and comparable – in terms of installed capacity – to building, installing and commissioning four nuclear reactors in a single year.
Worldwide, PV installations have grown at an impressive pace over the last years, with market volumes more than doubling year on year.
The cumulative installed capacity has been growing at a rate of about 40 per cent over the last five years, representing at the end of 2008 about 15 GW worldwide, and 9.5 GW in the 27 member states of the European Union alone.

Virtually limitless capacity

PV uses sunshine as its only fuel. The sun irradiates every year on the continents about 2,000 times the global primary energy demand, i.e. what the world consumes as energy, in whatever form, every year. And it is expected to shine for another 5 billion years.
Furthermore, the technology has no material or industrial limitation. Most PV cells are today built from silicon, the second most abundant material (after oxygen) in the earth's crust. Industry has also shown in the last years a virtually limitless capacity to grow rapidly and adapt to the soaring demand.

Best in class environmental payback

As for any technology, building a PV system requires energy which is embodied in the system (also called grey energy).
Under the effect of rapid technology advances, the usage of energy intensive materials has been reduced to very low levels. A solar panel today has typically an environmental payback time between one and two years; this means that panels that will deliver electricity for more than their typical guaranteed lifetimes of 25 years will restore the energy that was used to produce them in less than two years. For some thin film technologies, this payback time is already as low as seven months. Furthermore, payback times are constantly being reduced under relentless technology advances, making PV one of the best in class technologies in terms of environmental payback.

Available today at competitive and reducing prices

Rapid technological evolution and steep price decline have brought PV close to competitiveness in most regions. With its high technology content, PV has demonstrated a consistent price decrease over the last 30 years and has still a huge cost reduction potential. Under the current market development pace, more than a halving of the price of PV can be expected every eight years.
This has immense implications, as the cost of PV electricity is mainly dependent on the initial system price. By 2020, the cost of PV electricity is expected to be as low as ten euro cents per kWh for larger systems, and well below 15 euro cents per kWh for residential systems, making PV by then a highly competitive energy source.
In Europe, PV is expected to become competitive in 2010 with residential prices in some southern regions. By 2020, PV could become competitive for as much as 60–75 per cent of the EU electricity market.

A potent CO_2 saver

A recent study conducted by the European Photovoltaic Industry Association (EPIA) indicated that, provided the electrical network infrastructure evolves to accommodate increasing penetration of intermittent renewable sources, and a temporary appropriate market support is available, PV could generate as much as 12 per cent of the total electricity demand in Europe by 2020. Such a penetration would enable savings in excess of 200 million tonnes of CO_2 every year in Europe only. In USA, the preliminary results of the study converge to the same level of potential PV penetration by 2020.

> "PV could generate as much as 12 per cent of the total electricity demand in Europe by 2020"

Global demand for energy has been increasing at a breathtaking pace, and this is particularly true in China, India and other rapidly developing economies. This sharp increase in world energy demand will require significant investment in new power generating capacity, especially in the developing world.
Another study conducted by EPIA reveals that in the 'sunbelt countries' with latitudes of less than 35 degrees north or south, double digit market penetrations could also be reached in the next decade without market

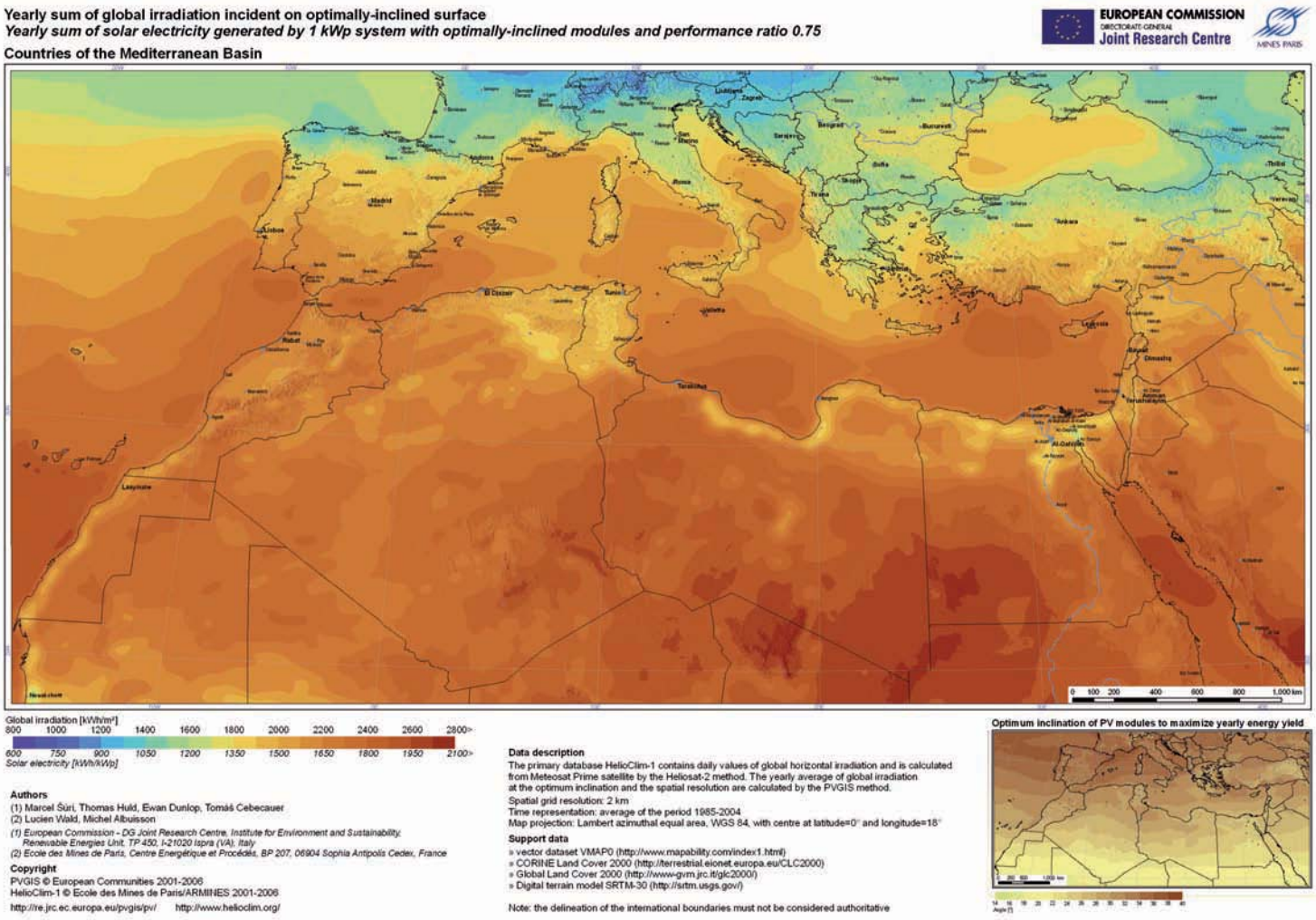

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Figure 1. Solar radiation map of the Mediterranean and North Africa.

support, by just capitalising on the high solar irradiation of these regions and their relatively expensive and inefficient conditions for conventional electricity generation.

Distributed generation for both town and country

PV can be used both in centralised power plants but also as a distributed energy source, generating electricity close to the point of consumption. Worldwide electricity is not available to more than 1.6 billion people, of which 80 per cent live in rural areas. In sub-Saharan Africa, only nine per cent of the rural population have access to electricity. PV represents a unique opportunity to electrify rural and remote areas in developing countries, removing this barrier to social and economic development.

At the other end of the spectrum, more than 50 per cent of the world's population is now urban, and cities make an important contribution to national greenhouse gas emissions. PV is one of the only renewable energy technologies that can seamlessly integrate with highly dense urban environments. At a time where many cities are developing strategies to reduce their emissions, PV is poised to become a standard building technology, ensuring that during the next decade, future buildings can be transformed into positive power plants.

A responsible investment

PV is a key tool in the fight against climate change, with the potential to save billions of tonnes of CO_2. But not only does it provide clean power from an inexhaustible indigenous source, it also boosts economic development by creating jobs, channelling investment into a sustainable energy model and saving billions in foreign imports of fossil fuels.

In order to achieve high penetrations of PV by 2020, temporary market support will be needed in regions where PV is still in a pre-competitive phase. A macro-economic analysis performed by EPIA has shown that in Europe, market support required for boosting PV to cover 12 per cent of the electricity demand in 2020 is an investment – not a cost – yielding a massively positive return to EU society as a whole. This is, inter alia, a consequence of the hedging value of PV; investing in PV in essence locks the price of electricity over the lifetime of the system (25 years or more) against the increase of fossil fuel generation technologies driven by growing and high volatile fuel prices. There are no fuel costs, no geo-political risk and no supply dependence on imported fuels from politically unstable regions

In addition, and especially at times of economic uncertainty and high unemployment rates, any technology that demands a substantial level of both skilled and unskilled labour is of considerable economic importance. PV creates a vast diversity of employment across its value chain, ranging from highly skilled scientists and engineers to simple installers. An important part of the workforce is needed lower down the value chain in the distribution, planning and installation of systems, which is in essence revitalising regional economies, providing local and non-displaceable quality jobs and expanding tax bases in rural regions.

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PV in a remote rural setting in Bolivia.

WHAT MATTERS TO THE PV INDUSTRY?

Even in this time of high economic uncertainty, the climate issue remains high on the agenda. The first commitment period of the Kyoto Protocol is coming to an end in 2012. While this agreement is not perfect, it is the only international policy tool we have to curb carbon emissions and combat climate change, and coming to an agreement for the period post-2012 in Copenhagen is now essential.

For the PV sector, the outcome of these negotiations is critical. In particular, two points are of key interest: the rigour of the emissions reduction targets, and ensuring an expanded carbon market.

Targets: the emission reduction targets for industrialised countries under consideration are much greater than those under the Kyoto Protocol's first commitment period. If ambitious targets are agreed and enforced, this will have an immediate impact on the framework conditions of the PV sector as the price of carbon will rise substantially and drive energy investment decisions.

The flexible mechanisms: The Kyoto Protocol's Clean Development Mechanism (CDM) must support the whole range of energy projects, including those small and mid-size projects that best match the distributed nature of PV structures and the needs of less developed economies.

THE IMPORTANCE OF COPENHAGEN

The window of opportunity to prevent global warming from reaching dangerous levels of two degrees Celsius or more above the pre-industrial temperature, which could trigger irreversible and catastrophic changes in the global environment, is closing fast. The average global temperature is already almost 0.8 degrees higher than in pre-industrial times, and some research indicates that past and present emissions may have already made a further rise of as much as one degree Celsius inevitable. This means that Copenhagen is almost certainly the last chance to get global emissions onto a progressively lower-carbon track that can prevent climate change from reaching two degrees Celsius or more. It is 12 years since the Kyoto Protocol was agreed, so Copenhagen is a rare opportunity for global action. With world emissions still rising steadily, waiting another decade or more to act will make it too late to prevent disastrous climate change.

A LOT OF WORK AHEAD FOR A NEW CLIMATE DEAL

Whatever the outcome in Copenhagen, we are at a crossroads of our energy future, the design of which will be fundamental to the future of the PV energy industry. Policy-makers have the choice between the path of sustainability, energy security, clean air and water, which would strengthen our economies and reduce our dangerous dependence on imported fuels; or they can continue on the disastrous course of business as usual. The future of our planet depends on making the right choice, and the PV industry stands ready to play its critical part in a sustainable energy future.

Author

Adel El Gammal is Secretary General of EPIA, the European Photovoltaic Industry Association. He has been leading work on the 'SET For 2020' report, a reference study on the future of PV. He is a civil engineering graduate from the Free University of Brussels (Belgium) and holds Business Administration degrees from Solvay Business School (Belgium) and INSEAD (France).

Organisation

The European Photovoltaic Industry Association (EPIA) is the world's largest photovoltaic industry association, with more than 200 member companies drawn from across the entire solar electricity sector. It represents about 95 per cent of the European photovoltaic industry and 80 per cent of the worldwide photovoltaic industry. EPIA members are present throughout the whole value chain, from silicon, cell and module production to systems development.

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www.serfor2020.eu
www.pvemployment.org

Evonik Industries –

WHERE ECONOMY MEETS ECOLOGY

It is universally accepted that energy, raw materials, agricultural produce and clean drinking water are the basis for supplying the world's population with food, medicines and other essentials. However, basic needs that are taken for granted in industrialised countries still are not adequately available in many parts of the world. Ensuring that these needs are met is a global challenge for politicians, the corporate sector and society – and the goal of sustainable industrial development.

The key questions are how to balance the projected increase in demand from world population growth and rising living standards, the impact of climate change and the need for global climate protection strategy with limited financial resources, and what demands this will create place on society.

Evonik Industries supports a broadly-based, inter-disciplinary approach to addressing these challenges. We believe it is particularly important that international agreements are binding on all signatories. Moreover, comparable obligations and objectives should be required of all parties. Otherwise, there is a risk of serious structural distortion of the business environment.

A central element in the development of Evonik's business areas is seeking trends as a basis for tackling megatrends. To address future challenges, the Evonik Group is already implementing pioneering business ideas in energy efficiency, globalisation and demographic change as well as health and well-being.

As an integrated industrial group, Evonik can use its specialised expertise in chemicals, energy and real estate to develop both segment-specific and wider-ranging solutions. These include developing strategies on the basis of extensive analyses in order to optimise the eco-efficiency of established products and services or speed up the time-to-market of new products and system solutions. Currently, energy efficiency is a particularly dynamic megatrend. We believe that this rapidly developing market environment offers us opportunities to make a substantial contribution to durable energy savings through our innovative products and services. Evonik's strategy is already aligned to sustainable production processes and products.

According to the Intergovernmental Panel on Climate Change (IPCC), by 2050 industrialised countries need to cut greenhouse gas emissions by as much as 80 per cent to prevent a significant increase in the earth's temperature. Energy generation and energy-intensive sectors of industry must make a contribution, along with the transportation and housing sectors. In our view, however, companies should not be judged solely on their emissions. The related benefits for society and the broader emissions reductions achieved should also be considered.

In July, the International Council of Chemical Associations (ICCA) published an extensive report on the chemical industry, prepared by an independent agency. The report showed that each metric ton of CO_2

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In Duisburg-Walsum, Germany Evonik is building the most advanced hard-coal-fired power plant in Europe.

emitted during production processes in the chemical industry, the industry saves its customers three metric tons of CO_2 emissions during the utilisation phase of the product. Further potential could be harnessed by an integrated approach that combines a pioneering policy framework that supports research and innovation with regulation and corporate responsibility.

"Companies should not be judged solely on their emissions. The related benefits for society and the broader emissions reductions achieved should also be considered"

Evonik's Energy Business Area plays its part in achieving far more efficient use of primary energy resources, reducing CO_2 emissions through technology transfer, modernisation of power plants and the use of renewable energies. A rough estimate suggests that efficiency-enhancing measures could reduce global CO_2 emissions by more than two billion metric tons a year.
Globally, most energy resources are used to heat buildings. Evonik's Real Estate Business Area continually upgrades its apartments to optimise energy use and incorporates smart energy concepts into the construction of new homes. Technologically, it will soon be possible to provide carbon-neutral housing. Evonik's 'three-litre house' was a pilot project in this field. Economically, however, such concepts have not yet achieved widespread market acceptance. Evonik attaches equal importance to extensive and structured analysis of its own direct and indirect CO_2 emissions and understands how emissions can be avoided through use of new products. Based on such information, the Evonik Group seeks to align its goals for future corporate development to sustainability.
The first element in this strategy is the establishment of the Eco2 Science-to-Business Center, which brings together the expertise of Evonik's Chemicals, Energy and Real Estate Business Areas in energy efficiency and climate protection in interdisciplinary development projects. Alongside research into established areas such as electric vehicles, efficient energy use, photovoltaics and tyres with low rolling resistance, the Science-to-Business Center is addressing future-oriented topics including smart power networks and carbon capture and use as an alternative to dumping CO_2 that is separated off from power plant emissions using energy-intensive processes.
Other areas of focus are the development and introduction of a Group-wide standard to evaluate product lifecycles, especially with a view to climate relevance.
At Evonik, energy efficiency is not restricted to products and services. We are also actively driving forward continuous improvement of our own production processes. Supported by internal management and process expertise, we are working on ways to identify and utilise the scope for sustained improvements in operational excellence both at individual sites and in a broader context.
All these examples clearly show that industry has a central role to play as the creator and enabler of smart solutions for the challenges facing us.
Companies that wish to play a successful role in the market therefore need to achieve a permanent improvement in efficiency and actively foster an innovation-driven culture. All-round approaches and behaviours that create value are required. Without value creation, current and future challenges cannot be solved. However, value creation requires space for development and a reliable policy framework. That is particularly true for long-term decisions in the chemicals, energy and real estate sectors, which need to be based on reliable foundations. Unilateral regional regulations on reducing greenhouse gases lead to market distortion and do not serve the interests of global climate protection or sustainable industrial development.

Evonik Industries brings the mass production of safe and environmentally friendly electric vehicles in Europe a lot closer to becoming a reality. Li-Tec Battery is a subsidiary of Evonik.

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Responding to the new challenge of ICT-driven sustainability

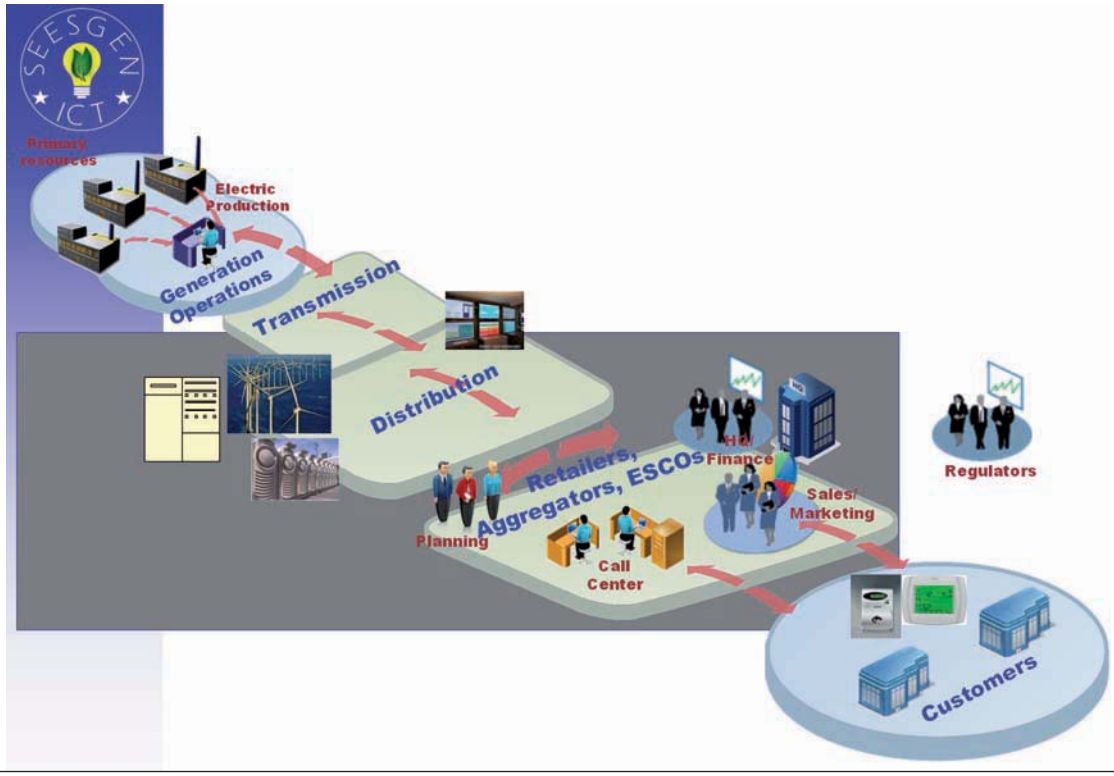
LUIS NEVES
CHAIRMAN OF THE GLOBAL E-SUSTAINABILITY INITIATIVE (GESI)

Modern high-speed communication networks are a crucial enabler for almost all industries, essential for leading the way to a low-carbon society. This is the firm belief of the Global e-Sustainability Initiative (GeSI), along with the conviction that sustainability is fundamental for long-term economic growth and competitiveness. In the context of the necessity to reduce greenhouse gas emissions, the author outlines the range of initiatives that GeSI has undertaken with its members and global partners.

The GeSI flagship report, 'SMART 2020: Enabling a Low-Carbon Society', shows that ICT has a significant and growing impact on the world's climate. The report's supporting analysis, conducted independently by consultancy firm McKinsey & Co, indicates that while ICT's own sector CO_2 emissions will nearly double by 2020, the application and diffusion of ICT in other business sectors can reduce total global CO_2 emissions by 15 per cent. These savings are five times larger than the total expected emissions from the entire ICT industry. In addition to these reductions, potential energy savings can be achieved from the capacity of ICT to enable dematerialisation – replacing high-carbon physical products and services with low-carbon virtual equivalents.
Over the past year, GeSI has enabled its working groups to go further by including new groups and partners. This has expanded the GeSI network so as to fully launch the vision of what the ICT industry can offer to create a more sustainable environment.

The SMART 2020 report has been extremely well received and continues to used and cited by the European Commission, ITU and OECD, financial institutions, universities, scientists and national governments. Meanwhile, GeSI members have been focused on implementing the recommendations and communicating the findings of the report. At the same time, GeSI has been supporting regional versions of the report, expanding the scope of its working and shaping policy needed to accelerate the transformation process needed to respond to the challenges of global warming.
In order to be able to fully utilise the positive impact of ICT, reliable and capable high-speed broadband networks are of the utmost importance. Without a world class state-of-the-art telecommunications infrastructure, we will definitely not be able to realise the ICT-related CO_2 emissions reduction potential. This makes the implementation of an investment-friendly framework, which effectively fosters the roll-out of high-speed Next Generation Access Networks, an even more pressing issue. Unfortunately, the current policy measure proposals do not provide the required breakthrough.
Without the superhighways built we will not be able to foster social inclusion and enhance competitiveness in the information age. These investments are also a prerequisite for effectively tackling climate change and achieving the necessary CO_2 emissions' reduction targets.

Figure 1. Focus of WP6 "Environment protection" on future technologies.



Source: http://seesgen-ict-erse.web.it

The vision of GeSI is about sustainable solutions through innovation. As stimulus packages for network recovery have been presented around the world, GeSI members have noted that, as mentioned, even more investment in broadband infrastructure will be necessary to realise green solutions.

The US Addendum

The SMART 2020 Report – US Addendum was published at the end of 2008. The report concluded that ICT has the potential to reduce total carbon dioxide emissions in the USA by 13 to 22 per cent by 2020, and US dependence on imported oil by up to 36 per cent.

To achieve the results outlined in this report, BCG and GeSI recommended that the US government commit itself to four overarching policies to accelerate adoption of ICT-enabled opportunities:

- Publicly recognise the important role the ICT sector can play in the National Energy Efficiency Strategy
- Build a national 'centre of excellence' to establish standards and metrics for CO_2 emissions, consolidate and validate data, co-ordinate public–private collaboration, and share best practices
- Encourage the ubiquitous deployment of broadband, since connectivity will be the backbone of all ICT solutions, and
- Create market mechanisms that reward energy efficiency and emissions reduction by monetising carbon emissions.

In addition, BCG and GeSI recommend specific policy measures that together could contribute to an annual reduction of 0.8 to 1.4 gigatonnes of carbon dioxide in 2020. For a summary or complete version of the report see www.gesi.org.

At present, many of the actors in society are still hesitant. Such hesitation seems unsustainable as well as short-term oriented, and could even be irresponsible. Every lost day in the effort towards stabilising global warming will cost us years of hard work later.

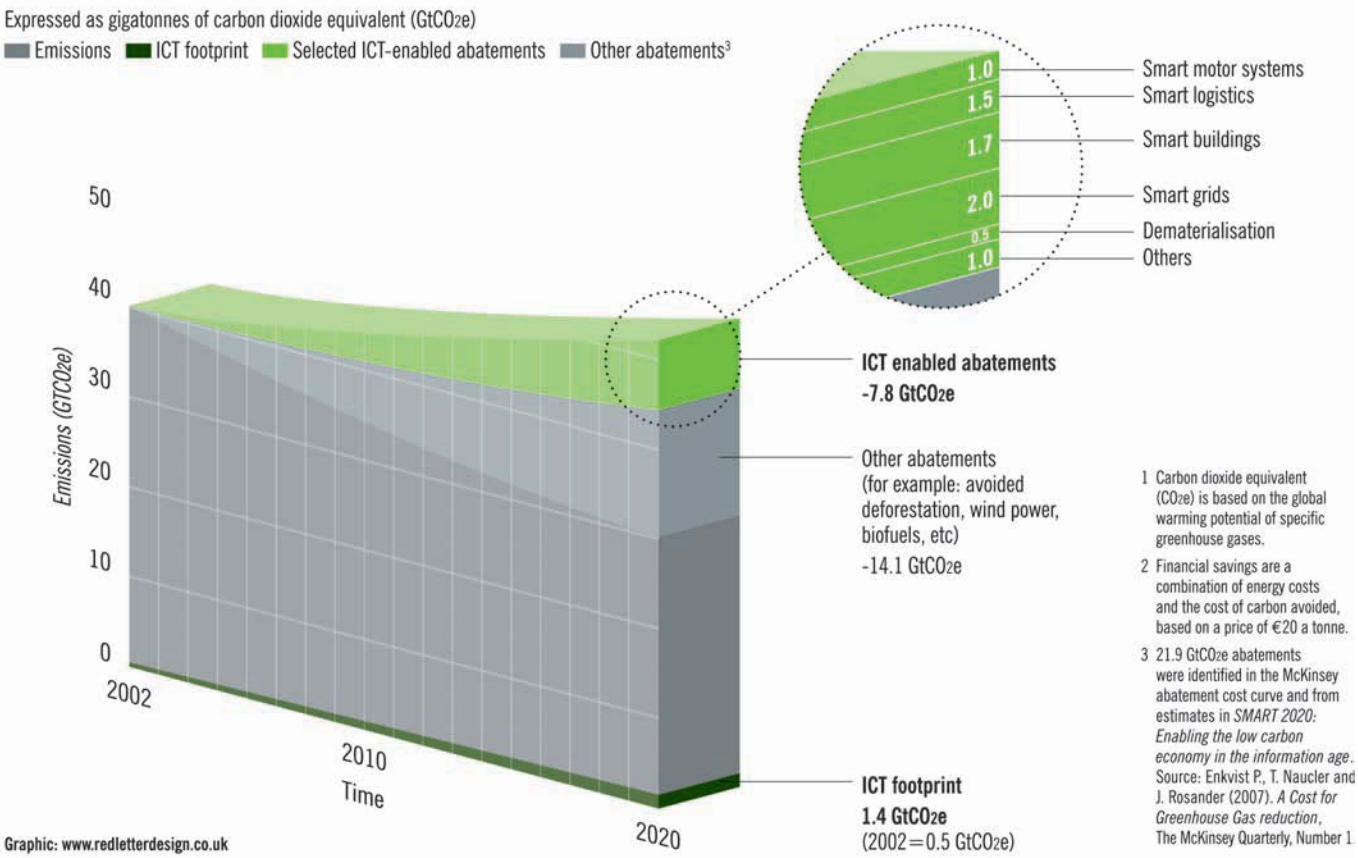
> "In order to be able to fully utilise the positive impact of ICT, reliable and capable high-speed broadband networks are of the utmost importance"

GeSI and its members are firmly convinced that only by engaging in developing new business models is it possible to address the challenges ahead of us.

INCORPORATING ENERGY EFFICIENCY

GeSI's public policy working groups have reached out to policy makers supporting their communications and recommendations on energy efficiency in the EU and programmes on the National Energy Efficiency Strategy in the US. In the EU, GeSI is working together with Digital Europe (formerly EICTA) and TechAmericaEurope (formerly AeA) on a roadmap aiming at energy efficiency for the ICT sector under a forum called ICT4EE (see below). In 2009, the Energy Efficiency Inter Operators Collaboration Group (EE-IOCG) was incorporated into GeSI. The new GeSI-EE IOCG group includes representatives from 21 telecommunications global operators who aim to co-ordinate strategic actions among standardisation bodies.

Figure 2. ICT impact: The global footprint and the enabling effect.



1 Carbon dioxide equivalent (CO_2e) is based on the global warming potential of specific greenhouse gases.

2 Financial savings are a combination of energy costs and the cost of carbon avoided, based on a price of €20 a tonne.

3 21.9 $GtCO_2e$ abatements were identified in the McKinsey abatement cost curve and from estimates in *SMART 2020: Enabling the low carbon economy in the information age*. Source: Enkvist P., T. Naucler and J. Rosander (2007). *A Cost for Greenhouse Gas reduction*, The McKinsey Quarterly, Number 1.

Source: GeSI's SMART 2020 Report (2008)

Also in 2009, GeSI's climate change working group (GeSI-CCWG) re-launched itself to guide and formulate climate change policy on a global basis, including work on energy efficiency. GeSI's climate change working group is focused on two main areas: (1) developing a roadmap that emphasises standardisation and reporting of CO_2 emissions and broadening the research of the opportunities of ICTs contribution; and (2) positioning this roadmap by region, Europe, North and South America and Asia. The strategic development involves collaboration of all GeSI members as the climate change working group co-ordinates closely with every other working group in GeSI.

OPPORTUNITIES TO PARTICIPATE IN EU FUNDED RESEARCH

In addition to the working groups, GeSI offers members an opportunity to participate in EU funded research programmes on smart grids (Supporting Energy Efficiency in Smart Generation Grids, 'SEESGEN') and smart transport initiatives (ICT21EE).

In ICT21EE, members are contributing examples of transport-related initiatives that, by improving the experience of taking public transport, reduce the dependency on car use and the amount of CO_2 emissions.

In SEESGEN, members are contributing to research efforts in the area of environmental protection of smart grids, with emphasis on computing activities in smart distribution grids, reducing carbon emissions in data centres, infrastructures dedicated to smart grids and how ICT systems can reduce greenhouse gas emissions. This research project will go through 2011 and the final objective is to create a repository of information for the European Commission. GeSI also has the role of liaising with a related EU smart grid research project, ICT4SMARTDG, so as to co-ordinate SEESGEN's work programme of environmental protection of smart grids with micro-grids (buildings and residential users).

FULL LIFE-CYCLE ANALYSIS – THE SUPPLY CHAIN WORKING GROUP

The supply chain working group (GeSI-SCWG), GeSI's largest working group, consists of several sub-groups: supplier reporting; validated audit processes; extractives; and learning and capabilities. The expansion of the working group to include these sub-groups demonstrates the group's commitment to a full life-cycle analysis of responsible sourcing.

> "Policy developments in the supply chain are also carefully monitored, especially as the past year has seen a dramatic focus on extractives coming from US legislators and NGOs"

The group has also integrated eWaste in its agenda; for example, the group considers end-of-life issues such as universal mobile phone chargers and extraction of minerals from specific mines.


Energy efficiency is key for achieving a low-carbon society.

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The learning and capabilities sub-group works to enhance corporate responsibility capabilities in the supply chain by developing training resources and organising events to increase awareness of social and environmental issues. GeSI continues to work with local training organisations, NGOs and other stakeholders to build capability among suppliers.
Policy developments in the supply chain are also carefully monitored, especially as the past year has seen a dramatic focus on extractives coming from US legislators and NGOs. Members have issued several public statements of support for the concerns raised in the supply chain area. In addition, GeSI attended several stakeholder events aimed at encouraging exchanges of views on how the industry could best respond to NGOs' concerns.

COLLABORATION WITH PARTNERS

GeSI facilitates collaborative responses to best represent the ICT industry. When submitting a response or participating on a panel, members are encouraged to speak not on behalf of their company, but as a unified voice of the ICT industry. Before reaching that point, especially when producing joint statements, GeSI members work diligently to focus on the common denominators of their positions and the overall objective for ICT-driven sustainability.
The result can be powerful – GeSI members have also joined forces with other industry associations such as DigitalTech Europe and TechAmericaEurope to respond to the EU Commission's recently published Recommendation on Energy Efficiency (October 2009). By focusing on the key priorities and implications of the Recommendation for industry, GeSI with the support of the above organisations is collaborating within the context of a three-year road map, the ICT for Energy Efficiency forum (ICT4EE) already mentioned. This forum demonstrates the sector's motivation to move forward on its representations that ICT offers solutions to climate change issues. Such collaboration and aligned messages will facilitate clearer communication with COP negotiators.

COP15

GeSI's representation at COP15 events will be with the ITU and the OECD, with a joint side event, 'ICTs and Climate Change'. The panel will consist of speakers to represent the major regions as well as less developed countries. At the COP15 conference in Copenhagen, GeSI will be presenting with OECD's 'The Voice of Business'.
At the COP-15 negotiations, GeSI's goal is, first, to contribute towards getting ICT back on the agenda; and secondly, to secure an understanding of reasonable carbon reporting, measuring and monitoring emissions for ICT products and services.

A FOCUS ON ICT-DRIVEN SUSTAINABILITY

GeSI members benefit from the association either by being active in working groups, projects, studies and position papers; or by participating in constitutional meetings such as board meetings and semi-annual general assemblies.
While other trade organisations offer their unique advantages, and GeSI partners with several of them GeSI is the only global association dedicated to helping its members provide ICT-driven sustainable solutions. Together, the Global eSustainability Initiative (GeSI) members continue to drive their vision of how the ICT industry can create a more sustainable society.

Author

Luis Neves was appointed Head of Sustainable Development and Environment at Deutsche Telekom Corporate Responsibility and as from December 1st 2008 he holds the position Vice-President Corporate Responsibility. Luis is member of the ETNO Sustainable Working Group. In March 2006 he was elected Chairperson of GESI, the Global e-Sustainable Initiative. In August 2008 he was re-elected for a second term of office. Luis has been playing a fundamental role in promoting the role of ICT in relation to Climate Change.

Organisation

The Global e-Sustainability Initiative (GeSI) is an international strategic partnership of ICT companies and industry associations committed to creating and promoting technologies and practices that foster economic, environmental and social sustainability, and drive economic growth and productivity. Formed in 2001, GeSI fosters global and open co-operation, informs the public of its members' voluntary actions to improve their sustainability performance and promotes technologies that foster sustainable development. Current members of GeSI include: Alcatel-Lucent, AT&T, Belgacom, Bell Canada, BT, Cisco, Deutsche Telekom, Ericsson, European Telecommunication Network Operators Association (ETNO), France Telecom, HP, Huawei, KPN, Motorola, Microsoft, Nokia, Nokia Siemens Networks, RIM, Sprint, Sun Microsystems, Telecom Italia, Telefónica, Verizon and Vodafone. Associate members are the Carbon Disclosure Project (CDP) and World Wildlife Fund (WWF). GeSI partners with three organisations: United Nations Environment Programme (UNEP), the International Telecommunication Union (ITU) and the World Business Council for Sustainable Development (WBCSD).

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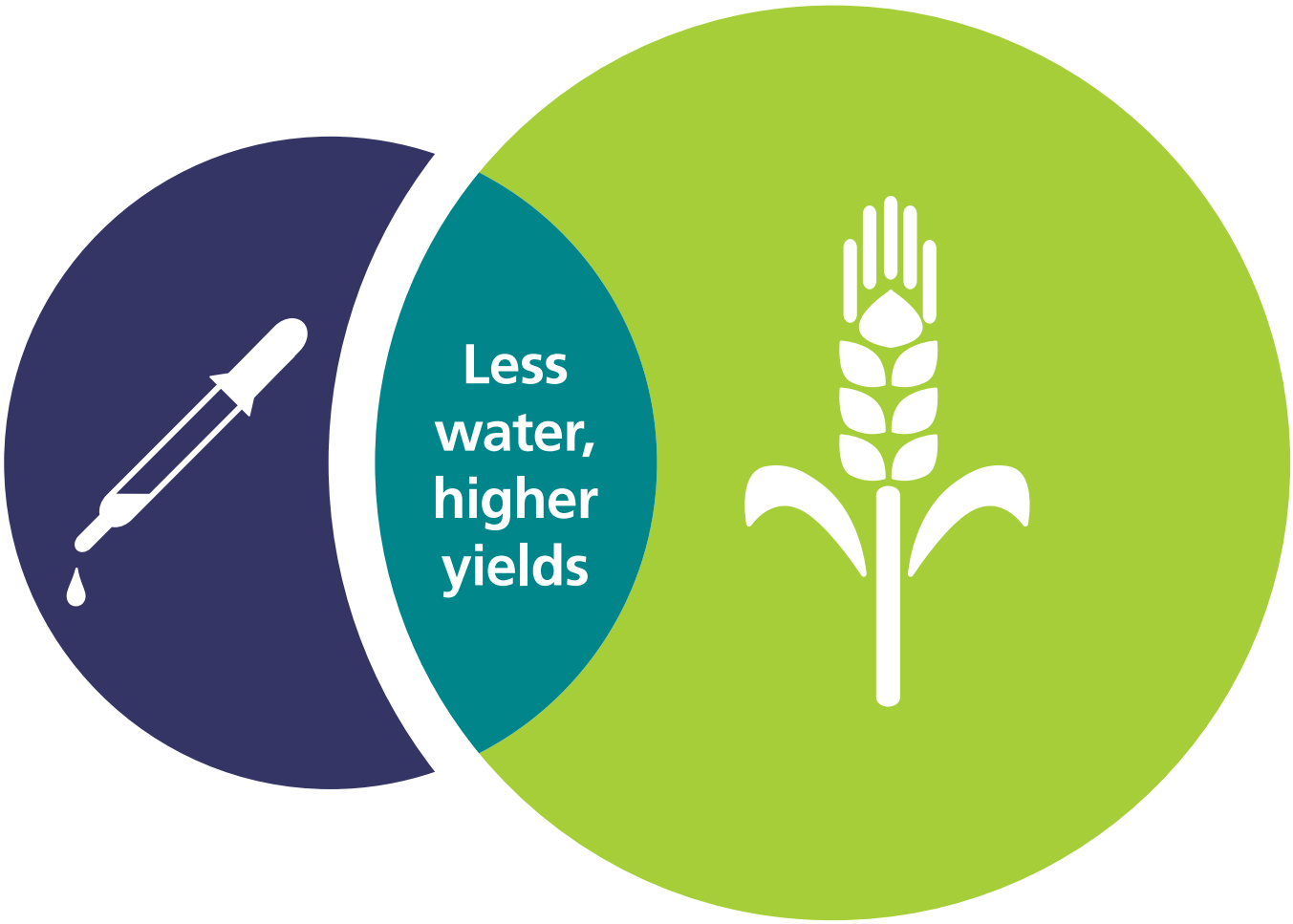

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Greening the world's telecoms networks

As the world's political leaders prepare for negotiation at the UN climate conference in Copenhagen in December, one industry is pressing for its role to be recognized as key to combating carbon emissions. Providers of information and communications technology (ICT) can play a vital part in improving the energy efficiency of other industries, buildings and ways of working – such as virtual conferencing that could ultimately replace static meetings such as Copenhagen.

But the ICT industry must also put its own house in order. As use of mobile devices and PCs explodes around the world, and energy-hungry data centers are built to manage vast information repositories, its own carbon footprint is set to double by 2020. While there is net benefit in rolling out communications and computing power to billions, especially in emerging countries such as India and China, parts of the ICT pathway where energy savings can be made must be addressed.

The networks of mobile and fixed line communications service providers (CSPs) are of particular concern, as Rohit Kumar, Head of Energy Solutions at Nokia Siemens Networks, points out. "Typically a CSP's infrastructure accounts for about 80% of the energy they consume, and even up to 30% of operational costs, with higher costs in emerging markets," he says. "There is a great opportunity – and pressure from costs and social responsibility – to cut energy consumption."

This applies, he adds, to both existing installed networks and in particular to new networks that are increasingly being built out to remote regions where electricity grids are unreliable or nonexistent. "Those CSPs that choose to rely on diesel generators to power remote base stations will be paying more as fossil fuel prices rise – and also paying a big environmental price," he says.

Indeed, as analyst Juniper Research reports, mobile base station electricity costs could shoot up by about 55% in the next five years unless CSPs cut their reliance on non-renewable energy resources and address network inefficiencies. In fact, Juniper warns that unless operators in Africa and Asia shift to renewable energy sources they will find their margins increasingly squeezed as they expand, such that their networks may no longer be financially viable in a few years time.

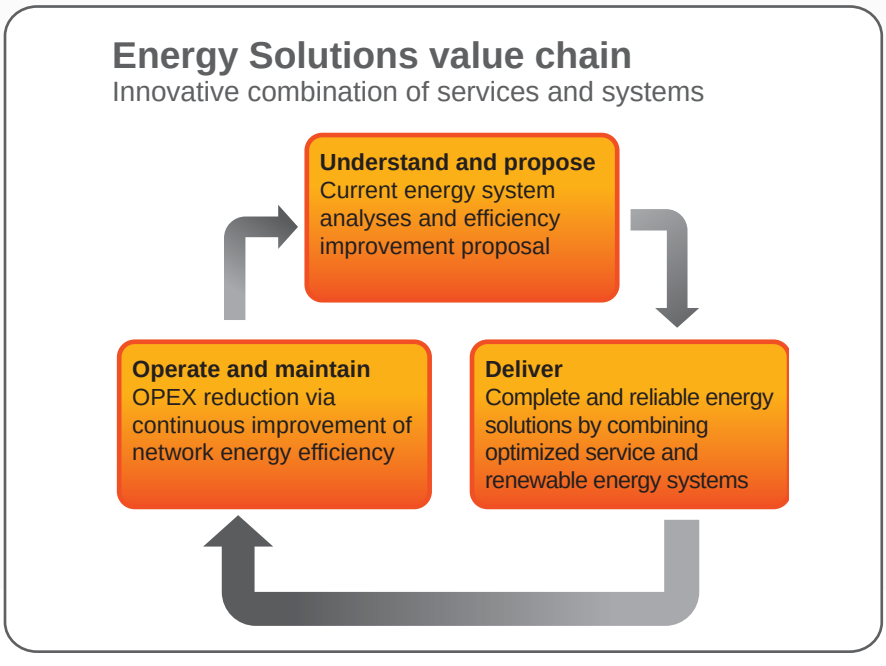
As Rajeev Suri, Chief Executive Officer of Nokia Siemens Networks, said recently at an International Telecommunications Union event in Geneva, the challenge is to bring affordable and sustainable connectivity to the world. "Providing affordable connectivity to the billions of people without it, while minimizing the environmental impact of connecting them, are the two major challenges facing us today," he said.

Several emerging markets – in particular India and China – are now rolling out networks to literally millions of new customers a month, and both are very much in the spotlight regarding rapidly rising carbon emissions generally. But as Kumar notes, it is not just emerging nations that suffer from energy challenges – there are so-called 'bad grid' areas in western countries, for example Italy (bad grid being poor supply reliability, or not constantly available), and many existing networks are running at very far from optimum energy efficiency. Furthermore, while wireless networks tend to get most attention, fixed line broadband networks also have extensive and complex energy needs.

"What we have been seeing in the market is a very fragmented picture when it comes to energy efficiency, with mostly piecemeal and 'point' systems being applied in certain locations, with few CSPs able to see an end-to-end view of exactly where they are consuming most power and why," says Kumar. "With current challenges for CSPs to deliver savings in OPEX and at the same time expand market reach, we are positioning an energy solution that will optimize this vital area for both new build and installed networks. It also inherently helps CSPs be more environmentally responsible."

With base station sites accounting for about 80% of CO_2 emissions in mobile networks, primarily from diesel generators, it is no surprise that systems that provide renewable energy to off grid and bad grid sites are now much more commonplace than a few years ago, but there is still a long way to go, and it is crucial to minimize conventional fuel consumption by diesel generators.

As an indication of the challenges, the GSM Association's Green Power for Mobile program has set the goal of helping the



Power points

- Based on key CSP benchmarks across the globe in developed markets, an average of 10% of network operational cost is energy. In emerging markets it can be from around 15% to 30%.
- As mobile networks expand in developing markets, an estimated 75,000 mobile base stations are built each year that need their own power source as they are not connected to an electricity grid.
- The number of base stations powered by renewable sources will reach 320,000 sites at the end of 2014, according to IMS Research, which also notes that power to keep the latest mobile devices going is increasing by 15% a year.
- Juniper Research estimates that by transforming base stations with equipment that takes less power and migrating from diesel to renewable energy to power off-grid generators, electricity costs will peak in 2011 and then drop to 10% below current levels by 2014.
- ABI Research has produced a vendor matrix that ranks the top 'green' mobile operators in North America. No operator leads in all criteria.
- The International Telecommunications Union (ITU) is lobbying for the role of ICT to be recognized at Copenhagen. The ITU is also developing standards for assessing the environmental impact of ITC.

mobile industry use renewable energy sources, such as solar, wind or sustainable biofuels, to power 118,000 new and existing off-grid base stations in developing countries by 2012. Achieving that target would save up to 2.5 billion liters of diesel a year and cut annual carbon emissions by up to 6.8 million tons. "By 2011 we are aiming to make renewable energy the first choice when shipping base stations to remote or rural areas," says Kumar.

Solutions for base stations include solar and wind power, low energy base station technology – which is becoming increasingly efficient – and battery and fuel cell banks. Where grid electricity is available, there is a range of measures that cut energy consumption, such as better cooling systems, eliminating air conditioning and heat exchangers.

But as Kumar points out, while these can be very effective and more 'green', savings may not be realized without careful planning and provisioning of the network as a whole – including factors such as the topology and mobile technology used – and central monitoring and maintenance. "It is a myth that CSPs can optimize OPEX of their networks on a site-by-site basis without taking a full view of the OPEX spent on the entire network," he says.

That's why Nokia Siemens Networks is placing emphasis on efficiency consulting services to optimize networks from an energy point of view, and has also implemented its Green Energy Control, which allows CSPs to manage all the power sources – from solar power to battery condition to the temperature of shelters. Apart from being able to adjust energy settings round the clock, this plays out in activities such as maintenance, allowing field staff to plan fewer and better targeted site visits.

CSPs win several times over by an energy planning and management strategy. "By making more sites autonomous, grid connections can be eliminated as long as climate conditions are favorable," says Kumar. "Capital and maintenance costs can be lower, and there is less risk of fuel theft. The total cost of ownership of equipment is also lower, and CSPs can often tap into government subsidies for alternative energy investment. In some cases, installation can generate power that is fed back to the grid, introducing new revenue streams." Energy efficiency improvements need not be costly, either – simply retrofitting an existing site can start bringing in up to 10% energy savings depending on the site configurations.

One company that is emphasizing the power reduction of a new investment is T-Mobile Austria, which is deploying 2,500 of Nokia Siemens Networks' Flexi base stations, estimating they will cut the carbon footprint by as much as 2,500 tons of CO_2 a year, as they work without air conditioning and also take less energy to transport and install.

But overall, the potential investment for energy improvements across the world's telecommunications networks is of the order of many billions of euros – and return on investment is measured in just a few years, not decades. And along with social responsibility, the energy rating of a CSP is likely to become an important factor for their customers. Other parts of the communications world will also play a part in contributing, such as with 'greener' mobile handsets, where consumers will undoubtedly have a say.

All told, the telecommunications industry has the key to uniting people and businesses to meet 21st century environmental standards – and now has the tools to play its own part in the energy stakes.

In line with its views on sustainability, Nokia Siemens Networks has joined with WWF, the global conservation organization, to persuade decision makers at the UN Climate Summit in Copenhagen in December 2009 to deliver a fair, ambitious and binding agreement to cut global greenhouse gas emissions.

For more information please visit www.unite.nokiasiemensnetworks.com/environment

Nokia Siemens Networks

ICTs' part in combating climate change

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UN Secretary-General, Mr Ban Ki-moon's signature on the Seal the Deal flag

HAMADOUN TOURÉ
SECRETARY-GENERAL
INTERNATIONAL TELECOMMUNICATION UNION (ITU)

UN Secretary-General Ban Ki-moon has described climate change as the 'moral challenge of our times' and declared 2009 as the year of climate change. He urged world leaders and top-level business executives to launch a global 'Green New Deal' that creates jobs and fights climate change by investing in renewable energy and technological development. During a visit to ITU headquarters in Geneva, he remarked that "ITU is one of the most important stakeholders in terms of climate change," in bringing the benefits of ICTs to meet the challenge of climate change. Indeed, we are living in one of the most challenging periods in human history, faced with the prospect of irreversible global climate change and its profound effects on earth's ecosystems.

The digital revolution has changed people's lives dramatically and boosted economic growth. At the same time, the proliferation of information and communication technologies (ICT) has also had a negative impact on the environment. According to various studies, it is estimated that the ICT sector contributes around 2.5 per cent of GHG emissions, with 40 per cent of this deriving from the energy requirements of personal computers and data monitors, plus a further 23 per cent from data centres. Fixed and mobile telecommunications contribute an estimated 24 per cent. The total does not include emissions from radiocommunication systems or equipment.

A recent study estimated that more effective use of ICTs could help reduce total global emissions by 15 per cent by 2020, representing carbon savings five times higher than the estimated emissions for the whole ICT sector in 2020. The Global e-Sustainability Initiative (GeSI), of which ITU is a part, estimates that these reductions could deliver energy efficiency savings to global businesses of over EUR 500 billion. So going green is not only good for the environment, it's also good for business.

ICT: PART OF THE SOLUTION TO COMBAT CLIMATE CHANGE

Climate change presents us with dire challenges, including food and water security, with new forecasts suggesting that half the world's population could face a climate-induced food crisis this century. Inevitably, the developing world will be the most vulnerable. We must act now to ensure a safe and prosperous existence for our children and future generations.

ITU's mission is to connect the world and ensure that all people, wherever they live, have access to the vast range of benefits ICTs offer. This of course presents not just a huge development challenge, but a formidable ecological challenge as well.

The good news is that ICTs can play a critical role in combating climate change through mitigation of its effects as well as through monitoring and early warning. As the UN Specialised Agency dealing with ICT-related issues and the global focal point for governments and the private sector in developing networks and services, ITU takes climate change very seriously indeed, focusing on how ICTs can help prevent and avert climate change.

Probably the most obvious area for carbon abatement opportunities offered by ICTs is in reducing or substituting travel requirements. The ICT industry offers a number of different tools and services which can replace physical travel, especially business travel,

ranging from the commonplace (e-mail, phone calls, text messaging) to the sophisticated (high-performance videoconferencing).
ICTs have also been extensively used for reducing CO_2 emissions caused by transport by promoting intelligent transport systems (ITS), such as 'eco-driving', congestion charging, as well as traffic management and parking optimisation.

FUTURE DEVELOPMENTS

'Dematerialisation', or the replacement of 'atoms' with 'bits', is the way forward with ICTs, exemplified by the shift away from pre-recorded movies and music (such as DVDs and CDs) to online delivery. ITU is also making its own contribution to dematerialisation by changing from paper-based publishing to online distribution. Many ITU publications are now available online free of charge.
New communication technologies are being designed to reduce emissions. Next-generation networks (NGN) have been a major focus of ITU's work in recent years. NGN are expected to reduce energy consumption by 40 per cent, compared to today's technology. The savings will be achieved in a number of ways, including:

- A significant decrease in the number of switching centres
- More tolerant climatic range specifications for NGN switching locations resulting in less need for air conditioning
- Implementation of standards, such as VDSL2 (ITU-T G.993.2), which specify three power modes (full, low and sleep) for ICT devices to lower energy consumption

The ICT industry is already taking steps to reduce its own CO_2 emissions, by adopting standards for environmental management and recycling waste. There have also been moves within the mobile industry to use renewable energy sources such as solar, wind or sustainable biofuels to power new and existing off-grid base stations in developing countries by 2012.
Measuring the impact of ICTs in reducing emissions is a key challenge. ITU held two major symposia on ICTs and Climate Change in Kyoto and London in 2008. As a result of those meetings, ITU's Study Group 5 in its Standardisation sector has been endowed with a new name and mandate, 'Environment and Climate Change'. It has started work on developing ITU-T Recommendations, such as the methodology giving ICT companies a consistent mechanism to report their carbon footprints.


© UN Photo
Wireless communications play an important role when disasters strike.

Furthermore, all ITU study groups working on standards have been encouraged to evaluate existing Recommendations and, in developing new standards, to always take into account ways to create more energy efficiency.
A third ITU Symposium on ICTs and Climate Change, held in Quito, Ecuador, in July 2009, stressed that bridging the digital divide and bringing the benefits of ICT to all citizens is fundamental to tackling climate change. Participants of the Symposium took note of the advantages of expanding broadband wireless networks that are more energy efficient.
The ITU World Telecommunication Standards Assembly, which took place in Johannesburg, South Africa in October 2008, recognised that ICTs can make a substantial contribution and be a major factor in mitigating the effects of climate change, for example through energy-efficient devices, applications and networks. Most recently, ITU approved an energy-efficient charger designed to fit all mobile phones. The Universal Charging Solution (UCS) enables the same charger to be used for all future handsets, regardless of make and model. The Assembly agreed that climate change is a high priority for ITU in contributing to the UN processes and global efforts to moderate climate change.

ICTs SAVE LIVES

The current impact of global warming on the world's climate is relatively small compared with what can be expected in the future, even if the increase in greenhouse gas emissions is stabilised. The impacts of climate change are likely to be highly uneven in their distribution, with low-lying coastal areas (such as small island developing states, the Gangetic delta in Bangladesh and the Netherlands) at risk because of rising sea levels; sub-Saharan Africa threatened by increasing desertification; a growing number of environmental refugees and increased pressure on sources of fresh water and on vulnerable ecosystems such as coral reefs, tundra and coastal wetlands.
ICTs can more than compensate for their own adverse effects and make a substantial net contribution to combating climate change and its consequences. ICTs facilitate concerted efforts to identify and measure the extent of the problem, develop effective response strategies, apply energy-saving and improved resource management technologies and processes across all sectors, and deal more effectively with disasters and other outcomes of climate change.
ICTs can save lives, and ITU promotes the use of ICTs for disaster management through the development of national emergency telecommunication plans, the setting up of early-warning systems and the deployment of remote sensing and geographical information systems (GIS). Wireless communications play an important role when disasters strike; and ITU has established a database of currently available frequencies for use in emergency situations. As part of the work on standardisation in emergency situations, the United Nations Office for the Co-ordination of Humanitarian Affairs (UNOCHA) was assigned a special E.164 country code (888) to facilitate the provision of an international system of naming and addressing for terminals involved in disaster relief activities.

Satellite communications can make a critical difference during the first crucial hours and days after a disaster. They are employed to assess the extent of damage, help locate survivors, measure the potential danger for rescue teams and ensure that humanitarian response crews can communicate effectively with their team members, other agencies, local hospitals and paramedics. In addition to developing regulatory and technical standards for disaster prediction and detection, early warning and emergency telecommunication systems, ITU has provided equipment and facilities for emergency communications following floods, earthquakes and other natural disasters to affected countries. For example, in May 2008 satellite terminals were sent to help relief operations in two areas: Myanmar, hit by a devastating cyclone, and Sichuan Province in China, which experienced a major earthquake.

ITU COMMITTED TO SEAL THE DEAL IN COPENHAGEN

ITU is pioneering the use of ICTs to reduce emissions through paperless meetings and offices, virtual conferencing and teleworking, as well as sharing its expertise with other institutions in optimising the use of ICTs as a vital component of energy-efficient work methods. A new initiative is also being undertaken to raise public awareness and illustrate the impacts of climate change and the relevance of work in the field of ICTs to address this issue. By pioneering the use of remote participation tools in its own work and lending that expertise to others, ITU serves as a model for the UN system and also assists in bridging the standardisation gap.

> “ICTs can more than compensate for their own adverse effects and make a substantial net contribution to combating climate change and its consequences”

ITU joins efforts of the UN system, which brings together the system's expertise and ongoing work in diverse areas – ranging from science and technology to agriculture, transport, forestry, and reduction of disaster risks – aimed at tackling climate change.
In 2000, UN member states adopted the Millennium Declaration as a renewed commitment to human development, including the eight Millennium Development Goals (MDGs). However, the impact of climate change will tend to offset progress being made to meet the MDGs by 2015. It is therefore crucial to empower developing countries to access the ICTs needed to adapt to climate change and reduce their vulnerability to natural disasters.
ITU and its members are committed as partners to all stakeholders to making ICTs a critical tool and enabling technology to successfully combat climate change and will continue to actively participate in the negotiations aimed at sealing the deal in Copenhagen in December 2009.

ICT Kiosk

The International Telecommunication Union (ITU) is contributing a special programme of daily high-level business talks by leaders in the ICT sector.
The high-level business talks are part of the UNFCCC exhibition “iSeeT@theKiosk” which will be held at COP 15 Copenhagen, 7-18 December 2009 and will show how information and communication technologies (ICTs) are helping to increase awareness and support concrete action on climate change in both developing and developed countries.

Author

Dr Hamadoun Touré is Secretary-General of the International Telecommunication Union, the specialized UN agency for telecommunications and ICT.

Organisation

The International Telecommunication Union (ITU) is the leading United Nations agency for information and communication technology issues, and the global focal point for governments and the private sector in developing networks and services. For nearly 145 years, ITU has co-ordinated the shared global use of the radio spectrum, promoted international co-operation in assigning satellite orbits, worked to improve telecommunication infrastructure in the developing world, established the worldwide standards that foster seamless interconnection of a vast range of communications systems and addressed the global challenges of our times, such as mitigating climate change and strengthening cybersecurity. ITU also organises worldwide and regional exhibitions and forums, such as ITU Telecom World, bringing together the most influential representatives of government and the telecommunications and ICT industry to exchange ideas, knowledge and technology for the benefit of the global community, and in particular the developing world.

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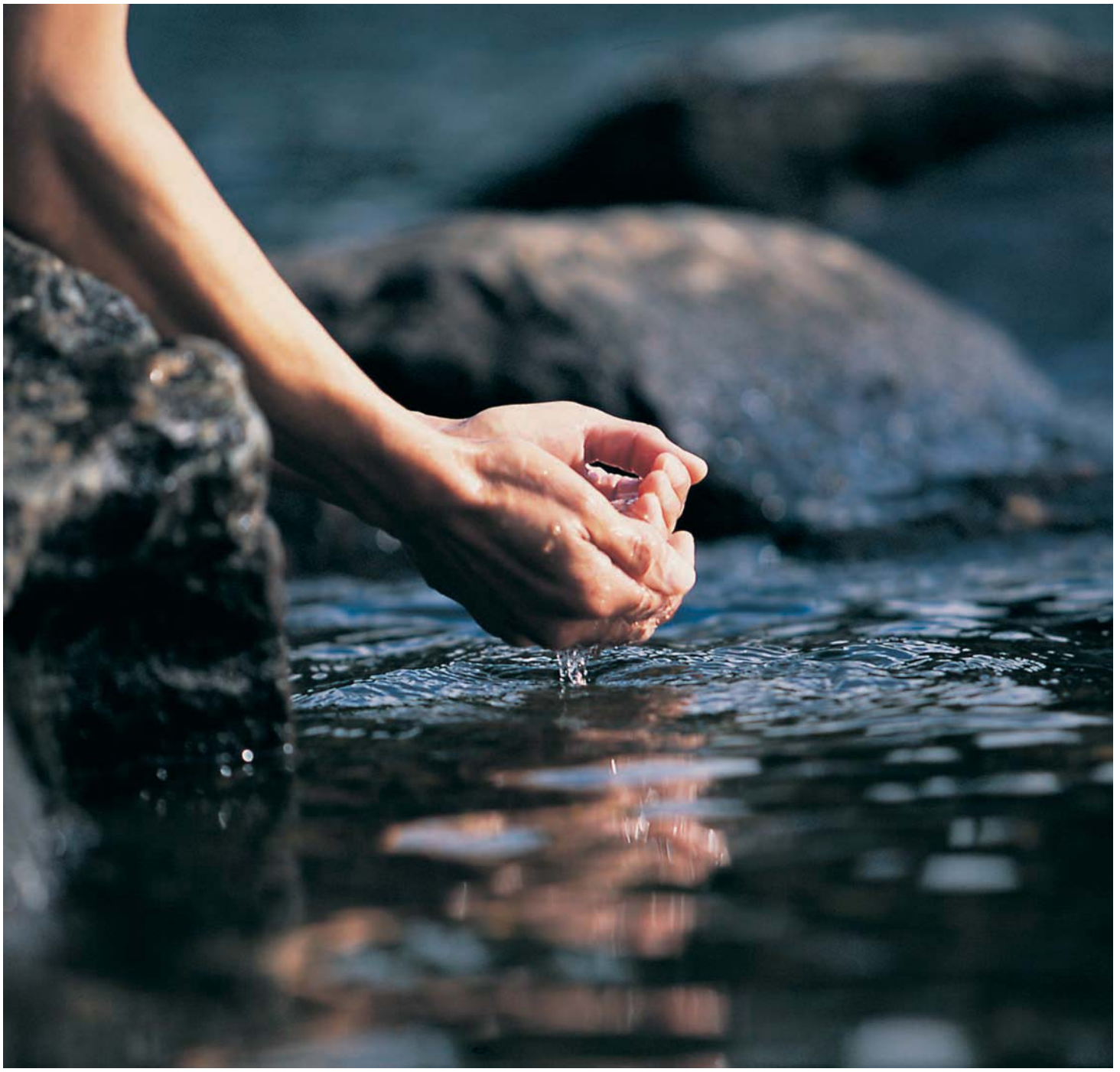
a key role in fighting climate change



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- implementing telemetering solutions;

This approach is supported by a dedicated consultancy practice, as we endeavour to continuously improve our solutions.

In particular, we carry out comprehensive studies so we can analyze the environmental impacts of our offers more precisely.

Among other things, we have evaluated the benefits of our Business Everywhere and Telepresence solutions.

We are also part of the "Climate Change and ICTs" Focus Group which was initiated by the International Telecommunications Union (ITU), a United Nations organisation. We also contribute to the corresponding publications. Moreover, in order to standardize the way energy consumption of network equipment is measured, we recently launched the Energy Efficiency Inter-Operator Group, together with 18 other telecom operators.

We practice what we preach

Our activities produce limited amounts of greenhouse gases, mainly through energy consumption from telecom network infrastructures and buildings, but also emissions from our vehicle fleet as well as staff business trips.

However, we are committed to contributing to the combat against climate change:

- reducing CO_2 emissions for France Telecom Group by 20% from the 2006 level by the year 2020;
- involving all of our employees in reducing the company's environmental footprint;
- reducing energy consumption by 15% from the 2006 level by the year 2020;
- sourcing 25% of Orange Group electricity in the EMEA zone from solar power by the year 2015.

One of our major initiatives to reduce our own carbon footprint regards datacenters.
We have consolidated our infrastructures, virtualized our servers, optimized the ventilation and implemented new air conditioning systems.
Through a dedicated programme, we have produced 8,000 virtual servers.
This has allowed an energy saving of 14 GWh and saved 650 tons of CO_2 emissions by the end of May 2009.

Because of our continuous efforts, we received the Frost & Sullivan 2007 and 2008 Green Excellence Awards, for "Product Innovation" and "Service Achievement".

"Orange leads the sustainable telecoms market" according to a ground-breaking report published in May 2009 by Verdantix, an independent analyst firm which provides commercial analysis of climate change, sustainability and energy issues.

Benefits brought by ICT in other sectors of the economy are estimated to be five times higher than the footprint generated by the ICT sector itself. This is one of the main conclusions of the Smart 2020 report.

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Innovation and invention to make the difference

BJÖRN STIGSON, PRESIDENT, THE WORLD BUSINESS COUNCIL FOR SUSTAINABLE DEVELOPMENT

They say necessity is the mother of invention. And, if we are to shift the world towards a sustainable, low-carbon economy and arrest damaging climate change, innovation and invention have never been more vital.

INTRODUCTION

Recent figures from the Food and Agricultural Organization show that one billion people – or one-sixth of the world's population – suffer from hunger. These are spread around the world: 642 million live in the Asia-Pacific region; 265 million in sub-Saharan Africa; 53 million in Latin America and the Caribbean; 42 million in the Middle East and North Africa; and 15 million in the developed world.

Who can blame these people for wanting better lives? Food security could easily be affected if climate change is allowed to continue. Further compounding this fact, the world's population is expected to grow by 50 per cent, or three billion people, by 2050, 85 per cent of whom will live in what we today call developing countries. All of these people will need food, water and housing. Many will move to cities; by 2050, it is expected that 70 per cent of the world's population will be urbanised. Globally, about 1.6 billion currently have no access to electricity, without which it will be difficult to improve their lives significantly.

More people with access to electricity cannot be allowed to mean more greenhouse gas emissions. A move to a high-growth, low-carbon economy is imperative. Breakthrough energy technologies will have to be found and put to work. Creative thinking and a lot of investment will be needed.

THE ROLE OF BUSINESS

Business knows it is part of the solution to the world's climate change problem. It knows it must be or it may find itself out of business. It is already responsible for 85 per cent of global investment and plays a leading role in the deployment of low-carbon energy technologies. But, as the major investor in and owner of technology, it wants to get on with working, planning and investing for the future. It cannot do this alone: among other things, it will need a clear, consistent policy framework into which to invest and new financial mechanisms that enhance project investments and technology deployment.

Some developing countries and those with emerging economies understand that they will need new technologies if they are to leapfrog high-carbon energy and make it into the low-carbon world and lament the inability of their countries to attract this type of investment. But those that propose mandatory technology transfer as the solution are wrong.

The International Energy Agency estimates that 70 per cent of greenhouse-gas emission reductions could be achieved through the diffusion of existing low-carbon and energy-efficient technologies, along with technologies already in an advanced state. These technologies are transferred through projects, and through products that are bought and sold, beyond national boundaries and at a fairly rapid pace. Companies transfer technology constantly, within their own branches in different countries, or by selling it to other companies operating elsewhere.

Countries and organisations that propose compulsory licensing of technology are misguided and wrong if they think this will hasten development and deployment. They fail to understand that roll-out is about much more

than merely owning technology. Successful deployment depends on having the necessary supporting infrastructure in place (for example, access to national electricity grids for renewable energy producers), political and regulatory stability in the host country, and a capacity locally to absorb the new technology with a competency to use it.

> "There is little point in deploying a particular technology if a skilled workforce is not available to use and maintain it"

Establishing suitable infrastructure may require significant investment by the host country, or parallel investment projects. There is not much point in building a new, low-carbon power plant if electricity from it cannot be uploaded into a country's supply grid, or if workers cannot access it because transportation infrastructure is poor, or if its operations are interrupted because of unreliable water supplies. This is an area worthy of investment and one where governments and other groups seeking to hasten commercial technology transfer could usefully contribute.

Equally, there is little point in deploying a particular technology if a skilled workforce is not available to use and maintain it. Around the world, substantial resources need to be directed at improving education systems and strengthening knowledge absorption through programmes that increase technological literacy in society, governments and businesses. Business can share in these costs, but governments must play a strong role in providing a platform that can support business development.

THE ROLE OF GOVERNMENT

Governments could help, too, by working to ensure a clear and consistent regulatory framework into which business can invest. A country with constant change, political upheaval and labyrinthine bureaucracy, where the risks may outweigh the likely rewards, will struggle to attract investors.

Technologies are diverse, are at different stages of maturity, have varied levels of carbon mitigation potential, and require different policy responses in developed and developing countries. But one constant is the need to stimulate investment so that these technologies can reach their full potential.

Financial incentives and mechanisms that drive investment towards developing countries will be essential. The International Energy Agency estimates that an annual incremental investment of US$1.1 trillion will be needed to reduce energy-related carbon dioxide emissions by 50 per cent from current levels by 2050. More than half of this investment is expected to be made in developing countries. Current levels of investment fall well short of this amount, and there is a clear and urgent need to boost them.

Financial mechanisms that 'pull' investment towards developing countries will need to be created. These will need to be fully fungible, highly liquid and transparent. These various mechanisms should be designed and used concurrently for maximum effect.

A GLOBAL CARBON MARKET

A global carbon market will be an important aid to reaching our long-term emissions goals. But to be effective this market will require the establishment of a long-term emissions pathway, with intermediate targets, in order to create sufficient demand in national carbon markets, boost investor confidence and drive investment in new technologies. This global market should be created by linking the various existing mechanisms, and assisted by the establishment of a global carbon price.

Legislators and policy-makers who come to Copenhagen in December need to understand that a future framework that is based on a 'one size fits all' approach will not be successful in delivering the necessary investment in technology. Financial mechanisms should be designed to incentivise low-cost mitigation opportunities (for example, energy efficiency) and higher-cost mitigation projects (such as new low-carbon technologies).

Market failures could occur where low-cost opportunities from developing countries generate large quantities of offsets that depress the carbon price in emissions trading schemes, and so prevent the development of higher-cost projects. Failures could occur also when few offsets are delivered and the emissions trading schemes include mainly higher-cost projects per emission reduced, resulting in overpayment for too little mitigation benefit.

Different policy measures will be needed around different types of mitigation opportunities that have various financial needs. For instance:

- Opportunities in low-cost mitigation projects, mainly energy-efficiency measures, can largely be self-financed but specific policy measures are required to help overcome market barriers to implementation. These will, for the most part, need to be on a country-by-country basis.
- Manufacturing industry and power generation mitigation projects need stable, long-term incentives. Funding for these low-carbon solutions should come mostly from carbon markets, as they develop at national and regional levels, and in some countries will need capital support.
- Reforestation and avoided deforestation are low-cost opportunities but more needs to be done through tailored financial mechanisms or funding. The current Clean Development Mechanism (CDM) precludes recognition of the important carbon management potential of managed forestry projects. Carbon markets, forest carbon policy and financial mechanisms must be designed to take full advantage of the multiple benefits offered by sustainable forest management.
- High-cost mitigation options will 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 to demonstration projects.

It is in this last area that unprecedented levels of public-private partnerships will be necessary if we are to get the breakthrough technologies we will need to fight climate change. Business alone will not be able to bear the cost of developing and bringing to market technologies such as carbon capture and storage, biofuels and next-generation nuclear. If solutions to climate change are to be found and implemented on a global scale, cooperation across all nations and all sectors of society will be paramount.

INTELLECTUAL PROPERTY REGIMES

Businesses make their investment decisions after weighing the risks and rewards. Innovative breakthrough technologies could help save our climate, but only if it makes sound business sense to invest in them. A strong intellectual property rights regime will be crucial if business is to invest in high-risk, high-cost new ideas.

There are some who advocate a weakening of intellectual property regimes because they see them as a barrier to the diffusion of low-carbon technologies around the world. I believe they are wrong.

Business invests in innovation because it sees a business opportunity: that is, it believes that after some years of significant financial burden and a lot of work, it will eventually see a profit from the particular project. That is the nature of business and the means by which it creates jobs, provides livelihoods and contributes to economic growth.

Strong intellectual property rights encourage investment in innovation – in finding solutions – because they protect the right of the inventor, or the investor, to profit from his or her work by granting exclusive rights for a limited period. By requiring inventors to disclose the details of their inventions in exchange for protection, patent systems promote the broad dissemination of knowledge from which further innovations may grow.

Measured by the number of patent submissions, innovation is currently concentrated in just a few countries: Japan (42 per cent of total patents); Germany (13 per cent); the US (12 per cent); China (six per cent); South Korea (five per cent); and Russia (four per cent). Despite the low percentage, last year China patented more technologies than it had done in the previous 25 years.

But what is really remarkable about patent statistics is that the number of innovations patented in developing countries grew at an annual average rate of 18 per cent between 1997 and 2003, compared with nine per cent globally. Research has shown that successful technology diffusion correlates to a supportive business environment, lower barriers to trade and foreign investment and tertiary education. Clearly, investment is a key factor, but so too is creating an enabling environment for that investment.

Many of the technologies needed for the climate solution will be in the energy sector. In some sectors, such as pharmaceuticals for instance, a single patent may be critical. A new drug may be the result of a single innovation, a single discovery or single process. But this is not the case with energy. Here, the technologies may be huge and complex, reducing greenhouse gas emissions in a range of ways, and this may involve myriad patents. The royalty costs for energy patents may be just a small part of developing a low-carbon energy technology, because for these kinds of technologies the big costs are in aspects that are not patentable, such as supporting transport infrastructure or operational and maintenance costs. For some other products, again such as a new drug, the patent royalties could be more than 90 per cent of the development cost.

Successful deployment of technology is not hindered by the patent system. It is hindered by such things as a lack of infrastructure, a lack of education and training, a lack of good organisational practices, political instability and a lack of a policy framework that fosters investment.

CONCLUSION

I believe we can reshape our world and get it back on a track that protects our climate and yet promotes economic growth. How we do this will be a test of our ingenuity and ability to work together for the greater good. Making the right decisions now will spur new industries, create green jobs, change our lives and secure our future. But we will not do this by thinking within narrow national borders or in a climate of blame and shame.

We are running out of time. We can design a better world, but only if all sectors of society work together with a renewed spirit of cooperation. We can do this. I know business stands ready.

Author

Björn Stigson amassed extensive experience in international business before becoming President of the World Business Council for Sustainable Development (WBCSD), the world's leading business organization focused on business and sustainable development. He began his career as Financial Analyst with the Swedish Kockums Group. He is presently a Member of the Board of the International Risk Governance Council and Prince Albert II of Monaco Foundation. He is also Chair of the Peer Review of German Sustainability Policies and Co-Chair of the China Low Carbon Economy Task Force.

Organisation

The World Business Council for Sustainable Development is a unique, CEO-led, global association of some 200 companies dealing exclusively with business and sustainable development. The Council provides a platform for companies to explore sustainable development, share knowledge, experiences and best practices, and to advocate business positions on these issues in a variety of forums, working with governments and non-governmental and intergovernmental organisations.

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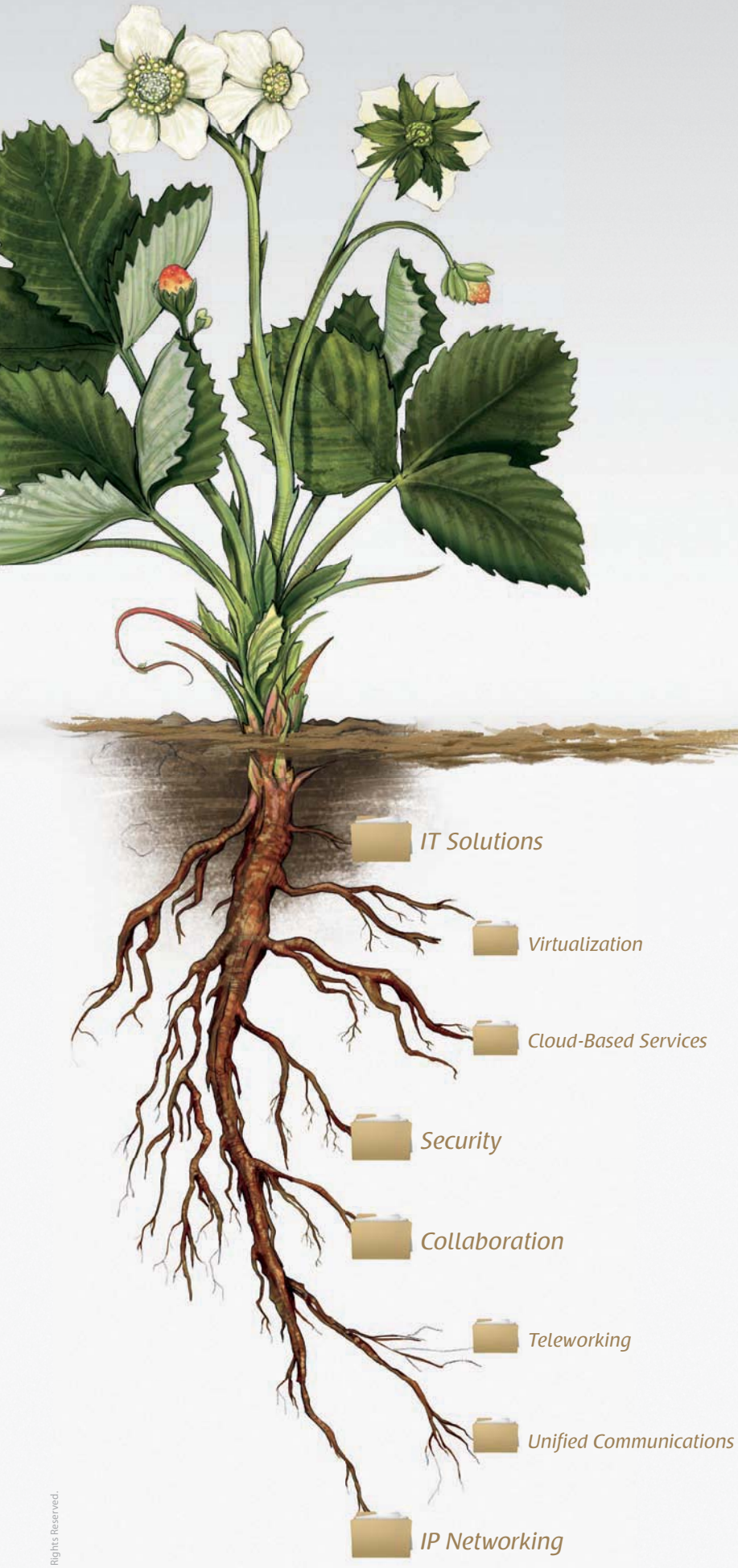

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Sustainable IT.
Good for the environment.

Sustainability continues to grow in importance as a global business issue. New regulations, changing economics, and environmentally savvy customers and shareholders have created the need for strategies that incorporate sustainability objectives as part of the business plan.

Smart business leaders are embracing sustainability to remain vital and competitive. And because it's the right thing to do.

ICT: Where Business Needs Meet Environmental Goals

Fran Shammo, president of Verizon Business, a global information communication technology (ICT) solutions partner to enterprises and governments, believes that his company has a responsibility to include environmental goals in its business planning.

"Verizon is committed to reducing the environmental impact of our operations by increasing conservation of energy and recycling. For example, we now require that new equipment used in our networks be at least 20 percent more efficient, and we were the first to establish a series of energy efficiency tests and ratings to guide our suppliers in this effort," he said. "But perhaps more importantly, our products and services enable our customers to be 'greener' and play an integral role in meeting their own sustainability goals."

"We've taken steps to improve cooling efficiency and reduce energy consumption within our data centers, such as employing virtualization techniques to reduce the amount of equipment needed, which helps controls costs and conserve energy. Using creative ICT solutions to merge our environmental targets with our business objectives just makes sense—and we can do the same for our customers."

Shammo is not alone in his outlook. Many companies increasingly view ICT as a tool to both address business challenges and show a commitment to environmental issues. Fifty-three percent of companies recently surveyed for Meetings Around the World II—a Frost & Sullivan research study, commissioned by Verizon and Cisco—listed carbon footprint reductions and other environmental concerns as important considerations in determining technology requirements. Sixty-one percent of IT business managers and IT decision makers believe collaboration technologies will reduce the need for business travel, and 54 percent see virtual meetings as an effective tool to build and maintain strong business relationships.

And your business.

Sustainable ICT Options

A global enterprise can't function unless it effectively connects its employees, partners, suppliers and customers. A single, secure, global IP network can help reduce the complexities of managing multiple network systems, reduce energy consumption associated with separate voice and data networks, and serve as a foundation for better business practices.

Today's distributed, 24x7 working environments demand tools that enable your employees to collaborate and remain productive when out of the traditional office setting. Unified communications and collaboration (UC&C) applications like voice over IP, audio, video, web conferencing, unified messaging, immersive video, and presence capabilities greatly reduce the need for in-person meetings, and help reduce your greenhouse gas (GHG) emissions and costs associated with business travel. For example, video conferencing expends 500 times less energy than a 1,000 km (620 mile) business flight.*

Teleworking can improve employee productivity by allowing work to take place at almost at any given location, while reducing wasted time and commuting-based emissions. In fact, many companies report a 10 percent to 50 percent increase in employee productivity through teleworking arrangements.*

Improving IT infrastructure and application performance provides a great opportunity to reduce energy usage and your carbon footprint. Server consolidation and virtualization can reduce the space necessary for servers, PCs, and storage equipment—and allow you to tap into the roughly 85 percent of computing capacity commonly left unused. Cloud-based computing and applications save investment in costly equipment and associated—and unpredictable—operational expenses, and can scale almost instantly to meet the fluctuating demands of your business.

Using ICT to Do Well by Doing Good

Even if you have to do more with less these days, you don't have to sacrifice quality, efficiency, or environmental goals in the name of cost control. Sustainable ICT solutions can securely connect your stakeholders far and wide, enable collaboration and flexible work arrangements, foster efficient data center operations, and decrease the amount of real estate and equipment required to run your business. And by reducing energy consumption and waste, you can enhance the value your business delivers to shareholders and the local communities in which you operate.

Sustainable ICT is a vital element for business success. And the right ICT solutions can do more than address corporate, and environmental responsibilities; they can bring about a transformation in your company, improving your efficiency and effectiveness, giving you a sharper competitive edge and helping you control costs. So you can do well by doing good.

To learn more about environmentally friendly and sustainable ICT and to join the green IT conversation, go to:
verizonbusiness.com/thinkforward/green

Long a leader in helping its employees, partners, and customers improve the environment and protect natural resources, Verizon has participated in the Carbon Disclosure Project's registry of corporate greenhouse-gas emissions (cdproject.net) since 2004.

Verizon is a founding sponsor of Global Releaf, a group that encourages shareowners to sign-up for electronic communications and for customers to sign-up for paperless billing; and a member of the Global eSustainability Initiative's (GeSI) Climate Change Working Group.

In 2007, Verizon was inducted into the United States Environmental Protection Agency's WasteWise Hall of Fame. Verizon was recently named to the Dow Jones Sustainability Index and listed by Newsweek among the top sustainable companies. Its environmental policies and customer-facing initiatives earned Frost & Sullivan's 2008 Green Excellence of the Year Award in the Corporate Leadership category for the telecom services industry.

Verizon's initiatives to save energy, reduce costs, and lower greenhouse gas emissions were among the initiatives highlighted in the Environmental Defense Fund's Innovations Review 2009: Green Advances for a New Economy.

**Broadband Services: Economic and Environmental Benefits*, American Consumer Institute, October 31, 2007

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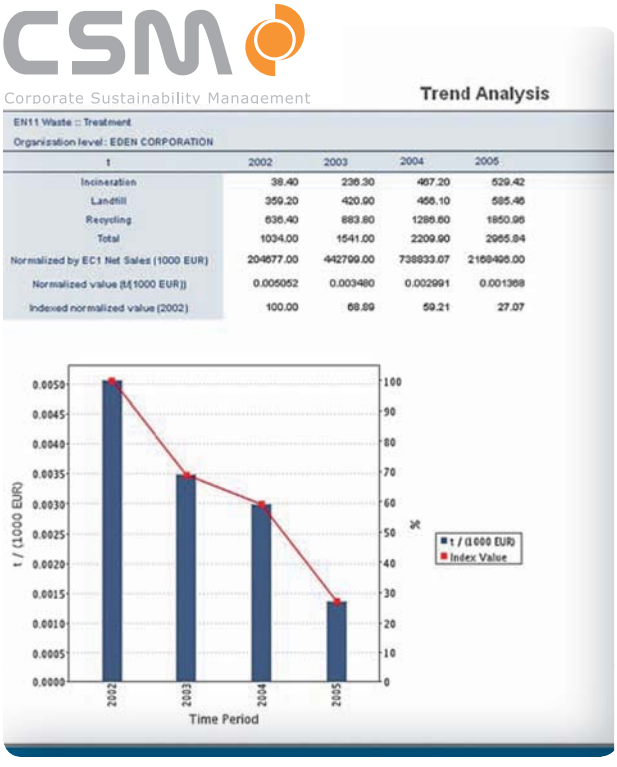
Why Sustainability Software

Sustainable Performance Management and Reporting based on Sustainability software results into rationalized framework of sustainability data management and costs savings through:

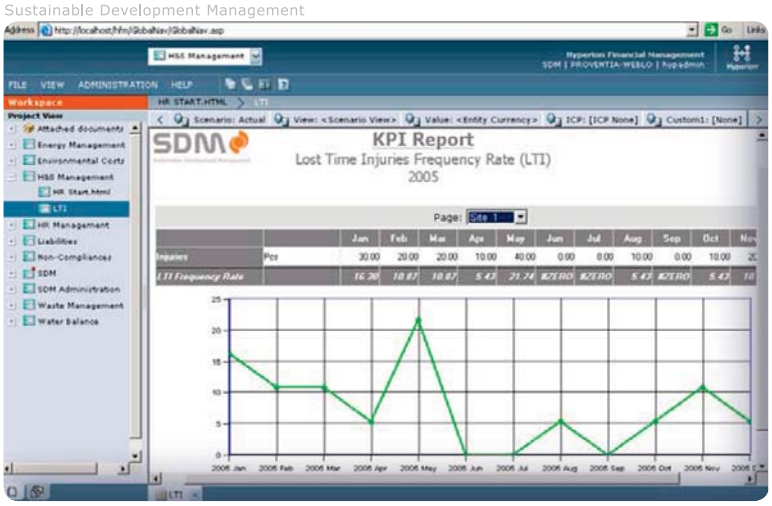
- Business Performance Improvements
- Automated, fast and controlled sustainability data management and reporting process
- Support in implementing the GHG Protocol and the GRI G3 indicators
- Proven implementation model for fast and fit for purpose solution
- Low IT investment with possibility for fully hosted solution

CSM
Corporate Sustainability Management



CSM SOLUTION is a fully web based application designed for sustainable business performance management and reporting. CSM has been created together with leading Scandinavian and Multinational companies. **CSM solution allows you to manage the economic, environmental and social performance data and communicate it to different stakeholders efficiently and according to reporting standards.**

SDM
Sustainable Development Management



2future and Hyperion have created an integrated solution for sustainability development management. **SDM solution is a fully Hyperion Financial Management based application utilizing the Hyperion FM features for Sustainability Management.** SDM solution allows you to leverage your existing Hyperion Business Performance Management platform for managing also the sustainability of your operations. Selected information is reported to stakeholders effectively and according to reporting standards.

2future is a leading provider of integrated sustainability management software and consulting services.

2future software solutions improve sustainable business performance, increase the efficiency of data gathering and reporting processes and provide a sophisticated tool for communicating sustainability performance to different stakeholders. 2future consulting services include both product responsibility and corporate responsibility services. 2future is a GRI Organisational Stakeholder and a GRI Technology partner.

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2FUTURE
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Nanotechnology, ocean energy and forestry –

INNOVATIVE SOLUTIONS TO CLIMATE CHANGE MITIGATION

Changes in land use such as deforestation results in soil erosion and contributes to the emission of greenhouse gases.

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MIGUEL ESTEBAN, KYOTO UNIVERSITY, JAPAN;
CHRISTIAN WEBERSIK, UNIVERSITY OF AGDER, NORWAY;
AND **DAVID LEARY**, UNIVERSITY OF NEW SOUTH WALES SYDNEY, AUSTRALIA

An effective policy response to climate change must achieve three key objectives: the release of CO2 and other greenhouse gases into the atmosphere must be prevented; new forms of renewable energy production must be developed; and new ways of storing this energy must be found. Innovative solutions that help reach these three objectives are nanotechnology, ocean energy and sustainable forestry practices. However, all of these are at a very early stage of development, and hence the creation of adequate policy and legislative frameworks for these innovations are urgently needed.

World leaders recognise that climate change is the most significant environmental, economic and security threat facing humanity. New technologies that offer cleaner energy, more advanced efficiency and lower emissions will be essential. However, technological innovation alone will not provide all the answers. An effective response also requires novel measures. In our report presented in Poznań 'Innovation in Responding to Climate Change: Nanotechnology, Ocean Energy and Forestry', we highlighted the potential of three innovative solutions.

NANOTECHNOLOGY AND CLIMATE CHANGE

Nanotechnology is science and engineering resulting from the understanding and manipulation of matter's most basic building blocks: atoms and molecules. By working at the molecular or atomic level it is now possible to create materials with novel properties with a wide range of new applications.

Nanotechnology is best described as a 'platform technology'. Nanotechnology will not by itself have a dramatic impact on climate change, but its incorporation into larger systems could have a profound impact on energy consumption and hence greenhouse gas emissions. Such systems may include solar power technology; next-generation batteries; improved insulation in buildings; the hydrogen-based economy; and the development of new fuel additives that could enhance energy efficiency.

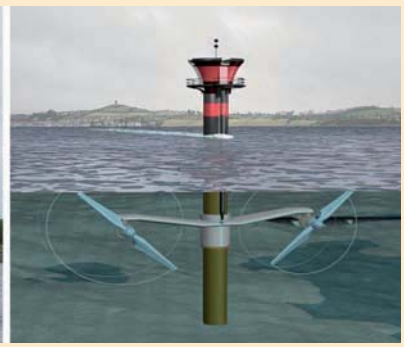
Managing the risks of nanotechology

While nanotechnology will bring many benefits, there are also emerging concerns about the potential risks that nanotechnologies present to humans and the environment, and the ability of current legal and regulatory regimes to sustainably manage those risks. The most significant issues relate to the toxicity of manufactured nanoparticles and their ability to enter the human body and reach vital organs via the blood. There are major gaps in scientific understanding of how nanoparticles act, their toxicity and basic risk management techniques such as how to measure and monitor exposure to nanoparticles. However, as the UK Royal Commission on Environmental Pollution in its 2008 report on nanotechnology has observed, so far there is "no evidence of actual ecological damage or harm to humans resulting from exposure to manufactured nanomaterials". But the actual level of risk remains an area of great uncertainty.

Major reviews of policy and legislative frameworks are emerging, such as the report of UK Royal Commission on Environmental Pollution cited above; an independent review by academics from Monash University of Australia's regulation of nanotechnology; and a parliamentary inquiry conducted in New South Wales, Australia. Policy-makers from these and other

Box 1. The SeaGen Turbine

SeaGen, situated about 400 metres from the shoreline in Strangford Narrows, Northern Ireland, is the first commercial-scale tidal turbine to have been connected to the grid. Developed by Marine Current Turbines, the turbines can be easily raised above the surface of the sea for maintenance. Its rotors operate for up to 18-20 hours per day, producing energy for 1,000 homes.



countries such as Canada, New Zealand and Singapore are also maintaining a watching brief on developments on nanotechnology through their participation in the ongoing work of the OECD and the International Organization for Standardization (ISO).

Two key themes seem to run through these reviews: to varying degrees all acknowledge that there is an urgent need for rapid improvement in scientific understanding of the risks of nanotechnology, especially risk assessment and management, particularly in the context of the handling of hazardous chemicals, and occupational health and safety. But these reviews have also concluded that existing regulatory frameworks are adequate for the time being. However, as the recent review in Australia highlighted, specific amendments may be required in future. The precise nature of these changes will not be known until new knowledge on hazards and exposure and monitoring tools become available.

Adaptive management, risk assessments shaped by research and the precautionary principle should lie at the core of policy-makers' response to our emerging understanding of nanotechnology. For the middle to long term, the priority should be on addressing gaps in scientific knowledge in relation to risks, rather than gaps in the law and regulatory frameworks. With greater scientific understanding, appropriate legal and regulatory responses can evolve over time.

OCEAN ENERGY

Ocean energy defines a wide range of engineering technologies that are able to obtain energy from the ocean and tides, using a variety of conversion mechanisms. It is an emerging industry, with the first commercial units connected to the grid in 2008.

Not all countries have access to adequate ocean energy suitable for electricity generation, but certain countries well endowed with it could eventually rely on it to produce a significant percentage of their energy needs. In the United Kingdom, for example, the Carbon Trust recently estimated the extent of the economically viable offshore resource at 55 TWh per year, about 14 per cent of current national demand.

Many of the pioneering companies and projects in the sector are located in countries such as the UK, Spain, Portugal, Australia and New Zealand. The first of these commercial projects are the result of work from UK companies and have just come into operation, with the Pelamis and SeaGen (see Box 1) having just been installed in 2008. In Australia other companies include Carnegie Wave Energy, which already has a demonstration plant at Fremantle, with construction of a commercial-scale plant due to commence by 2010 and connection to the grid due by 2013. Other pilot projects are under way or planned around Australia by companies such as Carnegie, Biopower Systems and Oceanlinx. Likewise final regulatory approval is imminent for the construction of a tidal energy plant at Kaipara Harbour on New Zealand's North Island, which will supply electricity to up to 250,000 homes.

Policy barriers to ocean energy

The lack of clear regulatory frameworks in many countries is acting as a barrier to wide-scale development of ocean energy. Regulatory frameworks need to be developed to more suitably deal with the environmental impacts of ocean energy projects. The environmental impacts are relatively benign, but they are currently treated by regulators as much the same as more harmful uses of the oceans such as oil and gas developments. Clearly there is a need for new regulatory regimes to be developed, where they do not exist, and a streamlining of the existing regulation. The interests of other stakeholders such as the shipping industry (who have an interest in managing potential hazards to navigation) and fishers also need to be taken into account in the development of law and policy.

The UK is providing leadership in this area with the Marine and Coastal Access Bill 2009, currently before Parliament, set to create a new Marine Management Organisation to manage approval of offshore renewable projects. The Bill also streamlines approval processes creating a single 'one project – one licence' system.

The competition with subsidised fossil fuel

One of the main problems that ocean energy faces is that it competes with subsidised fossil fuel energy sectors in many countries. There is an urgent need for clear carbon price signals to be introduced through mechanisms such as emissions trading, and it is imperative that the ocean energy industry be given greater financial assistance from governments in the early stages of its development. For example, the UK government recently launched its Marine Renewables Proving Fund, allowing wave and tidal energy developers to bid for US$36 million in new grants. In Australia funding assistance by the Federal and Western Australian governments over recent years have been a significant factor in assisting Carnegie Wave Energy, which is now on the threshold

of commercial-scale electricity generation from ocean energy. But much more funding than this is required.
The industry also needs adequate feed-in tariffs in its early stages of development. Our calculations show that with adequate feed-in tariffs and a period of support similar to that which the wind industry enjoyed in Europe, ocean energy could start to approach grid-parity by the early 2020s. For this to happen it is also imperative that help is given to the offshore renewable industry in improving connection from the offshore areas to the electricity grids.

FORESTRY AND CLIMATE CHANGE

Deforestation and forest degradation are one of the two most significant contributors to greenhouse gas emissions. Initiatives aimed at reducing emissions from deforestation and forest degradation (so-called REDD) have therefore been at the centre of much discussion surrounding climate change since the 2007 Bali meeting and before.
Several countries, such as Malaysia, Pakistan, Ghana, Nigeria and Uganda have lost significant forest cover in the past. REDD initiatives aim to reverse this trend by helping countries preserve tropical forests and generate forest carbon offsets with the potential to include them in global carbon markets. Essentially at its core REDD would aim to guarantee that countries that possess forests receive money for preserving these forests instead of converting them to other land uses.

How REDD works and its benefits

REDD mechanisms could allow countries to offset carbon credits against their emissions targets. There are other benefits, such as rural development, the prevention of biodiversity loss, opportunities for sustainable forest management and eco-tourism. In addition, rather than clearing forests for palm oil plantations, forest waste could be used to produce second-generation biofuels that rely on organic waste. Today, carbon credits from REDD projects can only be traded and sold in the voluntary carbon market. Policy-makers need to urgently resolve the issue of whether REDD credits should enjoy official value in the 2012 post-Kyoto regime.
REDD is a relatively low-cost option as it does not involve cost-intensive technologies. Also, the carbon mitigation benefits of REDD exceed in the long term the benefits from afforestation and reforestation.

Obstacles to the implementation of REDD

Ongoing REDD projects have shown that technological solutions are readily available to implement REDD. The major obstacles to conservation of tropical forests are social and governance failures. Further, a number of issues must be addressed. These include: establishing baselines (in order to understand the level of deforestation and forest degradation); verification of carbon credits (today, there are only a few independent certification agencies); acknowledging the rights of indigenous people and forest-dependent communities (successful REDD project implementation depends on the inclusion of indigenous and local communities who depend on forests for their livelihoods).
REDD could achieve two important objectives: increasing the present stock of biomass, as well as avoiding emissions of carbon. Early resolution of these issues should therefore be a high priority for policy-makers. Developed country members are well placed to provide both the financial assistance and technical expertise required by less developed Parties to the UN Framework Convention on Climate Change to implement REDD.

FROM INNOVATION TO ACTION

Solutions to the energy problem and climate change mitigation already exist. The solutions highlighted above – nanotechnology, ocean energy and forestry – have had very limited environmental effects to date. The main obstacles to their commercialisation are clear market signals and regulatory frameworks, issues that must be addressed at the upcoming climate talks in Copenhagen. Here, the governments leadership in those areas can play a significant role in innovation in responding to climate change.

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The authors have drawn on the works of many other scholars and policy-makers. Full references to these sources are set out in their original report 'Innovation in Responding to Climate Change: Nanotechnology, Ocean Energy and Forestry', available online at www.ias.unu.edu/sub_page.aspx?catID=111&ddlID=738

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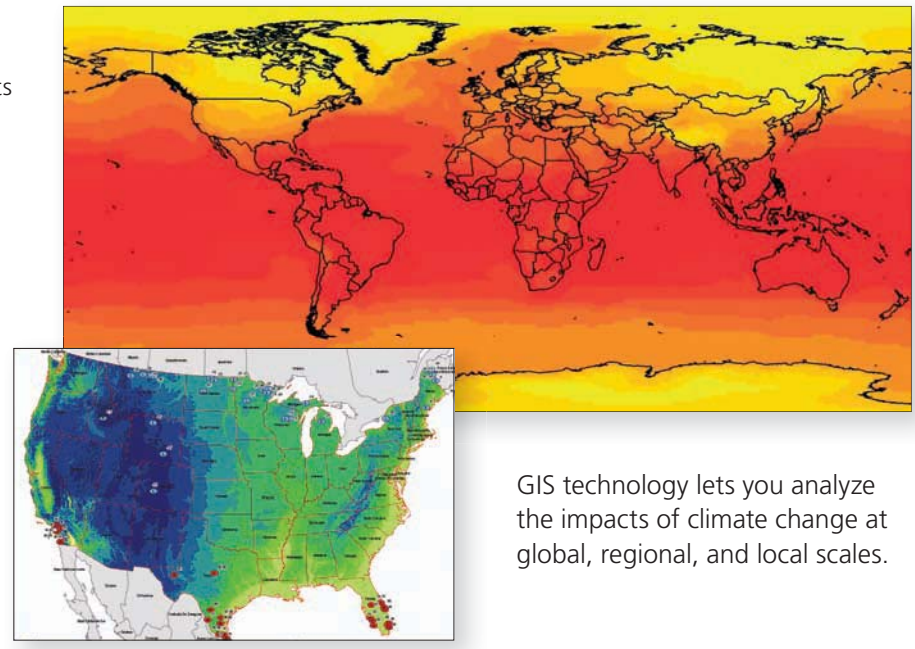
Climate Change Is a Geographic Problem That Requires a Geographic Solution

By Jack Dangermond, Environmental Systems Research Institute, Inc.

Geography is a fundamental science that helps us describe the natural and human systems of our planet, including components that contribute to and are influenced by climate change. Geographic information system (GIS) technology gives you a comprehensive understanding of complex systems so that you can make informed, actionable decisions.

People use GIS every day to view and manage information about geographic features, analyze geographic relationships, and model geographic processes. As a foundational technology, it lets local, regional, and global organizations collect, manage, and analyze a myriad of physical, biological, and cultural data describing Earth. Decision makers, policy makers, planners, scientists, and many others worldwide, rely on GIS for

- ✓ Climate Science and Modeling
- ✓ Sustainable Planning
- ✓ Renewable Energy Planning
- ✓ Reporting and Compliance
- ✓ Rainforest Management
- ✓ Carbon Accounting and Assessment
- ✓ Biomass Inventory
- ✓ Land-Use Inventory
- ✓ Disaster Planning and Management
- ✓ Real-Time Communication



GIS technology lets you analyze the impacts of climate change at global, regional, and local scales.

At the core of GIS is a geographic database, housing all kinds of information in "layers." These layers can be combined in a variety of configurations to support visualization, analysis, and modeling. The result is power and flexibility, making it the system of choice for analyzing and managing Earth's complex systems.

GIS is an established technology with a long history of driving climate science and environmental decision making. GIS users represent a vast reservoir of knowledge, expertise, and best practices in applying this cornerstone technology to the science of climate change and understanding its impact on natural and human systems.

Climate change is a geographic problem, and we believe solving it takes a geographic solution. A GIS-based framework for climate science gives us hope. With it we can gain a scientific understanding of Earth's systems at a truly global scale and make thoughtful, informed design decisions that ultimately allow humans and nature to coexist more harmoniously.

In 1969, Jack Dangermond founded Environmental Systems Research Institute, Inc. (ESRI), with a vision that computer-based mapping and analysis could make significant contributions in the areas of geographic planning and environmental science. The recipient of 10 honorary doctorate degrees, he has served on advisory committees for the National Aeronautics and Space Administration, the Environmental Protection Agency, the National Academy of Sciences, and the National Science Foundation.

Read about the many ways GIS is already being used for climate change at **www.esri.com/climate.**

ESRI works with organizations worldwide to create GIS applications that meet the climate change challenge.
Join an online roundtable discussion about ways GIS technology resolves climate change problems.
Visit Spatial Roundtable at **www.spatialroundtable.com/climate.**

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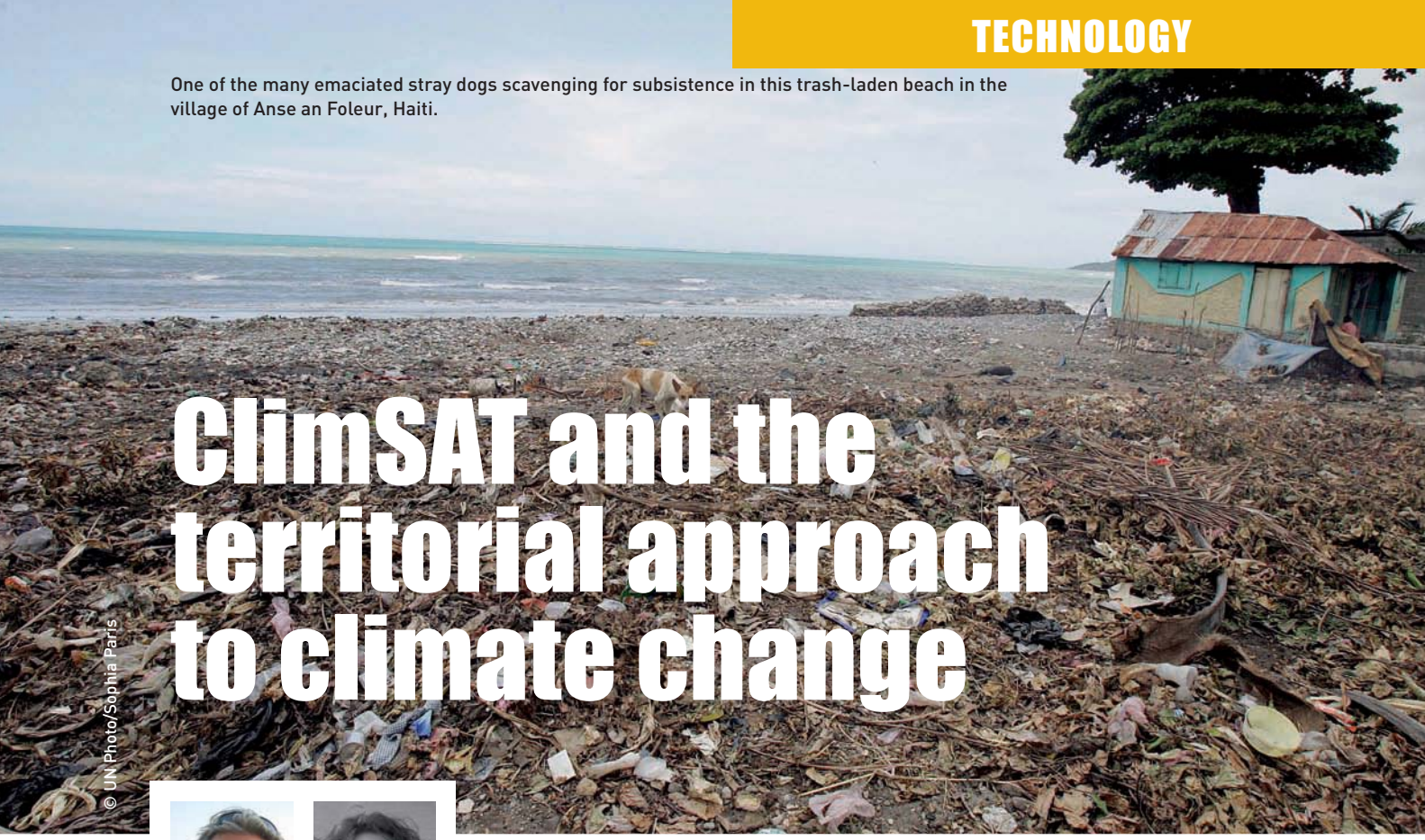

One of the many emaciated stray dogs scavenging for subsistence in this trash-laden beach in the village of Anse an Foleur, Haiti.

© UN Photo/Sophia Paris

ClimSAT and the territorial approach to climate change

ALAIN RETIÈRE, COORDINATOR,
VIOLAINE LEPOUSEZ, TECHNICAL ASSISTANT, CLIMSAT

Climate change is a global phenomenon that has to be tackled locally. Climate change is a reality, and physical direct impacts are already being observed all over the world. From mountainous areas, low-lying plains to coastal zones, from remote rangelands to tropical forest areas, the phenomenon involves major climatic characteristics which change in the long term. In the short term, they can induce more or less perceptible consequences such as rising temperature; decreasing yearly rainfall; melting glacier ice; changes in the hydrological balance of a water basin; and increasing frequency or intensity of hazards such as floods or storms.

INTRODUCTION

According to the International Panel on Climate Change (IPCC), by 2100, the average global surface temperature might be four degrees Celsius greater it is at present, and the sea level might be around 60 centimetres higher than the present sea level.

Those results are even more critical in some areas of the world. For instance, in some significant areas of the tundra, biomes might be experiencing a 10 degrees Celsius rise in their average temperature; and some coastal zones might have to face a one-metre sea level rise.

The consequences of climate changes in every continent are diverse, as it depends on the local climate as well as on environmental, social and economical assets such as ecosystems, water resources, but also population, energy, health, food security and tourism, among others. Therefore, to anticipate climate change and to try minimising its consequences, mitigation and adaptation strategies have to be designed and implemented at the local scale. Planning response should have some very accurate information on the assets of the territory to identify and design the best adaptation and mitigation policies and projects needed to tackle climate change.

THE UNDP TERRITORIAL APPROACH TO CLIMATE CHANGE

The first world summit of regions held in Saint-Malo, France, on the 29th and 30th of October has led some 100 regions from 65 countries of the five continents to gather and present 33 successful experiences in managing climate change at the regional level. The Signatories to the Declaration also committed to actively participate and take action in future international climate change endeavours, in line with the principle of common but differentiated responsibilities and respective capabilities.

This dynamic has been concretised with the "Towards Carbon Neutral and Climate Change Resilient Territories" five-year plan (also called the TACC Programme for Territorial Approach to Climate Change Programme). The main goal of this plan is to develop the capacities of regions in developing and transition countries and to implement their Integrated Territorial Climate Plan (ITCP) by making it possible for those regions to face up to the double challenge of mitigation and adaptation to climate change. In order to fulfil this mission, adding to the UN agencies (UNDP, UNEP, UN HABITAT, UNCDF, UNITAR, UNOPS and soon FAO and ILO) and the associations of regions (nrg4SD, CRPM, Northern Forum, AIRF, ARE, Climate Group, FOGAR,

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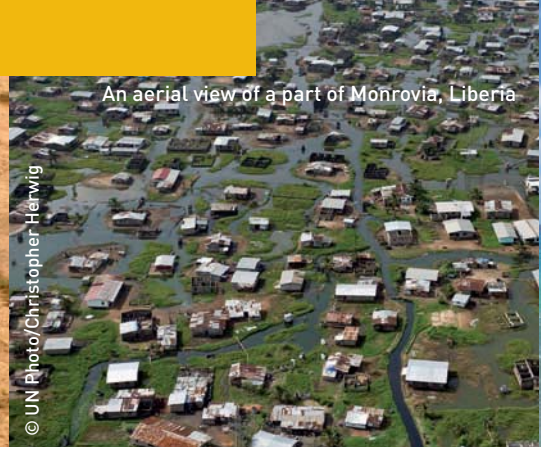
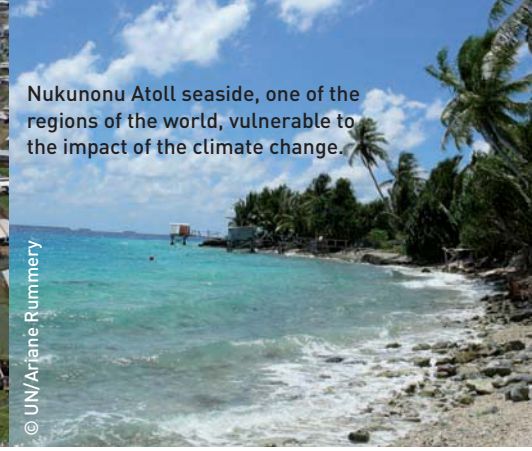
A young boy herds his families cattle in the dry and desolate lanscape of the city of Tawaila in Northern Darfur.
© UN Photo/Fred Noy


An aerial view of a part of Monrovia, Liberia
© UN Photo/Christopher Herwig


Nukunonu Atoll seaside, one of the regions of the world, vulnerable to the impact of the climate change.
© UN/Ariane Rummery

OLAGI) involved in the different steps of this plan, several partners are ready to collaborate with the nearly 500 chosen regions.

The TACC Programme is implemented in three phases over a five-year period. The first phase of awareness-raising and training allows the identification of the regions and their needs in policies to tackle climate change. The second phase of analysis and balance allows the assessment of the territorial vulnerability and of its carbon footprint in order to elaborate the ITCP. The implementation of the ITCP, which is an action plan added to a portfolio of investment and sustainable development projects, is the third phase of the programme.

In furtherance, this application promotes sub-national capacity in developing countries to develop and finance projects that benefit from the Clean Development Mechanism process proposed by the United Nations Framework Convention on Climate Change (UNFCCC).

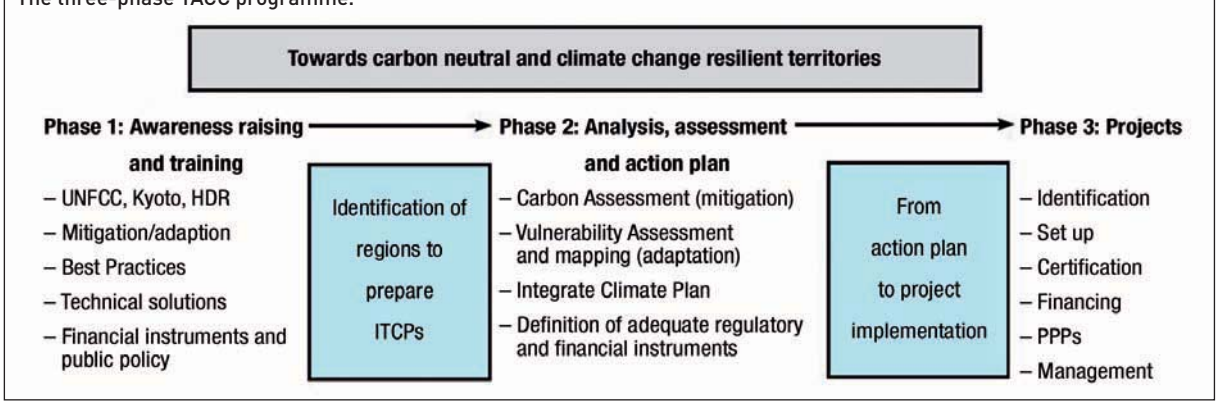
IMPLEMENTATION AND DEPLOYMENT

A number of scoping missions have been carried out in different regions of Uruguay, Albania, Macedonia, Senegal and Algeria since November 2008 in order to assimilate information on pre-project situations. Results indicate that regional and local governmental actions against climate change are severely constrained by various barriers, such as access to methodologies; data and expertise; limited access to knowledge; capacity; and financial resources. As a consequence of these findings, a comprehensive two-year project document has been prepared by local actors with the support of UNDP and experts from cooperating regions, and endorsed by the respective National Government as part of its National Adaptation Programme of Action (NAPA). A number of similar scoping and formulation missions are already planned for the coming months for Peru, Colombia, Egypt, Morocco, Bangladesh, Mexico, Nicaragua, Vietnam and Indonesia based on the expression of interest from partner regions and/or national governments through UNDP Country offices.

> “In order to fulfil the objective of designing Climate Profile and ITCP, the Brittany Region, in partnership with the United Nations Development Programme, has created ClimSAT, the hub in charge of providing technical services in the assessment and mapping of the territorial vulnerability to climate change”

In order to fulfil the objective of designing Climate Profile and ITCP, the Brittany Region, in partnership with the United Nations Development Programme, has created ClimSAT, the hub in charge of providing technical services in the assessment and mapping of the territorial vulnerability to climate change. Based on the use of earth observation, high-resolution data and sound methodology, ClimSAT is helping regions to

The three-phase TACC programme.



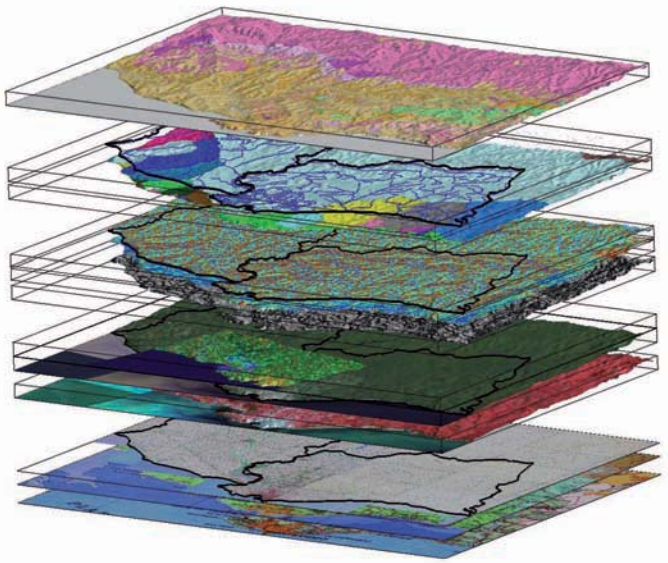
Competencies of the partners	Value-added services	Users
Spatial technologies	Observations	Regions
Communication	Evolution scenarios	Regional and local-scale territorial communities
Ocean and coast	Simulations	Businesses
Climate and weather	Cost-benefit analyses	Citizen associations and organisation
Development and territorial planning adjustment	GHG balance	
	Integrated Territorial Climate Plan	
	Action programme	

integrate the climate in their territorial management by improving accessibility and by disseminating and exchanging updated information on how to use them based on existing or developing territorial experiences. Furthermore, this hub expertise domain covers a large panel of issues thanks to the dynamic developing network.

ClimSAT, a methodological charter to assess and map vulnerabilities to climate change

ClimSAT's mission is to facilitate and guide the regions in sourcing and using satellite and other geo-spatial information and related management technologies to assess the physical impact of climate change and the associated vulnerabilities in a given territory.
The climate change vulnerability approach developed by ClimSAT consists of three-dimensional visual models expressing the incidence of current climatic conditions on the functioning and sustainability of local ecological environment (land, water, ecosystems, forest and protected areas, etc...), economy (agriculture, fisheries, industries, rural and urban service infrastructures, etc..) and society (living and working conditions, health, education, social and cultural services, etc...). By further integrating two extreme IPCC climate change scenarios (most optimistic and most pessimistic) in the climatic vulnerability modeling systems, future climate risks and hotspots induced by global warming will be evidenced in each regional territory and easily qualified and quantified. Different adaptive as well as mitigation options can be visualised and corresponding projects evaluated. This approach aims to ensure the full participation of local actors of the specific climate change vulnerabilities of their territory and, by using intuitive visualisation techniques, to facilitate consensus-building, decision-making, resource mobilisation and decision acceptance.

ClimSAT basic maps for the study of the metropolitan area of Montevideo in Uruguay.



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MAPPING THE TERRITORIAL VULNERABILITY TO CLIMATE CHANGE

Given the complexity and the numerous relevant pieces of information needed to express possible adaptation and mitigation opportunities, maps appear to be the most efficient tool to communicate results. Vulnerability maps allow analysing and developing possible options in a universal and directly accessible manner.
Remote sensing is the key tool to complete the inventory of the data needed for the assessment and mapping process. Image processing can lead to a large range of multidisciplinary information, from a simple red-green-blue view of the area of interest to a representation of the state of hydrical stress of a crop field, the classification of the land cover, or the state of the soil moisture.
Such reliable information is very useful to complete the set of available data needed for each territorial assessment and mapping; and even more so in developing countries that are, in most cases, the most vulnerable to climate change.

PROMOTE AND DEVELOP ACCESS TO AND USE OF DOWNSCALED CLIMATIC DATA

Helping territories to plan efficient planning response to climate change requires understanding the spatial organisation of climate impacts that are highly site-specific. Therefore, future climate data of high spatial resolution are needed. Furthermore, the four types of scenarios developed by IPCC are currently the most commonly applied to simulate future climatic trends. The use of the most pessimistic A1F1 and the most optimistic B2 scenarios are thus pertinent to visualise the panel of needed adaptation and mitigation strategies. Depending on the type of impacts the territory is facing, more or less high temporal resolution is employed in order to study the physical phenomenon.

GEOGRAPHICAL INFORMATION SYSTEMS

Geographical Information System (GIS) is a tool that shows features and feature relationships on a chosen surface. Most of all, type of data can be georeferenced and used to construct a map. The information can then be used again to support queries, analysis, crossing with other information and, at last, editing the layers of information. This clear representation of the territory allows identifying the "hotspot" where attention should be focused according to one set of indicators or queries.

HELPING THE TERRITORY TO DEVELOP THEIR CAPACITY BUILDING

Tackling climate change is a long-term process that has to be appropriated by local actors. The sustainability of development projects, as outlined in the Declaration de

A Uruguayan delegation at the CMS Lannion-Météo France during a ClimSAT training session.

Exchanging information on the existing pertinent sources of information and learning how to use technologies through training sessions are also necessary to improve the dissemination of the use and possible applications of those types of data and tools for operational purposes. These technologies include the Geographical Information System, remote sensing, image processing, three-dimensional tools and thereof are essential in building a perennial territorial approach to climate change.

Paris 2005, is based on the pertinence of the chosen solutions and on their appropriation by local actors. In order to achieve this objective, participative approaches and institutional building have to be implemented simultaneously in all the steps of the establishment process of the adaptation and mitigation strategies.

AWARENESS RAISING AND TRAINING SESSIONS

Climate change challenge is a major issue in all the international negotiations and involves national to local level of authorities. The existing institutional framework proposes new opportunities for local governments and sub-national authorities to implement successful initiatives. New types of financial tools and regulation practices have to be shared with all the actors dealing with climate change. Therefore organising the dissemination of this relevant knowledge, illustrated with examples of their use and implementation, is crucial to developing efficient adaptation and mitigation strategies.

ClimSAT a federative platform of services to regions

Because the ClimSAT initiative is dedicated to the regions and because ClimSAT is a partnership between regions and a United Nations Programme, ClimSAT has been mobilising an important set of experts to build a high level of knowledge and services at the European, national and regional scales and for international regional territories. Indeed, ClimSAT is federating scientific, technical and operational partners in a platform of services that will directly benefit the vulnerable regions. Based on the existing relevant research community of France and on the highly dynamic network of innovative actors in the region of Brittany, ClimSAT has also developed strong partnerships with spatial organisations such as the European Space Agency or the National Centre for Space Studies of France. It also belongs to international networks gathering actors of earth observation such as the Global Monitoring for the Environment and Security initiative or the intergovernmental Group on Earth Observations.

In designing and leading a federating platform, ClimSAT seeks to mobilise these areas of excellence around its objectives and its integrated territorial approach. This should harmonise and boost the working of networks and complementarities. The collaborative work impulsion will lead to pinpointing new potentialities and future action projects (R&D, innovations, technology transfers, development of new products and processes). ClimSAT has set itself the objective of co-constructing with all these partners a pool of competencies dedicated to territorial answers to climate change. It is a federating, multi-faceted and evolving hub project.
It is then envisaged to organise ClimSAT and its supporting platform as a collection of services that will communicate with each other in a fully service-oriented architecture (SOA). Such an approach will enable and guarantee the interoperability between the various service components that will operate in a fully distributed environment.

Authors

Alain Retière – ClimSAT Director, Climate Change Adaptation Specialist, Tropical agro-ecologist; Regional and local development planner; Expert in satellite imagery and GIS. Born in Nantes, France in 1961, is the coordinator of CLIMSAT. Previously he initiated and led the UN Operational Service Programme on Satellite Applications known (UNOSAT). He received in December 2006 the UN21 Award that was given by the Secretary-General in recognition of his exceptional contribution toward improving efficiency in the United Nations.
Violaine Lepousez – Technical Assistant at ClimSAT. Agronomist and Socio-Economist in the fields of sustainable development at the local level and agro environmental projects. Before joining ClimSAT, she has been involved in the study of GIS and RS applications within a UNOSAT project in Syria and in the study of the impacts on the local population in terms of appropriation and institutional implementation, of a long term series of French development projects in the Guinean mangroves.

Organisation

CLIMSAT is the technical service platform of UNDP Energy and Environment Group dedicated to provide assistance to Regions engaged in the fight against climate change and environmental degradation, by providing, processing and training in the use of satellite imagery and climate change models.

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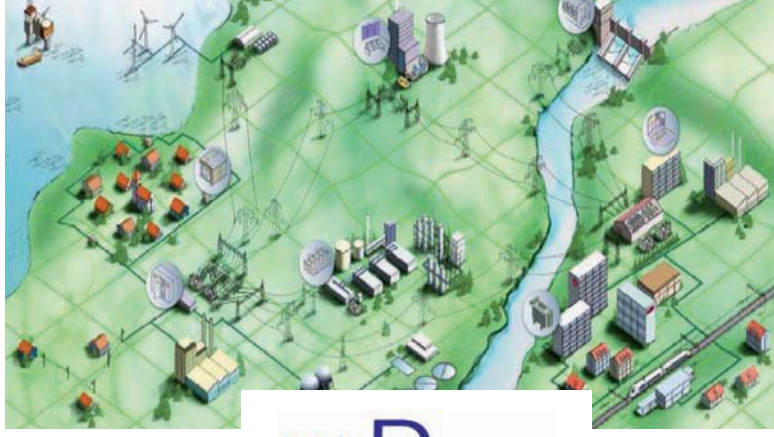
Criteria:

QUANTIFYING THE BENEFITS OF NEW TECHNOLOGIES



The European Union, in line with worldwide political agreements emphasising attention to environmental impact of human activities, has fixed ambitious environmental targets regarding both its energy and its environment policies. Those are the so-called 20/20/20 targets.

In the field of Electricity Transmission and Distribution (T&D), these objectives appear to be ambitious, but are in fact achievable. Many technologies have been identified to be helpful to match the goal and some of them are made available from the industrial point of view. The environmental advantages of such technologies need to be better documented towards shared methodology.
This will require a very strong contribution of the Electricity T&D Equipment Industry as well as EU support for improving generation, transmission and distribution of electricity.
T&D Europe, the association representing the European T&D industry, was set up in 2008 to provide the sector's expertise into the realisation of these goals.
The power grids play a key role in gaining efficiency and reducing CO_2, thanks to the operational optimisation they offer, but their architecture must be adapted to achieve such optimisation both in transmission and distribution:

- The existing architecture of the grid in Europe has been laid out at a time where power generation was built close to the consumption centres. It is no longer able to cope with long distance bulk power transmission that the incoming powerful renewable sources will bring.
- The present distribution system is primarily built for the distribution of electrical power in one direction. In the near future, it will have to be ready to collect power from millions of decentralised renewable sources and automation to manage balancing generation and load.

The state of the art of the T&D Europe industry can contribute to make the so called Smart Grid solutions a reality. Those are already available and can modernise the network by increasing the flexibility and the capacity of the transmission and the distribution grids in order to readapt them to the new perspectives of both the generation and the demand sides.
In order to reach the EU 20/20/20 targets, T&D Europe sector decided to make available its expertise so as to proactively present a methodology to classify its products and systems. In cooperation with some of the most renowned European Universities and Technological Centres[1] it tries to lay the foundations on the criteria for the quantification of how modern T&D systems help to accomplish the EU environmental goals.

The objective is to provide reliable criteria to be used by investors, decision makers, regulators and European Institutions to achieve the following targets:

- To define targets to the electricity sector.
- To evaluate the maximum efficiency achievable through network improvement.
- To provide a tool to guide actions and investments.

The study is characterised by a deep analysis of how the electrical power industry can fulfil the policy of low environmental impact in the T&D grid as the result of the following actions:

- Renovation of power system components.
- Integration of additional power system components of the recent generations, such as:
  - Upgraded protection and control devices.
  - Power quality devices for the Distribution network.
  - High Voltage Direct Current Transmission systems.
  - Flexible Alternative Current Transmission Systems.
- Modification of management strategies in T&D networks.
- Exploitation ICT infrastructures to enhance grid strength and dependability.
- Increase of voltage level of the distribution grid.

Such qualitative analysis provides a tool that will be able to rate the effects of the above cited actions with regard on: energy efficiency, reduction of CO_2 emissions, renewable energies penetration and quality of the electricity delivered.
In order to make it qualitative, performance indices are proposed, according to EU 20/20/20 expectations, introducing additional elements in terms of power quality. After every numerical analysis, the final result will quantify the benefits of the new T&D technologies compared to the mature technologies installed nowadays.
T&D Europe regards it as a duty to make a contribution to efficient power supply. The new method for evaluating low environmental impact equipment in the Electricity T&D Systems investments will provide the most efficient tool to decision makers in optimising decisions to be taken on the T&D grids to fulfil the EU 20/20/20 targets.

[1] Conducted by the University of Genoa

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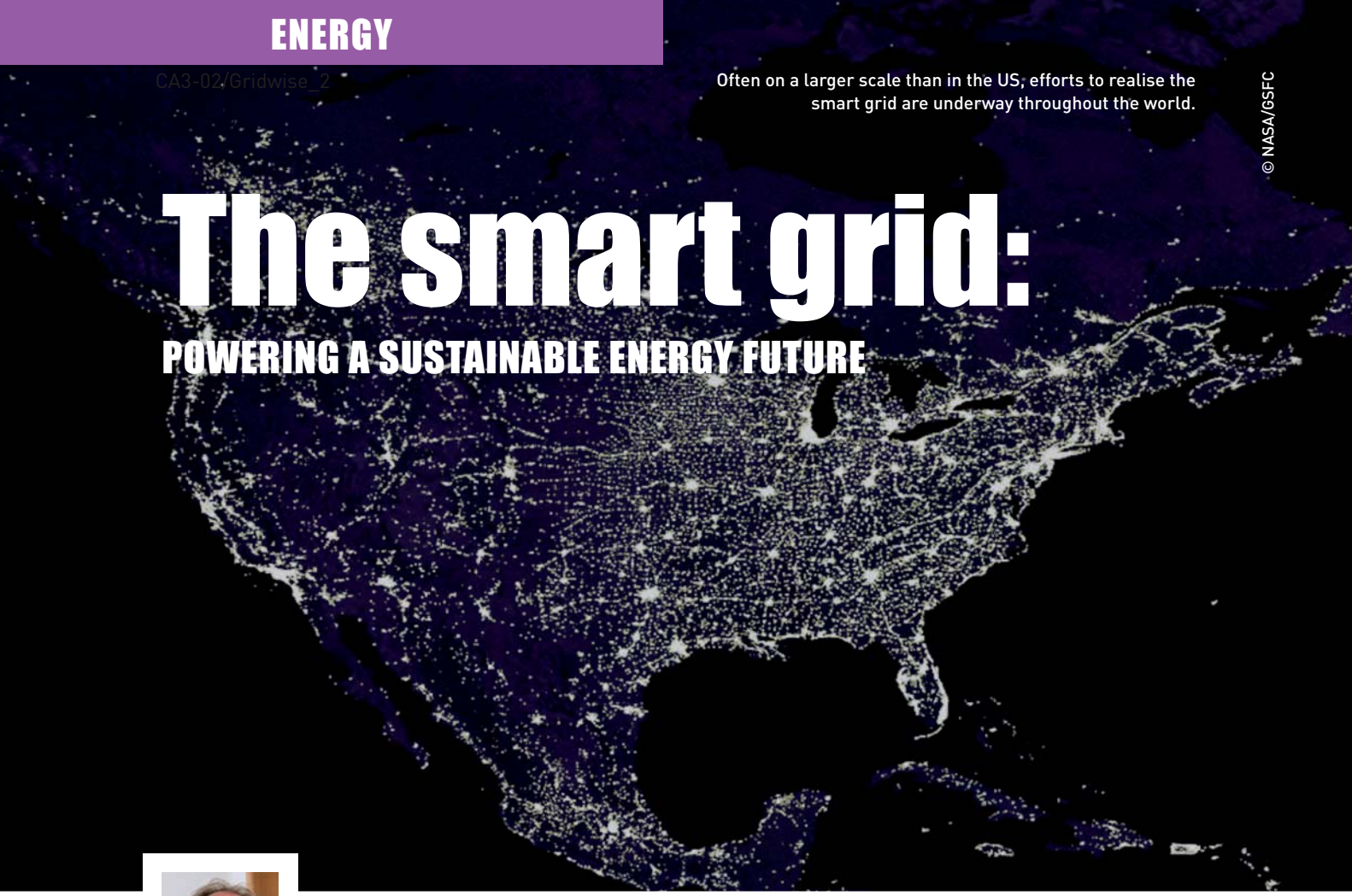


Often on a larger scale than in the US, efforts to realise the smart grid are underway throughout the world.

© NASA/GSFC

The smart grid:

POWERING A SUSTAINABLE ENERGY FUTURE

GUIDO BARTELS, CHAIR, GRIDWISE® ALLIANCE AND GENERAL MANAGER, IBM GLOBAL ENERGY & UTILITIES INDUSTRY

The need to integrate electricity generated from 'green' sources into the power supply while achieving gains in energy efficiency and reducing peaks in electricity demand explains why governments, utilities, technology companies, environmentalists and energy efficiency advocates are devoting so much attention to modernising the power grids. There is a growing consensus that, in order to use more environmentally-friendly sources of energy and encourage more sophisticated transmission, distribution and use of electrical power and electrical grids are going to have to become much 'smarter.'

To serve the planet's growing population and expanding economies, at least 33.3 trillion kilowatt hours of electricity will be generated worldwide per annum by 2030. That is almost twice the amount of electricity that was produced in 2005.

How this electricity is generated, distributed and used will exert an enormous impact on the earth's environment, particularly on the emissions of greenhouse gases that contribute to global climate change.

As is well known, generating electricity by burning coal and, to a lesser extent, natural gas can increase the concentration of carbon dioxide and other greenhouse gases in the atmosphere and increase global warming. Nuclear power raises its own environmental concerns. Hydroelectric power requires the construction of dams and turbines. For these and other reasons, many are encouraging the use of alternative energy sources – solar energy, wind and geothermal power – to generate electricity. These 'green' power sources offer two important advantages – no air pollution or carbon footprints. But solar energy and wind power also have disadvantages that must be overcome. They are intermittent energy supply sources. The sun does not always shine nor does the wind always blow. And they are generally located far from the areas with the greatest electricity consumption.

> "The challenge is to bring the world's electrical grids from the 20th century into the 21st century"

In a very real sense, the challenge is to bring the world's electrical grids from the 20th century into the 21st century.

INDUSTRIAL AGE POWER GRIDS

Modern information technologies have transformed almost every aspect of how we live, work, learn and play, with the notable exception of the ways in which we produce, transmit, distribute and use electricity. Just as the Internet exemplifies the nimble and interactive technologies of the information age, the existing power grids in the United States and much of the world represent the powerful but somewhat inflexible technologies of the industrial age.

I am most familiar with the US power grid, which was primarily designed half a century ago. With good reason, it has been called one of the greatest engineering marvels of its times. But as times have changed, the existing power grid has been increasingly unable to accommodate the needs of an evermore technologically advanced and information-oriented society.

> "A smart grid will seamlessly integrate all clean and green energy technologies"

Simply stated, existing power grids in the US and other areas of the world resemble one-way streets. The power stations are at the beginning of the street. The power users are at the end of the street. Other than paying their bills and reporting power outages, consumers of electricity have few, if any, opportunities to communicate with suppliers of electricity, much less to learn more about how much they are paying for the electricity they used over the previous month.

Whether they want to save the environment, to save energy or to simply save money, consumers have a hard time learning what they need to know: how their electricity was produced; how much carbon dioxide was produced in the process; how much electricity they are using when they are using it; and how much they will be charged when the bill arrives several weeks later.

Largely because their consumers are uninformed, electric utilities find it difficult to manage dispatch and distribution of electricity, especially at times of peak usage, such as during the work week or the hottest days of summer. Our existing transmission grids are not designed to accommodate renewable energy sources, which are not always available during times of peak demand or in the markets where most needed. Indeed, electric companies and electricity consumers have found it challenging even to conserve electricity, whatever its source, with the companies continuing to push out the power to meet the growing demand from uninformed consumers.

THE 'SMART GRID'

In order to transcend the limitations of the current system, innovators are seeking to use information technology to collect, share and act upon data about power use, creating a 'smart grid.'

By providing accurate, timely and detailed information on the energy being used, a smart grid will allow utilities and consumers to reduce peak demand and make the most of other opportunities to increase efficiency. Moreover, a smart grid will seamlessly integrate all clean and green energy technologies, from electric vehicles (which are best refueled at night – an off-peak time) to roof-top solar systems and wind farms. By expanding conservation efforts and using renewable energy sources, the smart grid will reduce the emissions of the greenhouse gases that contribute to climate change.

How will the smart grid achieve these goals? Among other improvements, it will transform two familiar features of electric power use – the meter and the bill. It will also allow the appliances in our homes to 'talk' to the grid.

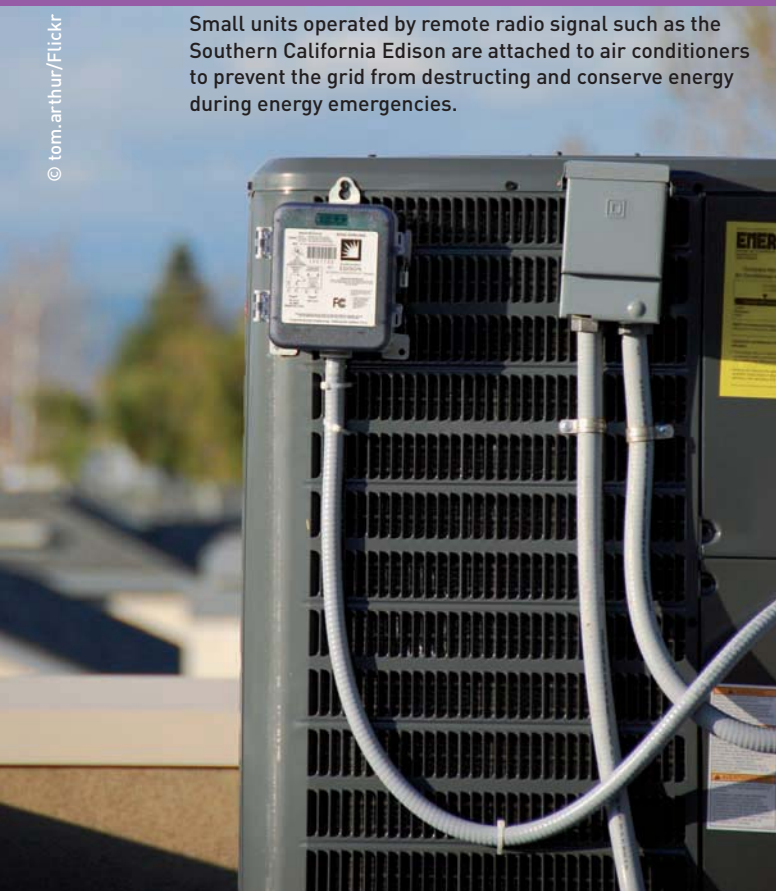
Conventional electric meters are one-way devices that track the number of kilowatts of energy that a consumer uses. At the end of the month, the consumer receives a bill for the electricity. But consumers have no way to identify how this energy was used throughout their home. With smart meters, consumers are informed and empowered to save money, to save electricity – and, ultimately, to reduce carbon emissions that contribute to climate change. Smart meters provide instant information about electricity consumption, so consumers will be able to see, in near real-time, how much energy their home is using and how much it costs. With this additional information, consumers will be better able to make wise energy decisions, such as running their dishwashers, washing machines and dryers at night. In fact, studies have shown that when consumers know how much electricity they are using on a daily basis, they will become five to 15 per cent more energy-efficient.

As appliances and other technologies align with a smart grid's capabilities, consumers will also be able to create 'home area networks' of smart appliances, thermostats, security systems and electronics that will 'talk' with the grid. Consumers could get voicemail or email messages during a peak-energy-use time that encourages them to turn off certain appliances in return for financial incentives. Alternatively there might be a setting on an appliance so that it would automatically run at a time when electricity demand is relatively low. These capabilities would allow consumers, companies and communities to save power and money and help reduce emissions of greenhouse gases.

PROGRESS IN THE US

In the US, public officials from both major parties and every level of government, together with leaders from business, academia, the environmental community and other segments of society, are actively promoting the smart grid. President Obama has declared that the smart grid "could save us money, protect our power sources from blackout or attack and deliver clean alternative forms of energy to every corner of the nation."

The Energy Independence and Security Act of 2007 calls for the creation of a smart grid. Because designing, building, maintaining and making use of the smart grid will create and support tens of thousands of jobs, the American Recovery and Reinvestment Act of 2009 (the economic stimulus program) appropriates $4.3 billion in matching funds for large regional smart grid demonstration projects and provides investment grants for state and local initiatives. This funding, and the efforts it encourages, represents a down payment on the cost of realising a smart grid.



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Small units operated by remote radio signal such as the Southern California Edison are attached to air conditioners to prevent the grid from destructing and conserve energy during energy emergencies.

Smart grid development is moving forward at the local and state levels as well. As cited in the 2008 Electricity Advisory Committee's report entitled 'Smart Grid: Enabler of the New Energy Economy,' Austin Energy's Smart Grid initiative started out as an enterprise architecture program, followed by an effort to redefine the company's business process using service-oriented architecture (SOA). Austin went on to enable consumer choice through different demand response/load management, distributed generation and renewable energy programs. These programs saved Austin Energy operational costs, allowing the utility to fund investment in new technologies at no extra cost to consumers.

In 2008, the California Public Utilities Commission (CPUC) approved $1.63 billion in funding from ratepayers for Southern California Edison's (SCE's) smart metering program, Edison SmartConnect. SCE will install 5.3 million new smart meters for its residential and small-business customers from 2009 until 2012. SCE has also designed and deployed its own neighborhood electricity circuit which delivers power to 1,400 customers. Similarly, the Public Utilities Commission of Texas (PUCT) approved plans from Oncor and CenterPoint Energy for the deployment of more than 3 million and 2.4 million smart meters, respectively, across their service territories.

PROGRESS WORLDWIDE

Often on a larger scale than in the US, efforts to realise the smart grid are underway throughout the world. Currently, most of China's electricity is produced by coal-fired stations – the power source that causes the most carbon emissions. China wants to reduce air pollution by increasing the share of its electrical power that comes from renewable sources to 15 per cent by 2020 by which time China's total demand for electrical power is expected to double. Last year, the nation lost an estimated 6.6 per cent of its electrical power in transmission over an antiquated power grid that has suffered from blackouts and the collapse of power lines during snowstorms.

This year, China has begun a decade long smart grid project, with estimated investments over this period of up to $100 billion dollars, to improve transmission efficiency, reduce the emissions of greenhouse gases, and incorporate renewable power sources. With the State Grid Corp. of China taking the lead, planning is underway and technical standards are being developed.

INDIA: A MASSIVE UPGRADE

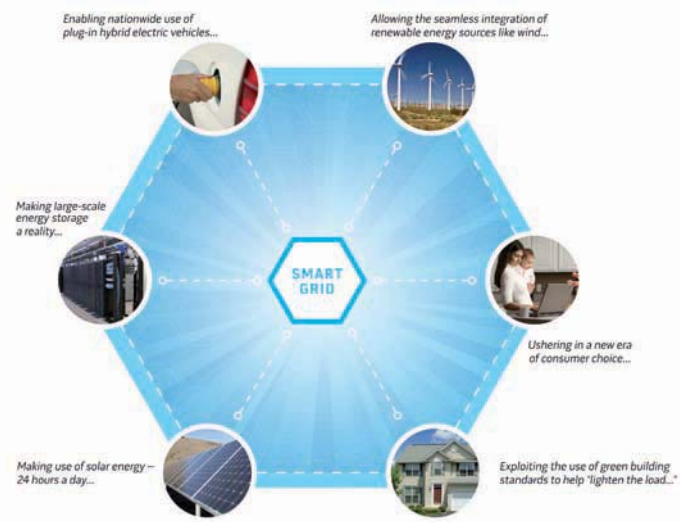
As India's economy and population continue to grow, the government is increasing the country's electrical generation capacity by 100,000 megawatts by 2012 and modernising the power grid. India will be investing $50 billion in generation and an equal amount in transmission, distribution and rural electrification. In order to make the grid smarter as well as larger, Indian cabinet ministers recently visited China and South Korea (which just recently announced ambitious plans to become the first smart grid nation in the world), seeking investment and technical assistance.

AUSTRALIA: SMART GRID, SMART ENGINEERS

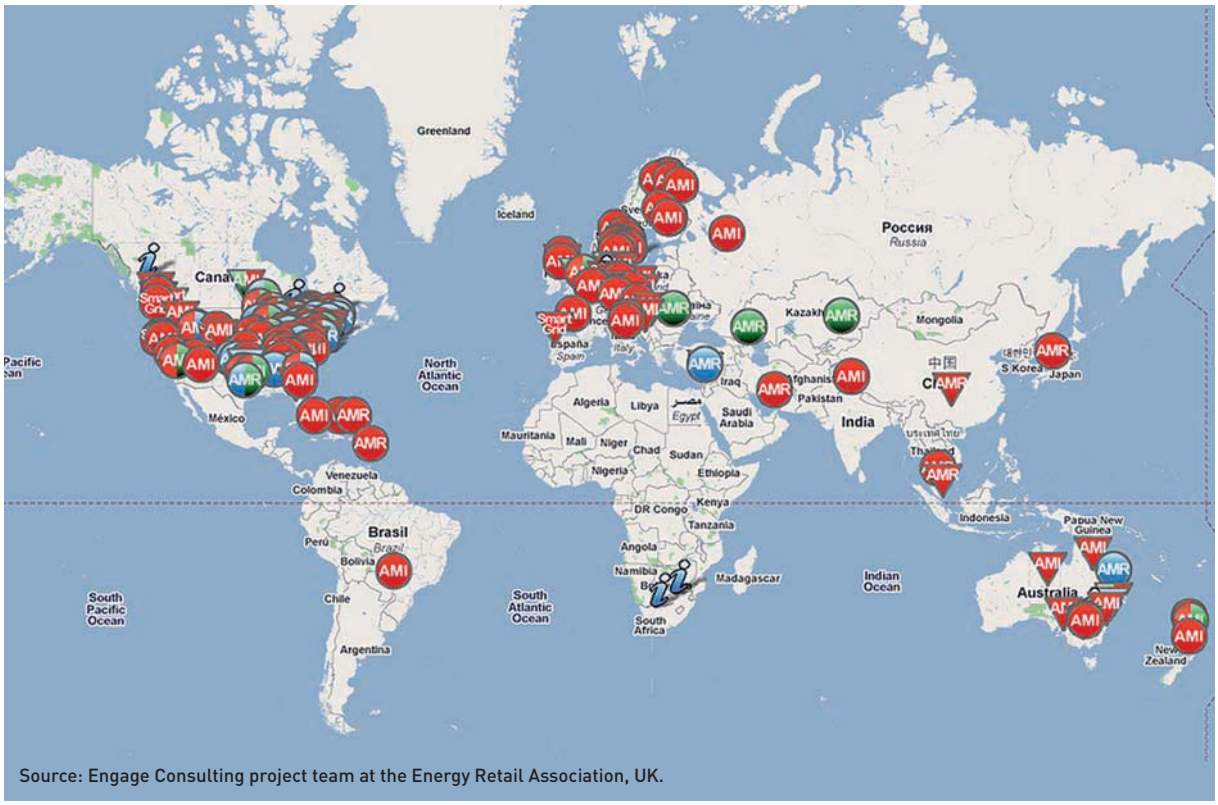
Australia's national government is investing an additional $3.5 billion, on top of the $1 billion that it has already allocated, for its clean energy initiative. An important element of this program is developing a smart grid energy network that will combine broadband with intelligent grid technology and smart meters in private homes. This will allow for more use of wind and solar power.

The government is looking to fast-track the implementation of renewable energy and encourage all participants by accelerating development projects through this stimulus package. Because this effort requires a skilled workforce, a utility has launched a partnership with two universities to investigate smart grid development and train the next generation of power engineers.

Illustrating the opportunities: the smart grid as enabling engine.



Source: The Smart Grid, An Introduction. Prepared for the U.S. Department of Energy by Litos Strategic Communication.



Source: Engage Consulting project team at the Energy Retail Association, UK.

EUROPE: THINKING REGIONALLY

In Europe, actions are being taken both in countries and on the European Union level. Building on the success of some of the regional grids such as 'Nord pool' to handle the intermittency of wind generation, the European Commission has released a 'green paper' presenting a 20-year strategy for secure and sustainable energy. The paper recommends a grid code, an interconnection plan and new construction. It invites further ideas about the issues of supply, delivery and end use and about how to reduce emissions contributing to climate change. As well as strengthening inter-country connections, this new European grid will also have connections to Asia and Africa and will manage and distribute energy increasingly coming from renewable sources. While the sun is shining in Spain or the wind blowing in Denmark, excess renewable energy can be sent to other countries to supplement or replace base load coal production.

CONCLUSION

All across the world, governments, businesses, educators and concerned citizens understand that modernising electric power grids is essential for growing their economies, conserving energy and preserving a planet whose climate and atmosphere are imperiled by emissions of greenhouse gases from old-fashioned power generators. The 'smart grid' is no longer just a smart idea – it's a necessity.

Author

Guido Bartels serves as Chairman of the GridWise® Alliance, a leading advocacy group of private and public companies who are supporting a national imperative for modernizing the electric system of North America. Bartels is also a member of the US Department of Energy's Electricity Advisory Committee (EAC), a 30-member group representing some of the country's top public and private sector electricity and energy policy leaders. As a member of the EAC and as Chairman of its Smart-Grid subcommittee, Bartels will help the DOE to meet the smart-grid related requirements of the Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007.

Organization

The GridWise Alliance, founded in 2003, is a consortium of public and private stakeholders which include utilities, IT companies, equipment vendors, new technology providers and academic institutions. The Alliance members are aligned around a shared vision of a smarter electric system that integrates the infrastructure, processes, devices, information, and market structure. This integration will ensure that energy can be generated, distributed, and consumed more efficiently and cost effectively resulting in a more resilient, secure and reliable energy system.

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LEADING
THE ENERGY CHANGE

We must combine all our efforts to preserve the planet, through considerate growth and an awareness of our impacts on the environment. As a utility group, we must contribute to tackle climate change. This means not only securing future energy supplies but also ensuring the safety of our installations and providing affordable access to energy.
We believe that energy and the environment are strongly linked.
We believe that low-carbon electricity will help solve the climate crisis.
EDF group has a large fleet of low-carbon facilities – hydro power plants, nuclear generation and renewable energy that includes wind farms. The Group is, and will remain globally, the lowest carbon emitter among the major European utility providers.
All the companies of the EDF group have a strong commitment towards their local communities.

As a Group,

- we contribute to combining sustainable growth with a responsible business conduct, thus fostering a common ethical approach;
- we continue to reduce our own greenhouse gas emissions and to develop renewable energy, based on a range of cost-effective technologies and on-going investments;
- we promote eco-efficiency through a growing range of products and services for businesses and residential consumers.

We realize that among the employees of the different Group companies there is growing awareness of sustainable development. The CEOs of the Group companies are committed to a shared sustainable development policy with three key issues:

- Environment: the fight against climate change and the conservation of biodiversity;
- Social: access to energy and close links with local communities;
- Governance: contributing to the debate on sustainable development through dialogue, information sharing and communication.

Our common vision will serve our businesses wherever we operate.

We are joining our efforts to promote this commitment.

Pierre GADONNEIX
Chairman and Chief Executive Officer
EDF Group

Vincent DE RIVAZ
Chief Executive
EDF Energy

Umberto QUADRINO
Chief Executive Officer
Edison

Hans-Peter VILLIS
Chairman of the Board of Management
EnBW

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Chairman and Chief Executive Officer
DEMASZ

David CORCHIA
Chief Executive Officer
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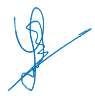
Philippe CASTANET
Chairman
EDF Polska

John RITTENHOUSE
Chief Executive
EDF Trading

Didier GUENIN
Chief Executive Officer
Électricité de Strasbourg



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Chairman of the Board
MECO

Patrick SIMON
Chief Executive Officer
Norte Fluminense

Pierre CHAZERAIN
Chairman of the Board of Directors
SSE

LEADING THE ENERGY CHANGE

EDF GROUP'S 9 COMMITMENTS

ENVIRONMENT

- **Remain, as a Group, the lowest emitter among the major European energy utilities**
- **Adapt our assets and our offers to take into account climate change**
- **Reduce our environmental impact, especially on biodiversity**

SOCIAL RESPONSIBILITY

- **Facilitate access to energy and eco-efficiency**
- **Develop and sustain links with local communities where we work**
- **Support education on major energy issues**

GOVERNANCE

- **Implement policies and share values within the Group and together with the stakeholders**
- **Communicate and report on the Group's sustainable development activities and results**
- **Contributre to the debate on sustainable development at both national and international level**

EDF GROUP'S RESPONSE TO CLIMATE CHANGE MITIGATION

The Group is actively engaged in reducing pollutant GHG emissions (CO_2, SO_2, NO_X, dust) from its fossil-fired power plants. Cornerstones of this strategy are the modernization of the existing fossil-fired facilities to improve output and reduce pollutants, the diversification of its generation assets from country to country, and investment in combined-cycle gas turbines (CCGT's). Owing to their very high efficiency and fuel type, they emit only one third of the NO_X and half of the CO_2 of traditional fossil-fired plants.
In France, two CCGT's are under construction in order to replace three oil-fired plants, and an additional CCGT is also under construction to replace two coal-fired units.
In the UK, EDF Energy is committed to reducing the intensity of its carbon dioxide emissions from electricity production and construction of its new CCGT at West Burton "B" (1,300 MW) is proceeding well. EnBW in Germany is building a RDK8 supercritical coal-fired plant with an energy output of over 45% as compared with a typical 38% at other plants.

Nuclear energy has a major role to play as a low-carbon solution. The EDF Group is committed to its development with the EPR (European Pressurized Reactor) project in Flamanville (Normandy) which is planned to start generating electricity by the end of 2012.
EDF Energy aims to invest in up to four new plants with the first operational by the end of 2017 based on the same (EPR) technology. In the UK, the early planning phase has been launched for the first of the four EPRs EDF Energy wishes to build.

Together with its affiliates and subsidiaries, the EDF Group, Europe's leading hydroelectricity producer, is contributing to the EU's Climate and Energy Package renewable target achievement.
Even though EDF Energies Nouvelles' (EDF EN) main growth driver remains wind power, it currently operates the largest solar power plant in mainland France with a capacity of 7 MWp, located in Narbonne (Southern France). It will supply the equivalent of the annual electricity consumption of over 4,200 people.
EDF Energy is investing in renewable energy in the UK through its 50:50 joint venture company with EDF Energies Nouvelles. The new company is called EDF Energy Renewables.
Through the use of renewable sources (mainly hydroelectric and wind power), Edison in Italy avoided 4,169,039 tons of CO_2 emissions in 2008 (about 30% more than in 2007). By 2014, its capacity from renewables installed is expected to reach 2.9 MW.

In Germany, EnBW is developing four windfarms in the North and Baltic sea (1,200 MW).
The companies of EDF Polska Group have doubled biomass burning between 2007 – 2008, with eventually more than 416 GWh being produced with biomass, saving nearly 380 KT of CO_2.
All in all, in 2008 the EDF Group generated 8.6% of heat and electricity from renewable energy sources.

Capacity building, a trademark

In the emerging countries where the EDF Group invests, it is firmly engaged in the concept of capacity building. In Laos where it is building a 1,070 MW hydro dam for the government, the Group contributed to reinforcing the country's legislation to help improve management of major projects in the sector of energy infrastructure. Thus, a training programme for the Ministry of the Environment's working teams was put in place in order to enable them to steer any future development projects. At the same time, EDF established partnerships with Electricité du Laos to train several tens of technicians in various hydropower operator jobs. Last but not least, during the entire construction period of the Nam Theun 2 dam EDF provided practical experience and offered qualifications to 8,000 workers on the project.

design Interbrand

The cost of renewable energy:

TIME TO DISPROVE THE MYTHS

© Flickr/Taylor Dundee

Causeymire Wind Farm, Caithness.
Seen on the A9 south of Thurso.

DR HERMANN SCHEER
GENERAL CHAIRMAN OF THE WORLD COUNCIL FOR RENEWABLE ENERGY

Among the many myths about our energy supplies, one of the most insidious is the high price of renewables. If all energy alternatives are too expensive, the argument runs, then the world should continue on its course of dependence on fossil-based sources. In this article the author debunks this myth and explains why we must keep developing the renewables, describing how each affected industry can make the most of the new opportunities.

When talking about renewable energies, there always follows – like a pavlovian reflex – the question of costs. The basic assumption still predominates that renewables are not affordable; that they cost too much in comparison with conventional energies. In other words, there is a negative economic myth about renewable energy. This assumption acts as a permanent excuse not to adopt a grand strategy to actively deploy renewable energy. It is argued that the time for renewables has not yet come. Investments in the field of renewable energy are considered an economic burden that no one is willing to shoulder. Those arguments are short-sighted, superficial and highly misleading.

They are short-sighted because they ignore the fundamentally different economic prospects of conventional energies on the one hand and renewables on the other. It is obvious that conventional energies will become more and more expensive over time, whereas the costs for renewables steadily decrease. Rising fuel costs from depleting resources (oil, natural gas, coal, uranium) inevitably result in increasing costs for the conventional energy supply. Extraction costs will rise because the remaining resources become harder and harder to extract, necessitating complex technical efforts. What is more, due to the depletion of conventional energy resources, the fuel supply is coming from fewer and fewer sources in an ever-decreasing number of countries, which increases the monopolisation of resources. Suppliers of conventional fuels gain more and more opportunities to raise prices.

> **“Conventional energies will become more and more expensive over time, whereas the costs for renewables steadily decrease”**

The inevitable price rises apply to oil, natural gas, coal and uranium. They evolve in escalating wave movements. At present – in the year 2009 – we are once again in a downswing compared with 2008, but this results from the critical global economic situation triggered by the financial crisis. These comparatively low fuel prices are only short-lived and not permanent. The mid-term trend of fuel prices is undoubtedly pointing upwards.

EXTRA COST FACTORS

Another factor that must be taken into consideration is price increases when erecting new large energy

TABLE 1. CHARACTERISTICS OF ENERGY SOURCES

	Fossil energy	Nuclear fission	Solar thermal heat	Solar thermal electricity	PV	Wind	Biomass (waste crops)	Renewable (biomass plants)	Small hydro plants	Large hydro plants
Unlimited availability	×	×	✓	✓	✓	✓	✓	✓	✓	
Reduce CO_2	×	✓	✓	✓	✓	✓	✓	✓	✓	
Reduce heat emissions	×	×	✓	✓	✓	✓	✓	✓	✓	
Avoid danger of major accident	×	×	✓	✓	✓	✓	✓	✓	✓	×
Reduce administrative costs	×	×	✓	✓	✓	✓	✓	×	✓	×
Relieve balance of payment	×	×	✓	✓	✓	✓	✓	✓	✓	✓
Reduce international conflicts	×	×	✓	✓	✓	✓	✓	✓	✓	☒
Social acceptance	×	×	✓	✓	✓	✓	✓	☑	✓	●
Reduce public transport costs	×	×	✓	✓	✓	✓	✓	✓	✓	✓
Create new jobs	×	✓	✓	✓	✓	✓	✓	✓	✓	×
Support regional economic	×	×	✓	✓	✓	✓	✓	✓	✓	×
structures										
Decrease risks to health	×	×	✓	✓	✓	✓	✓	☑	✓	✓
Decrease water consumption	×	×	✓	✓	✓	✓	✓	✓	✓	✓
Creating jobs	✦	✦	✶	✶	✶	✶	✶	✶	✶	✦

×=no ✓=yes ☑=yes, if correctly applied ☒=not always ●=not always and everywhere ✦=few ✶=many

production facilities. Because there only exist a few producers of the necessary materials and holders of the relevant know-how, the large number of developing countries with rising energy consumption rely on these few producers. And last but not least, rising costs associated with climate protection measures resulting from international liabilities (Kyoto I and in the future perhaps Kyoto II) that will be reflected in energy prices.
Many countries are faced with additional costs: investment will be necessary to provide for cooling water in nuclear and fossil power plants in countries that have insufficient water resources. Those countries where the distribution of mains electricity does not cover the whole territory (roughly two billion people) are facing high costs associated with the extension of a grid infrastructure.

SEEING THE WHOLE PICTURE

Prices for renewable energy are decreasing constantly, on the other hand, because – with the exception of biomass – only costs for technology are relevant. These decline due to mass production of renewable energy installations that comes about by mobilised market introduction and continuous technological improvements. Since installations producing renewable energy (in particular wind and photovoltaics) can be directly set up in those regions that need it, a widespread transmission infrastructure will be superfluous. What is more, wind and solar – except in the case of concentrated solar power (CSP) power plants – do not need water for cooling and produce no emissions. The conclusion is inescapable: investments in renewable energy today are the only chance to reach a cost-effective energy supply for everyone everywhere.
The negative myth of high costs that accompany the use of renewables is superficial and misleading because it does not differentiate between micro- and macro-economic assumptions – that is between expenses for a single investor on the one hand and for the whole national economy on the other. However, this distinction is crucial for the question of whether governments stick to conventional energies or decide to orient their activities towards renewable energies.
The comprehensive economic benefits accompanying the switch to renewable energy are manifold and evident – especially so if the renewables that are employed are harvested nationally, that is, if they are indigenous resources that do not have to be imported. The magnitude of these social benefits results from the macroeconomic costs of the conventional power supply, which can be avoided by employing renewables.
From a macroeconomic perspective, the step towards indigenous renewable energies boasts advantages. Nevertheless, macroeconomic benefits do not necessarily bring microeconomic benefits for all producers and consumers. This results in the imperative to translate the macroeconomic benefits with the right political instruments into microeconomic incentives for producers. These instruments have to aim at regulating

prices to the advantage of renewable energies. The best instruments are:

- Tax-differentiation between renewable and conventional energies. That means a lowering of taxes for renewables, possibly down to complete tax-exemption policies. It would be optimal to this end to generally replace taxation on energy by taxation on pollution. Like this, only polluting energies will be taxed.
- Low or zero interest rates for renewable energy investment credits. The result of this investment will be that the state only covers the difference between normal interest rates and the interest rate reduction. As a result, the investment creates benefits for the whole society and its economy.
- Feed-in tariff regulations in grid-connected areas with a priority access for power produced from renewable sources and a guaranteed fee. This results in an ever-increasing contribution of renewable energy, substituting conventional energies.

UNEXPECTED POTENTIAL WINNERS

The spectrum of potential winners from a shift in energy, however, goes well beyond the producers of renewable energy technologies. It also encompasses the vast majority of all other businesses, only a few of whom (admittedly) have recognised that they have a self-interest in achieving independence from the conventional energy business. Many companies would appear to be substantially more fitted for a role of their own as renewable energy technology producers than are the big corporations of the energy business.

Thus, it is in the interest of the car industry to overcome its 100-year alliance with the petroleum industry. Cars and, by extension their manufacturers, are regarded as an environmental danger largely because of the fossil fuels used to drive them.

> “Cars and, by extension their manufacturers, are regarded as an environmental danger largely because of the fossil fuels used to drive them”

When it comes to bottlenecks and price explosions as a result of scarce petroleum in the near future, this will affect the car industry immediately – in contrast to the petroleum suppliers, which have profited from every price increase so far. In the interest of securing their long-term existence, therefore, the car companies need to become a driving force pushing for the use of renewable energy. In their hand they hold a trump card they can use to facilitate this reorientation, namely by producing and marketing energy-saving cars that can be driven with biofuels and/or electricity. This trump can help the car companies clear the way for society to undertake the shift to renewable energy.

To do this they need to use their economic weight to create political parameters that will facilitate introducing biofuels into the market. Even more, the car industry might even become a producer of stationary motor power plants, whether we are dealing with communal heating plants, motors operated using fuel cells, or with Stirling or compressed air motors. Not only can the car industry contribute its experience in motor development; it can also bring in its experience marketing decentralised installations using a wide-reaching network of dealers and workshops. For this reason too, the car industry should no longer leave the design of energy laws exclusively to legislators in the electricity companies' sphere of influence. The more energy laws favour the introduction of decentralised facilities for producing electricity, the greater the market opportunities for motor manufacturers, including the small power station market.

The electrical and information technology industry should not have to wait for government to pass laws promoting its participation in renewable energy. It is already within its power to optimise electricity storage battery technologies, to develop new ones and put them up for sale. It is not just the market for existing renewable energy plants (a market that grows faster as storage technologies become better and less expensive) that awaits these new products; they are also anticipated by the market for improvements in the way today's electricity supply systems are serviced. Extra costs that might be incurred will hardly play a role in this group's purchasing decisions. Such additional costs can only be small, and it is easy to convey to the users of these devices that savings in electricity costs make up for the added expense. So what is this industry waiting for?

It is in the interest of the railway companies and the rail vehicle industry to make a commitment to developing locomotives operated with fuel cells. This opens up the possibility for powering locomotives with electricity produced on board, so that overhead train wires would no longer be needed. This would help save substantially on infrastructure and maintenance costs in railway operations.

It would be in the interest of airline companies and the aircraft industry to prepare intensively for the time when fossil aircraft fuels will be subject to taxation or perhaps no longer even be available. Aircraft also need a foundation in renewable fuels. In light of the importance of freight transport by air, moreover, it is incomprehensible that neither the air travel industry nor the airline companies have shown more interest in reviving the dirigible. It is also in the self-interest of the shipbuilding industry and of ocean shipping companies to convert to renewable energy. Many seagoing shipping companies would have already introduced biofuels to operate their ship motors if fossil fuels had not been available to them tax-free. Large passenger and transport ships can also avail themselves of special opportunities to produce renewable energy on board, whether it be from wind power, which can also be used for electricity production without free-standing rotors, or from solar electricity devices integrated into ship roofs or into walls on board. Hydrogen electrolysis on board is also a technical option.

Agriculture also has a unique opportunity to revive and turn itself into the economy's most important resource


ASU Solar Panel.
© Flickr/theregenerat

base. Farming has this chance for a revival (something once deemed inconceivable) through the integrated cultivation of plants for foodstuffs, energy and raw materials – a 'three-field economy'. In the cultivation of plants for raw materials, there lies a chance to 'ecologise' the chemical industry for a fundamental 'metabolism'. Plants will replace petroleum as the diverse basic material of the future. In my book 'The Solar Economy' (under the heading 'Forwards: towards the primary economy') I described the fundamental importance of this development as a reorientation whereby agriculture's marginalisation since the industrial revolution will be permanently ended, and a sociological decentralisation (in place of further centralisation) will be introduced into our mega-cities. Opportunities for a natural second line of business and for increased productivity will also open up for the foodstuffs industry if it proceeds systematically and vigorously to commercialise its biological residues and waste – to produce electricity on its own or to produce and market bio-fuels.

Next to agriculture, it is the construction business, including the building materials industry, that will experience the largest upswing if it seizes the opportunities provided by solar construction. Numerous new building materials and construction methods – from glass that insulates as it produces electricity to energy-saving wood constructions – could be employed. If every building is going to be capable of using cost-free solar energy optimally for heating and cooling purposes,

it needs to adapt these new materials and methods to the conditions of the local topography and bio-climate – each with its own special solar plan. Solar retrofitting of the existing building stock plus new solar buildings are a goldmine for the construction trades, architecture and building engineers.

And, finally, there is the municipal (or local government) and regional energy business, which is taking electricity production back into its own hands and, as a partner for regional agriculture, is discovering the production and marketing of biofuels as a new line of work. The same holds true for the 'energetic' marketing of organic waste in cities and local governments. On the basis of local government marketing of all energetically useful biomass and waste material, as well as on the basis of direct utilisation of the local potential for solar radiation energy, wind, water, terrestrial and atmospheric heat, it is possible to come up with integrated utilisation plans that have short routes from production to consumption, plans with which a centrally organised energy business (with all the expensive outlays for its wide-ranging infrastructure) cannot compete.

In these local schemes, the public's energy outlays remain in circulation inside municipal and regional economic channels. Even large energy corporations might be able to reconcile themselves with renewable energy by transforming themselves into holding companies for independently operating enterprises at the local and regional level; this way, they would also be able, in the words of Joseph A Schumpeter, "to avoid ... coming down with a crash", and instead "turn a rout ... into orderly retreat". As matters stand, however, they will probably be the last to attempt this.

In short, not only will new industrial enterprises emerge when renewable energy prevails, renewable energy will also open up opportunities for old branches of industry. The more autonomous investments flow into renewable energy, the faster old plant and equipment will be replaced by a new generation of decentralised energy facilities – and the better it will be for the industrial economy. What the energy business experiences as the destruction of capital breathes new life into industry and reinforces the economy at large.

Author

Dr Hermann Scheer, member of the German Parliament, founded the non-profit European Renewable Energy Association EUROSOLAR in 1988, and in 2001 the non-profit World Council for Renewable Energy (WCRE), serving as President and General Chairman, respectively, of the two non-governmental organisations on an honorary basis. Through these institutions Dr Scheer elaborated his original policy concepts for renewable energy disseminations, and initiated legal frameworks in Germany and the European Union. He has been the main driving force behind the establishment of the International Renewable Energy Agency (IRENA) in January 2009. Mandated by governments worldwide, IRENA will be the most important actor to globally promote a rapid transition towards the widespread and sustainable use of renewable energy.

Organisation

The World Council for Renewable Energy (WCRE) is the global voice for Renewable Energy. It operates independently and free of the vested interests of the present global energy system. As a non-profit and non-governmental globally working organisation it is focused on developing policies and strategies for renewable energy. Its mission is to bring renewable energy into the mainstream of world economy and lifestyle.

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It's time we all put our energy into a lower carbon future.

Now is the time to make lower carbon a high priority for all: pricing carbon emissions would provide business and consumers with powerful incentives to conserve energy; we also need more investments in technology to reduce emissions from traditional forms of energy; and we should accelerate the transition to lower carbon alternatives such as natural gas, wind, solar, biofuels and carbon capture. As one of the world leaders in these areas, we're working today on real pathways to the low carbon future. Let's do it together. Learn more at bp.com

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Energy efficiency: reclaiming America's future

Photo: White House photo 09.02.09 by Pete Souza

ARTICLE TAKEN FROM REMARKS BY
BARACK OBAMA, PRESIDENT OF THE UNITED STATES,
JUNE 29, 2009, ON ENERGY

Since taking office, my administration has mounted a sustained response to a historic economic crisis. But even as we take decisive action to repair the damage to our economy, we're also working to build a new foundation for sustained and lasting economic growth.

And we know this won't be easy, but this is a moment where we've been called upon to cast off the old ways of doing business, and act boldly to reclaim America's future. Nowhere is this more important than in building a new, clean energy economy, ending our dependence on foreign oil, and limiting the dangerous pollutants that threaten our health and the health of our planet.

And that's precisely what we've begun to do. Thanks to broad coalitions ranging from business to labor; investors to entrepreneurs; Democrats and Republicans from coal states and coastal states; and all who are willing to take on this challenge – we've come together to achieve more in the past few months to create a new, clean energy economy than we have in decades.

We began with historic investments in the Recovery Act and the federal budget that will help create hundreds of thousands of jobs doing the work of doubling our country's supply of renewable energy. We're talking about jobs building wind turbines and solar panels; jobs developing next-generation solutions for next-generation cars; jobs upgrading our outdated power grid so it can carry clean, renewable energy from the far-flung areas that harness it to the big cities that use it.

And thanks to a remarkable partnership between automakers, autoworkers, environmental advocates, and states, we created incentives for companies to develop cleaner, more efficient vehicles – and for Americans to drive them. We set in motion a new national policy aimed at both increasing gas mileage and decreasing greenhouse gas pollution for all new cars and trucks sold in the United States. And as a result, we'll save 1.8 billion barrels of oil over the lifetime of the vehicles sold in the next five years – the projected equivalent of taking 58 million cars off the road for an entire year. And we know that even as we seek solutions to our energy problems at home, the solution to global climate change requires American leadership abroad. That's why I've appointed a global climate envoy to help lead our reengagement with the international community as we find sustainable ways to transition to a global low-carbon economy.

And, now [on the 26th June 2009], the House of Representatives came together to pass an extraordinary piece of legislation that will finally open the door to decreasing our dependence on foreign oil, preventing the worst consequences of climate change, and making clean energy the profitable kind of energy. Thanks to members of Congress who were willing to place America's progress before the usual Washington politics, this bill will create new businesses, new industries, and millions of new jobs, all without imposing untenable new burdens on the American people or America's businesses. In the months to come, the Senate will take up its version of the energy bill, and I am confident that they too will choose to move this country forward.

> **"One of the fastest, easiest, and cheapest ways to make our economy stronger and cleaner is to make our economy more energy efficient"**


Wayne National Forest Ohio U.S.A in the midst of solar paneling construction funded by the American Recovery and Reinvestment Act.

Photo: Alex Snyder/Wayne National Forest, Flickr

So we've gotten a lot done on the energy front over the last six months. But even as we're changing the ways we're producing energy, we're also changing the ways we use energy. In fact, one of the fastest, easiest, and cheapest ways to make our economy stronger and cleaner is to make our economy more energy efficient. And that's something that Secretary Chu is working every single day to work through.

We know the benefits. In the late 1970s, the state of California enacted tougher energy-efficiency policies. Over the next three decades, those policies helped create almost 1.5 million jobs. And today, Californians consume 40 per cent less energy per person than the national average – which, over time, has prevented the need to build at least 24 new power plants. Think about that. California – producing jobs, their economy keeping pace with the rest of the country, and yet they have been able to maintain their energy usage at a much lower level than the rest of the country.

So that's why we took significant steps in the Recovery Act to invest in energy efficiency measures – from modernizing federal buildings to helping American families make upgrades to their homes – steps that will create jobs and save taxpayers and consumers money. And that's why I've asked Secretary Chu to lead a new effort at the Department of Energy focusing on implementing more aggressive efficiency standards for common household appliances – like refrigerators and ovens – which will spark innovation, save consumers money, and reduce energy demand.

So today, we're announcing additional actions to promote energy efficiency across America; actions that will create jobs in the short run and save money and reduce dangerous emissions in the long run.

The first step we're taking sets new efficiency standards on fluorescent and incandescent lighting. Now I know light bulbs may not seem sexy, but this simple action holds enormous promise because seven per cent of all the energy consumed in America is used to light our homes and our businesses. Between 2012 and 2042, these new standards will save consumers up to $4 billion a year, conserve enough electricity to power every home in America for 10 months, reduce emissions equal to the amount produced by 166 million cars each year, and eliminate the need for as many as 14 coal-fired power plants.

And by the way, we're going to start here at the White House. Secretary Chu has already started to take a look at our light bulbs, and we're going to see what we need to replace them with energy-efficient light bulbs.

And if we want to make our economy run more efficiently, we've also got to make our homes and businesses run more efficiently. And that's why we're also speeding up a $346 million investment under the Recovery Act to expand and accelerate the development, deployment, and use of energy-efficient technologies in residential and commercial buildings, which consume almost 40 per cent of the energy we use and contribute to almost 40 per cent of the carbon pollution we produce.

We're talking about technologies that are available right now or will soon be available – from lighting to windows, heating to cooling, smart sensors and controls. By adopting these technologies in our homes and businesses, we can make our buildings up to 80 per cent more energy efficient – or with additions like solar panels on the roof or geothermal power from underground, even transform them into zero-energy buildings that actually produce as much energy as they consume.

Now, progress like this might seem far-fetched. But the fact is we're not lacking for ideas and innovation. All we lack are the smart policies and the political will to help us put our ingenuity to work. And when we put aside the posturing and the politics; when we put aside attacks that are based less on evidence than on ideology; then a simple choice emerges.

We can remain the world's leading importer of oil, or we can become the world's leading exporter of clean energy. We can allow climate change to wreak unnatural havoc, or we can create jobs utilizing low-carbon technologies to prevent its worst effects. We can cede the race for the 21st century, or we can embrace the reality that our competitors already have: The nation that leads the world in creating a new clean energy economy will be the nation that leads the 21st century global economy.

That's our choice: between a slow decline and renewed prosperity; between the past and the future.

The American people have made their choice. They expect us to move forward right now at this moment of great challenge, and stake our claim on the future – a stronger, cleaner, and more prosperous future where we meet our obligations to our citizens, our children, and to God's creation – and where the United States of America leads once again.

That's the future we're aiming for. I've got a great Secretary of Energy who's helping us achieve it. I want to thank again the House of Representatives for doing the right thing on Friday, and we are absolutely confident that we're going to be able to make more progress in the weeks and months to come.

Barack Obama is the 44th President of the United States of America. He is the first African-American President to be elected President of the United States, and was the first to be nominated for President by a major US political party. He was the junior US Senator from Illinois from 2005 and a member of the Democratic minority in the 109th Congress where he helped create legislation regarding lobbying and electoral fraud, climate change, nuclear terrorism, and care for returned US military personnel until he resigned on November 16, 2008, following his election to the Presidency. He is the author of the New York Times bestsellers Dreams from My Father and The Audacity of Hope: Thoughts on Reclaiming the American Dream.

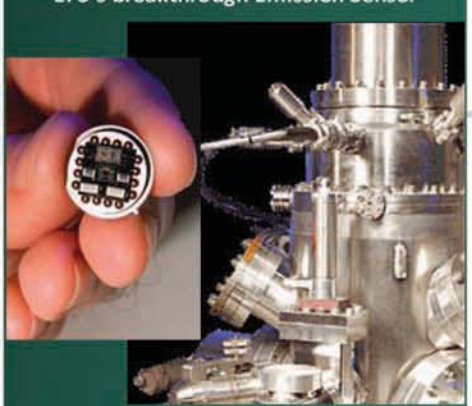
"Technology for a Cleaner and More Profitable Tomorrow"

The Company's FX Reactor is currently being used by several Fortune 500 Companies

Business Strategy:

- The Company will seek to license its technologies to OEM's, along with the auto and diesel industry and receive a royalty for all products sold
- The Company plans on leveraging its contacts within the industry for rapid deployment and quick growth in sales. Management especially believes that the sensor technology has the potential to be as disruptive in the industry as the catalytic converter was when it first came out
- Securing just one licensing agreement with a major automobile manufacturer will have a significant impact on the Company's market cap. There are over 25 automobile manufacturers and numerous diesel and heavy equipment manufacturers worldwide and deployment to most of these will make EPS a major company in the automobile and diesel industry
- The Company's goal is to maximize the value it believes the technologies represent and generate significant returns for shareholders in the years to come

EPS's breakthrough Emission Sensor



EPS

Emission & Power Solutions, Plc

Emission & Power Solutions, Plc ("EPS" or the "Company") is a U.K. based publicly listed company trading on both the Frankfurt stock exchange (symbol EPI) and on the Xetra platform. The Company maintains a corporate office in Carlsbad, California and since 2003 has developed, licensed and acquired technologies for improving fuel economy while reducing environmentally harmful exhaust emissions using advanced patented and proprietary fuel treatment devices.

Company Highlights:

- **Diversified portfolio** of advanced fuel and emission reduction technologies targeting NOx, CO2, CO, THC, PM (soot), and other harmful gases
- The Company owns **five issued U.S. patents, two pending international patents, controls many patents through worldwide exclusive agreements,** and is prepared to file several new patent applications for recent design/ technological improvements
- **High Barriers to Entry** due to EPS's proprietary, patent protected fuel saving technologies, recruitment of key personnel and high-margin, High cost of development, more than $10 million spent on development of sensor technology alone
- **Establishing Reputation** within industry:
  - Company established in 2004
  - FX Reactor used by numerous Fortune 500 companies. One prominent customer is Martin Marietta.
  - More than 200 million miles driven with the FX Reactor installed
  - High Interest from several OEM's and automobile manufacturers in Company's sensor technology
  - EPS has already received two purchase orders and one LOI for the sensor product. One purchase order is from a major automobile manufacturer
  - Several EPA recognized lab tests have shown efficiency of fuel technology

FX Reactor

The Company's in-line fuel treatment products include the FX Reactor technology which is an aftermarket fuel saving emission reducing device that can be added directly into the fuel line of a diesel engine. The Company is currently researching and developing additional models of the FX Reactor which can be used on a variety of diesel engines and gasoline vehicles.

The FX Reactor allows for the controlled restructuring of fuels to a more beneficial molecular state for optimal performance. When fuel passes through the FX Reactor it is reformulated and refined into a higher quality fuel. Higher quality fuels produce more energy resulting in more power and better fuel economy. The benefit is an increase in overall engine performance and horsepower, increased fuel efficiency, and lowering of emissions.

Sensor Technology

The Company has acquired exclusive worldwide rights to potentiometric sensor technology which can replace oxygen sensor technology currently being used in all gasoline and diesel car and truck engines worldwide. This new technology not only has the ability to reduce harmful emissions released into the atmosphere, it also improves fuel usage efficiency in both gasoline and diesel engines.

Since the potentiometric sensors measure exact amounts of multiple gases including NOx and CO, versus just oxygen like current sensors, the amount of each gas released into the atmosphere can be monitored and controlled to reduce the amount of greenhouse gases being released into the atmosphere. Potentiometric sensors do not use ceramic so they cost considerably less to manufacture compared to traditional oxygen sensors but could potentially sell for the same price.

Vapor Emission System

Researchers have developed a gasoline distillation apparatus for an engine that includes a heated vapor separator, a condenser and a controller. The heated vapor separator partially vaporizes the engine's primary fuel to generate a fuel vapor. The condenser cools the fuel vapor to produce a liquid secondary fuel that is more volatile than the primary fuel. The controller determines when the engine is supplied with either primary or secondary fuel. The secondary fuel is used only during an initial engine operation period. Total hydrocarbons is one important "leg" in the smog triangle, and removing THC will reduce smog accordingly. It is a simple, cost-effective device that reduces startup emissions by 80% and total vehicle emissions by 50%-75%. Additional patents pending relative to the production design .

For more information please visit the company's website at www.epsaves.com

In a few short years TAQA has gone from being a domestic power generation and desalination utility to a truly global energy company. With growth such as this comes great responsibility. That is why our vision is to continue to grow our business in an environmentally responsible way.

At the heart of our business lies a firm commitment to finding ways of minimizing our impact on the environment and a desire to inspire others to follow our leadership.

We may be a young company, but we are serious about climate change, serious about the environment, and serious about our Corporate & Social Responsibility (CSR).

We were the first GCC (Gulf Cooperation Council) company to join the 3C (Combat Climate Change) initiative. We're one of the first companies to pioneer corporate recycling in the United Arab Emirates.

And we're the first Middle East-based corporations to sign up to atmosfair, a German organization specializing in carbon offsetting for business flights.

Every day, our people do all they can to monitor and reduce emissions of harmful greenhouse gases at our assets across the world. As you read through this brochure, you will discover the steps we have taken to implement our CSR policy into our everyday business. Some are on an industrial scale with scope for major change. Others are so small sceptics might deem them to be insignificant. I disagree. They all count.

Climate change affects us all. Each and every one of us has a responsibility to take a lead in reducing our environmental impact and supporting a move towards a low emissions economy.

At TAQA, that's just what we're doing

FRESHFIELDS BRUCKHAUS DERINGER

Creating legal frameworks in emerging nuclear markets

'NUCLEAR NEW BUILD' IN EMERGING NUCLEAR MARKETS HAS A VERY DIFFERENT MEANING FROM 'NUCLEAR NEW BUILD' IN ANY COUNTRY WITH EXISTING NUCLEAR CAPACITY

Nuclear new build is not just physical infrastructure; it also calls for the fundamental reappraisal of existing legal frameworks. A comprehensive framework of nuclear laws must be based on three pillars: the international nuclear law, a coherent domestic regime of nuclear law and regulation and special procurement arrangements. In building up from these pillars, the right balance needs to be struck between the needs and expectations of the international nuclear community, sovereign states and the international supply market. In developing their legal framework, emerging nuclear countries face extraordinary challenges but also have an unprecedented opportunity to learn from others' experience and lead the global nuclear renaissance in certain key ways.

International regime

Emerging nuclear states will need to obtain the confidence of the international nuclear community. The first step is actively to engage with that community by:

- committing to non-proliferation and facilitating adherence through a comprehensive safeguards agreement with the International Atomic Energy Agency (IAEA);
- obtaining IAEA membership and strengthening co-operation; and
- ratifying the key international nuclear instruments.

Domestic regime

The domestic legal framework should be developed based on the following:

- implementation of international commitments and obligations;
- international best practice, at a minimum complying with the IAEA Basic Safety Standards;
- international experience in key areas such as licensing and permitting; and
- existing domestic legal practices and cultures.

The legal framework should establish an independent and robust nuclear regulatory body.

Procurement regime

There are a variety of approaches to procurement, all of which must consider the unique risk profile for nuclear power plants. A turnkey contracting approach may be favoured due to the lack of domestic human resources. This approach is assisted by the fact that many procurement arrangements involve developer consortiums, comprising the reactor supplier, the civil works contractor and, possibly, the operator and the fuel supplier.

The speed at which the legal framework can be adopted is largely dependent on the political will of the state and its legislators, the competence of its external advisers, the capacity of the international supply market and the balance sheet of the development vehicle and/or the liquidity of the financial markets. Conventional, step-by-step approaches are being challenged by states wishing to deploy nuclear power rapidly. At least one emerging market is developing its programme from scratch by launching its request-for-proposal process at the same time as adopting the international regime and developing its domestic regime.

A unique opportunity exists in regions where a number of states are embarking on nuclear programmes. These states have the ability to harmonise legal frameworks and co-operate in certain areas such as licensing and permitting and nuclear liability. This would assist in regional deployment of nuclear reactors, help to overcome human resource shortfalls, facilitate transparency and ensure a coherent regional regulatory framework. States in emerging nuclear markets have the opportunity to lead the way internationally through the development of their legal frameworks for nuclear power.

A detailed discussion of nuclear new build in the Middle East and North Africa can be found at www.freshfields.com/infrastructure.

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Freshfields Bruckhaus Deringer LLP

The Isar Nuclear Power Plant, Germany.

© Dreamstime.com

Judge nuclear on its merits

DR. H-HOLGER ROGNER, SECTION HEAD, PLANNING AND ECONOMIC STUDIES; **DR. FERENC L. TOTH**, SENIOR ENERGY ECONOMIST, PLANNING AND ECONOMIC STUDIES; & **ALAN MCDONALD**, HEAD OF THE PROGRAMME COORDINATION GROUP, DEPARTMENT OF NUCLEAR ENERGY, IAEA

Nuclear power is a technology that is available today, has very low greenhouse gas emissions, and could be expanded substantially to reduce future greenhouse gas emissions. It is on these features – its merits with respect to climate change – that it should be judged in climate change deliberations. The current exclusion of nuclear power from the Clean Development Mechanism and Joint Implementation, indeed the exclusion of any technology with climate benefits, only limits options, flexibility and cost-effectiveness.

VERY LOW GREENHOUSE GAS EMISSIONS

Figure 1 compares greenhouse gas (GHG) emissions from the full nuclear power life cycle — mining uranium; making fuel; building, operating and decommissioning the power plant; and dealing with the waste — to life-cycle emissions from other power generation technologies. The panel on the left shows fossil fuel technologies like coal-fired and natural gas-fired power plants. The panel on the right shows non-fossil technologies like wind, solar and nuclear. Note that the scale for the non-fossil technologies is smaller. It only goes from zero to 180 grams of carbon dioxide equivalent per kilowatt-hour (gCO_2-eq/kWh). The scale for fossil fuels in the left panel goes all the way from zero to 1800 gCO_2 eq/kWh.

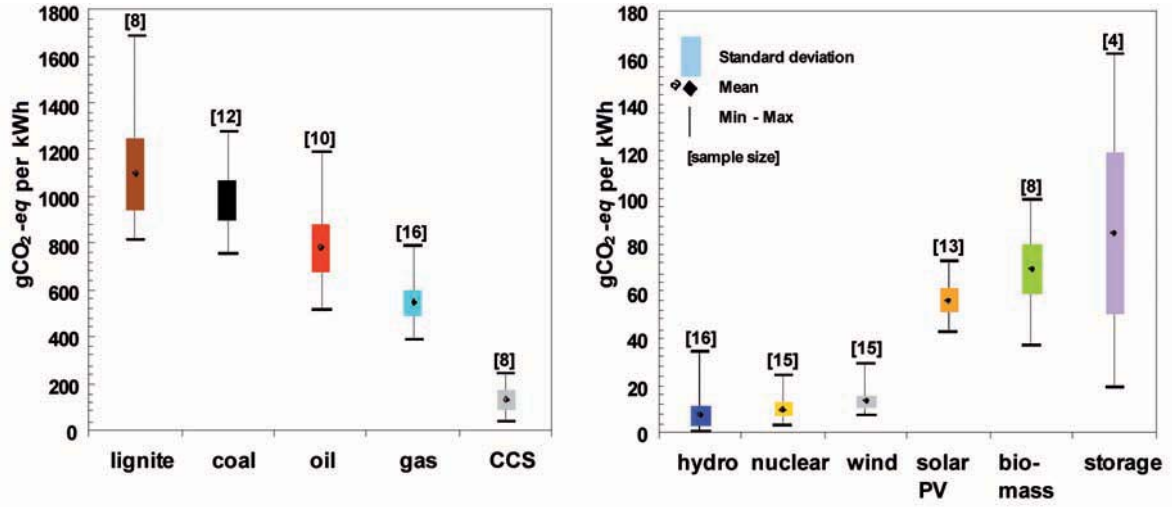
Figure 1 compiles the results of many studies. The bracketed numbers show how many studies were compiled for each technology. Thus there were eight studies that estimated life-cycle GHG emissions for lignite-fueled power plants, twelve studies that estimated emissions for coal-fired plants, and so on. The black dot in the middle of the coloured bar for each technology shows the mean of the emission estimates for that technology. The bar shows one standard deviation around the mean, and the black lines show the highest and lowest estimates for each technology.

Hydropower, nuclear power and wind power have the lowest life-cycle GHG emissions, more than an order of magnitude below fossil-fuel power plants and two thirds below the estimates for solar photovoltaics and biomass. For nuclear power, the mean is approximately 10 gCO_2-eq/kWh, from 15 estimates ranging from 2.8 to 24 gCO_2-eq/kWh. However, because of their intermittent nature, many renewables cannot provide reliable baseload electricity. Thus, while wind and solar power can complement baseload generation, they cannot fully substitute for hydro and nuclear power.

For nuclear power, most of the GHG emissions come from fuel cycle activities 'upstream' of the power plant, including uranium mining, milling, enrichment and fuel fabrication. Most of the variation in nuclear power's estimates comes from different assumptions about the technologies used to enrich uranium, specifically whether gaseous diffusion or centrifuge technology is used and what electricity source is used to power the enrichment plant. Centrifuge technology needs only two per cent of the electricity needed by gaseous diffusion plants, and if the electricity for enrichment is assumed to come from coal-fired power plants, estimated GHG emissions are high; if it is assumed to come from nuclear power, hydropower and wind power, estimated emissions are low.

As centrifuge plants continue to displace retiring gaseous diffusion plants and as more of the power for enrichment plants comes from low-carbon electricity,

Figure 1. Life cycle GHG emissions for selected power generation technologies.



Source: [WEISSER, D., A guide to life-cycle greenhouse gas (GHG) emissions from electric supply technologies, Energy 32 (2007) 1543–1559]. Left panel: fossil technologies. Right panel: non-fossil technologies.

GHG emissions from the nuclear power life cycle will tend toward the lower end of the range shown in Figure 1.

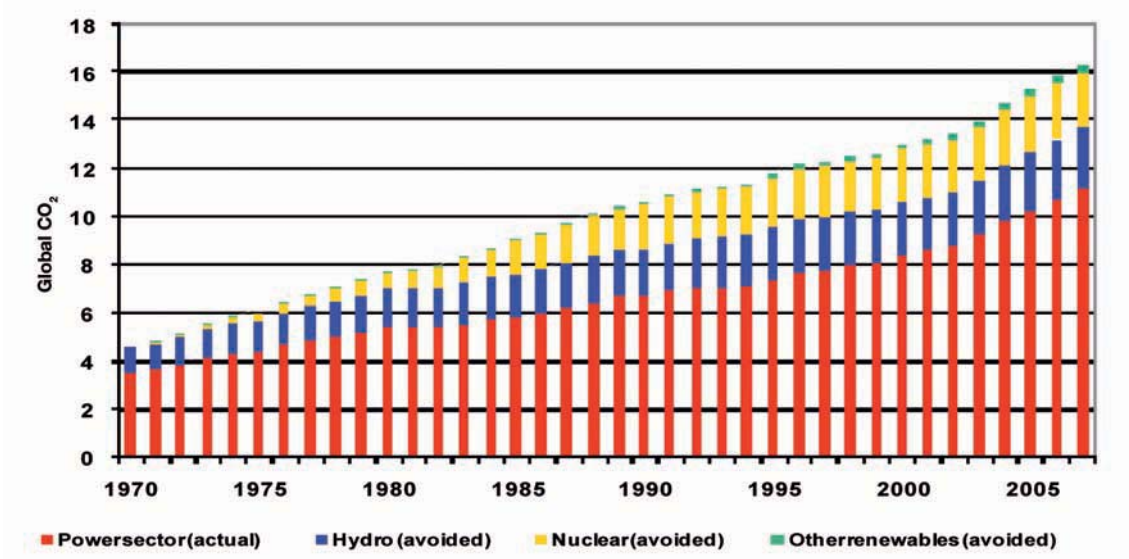
GHG EMISSIONS ALREADY AVOIDED BY NUCLEAR POWER

Nuclear power has been part of the world's electricity supply for over 50 years. Today, there are 436 power reactors in operation around the world, and since the mid-1980s, nuclear power's share of global electricity production has been 14-16 per cent. Thus nuclear power has already avoided significant GHG emissions, about the same as the emissions avoided by hydropower.

The red bars in Figure 2 show the historical trend of CO_2 emissions from global electricity generation. The blue, yellow and green bars are estimates of the emissions avoided by, respectively, hydropower, nuclear power and other renewables. Thus the total heights of the bars are estimates of what the emissions from global power generation would have been without these three electricity sources. In 2007, for example, global CO_2 emissions from electricity generation were about 11 gigatonnes (Gt). But without renewables, hydropower and nuclear power, they would have been an estimated 16.4 Gt.

Such estimates of avoided emissions depend very much on what one assumes would have produced the replacement electricity in the absence of renewables, hydropower and nuclear power. For the estimates in Figure 2, it was assumed that the electricity generated by these three sources would have been produced by increasing the coal-, oil- and natural gas-fired generation in proportion to their respective shares in the electricity mix. This approach probably underestimates the emissions avoided by nuclear power in the 1970s and early 1980s. Many of the new nuclear plants built after the oil crises of the 1970s were intended to reduce oil and gas dependence, and coal plants would more likely have been built in their absence than a proportional mix of coal, oil and gas.

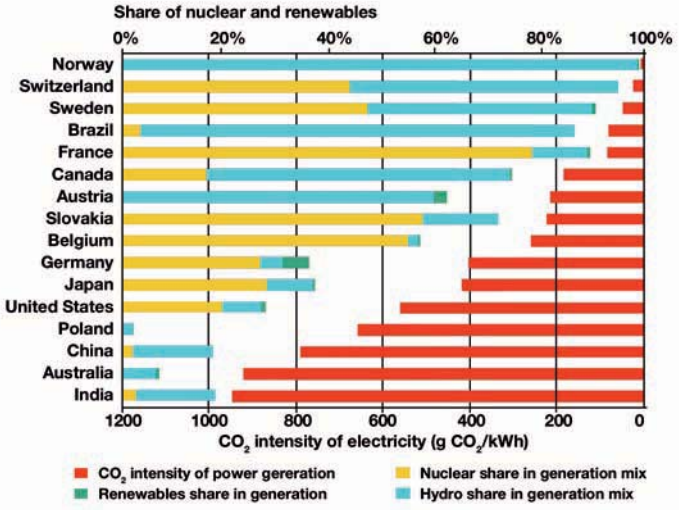
Figure. 2. Global CO_2 emissions from the electricity sector and emissions avoided by three low carbon generation technologies.



Source: IAEA calculations based on OECD International Energy Agency, World Energy Statistics and Balances: Energy Balances of Non-OECD Member Countries, OECD, Paris (2008).

Figure 3 shows, at the national level, the correlation between low CO_2 emissions and high shares of hydropower or nuclear power. The yellow, blue and green bars and the top scale show the electricity shares of nuclear power, hydropower and renewables for each of the countries listed on the left side. The red bars and the bottom scale, which goes from right to left, show the carbon intensity of the electricity in each of the countries. The chart shows that countries with CO_2 intensities that are less than 20 per cent of the world average, i.e. less than 100 gCO_2/kWh, generate 80 per cent or more of their electricity from either hydropower (e.g. Norway and Brazil) or nuclear power (e.g. France) or a combination of the two (e.g. Switzerland and Sweden). At the other end of the scale, countries with high CO_2 intensities of 800 gCO_2/kWh or more have either no nuclear or hydropower in their electricity mix (e.g. Australia) or only limited amounts (e.g. China and India).

Figure 3. Shares of non-fossil sources in the electricity sector and CO_2 intensities for selected countries in 2006.

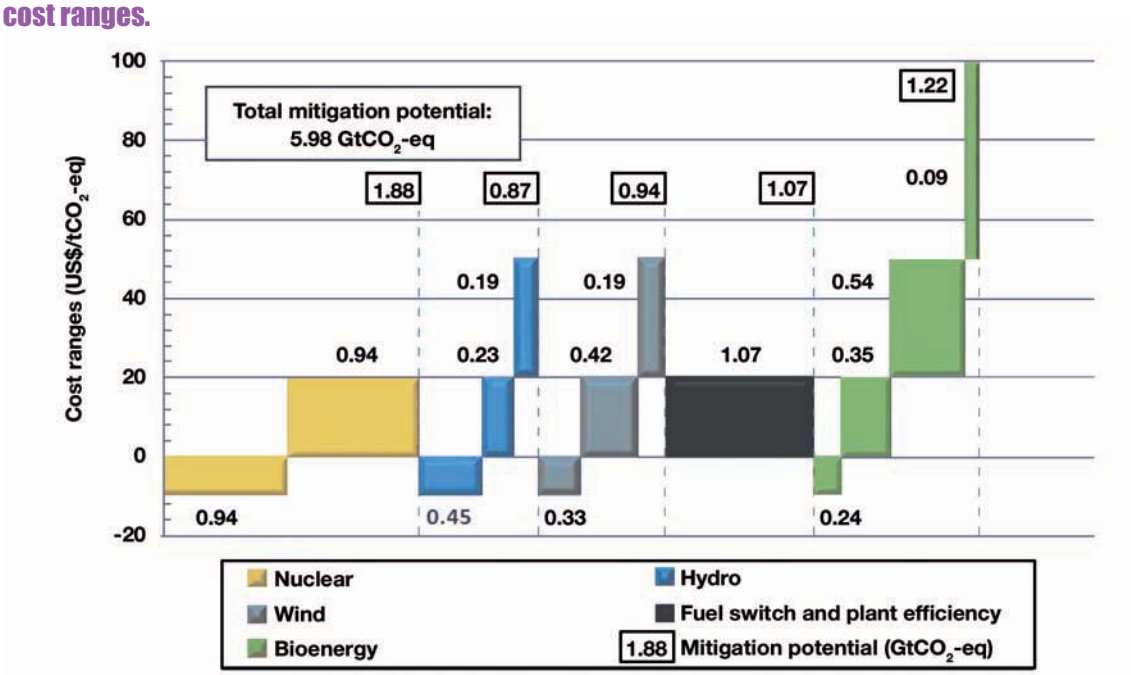


Source: IAEA calculations based on OECD International Energy Agency, CO_2 Emissions from Fuel Combustion, Vol. 2008 release 01 (http://masetto.sourceoecd.org/vl=2367203/cl=14/nw=1/rpsv/ij/oecdstats/16834291/v335n1/s4/p1).

LARGE GHG AVOIDANCE POTENTIAL FOR THE FUTURE

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) estimates the future GHG mitigation potential of various electricity options, specifically fuel switching among fossil fuels, nuclear power, hydropower, wind power, bioenergy, geothermal, solar photovoltaic, concentrating solar power, as well as coal and gas with CO_2 capture and storage. The IPCC analysis starts with the reference scenario in the *World Energy Outlook 2004*, published by the OECD International Energy Agency. It then estimates the GHG emissions that could be avoided by 2030 by adopting various electricity generating technologies in excess of their shares in the reference scenario. The analysis assumes that each technology will be implemented as much as economically and technically possible taking into account practical constraints such as stock turnover, manufacturing capacity, human resource development and public acceptance. The estimates indicate how much more (relative to the reference scenario) of each low carbon technology could be deployed at different cost levels. The costs are the difference between the cost of the low carbon technology and the cost of what it replaces. The estimates are shown in Figure 4 for technologies with mitigation potentials of more than 0.5 $GtCO_2$-eq.

Figure 4. Mitigation potential in 2030 of selected electricity generation technologies in different cost ranges.



Source: Based on data in Table 4.19, p. 300, of Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (Metz, B., Davidson, O.R., Bosch, P.R., Dave, R., Meyer, L.A., Eds), Cambridge University Press, Cambridge (2007).

urenco

enriching the future

URENCO - fuels nuclear power

To meet the growing energy demands of the world's increasing population, the electricity supply of the future has to be safe, clean, secure and cost-effective. With carbon emissions threatening the delicate stability of our planet, the development of a sustainable mix of energy sources is perhaps the most pressing challenge facing the world today. Nuclear power provides an essential part of this mix.

URENCO believes nuclear energy must be part of the solution to this complex problem and is well positioned to play a significant role in delivering that solution.

With the benefit of almost 40 years of expertise and continuous improvement, URENCO is today a leading supplier in the extended global enrichment market and positioned at the heart of the global nuclear industry.

Using our own centrifuge technology our focus is on providing safe, cost effective and reliable uranium enrichment services for civil power generation.

Nuclear fuel, as opposed to fossil fuel, is used in comparatively low quantities. This is illustrated by the fact that the 15% global electricity supply that is produced by nuclear generation today only uses 7,000 tonnes of enriched fuel per annum. The same amount of coal is burnt in a 1,000 mega watt coal plant per day.

The uranium that fuels nuclear power is found in abundance in both earth and seawater. It is a metal that occurs naturally like tin, silver or lead. Currently natural uranium is mined from Australia, Canada, Kazakhstan and southern Africa. The plentiful supply of uranium is more than sufficient to meet the current and future global demand for nuclear fuel.

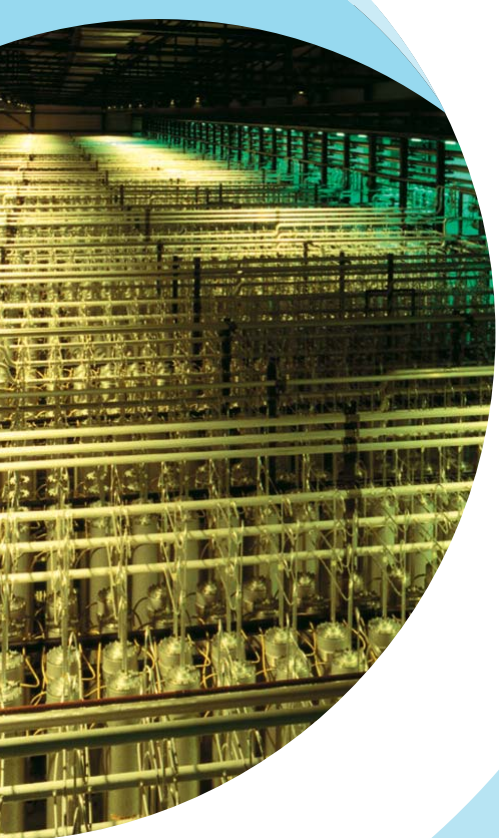
Uranium is made up of two isotopes: U235 and U238. It is the U235 that is used in the production of nuclear fuel. U235 makes up 0.7% of natural uranium and therefore needs to be enriched to around 4% before it can be used as a fuel in nuclear reactors.

URENCO's world-leading centrifuge technology rotates uranium at high speed in an almost frictionless environment. As the centrifuge spins, the centrifugal force separates the uranium by pushing the heavier isotope, U238 closer to the outer wall. As the process continues, the gas closer to the wall becomes depleted in U235, while the gas nearer to the rotor axis conversely becomes enriched in U235.

By using more enrichment, the utilisation of nuclear fuel can be enhanced. This ultimately reduces the amount of radioactive waste and, in addition, decreases the amount of natural uranium needed.

URENCO currently supplies around 25% of the global enrichment market, with demand for our services continuing to increase. We believe that nuclear power is an essential element for the future energy mix, thereby meeting the need for a sustainable global energy supply.

We believe that the future needs nuclear power in order to provide a reliable and secure supply of electricity without inducing climate change. Nuclear power can overcome the concerns of security of supply as oil and gas resources deplete and create a domestic source of energy, which is essential to protect against the risk of supply interruptions and the unpredictable costs of imported fuel.



URENCO is committed to supporting the nuclear industry by providing a secure supply of fuel to utilities worldwide.

www.urenco.com

Reactors under construction at the Kudankulam nuclear power plant, India.

The width of each rectangle in Figure 4 is the mitigation potential of that technology for the carbon cost range shown on the vertical axis. Each rectangle's width is shown by the number directly above or below it. Thus, nuclear power (the yellow rectangles) has a mitigation potential of 0.94 $GtCO_2$-eq at negative carbon costs plus another 0.94 $GtCO_2$-eq for carbon costs up to \$20/tCO_2. (Negative cost options, in the IPCC report, are those options whose benefits such as reduced energy costs and reduced emissions of local and regional pollutants equal or exceed their costs to society, excluding the benefits of avoided climate change.) The total for nuclear power is 1.88 $GtCO_2$-eq.

The figure indicates that nuclear power has the largest mitigation potential at the lowest average cost in the energy supply sector. Hydropower offers the second cheapest mitigation potential but its size is the lowest among the five options considered here. The mitigation potential offered by wind energy is spread across three cost ranges, yet more than one third of it can be utilized at negative cost. Bioenergy also has a significant total mitigation potential but less than half of it would be available at costs below \$20/tCO_2-eq by 2030.

NUCLEAR WASTE

An important concern is radioactive waste, which can create hazards for humans and the environment for centuries – or millennia. Over the past two decades, major scientific and technological advances have been made towards the safe storage and final disposal of radioactive waste.

Disposal in geological media is considered a safe method for sufficiently isolating radioactive waste. Geological repositories are designed to be passively safe, with long term safety ensured by multiple engineered and natural barriers. The first such repositories are scheduled to go into operation in Finland and Sweden in the early 2020s.

Most countries have already internalised the external costs of radioactive waste by requiring nuclear power plant operators to pay a fee, to finance final geological disposal, for every kilowatt-hour they generate.

JUDGE NUCLEAR POWER ON ITS MERITS

Nuclear power has very low greenhouse gas emissions (Figure 1), and, according to the IPCC's analysis, it has the largest mitigation potential at the lowest average cost in the energy supply sector (Figure 4). These are the merits on which nuclear power should be judged in climate change deliberations.

Yet nuclear power is currently excluded from the Clean Development Mechanism and Joint Implementation. Such exclusion cannot be based on climate concerns.

The underlying concerns about nuclear power are that it could be unsafe, uneconomic, or associated with weapons production. But we respectfully suggest that negotiations on climate change are not the appropriate forum to deal with any of these concerns. As regards safety, the Convention on Nuclear Safety provides an effective international mechanism for review. Regarding costs, it is investors who are best equipped to forecast what will be economically attractive now and in the future. And, as concerns proliferation, there is in place the now indefinitely extended Non-Proliferation Treaty, and the growing adherence to the Additional Protocol, which further strengthens the safeguards agreements under this Treaty.

The UN Commission on Sustainable Development has concluded that although countries disagree on the role of nuclear power in sustainable development, "[t]he choice of nuclear energy rests with countries". It is not for climate change agreements to remove that choice. The best chance for sustainable development – for meeting the needs of the present without compromising the ability of future generations to meet their needs – lies in allowing those future generations to make their own decisions about energy supply options, and allowing these options to compete on a level playing field.

Authors

Dr. H-Holger Rogner received an MSc in industrial engineering and a PhD in energy economics. He joined the IAEA in 1997 as Section Head, Planning and Economic Studies Section. His work focuses on the contributions to sustainable energy development of different energy demand and supply options, and capacity building in energy-environment planning in developing countries.

Ferenc L. Toth is a senior energy economist in the Planning and Economic Studies Section of the IAEA's Department of Nuclear Energy. His work includes energy-economy-environment interactions, energy economics and policy analysis at national to global scales, indicators and studies on strategies for sustainable energy development, and economic and policy analyses of climate change impacts, adaptation and mitigation.

Alan McDonald is Head of the Programme Coordination Group in the IAEA's Department of Nuclear Energy. The Department supports Member States in improving the performance of nuclear power plants and the nuclear fuel cycle, catalysing innovation, building energy planning capabilities around the world, managing nuclear knowledge, and advancing science and industry through improved operation of research reactors.

Organisation

The IAEA was created in 1957 and now has 150 Member States. Its mission is "to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world". It assists Member States in their use of nuclear technologies in medicine, power production, agriculture, environmental monitoring, and industry. It also verifies compliance by the parties to the Treaty on the Non-Proliferation of Nuclear Weapons with their obligations under the treaty.

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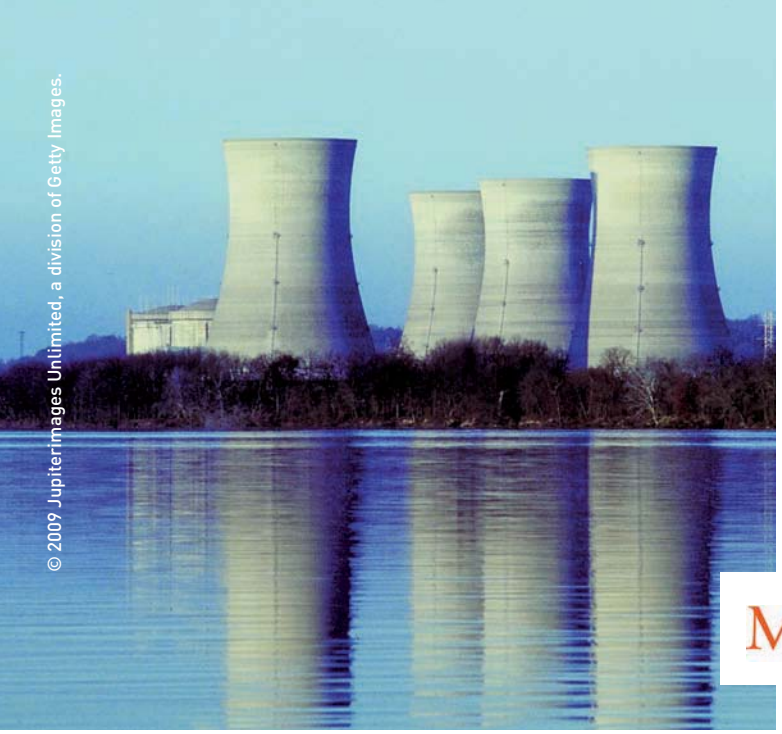

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Siting:

AN ESSENTIAL ELEMENT OF ANY NUCLEAR PROGRAMME THAT WARRANTS EARLY CONSIDERATION

Morgan Lewis

There is a clear scientific consensus that nuclear power is a proven, available technology that could be expanded substantially to reduce future greenhouse gas emissions. At the same time, any country considering development of a nuclear power programme should not do so lightly, and must recognise the significant time commitment and complexities involved.

A NUCLEAR POWER PROGRAMME

In its publication titled *Milestones in the Development of a National Infrastructure for Nuclear Power* (the IAEA Milestone Guide), the International Atomic Energy Agency (IAEA) estimates that the introduction of a new nuclear power programme involves a 100-year commitment to create and maintain a national infrastructure, and that it will take 10 to 15 years from the decision to launch such a programme to the operation of the first nuclear plant.

Over this period, those developing nuclear programmes will be confronted by numerous complex and interrelated challenges. The IAEA Milestone Guide outlines 19 essential programme elements and, with respect to each element, highlights issues to consider at three distinct stages – at the time of making a knowledgeable commitment to nuclear; at the point of inviting bids for services; and upon commissioning operations.

Addressing each programme element in a logical and cost-efficient manner, and in the right sequence, may be the difference between 19 insurmountable obstacles and 19 pillars of a successful programme. For example, certain elements will become the foundation from which other elements will be developed, and they are also relatively inexpensive. Developing a national position statement, the necessary legislative framework, and the implementing regulations would appear to fall into this category. Other programme elements by definition will be slow to develop and involve considerable cost, such as the development of nuclear capability and experience among the indigenous population, an electric grid sufficient to support eventual nuclear operation, and a security and physical protection regime necessary to receive and possess nuclear material.

PRELIMINARY SITE SURVEYS

One element that should be explored early, and can be done on a relatively cost-effective and graded basis, is a preliminary site survey. Site surveys involve applying an increasing number of technical and socioeconomic criteria to an ever decreasing number of potential sites or geographic areas. Initially, the survey would employ relatively objective technical exclusionary criteria to eliminate sites or regions. As the name suggests, exclusionary criteria are those that, if not met, exclude that site or region from further consideration. Exclusionary criteria involve such subjects as geology and tectonics, seismology, population profiles, the availability of an adequate water supply for plant cooling, and other selected infrastructure considerations. Once certain areas have been eliminated from further consideration, refined and more exacting criteria are applied relative to these same technical areas, and socioeconomic considerations are weighed. Such considerations include environmental protection, risks from other manmade facilities, ease of access, public interaction and interest, and vulnerability to malicious acts.

Through early conduct of a site survey applying exclusionary criteria at relatively minor expense, a country can eliminate certain potential sites and regions, and have a scientific basis to consider a limited number of sites in more detail.

Narrowing the number of potential sites early, based upon sound science, also has an added benefit when testing stakeholder and public support, investor interest, and the willingness of continued industry involvement. Experience also shows that programme development is accelerated when conducted along with an actual project, as opposed to a theoretical concept. Site selection can test project feasibility without the significantly greater expense involved in choice of technology and reactor design, and the purchase of long-lead components.

Author

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Greening European transport with sustainable biofuels

More and more drivers are discovering the advantages of switching to sustainable biofuels.

MATTHIAS RUETE, DIRECTOR-GENERAL FOR ENERGY AND TRANSPORT AT THE EUROPEAN COMMISSION

The new European Union (EU) Climate and Energy policy legislation has made the EU the frontrunner in the fight against global climate change. At the same time it provides a major contribution towards tackling the challenge of energy security. This new legislation includes a framework for renewable energy and binding targets for 2020 with a 20 per cent overall share of renewable energy and a 10 per cent renewable energy share in transport. It represents a green "new deal" which will encourage innovation, provide new business opportunities and create new green jobs. It also includes the first biofuels sustainability scheme that is binding for both European producers and international producers exporting to the EU market. We want to prove that sustainably-produced biofuels and the use of other types of renewable energy in transport can significantly improve the environmental performance of the transport sector. We also want to demonstrate that these aims can go together with the competitiveness of the European economy and sustainable development in our Member States as well as in third countries.

WHY DOES EUROPE NEED MORE BIOFUELS?

There are good reasons for an ambitious renewable energy policy in transport, including an increasing use of biofuels. Like any other element of our energy policy, it ties in with objectives of sustainability, competitiveness and security of supply.

Firstly, biofuels will contribute to sustainability because biofuels are produced from plants that absorb the CO_2 they generate when they are burnt. We want to decarbonise transport by 2050. While it is true that the growth, transformation and transport of biofuels involve energy consumption and CO_2 emissions, so too does the extraction, refining and transport of oil, while the latter does not absorb any CO_2.

Secondly, for security of supply reasons, Europe needs to increase the use of renewable energy in transport, including biofuels. Most of the biofuels consumed in Europe can also be produced in the EU. That will reduce substantially our foreign oil dependency which is set to increase significantly in the years to come. The transport sector, with a dependency on oil of more than 90 per cent, is particularly vulnerable to fluctuations in foreign supplies and biofuels are currently the only alternative to oil in this sector.

A third reason for more biofuels in Europe is maintaining our competitiveness. Growing energy crops is a positive agricultural alternative for European farmers. Many other countries also see bioenergy as a potential chance to increase their exports and to create new income and work opportunities for their farmers. Strict sustainability requirements will ensure that biofuels development does not harm the environment or social wellbeing in producer areas.


Rapeseed can be used to create clean biofuels.

EUROPEAN SUSTAINABILITY SCHEME FOR BIOFUELS

The EU has promoted biofuels since the late 1990s, when the first renewable energy strategy was adopted. Specific legislation on the promotion and use of renewable transport fuels followed in 2003. With the new Climate and Energy Package, the legal framework for the promotion and use of renewable energy, including biofuels, is the new Renewable Energy Directive.

With this piece of legislation, the EU has set an example in the area of biofuels. In the Commission we are of course well aware of the debate surrounding the overall sustainability of biofuels. For that reason, the 10 per cent binding target for renewable energy use in transport is accompanied by a set of binding sustainability criteria for biofuels produced or consumed in the EU. This is the first time that binding sustainability criteria have become law and we hope that this will encourage other biofuel producer and consumer countries in the world to follow the same path.

The EU biofuel sustainability criteria contains a minimum greenhouse gas saving requirement expressed in a comparison to the use of conventional fuels (35 per cent, rising to 50 per cent in 2017 and 60 per cent in 2018 for new installations). In this way we can be sure that only those biofuels that lead to real reductions in greenhouse gas emissions are promoted. The criteria also include a ban (for biodiversity reasons) on using biomass from primary forest, nature protection areas or highly biodiverse grassland, and (for carbon stock reasons) on using biomass from land that was previously wetland, forest or undrained peatland. The biofuel sustainability scheme also requires companies to report on what environmental and social impact has resulted from increased biomass use for biofuel production.

The Commission has started to monitor and report regularly on the impact of an increased demand for biofuels on the social sustainability in the EU and third countries, and the availability of foodstuffs at affordable prices, in particular in developing countries. Similarly, we will keep an eye on land and labour issues related to the increased demand for biofuels in the EU and in third countries.

Looking forward to second-generation biofuels

Today most biofuels used in the EU are so-called first generation biofuels. They are produced from rapeseed, wheat, sugar beet and sugarcane. We thus clearly recognise the need to promote more advanced technologies, in particular second generation biofuels produced from waste, residues and ligno-cellulosic material. The contribution from these technologies counts double towards our target, making it easier to reach.

The European approach to the support of advanced technologies has also been confirmed in the Strategic Energy Technology (SET) plan, which foresees a better coordinated and streamlined support to key areas, such as bioenergy and second generation biofuels. The EU research budget is the main tool used by the European Commission to support the development of innovative energy technologies and their subsequent deployment in the market.

With the adoption of the sustainability rules for biofuels and bioliquids, the Commission is committed to exploring the possibility of adopting a similar sustainability approach to other uses of biomass for energy purposes. This work is ongoing. The aim is to publish a report and, if appropriate, a proposal for a scheme for biomass sustainability by the end of this year.

FROM LEGISLATION TO ACTION

The adoption of the Climate and Energy Package – one of the highest priorities under the first Barroso Commission's mandate – has confirmed the determination of the EU to move towards a low carbon economy in which renewable energies, including biofuels for transport, play a significant role.

> “This is the first time that binding sustainability criteria have become law and we hope that this will encourage other biofuel producer and consumer countries in the world to follow the same path”

The emphasis is now on moving to implementation and action on the ground as the targets are truly ambitious. Meeting them will require a change in our approach to energy supply and consumption. We all have a huge challenge in front of us, a challenge which we can only successfully overcome with strong and determined efforts at all levels.

New legal requirements

The new legal requirements for sustainable biofuel production will put new demands on European producers and international biofuel producers exporting to Europe. For Member States' governments and administrations it will mean new evaluation and control functions. In this

multi-level framework, the European Commission has also committed to regularly monitor and report to the European governments and elected representatives of the European Parliament on the implementation of the European biofuel sustainability criteria and the impact of an increasing biofuel production.
Our work on the implementation of the new scheme is well on track. We are currently working out the practical guidance for the EU and third country producers to help them in adapting to the environmental criteria and to the numerous information compilation and reporting tasks in order to document each step in their biofuel production pathway. We have also engaged in dialogue with international partners in view of facilitating the compliance with EU rules for biofuel producers from third countries. Last but not least, the Commission is studying the indirect land use change phenomenon associated with increased biofuel production. This work, which could result in new policy proposals, will be completed next year.

Facing the challenges ahead

Our experience in designing the EU sustainability scheme proves that it is not easy to be a pioneer. Once acclaimed for their potential environmental benefits, biofuels have come under fire over the last few years for allegedly causing damage to the environment, influencing the commodity markets and posing risks to food insecure developing countries.
The EU has not remained silent in this debate. From the very outset our biofuels policy has been designed to include sustainability requirements, and these sustainability safeguards have been built up during the legislative process. The European Commission has been entrusted by the Member States and the European Parliament to remain active in the scientific debate on the merits and impacts of increased biofuels use. We are also actively working with our international partners to promote the sustainable production of biofuels not only within the EU, but also on a global scale.

> “The transport system’s almost exclusive reliance of fossil fuels must change radically in the decades to come”

While the challenges that we have to tackle are daunting, they also represent nothing less than the industrial opportunity of this century. It takes courage to seize this opportunity. I am proud to see European companies investing in renewable energy projects in the EU and beyond its borders.
Preparing for the decarbonisation of the EU’s energy sector remains a key priority on our political agenda. Investments in energy infrastructures last for decades. It is therefore necessary to start thinking about where we should be by 2050 – and to agree on how to get there. In so doing we should put a strong emphasis on the transport sector – it has too long been the black sheep of the family when it comes to reducing CO_2 emissions. The transport system’s almost exclusive reliance of fossil fuels must change radically in the decades to come. In addition to an increase in the use of biofuels, tighter links with the electricity system represent another aspect of this transformation. A better integration of the energy and transport systems will, together with a much stronger focus on renewables and on using energy more efficiently, be key in bringing us onto a truly sustainable path where the needs for energy services can be met without putting the global climate, the environment and the prosperity of our children and grandchildren at jeopardy.

Author

Matthias Ruete has been the European Commission’s Director-General for Energy and Transport since 2006. He joined the European Commission some twenty years ago and held a variety of positions dealing with the internal market, EU enlargement, industrial and research policy, and energy and transport policy before attaining his current role. Matthias Ruete holds a PhD in law following studies in Germany and the UK. Before joining the European Institutions, he lectured on European and international law in the UK.

Organisation

The Directorate-General for Energy and Transport is responsible for developing European policies in the energy and transport sectors within the European Commission. Policies need to take into account safety and security, economic and environmental factors, as well as social needs and the international dimension of these issues. The Directorate-General, which has a staff of more than 1,200 people, carries out these tasks in many different ways including: developing strategic policies; proposing new and monitoring the implementation of existing EU law; encouraging voluntary agreements and the exchange of best practices; co-financing infrastructure in the Trans-European energy and transport networks; and running financial support programmes.

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Eco-efficient aviation:

A DOUBLE VALUE PROPOSITION AT WORK

© Airbus S.A.S. 2009 – Computer rendering by Fixon – GWLNSD

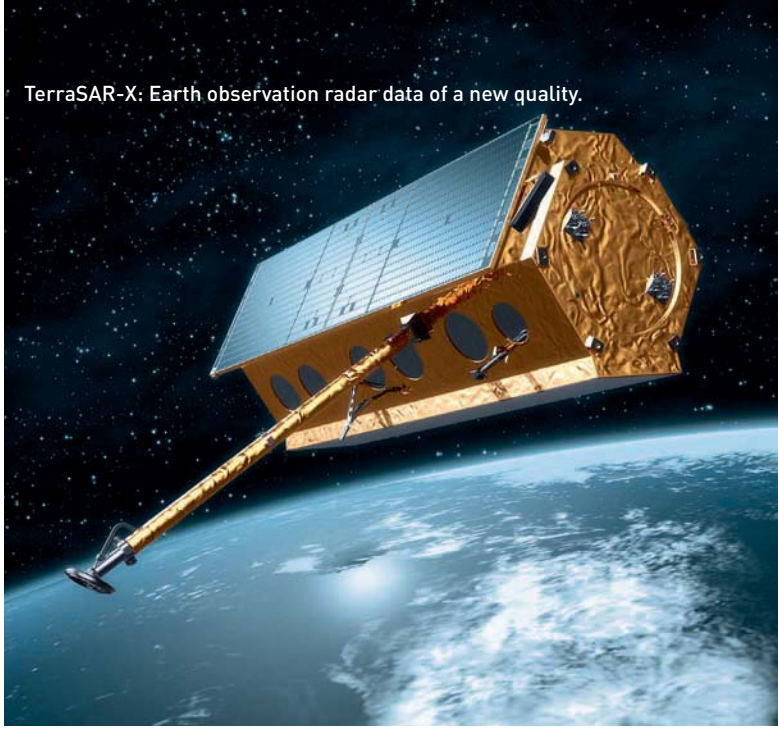
Aviation supports more than 15 million jobs worldwide, connects the world and stimulates international trade. Approximately 2.5 billion passengers and 50 million tonnes of freight are flown worldwide annually. Now, how can the aviation industry make the transition towards a low carbon economy? At EADS, the world's second largest aerospace company, we are convinced that this transition will only succeed if environmental progress also brings economic benefit for companies and societies: eco-efficiency is all about "doing more with less".

Reconciling environmental progress with adding value to the business is not easy to achieve. We are determined, however, to overcome cultural and historic barriers, and to open the way for innovation and sustainable growth. Consequently, eco-efficiency is one of the key targets embedded into the company's long-term strategy, "Vision 2020".

LAYING THE MANAGERIAL FOUNDATION FOR LOW-CARBON SUCCESS

EADS has documented its commitment to eco-efficiency in its Environmental Policy. We are following up on this commitment by establishing an ambitious roadmap aimed not only at making our aircraft more eco-efficient, but turning EADS overall into an eco-efficient enterprise. This roadmap contains clear and ambitious emissions reduction and technology goals, with concrete milestones up to the year 2020. By then we will have met many goals, including reducing both our energy use by 30 per cent and CO_2 emissions by 50 per cent. To achieve this, EADS is moving towards an integrated Environmental Management System with a full life-cycle approach. Computerized reporting tools help us to monitor progress. A full greenhouse gas (GHG) inventory according to UN standards is underway. EADS has established good transparency across the business, which has greatly helped us in forging ahead with ISO 14001 certification. As of today, 62 sites are certified and more than 93 per cent of EADS's 118,000 employees are covered by standards for environmental management (EMAS or ISO 14001). And, as a signatory of the UN Global Compact and the Caring for Climate initiative, we are also committed to selecting and educating our suppliers in terms of how they manage environmental aspects.

The HyLiner, a visionary aircraft concept developed by Bauhaus Luftfahrt. EADS is a founding member of this aerospace think tank.


TerraSAR-X: Earth observation radar data of a new quality.

EMBARKING ON THE JOURNEY TOWARDS GREENER AVIATION

As a major player in civil aviation, a key goal of EADS is to strike a balance between environmental sustainability and the human need for mobility. Our A380 is already currently the world's most eco-efficient airliner.
For the future, our central research unit is inventing lighter materials and, together with partner research institutes and companies, is developing sustainable bio-fuels. Eurocopter's recently launched "Bluecopter" initiative also aims at reducing noise and gas emissions.
As an important part of our approach, EADS is taking into account the entire life-cycle of the product. Within the PAMELA project, over 85 per cent of the components of a narrow-body aircraft will be reused or recycled.

MONITORING OUR ENVIRONMENT FROM SPACE

Space technology is a key asset when it comes to understanding and monitoring climate change – for example the European Union's "Kopernikus" project to which EADS is making important contributions. EADS's space technology division Astrium has developed, manufactured and launched into service numerous observation satellites dedicated to the environment, including Envisat, the largest Earth Observation spacecraft ever built. With its sophisticated optical and radar instruments, it is helping to monitor our environment from above.

INDUSTRY AND POLITICS JOIN FORCES FOR THE ENVIRONMENT

Single-product or company initiatives alone will not be sufficient to tackle climate change. A systemic approach is needed – an approach to which EADS is fully committed. A revamped Europe-wide air traffic management system will save millions of tons of CO_2 emissions. In June 2009, Airbus became a full member of the SESAR Joint Undertaking, a unique Private-Public Partnership to modernize air traffic management (ATM).


The A380 – the most efficient airliner in service today – respects our environment while answering the human need for mobility.

In another 'systemic' approach, EADS is taking a leading role in the European Clean Sky initiative to further drastically reduce emissions from commercial aircraft. The Group is underlining its commitment with huge investments. Of course, EADS's Airbus division has also subscribed to the 2020 goals of the Research and Technology Advisory Council for Aeronautics Research in Europe which stipulates the reduction of CO_2 emissions by 50 per cent, aircraft noise levels by 50 per cent and NOx emissions by 80 per cent.
EADS strongly believes that actions to protect the environment and combat climate change can be harnessed in favour of economic growth. To do so, industry and politics must join forces, through well-targeted policy instruments encouraging investment and technological development.

RECONCILING MOBILITY AND SUSTAINABILITY

Reconciling mobility and sustainability is a tough challenge, but EADS will master it. We feel a strong responsibility towards both our economies and societies. EADS and its employees are proud of this responsibility and are taking up the challenge. By taking on such difficult challenges – and creating the breakthrough technologies needed to master them – EADS is leading the way in making the fascinating aerospace industry eco-efficient. We invite everyone to join us in this effort!

Organisation

EADS is a global leader in aerospace, defence and related services. In 2008, EADS generated revenues of EUR 43.3 billion and employed a workforce of about 118,000. The Group includes Airbus, Eurocopter, EADS Defence & Security and EADS Astrium.

Enquiries

Website: www.eads.com

© Pratt & Whitney

PurePower® PW1000G Engine.

Jet engine technology:

AT THE HEART OF AVIATION CLIMATE DISCUSSION

Pratt & Whitney
A United Technologies Company

The aviation industry, and more specifically jet engine manufacturers, have aggressively worked for decades to make their products more fuel efficient with less noise and significantly reduced emissions.

US-based Pratt & Whitney, which has been building jet engines for nearly 85 years, is nearing the assembly phase for a new family of engines that it claims is revolutionary and will 'change everything.'

The company's PurePower® PW1000G engine is the first of a new class of ultra-high bypass ratio, geared turbofan aircraft gas turbine engines that set a new standard for fuel economy and all aspects of environmental performance – including significant reductions in CO_2, NO_x particulates, and noise.

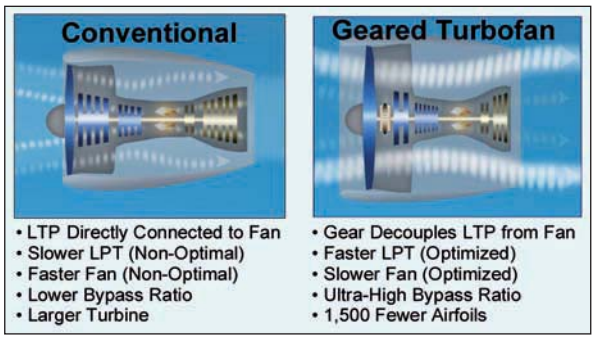
"Each PurePower PW1000G engine will reduce fuel consumption by 15 per cent or more and CO_2 by 1,500 tons per year at the 150 passenger size," said Alan Epstein, Pratt & Whitney vice president, Environment and Technology. "We anticipate a market for 10,000-20,000 engines of this size, for a total CO_2 savings of as much as 30 million tons per year."

In addition to pronounced fuel consumption and CO_2 reduction, the PurePower PW1000G engine family will be the quietest commercial aircraft engine ever built at this size and will produce the least NO_x and numbers of particulates – less than 50 per cent of the NO_x allowed under current standards. This is important because in addition to CO_2, NO_x is a greenhouse gas responsible for a considerable portion of the forces driving climate change.

"Additional environmental benefits include improvements to local air quality through the reduction of NO_x and particulates as well as a dramatic reduction in aircraft noise," Epstein said.

The reduction in noise is so significant that less than one quarter as many people on the ground will be subjected to objectionable noise-levels as is currently the case for the most modern 150 passenger aircraft. This will also help airlines reduce or eliminate takeoff and landing noise tariffs, noise-related flight curfews and will provide opportunities to use more direct flight paths.

The environmental benefits touted by Pratt & Whitney are possible because of the innovative architecture embodied in the PurePower engines that represents a step change from past practice. These engines incorporate three innovative elements – a light, longlived fan; drive gear system; an ultra efficient, light weight fan and an advanced nacelle system. Each element alone could contribute about a two per cent reduction in fuel consumption if added to a conventional engine architecture. However, the combination of all three in an integrated, optimised design enables low velocity, ultra-high bypass ratios of 12 and above yield-gains of 15 per cent or more reduction in fuel consumption and thus corresponding CO_2 reduction.



With all of the extraordinary benefits associated with this engine, it begs the question why other companies are not pursuing this technology. The answer is that Pratt & Whitney has invested approximately $1 billion in research over 20 years to mature the technology.

Bombardier and Mitsubishi apparently recognise the benefits of this advanced technology as both have selected the PW1000G engine as the exclusive powerplant for their all new aircraft, known as the CSeries and Mitsubishi Regional Jet, respectively. Not surprisingly, the aircraft are attracting customers with environmental and economic benefits powered by this amazing engine.

Enquiries

For more information about the PurePower PW1000G engine, visit www.PW1000G.com

Shipping and climate change

World trade has always depended on ships to efficiently move goods and materials. Today they carry 90 per cent of world trade. Through the centuries the shipping industry has risen to many challenges to provide this vital service. The reality of man-made climate change presents shipping with another profound challenge – how to balance demand growth whilst reducing greenhouse gas (GHG) emissions.

PLOTTING A COURSE TOWARDS EMISSIONS REDUCTIONS

Ship engines emit CO_2 at a ratio of 3:1 per tonne of fuel consumed. A recent study by the International Maritime Organisation (IMO) concludes the shipping sector collectively emits approximately 850 million tonnes of CO_2 per annum; representing approximately 2.7 per cent of the world total CO_2 and similar to land-based emissions produced by Germany or Japan.

WHAT CAN BE DONE?

The key to effective emissions control in the maritime sector lies with optimising reductions over the supply chain, and not just looking at the hardware of single ships. In order for this change to materialise, realistic and achievable reduction targets must be applied.

Developments in slow speed two-stroke diesel engine design over the years have achieved a thermal efficiency approaching its theoretical limit. However, scope remains to improve efficiency through heat recovery, in exhaust streams and cooling water systems, as well as propeller and rudder designs. Innovative propulsion assistance concepts are being developed, including a 'kite' system and the development of the flettner rotor to harness wind power. Overcoming wave and water resistance increases fuel consumption. Reducing resistance through improved hull designs, 'slippier' hull coatings, and by introducing airflows under the vessel's hull saves fuel. Unfortunately, these innovative solutions are only likely to deliver reductions in the range of between 15 and 30 per cent depending on the type of vessel; a result that is considerably short of the reductions expected.

Revolutionary concepts for energy efficient ships of the future have been proposed but remain only concepts. Such vessels would utilise wave, solar and wind power to dramatically reduce their carbon footprint. Given that these concepts are untested, that the current world fleet is comparatively young, and a vessel's design life is 25 years, theoretically achievable emissions reductions will not be realised for many decades.

Optimising the environmental performance of a vessel requires behavioral change with ship owners, charterers and cargo owners working to achieve a common goal. This precedent is established in industry to improve safety performance where it is now accepted that making positive behavioural change delivers sustainable gains.

As with other processes, such as driving, it is the manner in which hardware is operated that affects fuel consumption. Ship operators may make energy efficiency improvements to their ships and save fuel by using weather and tides to greater advantage. However, far greater reductions may be achieved by optimising the supply chain through measures such as commercial recognition of efficiency, virtual arrival, ballast passage reduction and just-in-time arrival.

BRIDGING THE GAP

Today's hard truths are that the world fleet does not have measures to minimise GHG emissions incorporated into their designs, and this fleet will essentially continue to serve world trade for at least the next two decades. Modifications and efficiency measures, whilst delivering some benefits, will collectively fail to deliver significant reduction percentages. While far more efficient ships are theoretically possible, the required technology does not exist today and the research and development investment to create change has yet to be made. The industry therefore must develop a solution to bridge the 40-year gap to the ship of the future. This bridge must be through the introduction of market-based instruments (MBIs) tapping into the world's carbon markets, which have been proven to be able to cut pollutants substantially, rapidly and cost effectively.

FINISHED WITH ENGINES?

The realisation of a zero carbon emissions shipping industry is in all likelihood decades beyond the horizon. However, the first step must be to set the industry an emission reduction target to seek new technology and develop long-term solutions. The need to meet public demand for GHG reduction today is imperative, and cooperation to optimise the supply chain can deliver some reductions in the short term. However, physical measures alone are not enough. The shipping industry must be given the opportunity to utilise MBIs in the form of a cap and trade scheme, so successful in land-based industry, creating reductions where they are most efficient and addressing a global problem with a global solution.

Organisation

Shipping Emissions Abatement and Trading (SEAaT) is a cross-industry, unique, pro-active and self-funding group, whose mission is to encourage and facilitate efficient reduction of harmful emissions to air from shipping. Formed in 2002 to raise awareness and acceptance of solutions for emissions reductions that are sustainable, cost effective and achievable, its founding sponsors are shipping and oil companies committed to exploring and implementing cost effective methods of reducing emissions.

Enquiries

Website: www.seaat.org

The maritime climate challenge

© Orchidpoet/Fotolia

After 150 years of industrialisation, global warming now has momentum and it will continue to affect the earth's natural systems for hundreds of years.

EFTHIMIOS E. MITROPOULOS
SECRETARY-GENERAL,
INTERNATIONAL MARITIME ORGANIZATION (IMO)

Mankind is facing a dilemma. For, whether we like it or not, our collective way of life has become unsustainable and we need to do something about it – and soon. The choices we have made about the way we lead our lives have been slowly eating away at the very support system that enables us to live and breathe. This cannot, and should not, go on. Climate change, as explained in this article is a challenge the shipping industry is addressing.

Despite the inertia that characterised initial reactions to early warnings concerning global warming and ocean acidification, it is encouraging that, albeit belatedly, we have now come to acknowledge that increased concentrations of greenhouse gases and the resulting increases in global temperatures are altering the complex web of systems that allow life to thrive on Earth. Cloud cover, rainfall, wind patterns, sea levels and ocean currents, and the distribution of plant and animal species, are, to various degrees, all being affected.

We need to make some tough decisions, we need to make them now and we need to act on them as one, with total and undivided commitment – today and in the future. Faced with facts we cannot argue against, we need to consider our priorities and accept that we have to make certain sacrifices; we need to start putting 'life' ahead of 'lifestyle'.

CLIMATE CHANGE IS INEVITABLE

As a result of past and current emissions of what we now know to be 'greenhouse gases,' climate change seems to have become inevitable. The climate does not respond immediately to external influences but, after 150 years of industrialisation, global warming now has momentum and it will continue to affect the

> "We need to start putting 'life' ahead of 'lifestyle'"

Earth's natural systems for hundreds of years, even if greenhouse gas emissions are reduced immediately and their levels in the atmosphere stop rising.

To introduce a maritime analogy, climate change is like a giant oil tanker, in that, stopping it, or even altering its course, not only takes a massive force but also a considerable amount of time and distance – even though it only takes a light push on the right button on the engine panel or the autopilot to actually initiate the action of stopping or changing course. In the analogy, the oil tanker is the world going about its business as usual, the massive force would be the world community forcing world leaders to act, and the push on the right button would

be Ministers and Heads of State acting decisively and in concert when they meet in Copenhagen in December of this year to agree on a new treaty instrument to combat, as a successor to the Kyoto Protocol, climate change.

THE COMPLEXITY OF THE SHIPPING INDUSTRY

At IMO, we are heavily and consistently engaged in the fight to protect and preserve our environment – both marine and atmospheric. Having achieved a breakthrough in 2008 in our efforts to reduce air pollution from ships, we are now energetically pursuing the limitation and reduction of greenhouse gas emissions from shipping operations – indeed, when considering which theme to choose for this year's World Maritime Day, we unanimously opted for "Climate change: a challenge for IMO too!", in recognition of the intense focus this topic is receiving within the IMO, especially this year.

Our work on this hugely important subject stems from the genuine concerns for the environment of our Member States and the industry organisations that help us make balanced decisions in the pursuit of the Organisation's objectives – not to mention those entrusted to us under the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol, which specifically provide that the limitation or reduction of emissions of greenhouse gases from ships should be pursued through IMO.

To that end, IMO has established an ambitious but achievable action plan and is now working towards the finalisation of a robust regime that will regulate shipping at the global level and contribute to the deceleration of climate change. Much progress has been made by our Marine Environment Protection Committee on the development of an Energy Efficiency Design Index for new ships and a Ship Energy Management Plan for all ships (which includes guidance on best practices for fuel-efficient ship operations) and an Energy Efficiency Operational Indicator (which helps to determine the fuel efficiency of a ship).

All these efforts, together with a progress report on our discussions on potential market-based mechanisms, will result in a comprehensive package of measures that IMO will be able to convey to the aforementioned Copenhagen Conference.

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The shipping industry has made considerable technical progress to address energy efficiency issues.

Aside from the regulatory arena, which is IMO's main field of competence and responsibility, the shipping industry itself has made considerable progress, from a technical perspective, to address energy efficiency issues. A range of technologies is available that could reduce the emissions from new ships, per tonne/mile, by 15 to 25 per cent, depending on the ship type and size. Some of these are cost-effective in times of high oil prices, while others are not so. The challenge is to provide the industry with incentives to reward carbon efficiency beyond simple fuel-bill reduction and to correct any inefficient behaviour. Since carbon emissions and fuel efficiency are directly linked – in simple terms, the less fuel burned, the smaller the volume of carbon emissions – the efforts to develop propulsion systems and propeller designs that can reduce fuel consumption by about 10 per cent, while delivering the same power output as their predecessors installed some 10 years ago, should be duly recognised. Concurrent improvements in hydrodynamics and vessel hull design have also succeeded in reducing fuel consumption by between two and four per cent.

The complexity of shipping also serves to illustrate just how difficult it is to make the right choices in our desire to play our part in the world efforts to protect and preserve the planet. For example, some argue that reducing a ship's speed by 10 per cent will cut emissions, on average, by 20 per cent and, for some ships, by even 30 per cent. However, to then transport the same quantity of cargo in the same timeframe would mean using more ships – and the alternative would have obvious implications for a world accustomed to 'just in time' delivery.

Larger ships, while offering undoubted economies of scale, will also have implications for port capacity and facilities, which would need to adjust accordingly – not to mention the knock-on effects of networks of 'feeder services', using smaller ships, which would bring their own environmental concerns. The lesson in all this is that we need – before we rush to conclusions – to understand fully the net environmental benefits of all the initiatives, mechanisms and practices that aim to reduce climate change – not just in the shipping arena, but across the board. There should always be a holistic consideration of all the parameters – both positive and negative – of any solution proposed.

GLOBAL ISSUES, GLOBAL SOLUTIONS

Climate change will, of course, affect everybody. No-one can be immune to it. By the same token, responsibility for finding the solution cannot, realistically, be laid at the door of any particular country or group of countries, nor of any particular region or continent – neither should it be pursued through only one or a few human activities. We are, perhaps as never before, all in this together. Successfully addressing the climatic challenges facing us will be far from easy, but the consequences of failing to do so are far too dire to contemplate.

To achieve the desired goals in the fight against climate change, the solutions we will opt for need to be realistic, pragmatic, workable, cost-effective and, above all, well-balanced, implemented through mechanisms that are clear, practical, transparent, fraud-free and easy to administer. I know that there are difficult and complex issues involved, not just from the technical standpoint but from a political perspective too, as they have sensitive connotations, particularly for developing countries, and

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The challenge is to provide the industry with incentives to reward carbon efficiency beyond simple fuel-bill reduction and to correct any inefficient behaviour.

that is something we cannot ignore. If the solutions proposed are to be truly effective in combating climate change, they must be universally applied – and, for this to be achieved, there is a need for global involvement and endorsement by consensus.

In a speech to industry leaders in India in February of this year, United Nations Secretary General Ban Ki Moon accurately summed up the situation when he said, "Industrialised countries bear a great deal of responsibility for the state of the planet today. And they must bear their share of the burden when it comes to paying for solutions. But, at the same time, countries, which did not contribute as much to global warming, still have a responsibility to address it. I don't think this is the time for finger pointing."

> **"If the problem pays no heed to man-made borders, then neither can the solution"**

Paraphrasing President Obama's speech at the Cairo University on 4 June, this is how I would address those who represent industrialised countries and those who represent emerging economies and the developing world: "The two groups are not exclusive and need not be in disharmony with each other. Instead, they overlap and share common principles and objectives: for a safer, more secure and, certainly, cleaner, greener and healthier environment. Humbled by the task before us to do our duty towards our environment, I ask the IMO Members and industry organisations to endorse the belief that the interests we share as citizens of this planet are far more powerful than the forces that drive us apart. All of us share this world for but a brief moment in time. The question is whether we spend that time focused on what pushes us apart or whether we commit ourselves to an effort – a sustained effort – to find common ground and to focus on the future we seek for our children; whether to continue the controversy as to who is to blame for the state of the planet and who should take the first step or how we should all, together, use our gifts to halt the destruction of our common heritage and bequeath, to generations to come, a world we will be proud of."

The message is clear: to succeed in combating climate change, we must work together and play our part with the seriousness that the circumstances demand. If the problem pays no heed to man-made borders, then neither can the solution. We all have a responsibility to take bold, comprehensive and coordinated action that not only jump-starts the recovery of the planet but also launches a new era of serious and meaningful engagement to prevent a crisis, like the one we are facing at present, from worsening or recurring. Working together, with a sense of responsibility for future generations, the agreements the Copenhagen Conference will be able to make later this year can have genuine and lasting value. From the human perspective, difficult issues such as poverty, disease, uneven economic development and population growth are additional factors that serve to exacerbate and complicate the problem. Climate change and our response to the multi-faceted problems it represents has really become "the defining challenge of our age." Let there be no doubt that, as the 2009 World Maritime Day theme proclaims, it is a challenge for IMO too and that we – Member States, international shipping and Secretariat – are fully engaged in helping to redress it.

Author

Mr Efthimios Mitropoulos of Greece is the seventh Secretary-General of IMO. He joined the IMO Secretariat in January 1979, in the Maritime Safety Division, and, in May 1992, was appointed Director of the Division. In May 2000, he became Assistant Secretary-General and, in November 2003, was elected Secretary-General for 2004 to 2008. In November 2006, his mandate was renewed for a second, four-year term, concluding on 31 December 2011. He is also Chancellor of the World Maritime University (Malmo, Sweden) and Chairman of the Governing Board of the International Maritime Law Institute in Malta. Mr Mitropoulos is the author of several books on shipping economics and policy, categories/types of merchant vessels, safety of navigation and other shipping-related matters.

Organisation

The International Maritime Organisation (IMO) is the United Nations specialised agency with responsibility for safety and security of shipping and the prevention of marine pollution by ships. It is also involved in legal matters, including liability and compensation issues, and the facilitation of international maritime traffic. IMO currently has 169 Member States and three Associate Members.

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International

MAKING WAVES IN CO_2 REDUCTIONS

An estimated 350 million tonnes of fuel is consumed annually by the world's shipping fleet. At this level of consumption the industry currently emits over 1 billion tonnes of CO_2 and over 10 million tonnes of SO_2 annually.

The marine industry has tried for years to find viable means of improving fuel efficiency and so reducing environmental impact – an area where International Paint continues to play a significant role.

Fouling control coatings are key, improving the speed and energy efficiency of ships by preventing organisms such as barnacles and weed sticking to the underwater hull. If ships didn't use fouling control coatings, fuel consumption could be increased by as much as 40% – with current fuel use consequently rising by 140 million tonnes per year to a total of almost 500 million tonnes per year.

At International Paint we take our environmental responsibilities seriously, and that's why we've been leading the way in developing new coatings technologies, designed to cut shipping's emissions dramatically.

This technology is already making a difference. In 2007 we introduced a new generation of foul release technology, Intersleek®900, which is now delivering startling cuts in fuel consumption and corresponding emissions of CO_2.

But so much more could be achieved. If every ship in the world were coated with the latest foul release technology we could be making additional savings in annual CO_2 emissions of 90 million tonnes, right now.

International Paint Ltd. is part of AkzoNobel, one of the world's leading industrial companies and the world's largest coatings manufacturer.

Find out how we can help you to meet the challenge
www.international-marine.com/intersleek900

AkzoNobel

Coal-washing plant of Batán.

Metro de Madrid:

ADDRESSING CLIMATE CHANGE

Transportation is today one of the main sectors, along with the energy sector, that causes greenhouse gas emissions. In fact, during the last 20 years, CO_2 emissions directly related to transportation have increased in an alarming way, almost reaching the emissions of the energy sector in terms of volume. This paper assesses the positive impact on railway transport emissions as a result of the implementation of extension plans for the Metro de Madrid in Spain.

RAILWAY TRANSPORT EMISSIONS

Railway is the most efficient transport mode with the least CO_2 emissions per passenger/kilometre. It is also the only mode where gas emissions are expected to drop in a fast-growing emission sector. In major cities, underground transportation plays a key role in region mobility. Metro de Madrid, as the main collective transportation system in the Madrid region, helps reduce the impact on climate change by maximising energy efficiency. Only 0.7 per cent of CO_2 emissions in the autonomous community of Madrid are produced by Metro de Madrid, which carries 42 per cent of total travellers.

EXTENSION PLANS: 1995-2007

The contribution of Metro de Madrid to the environment is considered especially important if we quantify the CO_2 emissions savings obtained during the three extension plans carried out between 1995 and 2007.

From 1995 to 2007 the company had to manage an increase of 1.819 million trips as a consequence of the network growth. This figure is equivalent to nearly 11,000 million trips-kilometres of extra mobility demand.

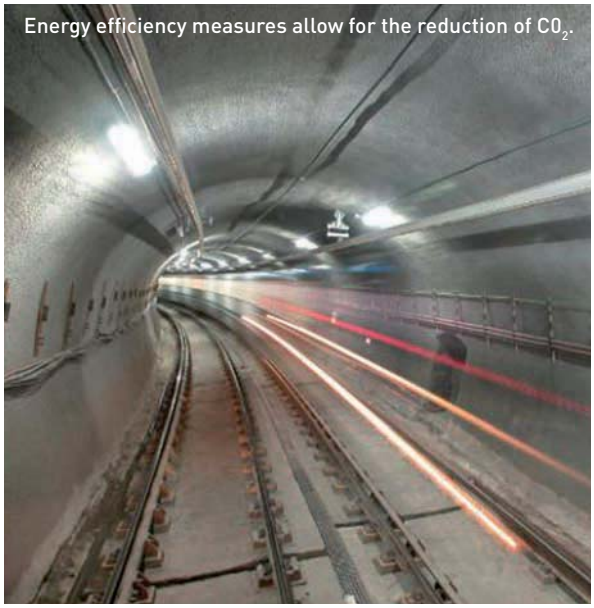
The average CO_2 emissions from private cars amounted to around 0.250 kilograms of CO_2 per passenger-km while Metro de Madrid's emissions totalled 0.065 kilograms of CO_2/passenger-kilometres in the period considered, resulting in an emission unit saving of 0.185 kilograms of CO_2 per passenger-kilometres. This figure, applied to the extra mobility demand in the period, implies savings of two million tons of CO_2 that would have been emitted if travellers had moved around by car instead of Metro.

> **“Only 0.7 per cent of CO_2 emissions in the autonomous community of Madrid are produced by Metro de Madrid, which carries 42 per cent of total travellers”**

IMPROVEMENTS IN THE METRO DE MADRID

Apart from these savings in CO_2 emissions by 'substitution' between modes of transport, other additional savings came directly from improvements in the Metro de Madrid network during the last three extension plans. Some measures implemented were:

- **Maximisation of the use of sunlight in stations**
  Spain, thanks to its location and climate, is a country with high solar radiation, making the solar energy the most respectful with the environment.
  Aware of this, Metro de Madrid has developed constructive solutions that allow the use of sunlight and minimise the need for artificial light. One such solution involved the installation of large glazed accesses (temples) in trapezoidal shapes, allowing the entry of sunlight inside the station. Thus, the accesses are fully illuminated by sunlight during operating hours, reducing the need for artificial lighting. As of today, there are 62 accesses with these characteristics.
  This measure has been completed with the installation of photocells that detect the level of illumination generated by sunlight and regulate the use of artificial lighting systems.
  The annual energy savings resulting from the use of direct sunlight instead of artificial lighting during an estimated 1,800 hours per year is 171,000 kWh, which means that 65 TM CO_2 equivalent are no longer emitted annually to the atmosphere.
- **Tri-phosphor fluorescent tubes and electronic ballasts installation**
  The tri-phosphor technology provides increased durability, colour and luminance resolution. Electronic ballasts have also been installed in order to provide a longer life to the luminaries and improve lighting efficiency.
- **Automatic night cut-off lighting circuit**
  Generally it is used between 2:30 to 5:30pm, staying lit only in the emergency circuits. This LEC System (Light Energy Controller) provides 30 per cent savings in consumption.
- **Improvements in energy management in the running of trains**
  Accumulators have been installed so that the braking energy is reused for other train starts. These modern systems based on super capacitors, absorb part of the braking energy of trains (which would be lost as heat through electric resistors) and return it to the network for later use. Also, an Automated Train Control System has been implemented, including energy-efficient criteria for train traffic management.
  A detailed motion simulator and a systematic generation algorithm have been developed. These, applied in line 1, show potential savings of around 10 per cent for an increase in travel time of only 0.5 per cent.
- **Commissioning of rolling material**
  Together with the parallel configuration of substations and the installation of electrical energy accumulators, the commissioning of rolling material produced in 2006 a savings of 41 GWh per year, avoiding annual indirect emissions of more than 13,700 tons of CO_2 equivalent.



Energy efficiency measures allow for the reduction of CO_2.

- **Use of energy saving devices**
  These were implemented in lighting systems and refurbished stairways.

POSSIBLE FUTURE IMPROVEMENTS

Besides all the above mentioned measures, other ideas have been proposed for new projects and facilities upgrade. These include the installation of special systems in lighting that allow substantial energy consumption reductions, or the installation of solar plants on the roofs of the buildings and warehouses which would result in a great deal of clean energy and reduced CO_2 emission into the atmosphere.
These energy efficiency measures allow for the reduction of CO_2 emissions thanks to a significant reduction in electricity consumption and reflect the continuing efforts of Metro de Madrid to promote an efficient use of natural resources for maximum protection of the environment in the constant struggle against climate change.
Furthermore, and taking into account the impact of Metro de Madrid on the local citizens in the metropolitan area who make almost 700 million trips every year, the company carries out periodical information campaigns in order to increase general knowledge on climate change and to promote individual actions that reduce emissions of CO_2 into the atmosphere.

Enquiries

Website: www.metromadrid.es

Knowledge

Building knowledge for future yields

The use of mineral fertilizer is essential for sustainable agriculture. It stimulates plant growth, increases CO_2 uptake in the soil, and helps to preserve natural land from being converted into cropland.

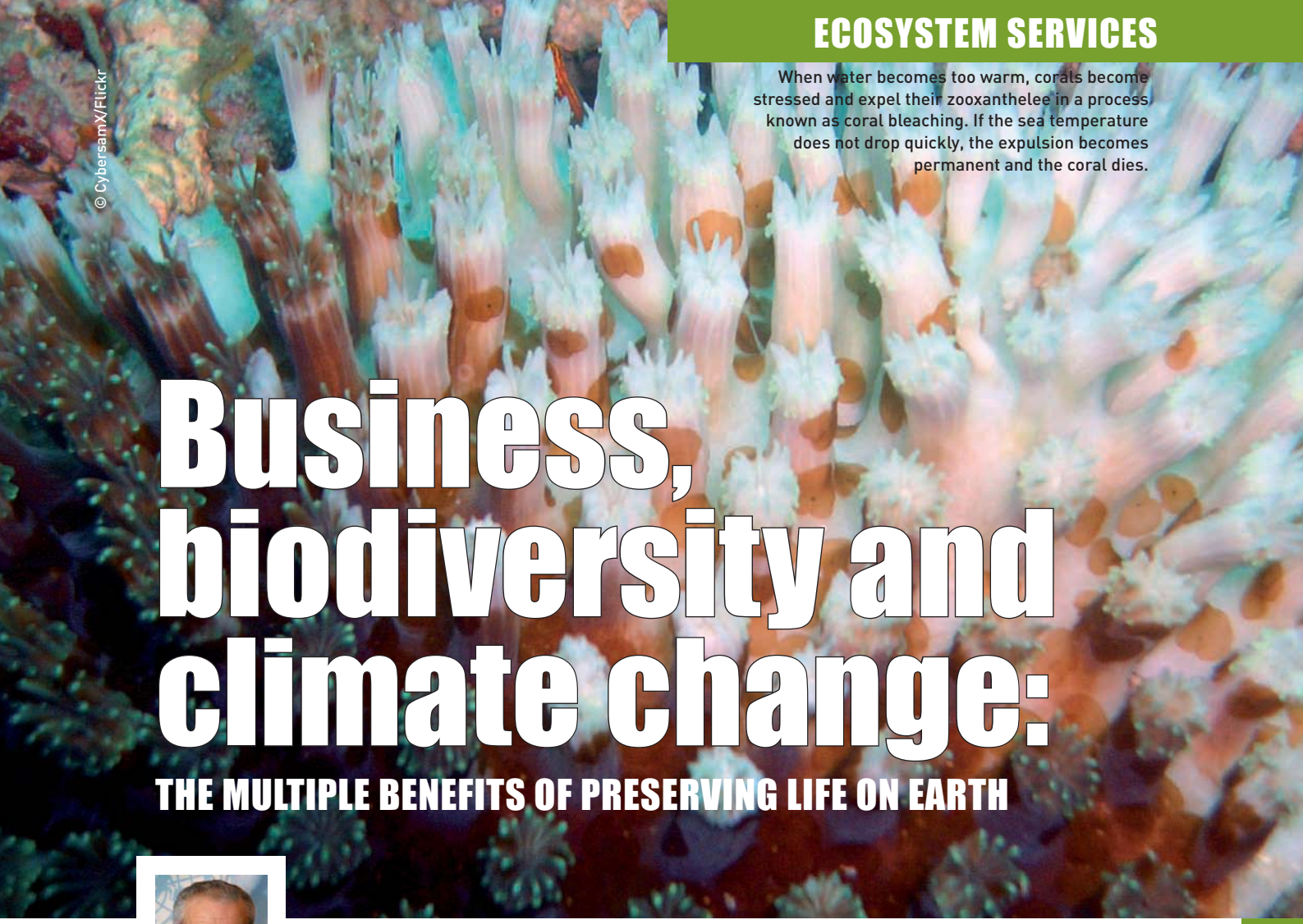
Yara's measures to reduce GHG emissions include a pioneering use of life cycle assesments in agriculture. that includes energy efficiency of plants, best farming practice and fertilizer application techniques.

Yara's well proven N_2O catalyst technology is the solution of choice for reducing greenhouse gas emissions from nitric acid production, with N_2O reductions of up to 90 percent. Its success builds on more than 15 years of dedicated research effort.

Climate change, population growth and consumption patterns challenge food security. To meet future food demand with limited land and water resources, world agricultural productivity has to be maximised. **Yara International ASA**, the global leader in mineral fertilizer and crop nutrition knowledge recognizes the connection between energy, climate and food, and contributes to solving major global challenges.
Visit us at www.yara.com

YARA

Knowledge grows



When water becomes too warm, corals become stressed and expel their zooxanthelee in a process known as coral bleaching. If the sea temperature does not drop quickly, the expulsion becomes permanent and the coral dies.

© CybersamX/Flickr

Business, biodiversity and climate change:

THE MULTIPLE BENEFITS OF PRESERVING LIFE ON EARTH

AHMED DJOGHLAF, EXECUTIVE SECRETARY OF THE CONVENTION ON BIOLOGICAL DIVERSITY

Despite our reliance on biological goods and ecosystem services, the economic value of biodiversity is not widely appreciated. Agriculture is a case in point: the loss of crop, livestock and pollinator diversity threatens to undermine agricultural productivity and returns. Worryingly, the impacts of biodiversity loss will be increasingly magnified by climate change – and vice versa – as the two phenomena interact with each other. 2010, the International Year of Biodiversity, presents an opportunity to follow the Copenhagen climate talks with a concerted effort to engage the private sector in synergistically combating these two great threats to human wellbeing.

THE ECONOMIC VALUE OF BIODIVERSITY

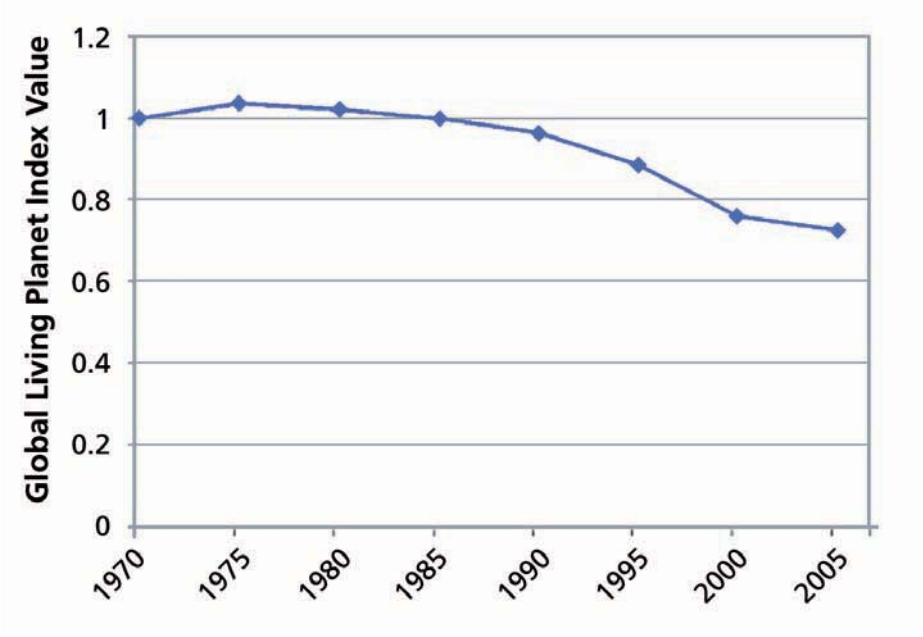
Biological diversity – or biodiversity – is deeply important to society, as the variety of organisms on earth and the ecosystems they create contribute so much to human wellbeing. Our food, fuel and medicines, and much of our fibre and building material all have biological origins. Biological goods support such diverse industries as agriculture, cosmetics, pharmaceuticals, pulp and paper, horticulture and construction.

Moreover, ecosystems provide human beings with a range of services that would be extremely costly or impossible to replace. These include: purification of air and water; detoxification and decomposition of wastes; stabilisation and moderation of the earth's climate; moderation of floods, droughts, temperature extremes and the forces of wind; generation and renewal of soil fertility; nutrient cycling; pollination of wild plants and crops; and control of pests and diseases.

> "Worryingly, the impacts of biodiversity loss will be increasingly magnified by climate change"

Despite our fundamental dependence on the products and services that biodiversity offers, the economic value of biodiversity has historically been overlooked. In his preface to Phase 1 of the report, 'The Economics of Ecosystems and Biodiversity (TEEB)', launched in 2008 at the Convention on Biological Diversity's ninth meeting in Bonn, Germany, project leader Pavan Sukhdev wrote:

Figure 1. Relative aggregate population size of 1,686 vertebrate species across all regions of the world over time, with 1970 as the baseline.



Source: WWF Living Planet Report 2008.

"Nature is the source of much value to us every day, and yet it mostly bypasses markets, escapes pricing and defies valuation...The economic compass that we use today was a success when it was created, but it needs to be improved or replaced."

ESTIMATING THE COSTS OF BIODIVERSITY LOSS

The first phase of the TEEB report gives us a glimpse of some of the impressive statistics on the economic value of biological goods and ecosystem services. Approximately half of synthetic drugs have a natural origin, including ten of the 25 highest selling drugs in the United States of America. Of all the anti-cancer drugs available, 42 per cent are natural and 34 per cent semi-natural. The value of the watershed protection provided by intact coastal ecosystems, such as mangroves and other wetlands, has been estimated at $845 per hectare per year in Malaysia and $1,022 per hectare per year in Hawaii. Moreover, an earlier scoping study estimated that, because of biodiversity loss, we are currently experiencing a welfare loss of land-based ecosystem services of about €50 billion each year, with a projected cumulative loss of €14 trillion by 2050, or seven per cent of projected global gross domestic product (GDP).

Once completed, the TEEB report will provide more extensive data on the costs brought about by the destruction of nature. It will also present an economic framework that takes into account the value of our

Widespread failure in our handful of remaining major crops and animal breeds due to disease or pest outbreaks is a very real possibility.

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An ongoing global decline in pollinators such as bats and bees has negatively affected agricultural productivity.

biological resources. This task could not be more important, as humans are currently driving species extinct at up to 1,000 times the natural background rate. The 2008 Living Planet Index showed that vertebrate population sizes have on average declined by almost 30 per cent over the last 35 years (Figure 1), while the 2008 International Union for Conservation of Nature (IUCN) Red List revealed that 38 per cent of all examined species worldwide currently face a high risk of extinction. Given our dependence on biodiversity, these trends do not bode well for the long-term viability of many of our industries. Nor, as we will see below, do they bode well for our ability to deal with the unfolding climate crisis.

BIODIVERSITY AND AGRICULTURE

Agriculture is a prime example of the perils of biodiversity loss. To start, the genetic diversity of our crops and livestock has already been drastically reduced. 75 per cent of the food crop varieties we once grew have disappeared from our fields in the last 100 years. Around 20 per cent of domestic animal breeds are at risk of extinction, with an average of one breed lost each month. Of the 7,000 species of plants that have been domesticated over the 10,000-year history of agriculture, a mere 30 account for 90 per cent of all the food that we eat every day.

The loss of diversity has potentially devastating consequences. For example, widespread failure in our handful of remaining major crops and animal breeds due to disease or pest outbreaks is a very real possibility: given that pest and pathogens are constantly evolving, a diverse gene pool is essential if we are to develop insect- and disease-resistant strains in the future. Moreover, our reliance on so few plants and animal breeds makes human populations vulnerable to climatic changes: as growing conditions change, the most suitable species or breeds in a given region may likewise change.

Land degradation due to climate change is further exacerbating these problems. In Africa, for example, agriculture accounts for 20 to 60 per cent of national GDP, with most production taking place in dry and sub-humid lands. However, almost half of these areas are vulnerable to desertification, with climate change expected to increase vulnerability through exposure to wind and water erosion, prolonged drought and wild fires.

The loss of pollinators is also a major problem. One-third of the world's crops require pollination to set seeds and fruits. The annual value of this service in the United States is calculated at $6-8 billion, with the worldwide estimate being $65-70 billion. It is therefore not surprising that an ongoing global decline in pollinators such as bats and bees has negatively affected agricultural productivity: in one study of 30 crops, estimated harvest loss through lack of pollination was $54.6 billion, representing a 46 per cent loss of crop yields.

BIODIVERSITY LOSS AND CLIMATE CHANGE

If we are just now starting to appreciate the monetary costs of biodiversity loss, the economic repercussions of climate change have garnered broad attention since the publication of the Stern report in 2005. We should therefore note that biodiversity loss contributes significantly to climate change. Deforestation is currently estimated to be responsible for 20 per cent of annual human-induced CO_2 emissions, as forests account for as much as 80 per cent of the total above-ground terrestrial carbon. Further, peat lands, which cover only three per cent of the world's terrestrial surface, store 30 per cent of the carbon contained in both terrestrial vegetation and soils. Hence, as forest and peat land loss continues, a much greater proportion of global carbon ends up in the atmosphere and not in terrestrial biomass. Likewise, intensive agricultural practices that destroy ground cover and increase soil erosion decrease the retention time of carbon in the soil.

> "Deforestation is currently estimated to be responsible for 20 per cent of annual human-induced CO_2 emissions"

Moreover, just as biodiversity loss contributes to climate change, climate change in turn contributes to biodiversity loss. Approximately 10 per cent of species assessed so far have an increasingly high risk of extinction for every one degree celsius rise in global mean surface temperature. This trend is expected to hold true up to at least a five degrees celsius increase, which would result in about 50 per cent of species facing increased risks of extinction. Indeed, climate change is projected to be one of the leading causes of biodiversity loss in the years to come. Recently, observed changes in the climate have produced alterations in species distribution and population size, timing of reproduction or migration events, and an increased frequency of pest and disease outbreaks. Climate change has also been implicated in widespread coral bleaching; wetland salinisation and salt-water intrusion; the expansion of arid and semi-arid lands at the expense of grasslands

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Mangroves and coral reefs, for example, protect shorelines from the wind-generated waves of storms and hurricanes.

and acacia; poleward and upward shifts in habitats; replacement of tropical forests with savannah; and the shifting of desert dunes.

CLIMATE CHANGE MITIGATION

On the positive side, given that biodiversity loss and climate change interact with each other, they can also be addressed synergistically. Sustainable land management in agricultural areas can increase carbon sequestration in the soil through techniques such as integrated pest management, conservation tillage, intercropping, and the planting of cover crops. When cover crops are used in combination with conservation tillage, soil carbon content can increase annually for a period of up to 50 years. The sustainable management of grazing land can provide similar co-benefits, since such lands contain between ten and 30 per cent of the world's soil carbon stocks.

Bara, a drought-prone province in western Sudan, provides an example of such techniques working in practice. Cultivation of marginal lands, fuel wood gathering and overstocking of livestock have historically depleted the vegetation in this region. As a result, soil erosion, desertification and atmospheric dust have all intensified. However, beginning in 1992 and continuing through 2000, a group of 17 villages took part in a project funded by the Global Environment Facility to rehabilitate overexploited and highly vulnerable rangelands. Activities included the improvement of rangeland with native vegetation, the stabilisation of sand dunes with trees and grass, and the creation of 195 kilometres of tree windbreaks. In the end, 700 hectares of rangeland were rehabilitated, resulting in increased soil cover, reduced soil erosion, greater carbon sequestration, increased biodiversity levels, and generally healthier ecosystems.

CLIMATE CHANGE ADAPTATION

Not only can preserving biodiversity mitigate climate change, it can also lessen the impacts of changes that do take place. It has been estimated that enhancing agricultural biodiversity through activities such as changing varieties and planting times can result in the avoidance of a ten to 15 per cent reduction in yield under one to two degrees celsius local temperature increases.

In addition, biodiversity can help safeguard us against the extreme weather events associated with climate change. Mangroves and coral reefs, for example, protect shorelines from the wind-generated waves of storms and hurricanes. This is very clearly seen in a case study from Vietnam, a country where extreme weather events such as typhoons often cause considerable damage.

> "Biodiversity can help safeguard us against the extreme weather events associated with climate change"

Since 1994, the Vietnam National Chapter of the Red Cross has been working with local communities to rehabilitate mangroves. Activities include the planting and protection of mangroves and upland trees, disaster preparedness training and general awareness-raising about the value of mangroves. Around 12,000 hectares of mangroves have been planted. During the devastating typhoon Wukong in 2000, project areas remained unharmed while neighbouring provinces suffered severe casualties and property damage. Overall, the Vietnam Red Cross estimates that about 7,750 families benefited from mangrove rehabilitation. The Vietnam experience was also borne out in Thailand during the catastrophic 2004 Asian tsunami. A study showed that communities protected by mangroves and other coastal plants escaped with little damage, while neighbouring villages without such protection were completely destroyed.

THE CONVENTION ON BIOLOGICAL DIVERSITY

Recognising the relationships between biodiversity loss and climate change, the Parties to the Convention on Biological Diversity (CBD) – the international instrument for the conservation and sustainable use of biodiversity – have incorporated climate change into almost all of their programmes of work. Further recognising the economic dividends of protecting biodiversity and the need to engage the private sector, the Parties began to

seek business participation in the implementation of the Convention following their eighth conference (COP8) in Curitiba, Brazil, in 2006.
This initiative is already bearing fruit. This past summer a Brazilian project called "LIFE certification" was launched in Curitiba, which aims to both quantify and officially recognise actions by companies related to biodiversity conservation. In addition, at COP9 in Bonn, the First International Business Initiative for the Protection of Biodiversity was launched. Bringing together a group of 34 companies from Germany and other countries, the initiative aims to more closely involve the private sector in achieving the CBD's objectives. Japan, which will host the CBD's tenth meeting in October 2010, is also contributing to these efforts: Keidanren, the Japanese Business Federation, has launched a business and biodiversity initiative, while the Japanese Ministry of the Environment has been preparing guidelines on the topic.

THE INTERNATIONAL YEAR OF BIODIVERSITY

2010, the International Year of Biodiversity (Figure 2), will be a critical period in the fight to save biodiversity. Seven years ago the international community adopted the 2010 Biodiversity Target, a resolution to significantly slow the rate of biodiversity loss worldwide by 2010. The last three meetings of G8 environment ministers have all endorsed the 2010 Target and called for increased engagement at the highest political levels, putting biodiversity loss on the agenda at G8 summits in Heiligendamm in 2007, Hokkaido/Toyako in 2008, and L'Aquila in 2009. In September of next year, just prior to COP10 in Nagoya, heads of state and government attending the 65th session of the UN General Assembly will discuss the importance of biodiversity for the first time ever. At COP10 itself, we will asses how close we have come to achieving the 2010 Target, as well as create a forward-looking strategy for ultimately stopping biodiversity loss in the years to come. The importance of the International Year of Biodiversity is increased by the fact that it begins shortly after the Copenhagen climate talks. There is a pressing need to link biodiversity loss and climate change in the international consciousness, and to make the economic benefits of jointly addressing these crises more widely known. The 10 months between Copenhagen and Nagoya present a prime opportunity to do just that: now is the time for companies, businesses and industries to become aware and involved.

Figure 2. 2010, the International Year of Biodiversity will be a critical period in the fight to save biodiversity.

Author

An Algerian national, Dr. Djoghlaf has pursued a distinguished diplomatic career that has included postings with the government of Algeria and UNEP. He assumed the position of Executive Secretary of the Convention on Biological Diversity (CBD) on January 3, 2006. He was named to his previous position as Assistant Executive Director of UNEP in June 2003, following his success as Director and Coordinator of UNEP's Division of the Global Environment Facility (GEF), where he played a key role for some seven years and successfully raised UNEP'S profile. During his tenure at the GEF, the portfolio grew from six projects worth $28 million to 600 projects worth more than $1 billion implemented in 155 countries.

Organisation

Opened for signature at the Earth Summit in Rio de Janeiro in 1992, the Convention on Biological Diversity (CBD) is the international framework for the conservation and sustainable use of biodiversity and the equitable sharing of its benefits. With 190 parties, the CBD has near-universal participation among countries that have committed to preserving life on earth. The CBD seeks to address all threats to biodiversity and ecosystem services, including threats from climate change, through scientific assessments, the development of tools, incentives and processes, the transfer of technologies and good practices and the full and active involvement of relevant stakeholders including indigenous and local communities, youth, NGOs, women and the business community.

Enquiries

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Environmental Science – a Global Role in the Future of the World's Forests

By John Hall, Business Development Manager of the Forestry Business at Environmental Science, a Business Operations unit of Bayer CropScience

Environmental Science is a business group of Bayer CropScience which provides branded solutions for consumers and professionals to keep living environments healthy and pest free in order to improve quality of life. With annual sales of 591 million Euros in 2008, Environmental Science is the global leader in the Environmental Science market.

Environmental Science is naturally part of the emissions process, but importantly, it is also a key partner for governments and multinational organisations pledged to delivering on carbon reduction goals through sustainable forestry management. In a world of increasing concern over the effects of carbon emissions and deforestation, we are committed to delivering sustainable forestry solutions.

Bayer's climate strategy and climate program
For Bayer, climate protection starts with its own plants and facilities, with the focus being on the energy supply and optimization of production processes. Bayer has been recently included once again in the "Dow Jones Sustainability World Index" which is a major index focusing on sustainability with a special focus on climate protection.

The climate program initiated at the end of 2007 clearly signalizes that Bayer wants to be a world leader in climate protection (see www.climate.bayer.com). Bayer is taking an active and integrated approach to the challenges posed by climate change by making substantial investments (Euro 1 billion from 2008-2010) in climate protection and specifically developed products and processes.

Safeguarding and boosting crop yields
As part of the Bayer Climate Program, the Bayer CropScience subgroup has initiated a number of projects to make plants more stress-resistant and achieve a significant increase in agricultural productivity, i.e. the yield per hectare of land under cultivation. Bayer CropScience is carrying out intensive research into solutions that can help to meet the growing demand for agricultural products. This can only be achieved by using an integrated approach that encompasses new crop protection solutions, seeds with higher potential yields, and optimized crop rotation, irrigation technology and fertilization. Bayer CropScience aims to further reduce greenhouse gas emissions in its production facilities and to develop new solutions for protecting the climate and dealing with the consequences of climate change.

Beside mitigation and adaptation Environmental Science supports emission reduction and sequestration in the forestry sector through the development and stewardship of its forestry growth and protection product technology.

Environmental Science – our Commitment for a Sustainable Development

- Development of modern, affordable technology for the benefit of all people
- Continuous review of human and environmental risk assessments
- Cleaner, efficient, resource-conserving manufacturing processes
- Solutions that minimise environmental impact
- Education and training to promote responsible use of our products
- Partnerships with customers to achieve integrated Sustainable Development goals

Empower employees to approach a Sustainable Development from a customer and consumer perspective

Developing solutions fitting with Sustainability
These tenets drive our exploration of new chemistry and delivery technologies. We continually bring new exciting sustainable forestry products to the global market. These products both reduce our own emissions and contribute to a healthier environment.

Some products are designed to produce more sustained initial tree growth, which in turn will sequester more carbon from the atmosphere; others are aimed at protecting trees to enable them to survive the latest influx of invasive pests (considered by many to be caused by climate change itself) and the ever increasing number of pest generations able to survive the more moderate climate conditions and longer seasons; whilst herbicides are being developed to cover, at very low doses with the minimum environmental impact, the resistance gaps left by older chemistry.

Looking at specific examples:

Application of our product Merit® has shown significant improvement in leaf area and numbers in both drought and non-drought conditions, while increasing the mid-term tree stem thickness.

Initiator®/SilvaShield®, has an active ingredient and fertilizer combination that is released slowly over time thus promoting the growth of treated trees and ornamentals. The treatment helps the plant mediate stress from drought or over-watering, poor planting practices, poor soil fertility and quality and sub-optimal sunlight.

Our pre-emergent herbicide ForDor® can help reduce the number of glyphosate applications needed by up to 3, significantly reducing the amount of chemical being used, and the resulting environmental impact. Our technology also maximizes speadability on the leaf/plant surface, reducing run-off and achieving maximum effects from reduced application rates.

But the products' ultimate efficacy depends in part on the operators applying them. As an Associate Member of the Forestry Stewardship Council (FSC), we will ensure that we are in line with the rigorous standards promoted by the FSC for the responsible use of products in forestry. We will drive stewardship programs for all of our forestry products to ensure that they are applied correctly, targeted and in the right place, but also cause minimal environmental impact.

Environmental Science will continue to be at the forefront of developing Forestry and Industrial Vegetation Management products, keenly supporting the 'Plant for the Planet, the Billion Tree Campaign' initiative by United Nations Environment Programme (UNEP). Our global presence will realize real positive change in the drive for ecological sustainability through building partnerships with those who are like-mindedly committed to preservation of our environment for the future.

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Bayer CropScience

Kimberly-Clark Professional

PURSUING ENVIRONMENTAL SUSTAINABILITY ON A GLOBAL SCALE

REDUCE TODAY, RESPECT TOMORROW

Takes a bigger-picture approach to Environmental Responsibility

Kimberly-Clark Professional recently announced that it is accelerating its efforts to meet increasingly urgent environmental challenges with a new approach branded Reduce Today, Respect Tomorrow.

One of four global business sectors within Kimberly-Clark Corporation, Kimberly-Clark Professional is one of the largest manufacturers of washroom products in the world, serving commercial and institutional facilities such as office buildings, hotels, schools, healthcare facilities, manufacturing plants, and other public buildings.

Kimberly-Clark Professional is aligned with its parent company's commitment to sustainability at all levels of its business. And while the sustainability agenda is not new to the company (Kimberly-Clark has topped the Personal Products category of the Dow Jones Sustainability World Index for the past five years in a row), Kimberly-Clark Professional's approach reaffirms the organisation's commitment to environmental stewardship as a daily part of its business practices. "Our ongoing efforts to achieve outstanding environmental performance are not just our responsibility as corporate citizens, they are vital to our success as a business," said Jan Spencer, President, Global Kimberly-Clark Professional. "These efforts are also guided by global, company-wide objectives for improving operational performance in energy, water, waste, and environmental management systems."

Kimberly-Clark Professional's philosophy is driven by a deep understanding that to tackle environmental problems, it must look at the entire life cycle of its products – from raw materials sourcing to manufacture through customer use all the way to end of life disposal. And by working to apply the principles of source reduction, or waste prevention, at each of these stages in the product's life, their environmental impact can be reduced.

Products created with source reduction in mind are designed in such a way that users actually consume less, either through improved performance, more reliable dispensing methods, or both. Reduced consumption leads to less waste and other environmental benefits throughout the life cycle of the product. One way this is currently achieved is through use of a patented tissue manufacturing technology that can reduce the total wood fibre needed to make tissue by up to 17 per cent while improving product performance. This can lead to a reduction in total consumption of certain KLEENEX and SCOTT towels by up to 28 per cent. Redesigning packaging to fit more product into each case and more cases into each truck also prevents waste and reduces transport emissions.

Of course, Kimberly-Clark understands that the environmental impact of its products begins well before they are used by a customer. So, another area where they have had long-standing environmental commitments has been in product manufacturing. The company's global Vision 2010 environmental objectives program commits it to achieve reductions in water use, waste generation and energy use.

The company has emphasised energy use reduction since before the first Vision program, which was launched in the mid-1990s. Given today's global concerns related to increasing global CO_2 emissions and the fact that energy costs continue to rise, Kimberly-Clark's longstanding focus on energy reduction has proven both economically and environmentally beneficial. And today, they are as focused as ever.

The Vision program allows the company to progress by defining energy use benchmarks specific to manufacturing technologies and customised by facility. This standardised approach identifies the best facility performers and challenges other manufacturing sites to achieve at least the same level of performance. It also requires a robust data management system to collect detailed energy information from plants all over the world so that progress can be measured and gaps managed appropriately. With energy reduction as the driver, Kimberly-Clark's global carbon dioxide emissions have also been reduced: since 2005, energy use has been reduced by six per cent and CO_2 emissions per unit of production by seven per cent.

These are just a few examples of how Kimberly-Clark is putting the Reduce Today, Respect Tomorrow principles to work. "We know that sustainability is a journey we're on, not a destination we've reached. We've spoken to customers, environmentalists and consumers, and we know they are looking to us, as the market leader, to front lasting change. The Reduce Today, Respect Tomorrow campaign is part of our effort to do just that", said Lisa Morden, Global Sustainability Leader for Kimberly-Clark Professional.

For more information about Kimberly-Clark Professional, its products and its sustainability program, visit www.kcpReduceToday.com.

Organisation

Kimberly-Clark Professional is an indispensable business partner, delivering leading-edge health, hygiene and productivity solutions that provide tangible value every day, everywhere. Known for innovative, quality solutions for away-from-home washrooms, "clean" and "industrial" manufacturing environments, and DIY settings, the global brands of Kimberly-Clark Professional include Kleenex, Scott, Kimcare, WypAll, KleenGuard, and Kimtech. With the acquisition of Jackson Safety, Kimberly-Clark Professional offers an even broader range of PPE and other safety offerings, including market-leading welding and work zone safety products. Kimberly-Clark Professional, located in Roswell, Ga., is one of Kimberly-Clark Corporation's four business segments and can be visited on the web at www.kcprofessional.com.

Enquiries

For more information about Kimberly-Clark Professional, its products and its sustainability programme, visit www.kcpReduceToday.com

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Integrity of forest climate projects:

HOW FOREST CERTIFICATION CAN SUPPORT SUSTAINABLE DEVELOPMENT

ANDRE GIACINI DE FREITAS, EXECUTIVE DIRECTOR, AND
STEFAN SALVADOR, POLICY MANAGER, FOREST STEWARDSHIP COUNCIL (FSC)

The Forest Stewardship Council (FSC) as a globally leading and recognised forest certification scheme has a unique role to play in addressing some of the challenges around forest carbon through the provision of management standards, certification and accreditation systems, and governance models. Only rigorous standards, tight controls, traceable products and good governance will ultimately ensure forest climate projects and programmes that encapsulate social equity and environmental sustainability.

FORESTS ON THE INTERNATIONAL AGENDA

Thanks to their critical role in regulating the Earth's climate and in their function as the largest terrestrial reservoir of carbon, forests again feature highly on the international agenda. Nearly two decades after the UN Conference on Environment and Development (UNCED) in Rio, hopes are high that later this year in Copenhagen negotiators will agree upon a new climate treaty that could constitute the turning point for tropical forests in developing countries, allowing the survival of one of the world's greatest treasures, and thus closing one of the darkest chapters in mankind's long history of forest destruction and exploitation.

A similar excitement surrounded the 1992 'Earth Summit' that had a major focus on forests, not least due to their interdependencies with climate change and biodiversity. While the latter two agenda items made it into conventions, the forest issue, as one of the politically most sensitive and contentious issues polarising the industrialised and developing countries, remained unsolved. The first opportunity to address international forest policy and related actions on the highest political level had been foregone.

LAYING THE FOUNDATIONS

While tedious negotiations about a legally binding forest convention continued after Rio, civil society and forest product markets no longer relied upon the intergovernmental process, but took their own route in the attempt to reach international agreement about a framework to promote, define and implement sustainable forest management. Scientists and advanced practitioners developed and tested models for responsible forest management in forest types around the world, and had proven their feasibility and viability. Boycotts of tropical timber had shown to be ineffective if not counterproductive in addressing deforestation and forest degradation, calling for alternative market instruments. The time was ripe – in this atmosphere of increasing discrepancy between governmental inactivity, scientific knowledge, and societal demand for resource protection and responsible production, the FSC formed in 1993.

THE FOREST STEWARDSHIP COUNCIL

FSC is a concerted effort of industry and non-governmental organisations to foster sustainable

Box 1. The FSC mission

The FSC shall promote environmentally appropriate, socially beneficial, and economically viable management of the world's forests.

- Environmentally appropriate forest management ensures that the harvest of timber and non-timber products maintains the forest's biodiversity, productivity, and ecological processes.
- Socially beneficial forest management helps both local people and society at large to enjoy long term benefits and also provides strong incentives to local people to sustain the forest resources and adhere to long-term management plans.
- Economically viable forest management means that forest operations are structured and managed so as to be sufficiently profitable, without generating financial profit at the expense of the forest resource, the ecosystem, or affected communities.

development in the forestry sector (Box 1). Its operating principle is the balanced participation of major societal interests in all its bodies and activities. It functions as a certification system that empowers buyers and consumers to demand responsible forest management, and allows participating operations to differentiate themselves and their products from the main stream. In its essence, the FSC system tries to change and interlink consumption patterns and production practices.

> "In its essence, the FSC system tries to change and interlink consumption patterns and production practices"

WHAT MAKES FSC UNIQUE

FSC has not taken the easy way out in its attempt to allow reliable market claims about responsible forest management practices. It has features and rules both as a membership organisation and as a certification system that – while often referenced as a model and partly mimicked by competitor schemes – are so demanding that, to date, FSC maintains a lead role amongst voluntary sustainability initiatives.

Five cornerstones mark FSC's unique approach:

1. **Good governance:** all parties affected by or interested in forest management can participate at global, regional and forest level in the definition of certification requirements and issues to address. Certification decisions and conditions are made transparent towards the public.
2. **Global standard:** a single standard, the "FSC Principles & Criteria", defines environmentally appropriate, socially beneficial, and economically viable forest management.

Forest climate projects are at the focus of the international forest and climate policy debate.

3. **Regional adaptation:** relevant and measurable indicators are specified in multi-stakeholder processes within the regional context.
4. **Two-tier verification:** compliance of participating operations with forest management standards is assessed by independent certification bodies that are, in return, subject to witness audits from the FSC's-own accreditation body.
5. **Market linkage:** a traceability and labelling system for forest products links them to certified forest operations and communicates their origin to customers and consumers.

SAFEGUARDING REDUCED EMISSIONS FROM DEFORESTATION AND FOREST DEGRADATION

Today, forest climate projects – which can be described as forest operations and activities that prioritise the sequestration or storage of carbon over the extraction of certain resources – are at the focus of the international forest and climate policy debate. In particular, the introduction of an intergovernmentally agreed reward and safeguard scheme for Reduced Emissions from Deforestation and forest Degradation (REDD) throws up questions of project-level integrity and the reliability of related market claims. While the concept of 'sustainable forest management' and its verification through 'forest management certification' are widely called for, differences between forest certification schemes in practice may result in substantial performance variation and may sometimes go little beyond business-as-usual scenarios.

This variation between certification schemes is further increased by newly emerging carbon verification initiatives that try to address social and environmental performance aspects as well. All too often, essential social and environmental forest functions and services are downgraded to 'co-benefits' and their safeguarding only superficially dealt with through certification requirements. There is a clear trend, to not bother about how schemes are operated and standards are developed: most, if not all, schemes lack an open and balanced multi-stakeholder approach and leave it to a few experts to come up with technical solutions.

> "The success of REDD as a climate change mitigation strategy depends, in large part, on shared confidence in the basic minimum standards of practice underpinning the mechanism"

Finally, there is a distinctive lack of certification body control due to reliance of accreditation functions being exerted by other schemes, though their standards and requirements might have only little in common with those the certification body actually uses.
The success of REDD as a climate change mitigation strategy depends, in large part, on shared confidence in the basic minimum standards of practice underpinning the mechanism; both in robustness of the methodology and in the overall quality of forest management practice. FSC as a globally leading and recognised scheme has a unique role to play for REDD in the provision of management standards, certification systems and governance models. Only rigorous standards, tight controls, traceable products and good governance will ultimately ensure forest climate projects and programmes that encapsulate social equity and environmental sustainability (Box 2).

COPENHAGEN AND BEYOND

Much is at stake in Copenhagen. Failure to agree upon a legally binding instrument that effectively tackles the drivers and causes of deforestation and forest degradation will certainly decrease the chances to preserve the world's tropical forests, their biological diversity and indigenous peoples' cultures, and to avoid the devastating impacts of continued forest destruction on the global climate.
The Rio conference has shown, however, that failure at intergovernmental level may be followed by civil society success: in a sense, it gave a kick-start to a non-governmental initiative that changed large parts of the forestry sector and the international timber trade. And while we all wish Copenhagen to become a success, we might well see the rise of yet another movement that constitutes to fill the gaps left by negotiators.

Box 2. Standard level cross-linkages to REDD

FSC as a global system can provide a solid foundation from which to address leakage, as well as, long-term goals, biodiversity conservation, and social justice.

- FSC standards incorporate multiple mechanisms that are compatible with increasing or maintaining forest-based carbon stores (restoration of degraded forests, maintaining carbon-rich soil structures, and ensuring that harvest volumes never exceed growth).
- FSC standards incorporate strong requirements to ensure social justice, including establishment and recognition of the rights of people living in and around the forests, participation of local stakeholders in management decision-making, and allocation of benefits from forest projects to local communities.
- FSC standards include requirements to protect environmental values of the forests, including maintaining areas of high conservation value and restricting conversion from natural forests to other land uses including plantations.
- FSC provides on-the-ground, project-level credibility for claims (e.g. verification of carbon measurement and monitoring) that can additionally link remote-sensing claims with ground-verified measurements.

Authors

Andre Giacini de Freitas is Executive Director of FSC. Prior to his current role, he served as FSC Head of Policy and Standards. Previously, Andre managed Imaflora (a Brazilian NGO and SmartWood affiliate), developed the social and environmental policy for Rabobank in Brazil, and worked as an auditor and regional forest coordinator in Latin America.

Stefan Salvador, Policy Manager, coordinates FSC's activities around forest-based carbon and climate change. He further manages the FSC Chain of Custody programme and oversees the development and review of related standards. He worked in several functions for and with FSC for over 10 years. Stefan holds an M.Sc. in Forestry Sciences.

Organisation

FSC is an independent, non-governmental, not-for-profit organisation established to promote the responsible management of the world's forests. Founded in 1993 as a response to concerns over global deforestation, FSC is widely regarded as one of the most important initiatives of the last decade to promote responsible forest management worldwide. FSC is a certification system that provides internationally recognised standard-setting, trademark assurance and accreditation services to companies, organisations, and communities interested in responsible forestry.

Enquiries

Website: www.fsc.org

ARAUCO:

COPING WITH THE CHALLENGE OF GLOBAL WARMING

ARAUCO

Arauco has come a long way since it began operations in 1972 with a single mill in central Chile and a handful of employees. Today, it has become a global leader in the production of sustainable forest products and pulp, with manufacturing facilities in three countries and some 1.5 million hectares (3.7 million acres) of forestland under management.

As a leading actor on the world stage, Arauco is committed to minimising the impact of its operations on the environment as a whole, and on global climate change in particular. Accordingly, the company has defined its development strategy based on sustainable plantations, native forest protection and strict controls on greenhouse gas emissions.

Arauco respects and conserves the full range of values and ecosystem services delivered by its plantations and natural forest holdings. In addition to supplying high-quality, plantation-grown wood fibre, its vast forest estate serves as a carbon store – binding atmospheric CO_2 (carbon dioxide) and releasing oxygen into the air. Its natural forest holdings are biologically diverse, supporting hundreds of species of flora and fauna. In addition, the forests help provide clean water, offer recreational and educational opportunities, and have cultural and spiritual significance.

The company's commitment to conserving forest-based values is embodied in its decision to permanently set aside from harvest all of the 309,000 hectares (763,000 acres) of natural forestland that it owns. In addition, the company does not purchase any third-party wood that comes from natural forests.

Arauco recognises that it does not operate in isolation, but that it is part of the global community and understands that its actions and operations can have impacts upstream and downstream of its facilities. That is why Arauco is committed to using its forest resources wisely, ensuring lasting benefits to society and the global environment, as well as to shareholders. And it is why Arauco is committed to continuous improvement and implementing best practices and innovations to ensure that its operations have minimal impact on the flora, fauna, water resources, atmosphere and climate of the planet.

Through its Bioforest research centre, the company applies the latest biotechnological procedures in a search for new ways to increase the quality, production and performance of its plantations; to develop skills and plans in order to care for the biodiversity present in its forestry assets and to introduce improvements into the pulp production processes.

BIOMASS COGENERATION

The development of electrical-generation projects using forest biomass – a renewable resource – for fuel is an integral part of Arauco's environmental policy. This policy calls for the comprehensive and efficient use of all forest resources, energy independence through reliance on self-generated electricity from renewable sources, and the provision of surplus electricity to Chile's power grid.

Forest biomass is a mix of tree bark, sawdust and other downfall from forest-products manufacturing. By debarking logs at its mill sites (rather than in the field), and using the bark as fuel, Arauco is able to realise a number of environmental advantages, including:

- A reduction in the fuel load on its plantations, minimising both the incidence and intensity of forest fires;

- A substantial reduction in green house gas (GHG) emissions caused by the anaerobic decomposition of forest biomass in the field.

Arauco utilises its forest biomass as a renewable fuel for the power boilers that cogenerate the steam and electricity required for its manufacturing operations. Biomass cogeneration allows for a high thermal efficiency, approaching 80 per cent in some cases.

The company's use of renewable forest biomass has virtually eliminated its dependency on fossil fuels in both pulp and forest-product manufacturing operations. In addition to meeting its own energy needs, Arauco generates a significant amount of surplus green energy and delivers it to the Chilean power grid (the Central Inter-connect System), helping to reduce the country's dependence on coal and imported fossil fuels.

Currently, Arauco has a total installed generating capacity of 504 Megawatts (MW) of electricity from biomass, including a surplus of up to 134 MW that can be sent to the grid, helping to meet the needs of one-half million residential customers.

Four of Arauco's cogeneration power plants in Chile – one at its Trupan facility; two at its Nueva Aldea complex in the Bio Bio region; and one plant in the Los Rios region at the Valdivia mill – are registered as emission reduction projects within the Clean Development Mechanism (CDM) of the Kyoto Protocol.

In its search for alternative sources to replace fossil fuels, Arauco, together with universities, NGOs and other private companies, established the Bioenercel Technological Consortium. This entity is developing a pilot facility to produce second-generation ethanol using lignocellulose, a raw material derived from forestry biomass.

CARBON FOOTPRINT

In December 2008, in demonstration of its commitment to minimising its greenhouse gas emissions and its contribution to global climate change, Arauco made a decision to embark on a comprehensive assessment of the carbon footprint produced by its operations in Chile, Brazil, Argentina and Uruguay during 2008. The assessment was completed in July 2009.

Designed to benchmark Arauco's emissions of the six greenhouse gasses (GHGs) covered by the Kyoto Protocol, the Carbon Footprint Assessment (CFA) will serve as a point of reference for efforts to reduce the company's carbon signature.

"Just as you need to know where you are before you can navigate to your destination, Arauco needs to know where it is, emission-wise, before it can embark on successful initiatives to reduce our role in global climate change," said Arauco CEO Matías Domeyko. "Our Carbon Footprint Assessment does just that – it tells us where we were in 2008, allows us to see where we need to go, and, later, will enable us to measure how far we have come on our journey toward ensuring greater sustainability for our planet."

The Carbon Footprint Assessment was completed under the guidance of a US-based independent consulting firm, AECOM Environment. Fundación Chile, a non-profit, non-governmental organisation committed to increasing the competitiveness of Chile's industrial and commercial sectors, served as a consultant to the project team. To ensure the credibility and comparability of the study, AECOM Environment employed internationally accepted methodologies and calculation tools.

Arauco's CFA was designed to determine and report on Arauco's direct and indirect emissions of carbon dioxide and total carbon dioxide equivalent (CO_2e). CO_2e was calculated using the Intergovernmental Panel on Climate Change's global warming potentials for five GHG compounds: methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6).

The CFA addressed: direct GHG emission sources owned or controlled by the company including stationary combustion and company-owned or company-controlled mobile and harvesting equipment (Scope 1); GHG emissions from indirect sources, such as purchased electricity and/or steam (Scope 2); and GHG emissions that occurred at other indirect sources as a consequence of company activities such as the transport of significant raw materials, transport of products, contractor transports, transport of wood, contractor wood-harvesting equipment, and business travel (Scope 3).

The CFA also addressed CO_2 that is stored (sequestered) during the long-term life of wood products produced during 2008 as well as carbon-neutral biomass-derived CO_2 emissions.

In September 2009, Fundación Chile made a presentation about the AECOM Environment report to a large group of stakeholders. Fundación Chile noted that direct and indirect GHG emissions generated by Arauco were below those reported by other forestry companies around the world. (It should be noted that some parties question the comparability of different carbon footprint studies because of the different methodologies employed.) Fundación Chile also noted the beneficial environmental effect resulting from CO_2 captured by the annual growth of Arauco's forests. Even though this factor is not taken into account when assessing a carbon footprint according to generally accepted methodologies, Fundación Chile, applying the most stringent measurement procedures, calculated that the CO_2 sequestered during 2008 by Arauco's forests greatly exceeded the company's GHG emissions during that period.

"Completing our first Carbon Footprint Assessment does not mean that Arauco has crossed the finish line," said CEO Domeyko. "Quite the contrary – we have put ourselves in the starting block for continued progress in reducing our greenhouse gas emissions. As with so many aspects of a shift toward greater sustainability, this is a marathon, not a sprint. But Arauco is definitely in the race to combat global climate change."

Enquiries

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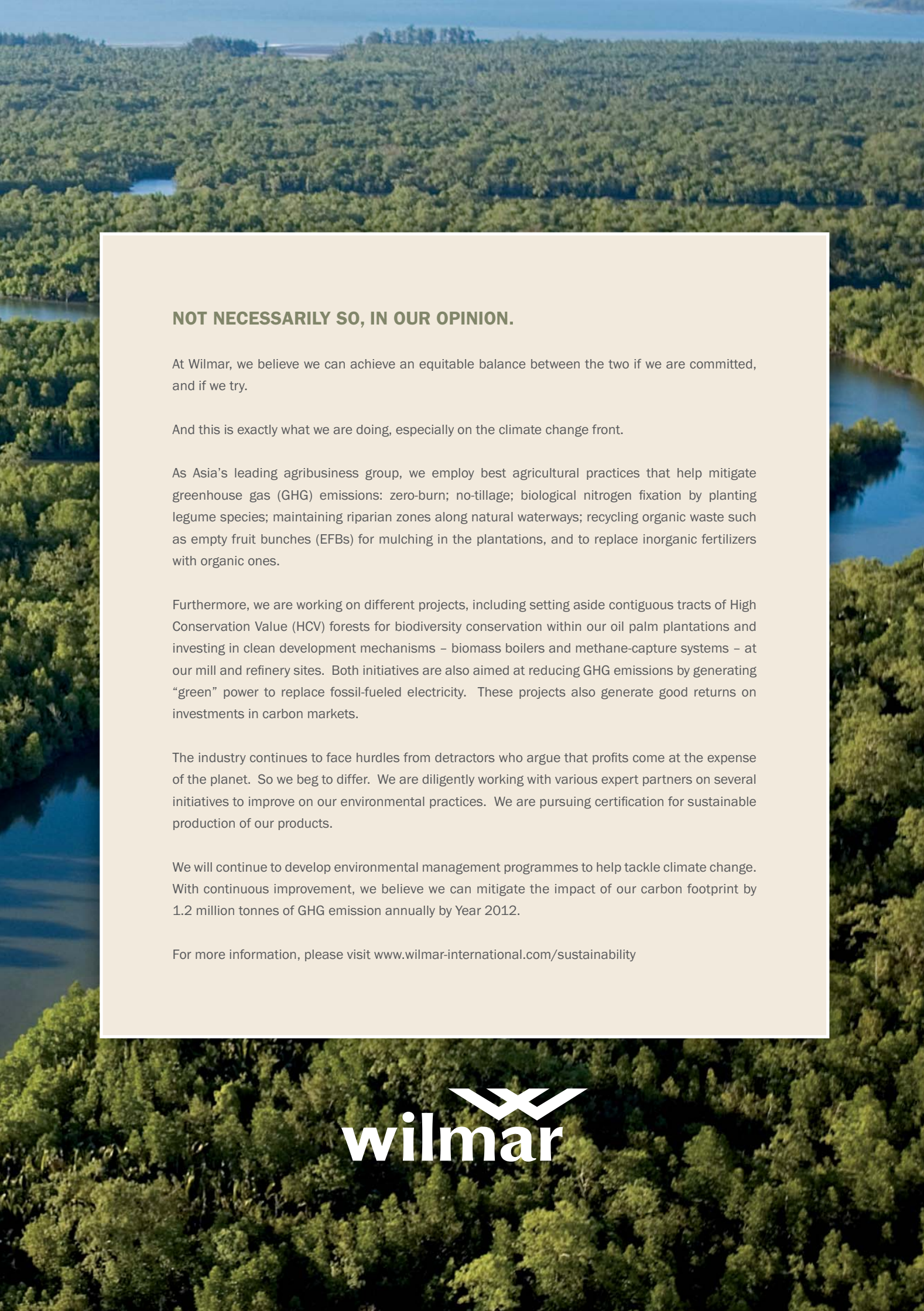
PROFIT
vs
PLANET?



NOT NECESSARILY SO, IN OUR OPINION.

At Wilmar, we believe we can achieve an equitable balance between the two if we are committed, and if we try.

And this is exactly what we are doing, especially on the climate change front.

As Asia's leading agribusiness group, we employ best agricultural practices that help mitigate greenhouse gas (GHG) emissions: zero-burn; no-tillage; biological nitrogen fixation by planting legume species; maintaining riparian zones along natural waterways; recycling organic waste such as empty fruit bunches (EFBs) for mulching in the plantations, and to replace inorganic fertilizers with organic ones.

Furthermore, we are working on different projects, including setting aside contiguous tracts of High Conservation Value (HCV) forests for biodiversity conservation within our oil palm plantations and investing in clean development mechanisms – biomass boilers and methane-capture systems – at our mill and refinery sites. Both initiatives are also aimed at reducing GHG emissions by generating "green" power to replace fossil-fueled electricity. These projects also generate good returns on investments in carbon markets.

The industry continues to face hurdles from detractors who argue that profits come at the expense of the planet. So we beg to differ. We are diligently working with various expert partners on several initiatives to improve on our environmental practices. We are pursuing certification for sustainable production of our products.

We will continue to develop environmental management programmes to help tackle climate change. With continuous improvement, we believe we can mitigate the impact of our carbon footprint by 1.2 million tonnes of GHG emission annually by Year 2012.

For more information, please visit www.wilmar-international.com/sustainability

wilmar

Book&Claim:

MAKING SUSTAINABILITY COMMERCIALLY SUSTAINABLE

No business or industry sector can afford to ignore the need to be socially responsible and environmentally sustainable.

Customers demand it, stakeholders look for it and, increasingly, it is the only way to operate in a world where climate change is at the top of the global agenda. Yet it's not always easy to do the right thing. Take ethical sourcing for example.

ETHICAL SOURCING

In a world of complex, interwoven supply chains it can be difficult, if not impossible, to identify and secure a supply of sustainably-produced material.

Even if a sustainable source can be found, segregating and tracking material to ensure that it is not intermingled with supplies from unsustainable sources can prove to be so expensive as to make it commercially unviable.

The alternative is to try to promote the sustainable production of essential commodities – using purchasing power as a lever. Trying to make producers change their ways by threatening not to buy is rarely successful.

Instead of encouraging sustainability, such initiatives can simply drive the product to other markets or, worse still, harm livelihoods in parts of the world where people can least afford to lose work.

A new initiative, Book&Claim Certificate Trading, is designed to tackle these issues head on, and is already proving its worth for the palm oil industry (visit www.bookandclaim.co.uk).

BOOK&CLAIM CERTIFICATE TRADING

Book&Claim is based on the principle that the best way to encourage producers of essential commodities to operate sustainably, is to pay them more for doing so. It overcomes the problems of complex supply chains by by-passing them completely.

Producers who can prove that they are operating sustainably are invited to register a quantity of their output with the Book&Claim certificate trading programme.

They are offered certificates on a pro rata basis for the quantity of sustainably produced material they register with Book&Claim. These can then be offered for sale on the Book&Claim on-line trading platform.

Manufacturers or retailers of products containing that commodity can then bid for and purchase certificates online and, in doing so, pay a voluntary premium directly to the producer which is operating sustainably.

The commodity itself is bought and sold in the usual way, with no need for costly segregation or tracing. Products covered by Book&Claim do not therefore contain sustainably-produced material, but their production has supported sustainable sourcing.

Manufacturers and retailers can therefore demonstrate that they have supported sustainable production at a grassroots level, with that support being audited and verified by the Book&Claim system. Claims can be highlighted in CSR policies, on pack, on-line and in store.

In this way Book&Claim provides a clear route through the complexities of interwoven global supply chains.

It gives producers a clear incentive to meet social and environmental criteria, as they are rewarded for continuing to work sustainably – even if their products are consumed locally and never leave the area in which they are made.

THE GREENPALM SUCCESS STORY

The Book&Claim concept is already achieving real results for the palm oil industry, with an initiative called GreenPalm: www.greenpalm.org

By enabling palm oil producers to earn more for their crop by operating sustainably, GreenPalm is beginning to tackle the environmental and social concerns regarding palm oil production.

Globally, from the 1990s to the present day the area under palm oil cultivation has increased by about 43 per cent. Most of this growth took place in Malaysia and Indonesia, where palm oil production is a vital source of revenue for some of the world's poorest people.

While better managed plantations and oil palm smallholdings serve as models of sustainable agriculture, it is clear that not all palm oil is being produced in a sustainable way. Working with the Roundtable on Sustainable Palm Oil (RSPO), Book&Claim Ltd established GreenPalm to support and promote the production of sustainable palm oil.

A MILLION-DOLLAR REASON TO JOIN

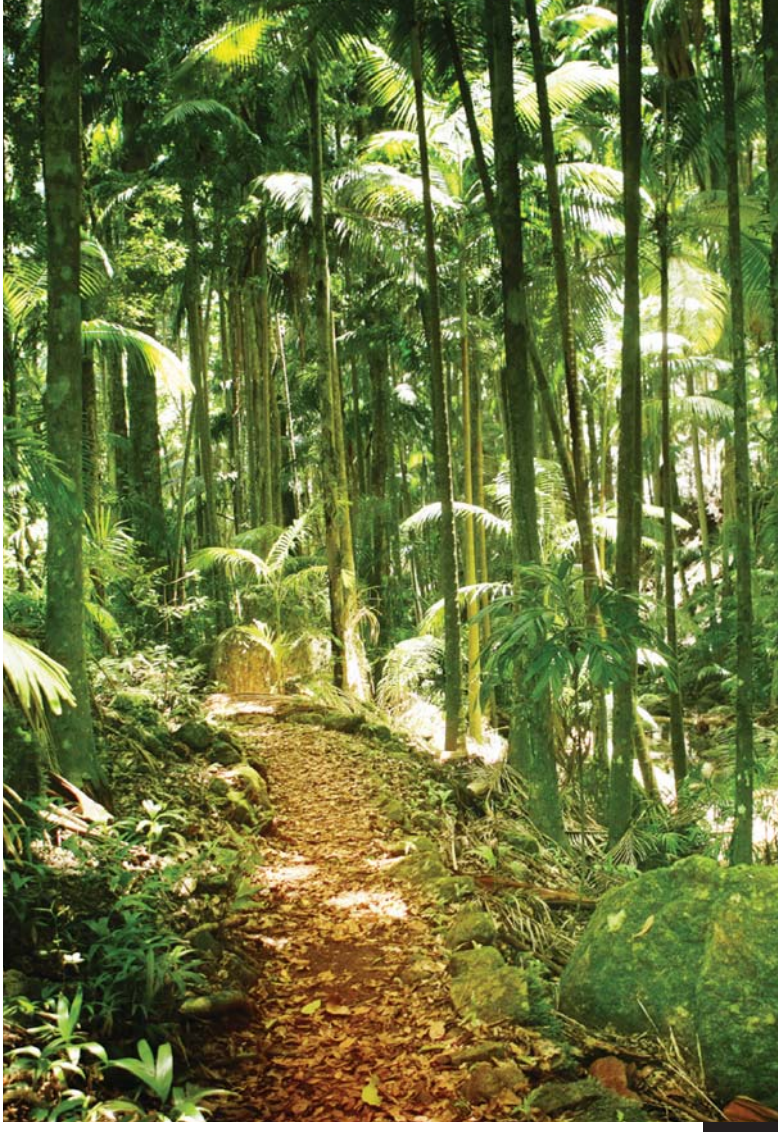
Less than a year after GreenPalm began trading certificates, palm oil producers who joined the programme, and who have met the RSPO's rigorous guidelines for social and environmental sustainability, have collectively earned an additional $2.5 million for their efforts.

None of this would be possible without the manufacturers and retailers who buy and redeem the certificates – so far more than 240,000 have been traded – in the process, demonstrating their commitment to supporting sustainability.

> **"The best way to encourage people to do things differently is to reward them for doing so"**

General Manager of Book&Claim Ltd, Bob Norman, said: "This is an important achievement for GreenPalm, since the programme is based on the idea that the best way to encourage people to do things differently is to reward them for doing so. "The hope is that it will provide strong encouragement for them to continue to produce sustainably and for others to follow suit."

Any organisation which makes or sells products containing palm oil or palm kernel oil can support sustainable production by buying GreenPalm certificates. For many it is currently the only viable supply chain option endorsed by the RSPO – a point which has been publicly acknowledged by the WWF, a founding member of the RSPO.



HOW BOOK&CLAIM COULD WORK FOR YOU

The success of GreenPalm has demonstrated the viability and effectiveness of the Book&Claim concept. Book&Claim's founders believe that it could be similarly effective in any global market place, where there is a complex supply chain and where commodities are intermingled at every stage.

It can be operated in a variety ways, either through franchising or by the Book&Claim team offering a turn-key solution. Either way it will be tailored to suit individual requirements, with the ultimate aim of making sustainable sourcing commercially viable and therefore sustainable.

GreenPalm SUSTAINABILITY

Enquiries

To find out how Book&Claim can work for your business or industry sector, call Bob Norman on +44 (0) 1482 332013, +44 (0) 7776 144731, or email bob.norman@bookandclaim.co.uk.

Visit the website at www.bookandclaim.co.uk.

Climate action for water quality

SABRINA BARKER, CONSULTANT,
UNEP GLOBAL ENVIRONMENT MONITORING SYSTEM (GEMS/WATER PROGRAMME)

Public awareness about many climate change issues – carbon footprints, green house gas emissions, global warming and others – has improved significantly in the past few years. For example, people are increasingly concerned about the future of small islands, polar bears and sea level rise caused by increasing global temperatures. What is less known, but just as important, are the effects that climate change can have on our inland water supplies. While some effects may be beneficial, others may be detrimental to both aquatic ecosystems and to human well-being.

INTRODUCTION

Changes in average temperature, precipitation levels and rising sea level are expected to occur over the next few decades, partly in response to large-scale atmospheric events such as El Niño and the North Atlantic Oscillation. It is anticipated that precipitation will increase at higher latitudes and decrease at lower latitudes.

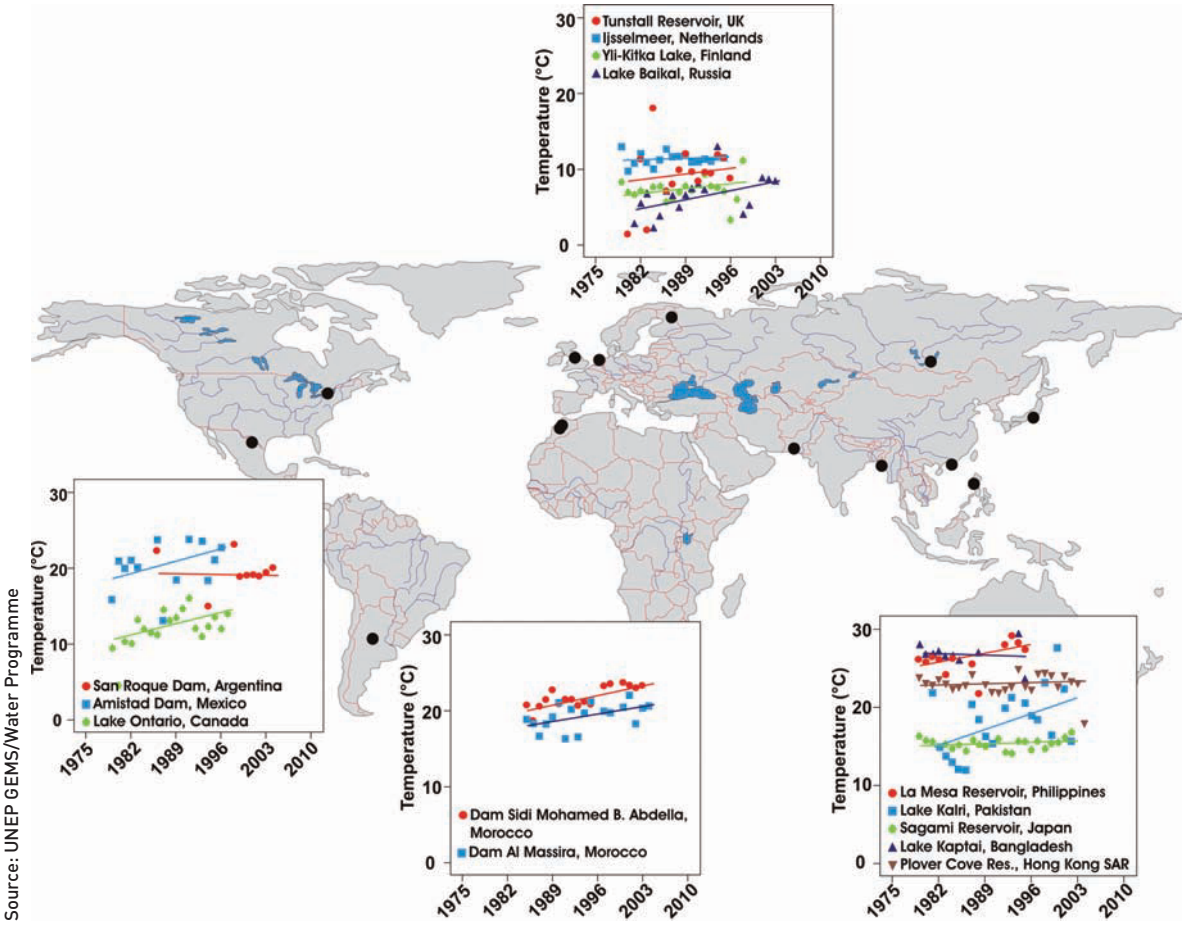
In areas with more frequent and intense precipitation, more pollution and sediments will be flushed into lakes and rivers, thereby degrading water quality. Consequently, more resources will be needed to treat water for drinking, irrigation, as well as industrial uses. However, in other areas, higher water flows could dilute pollutions, causing water quality to improve.

Further, increased flooding associated with more frequent and intense precipitation could damage or overwhelm municipal treatment facilities, mine tailing ponds, or landfills, and increase the risk of contamination. Areas of standing water could provide breeding grounds for insect and microbial pathogens, increasing the risk of disease. In regions that undergo periods of drought or receive lower than average annual rainfall, lower river flows will concentrate pollutants and increase salinity, as the dilution effects of watercourses will be reduced.

> “Over the last century, fifty per cent of species are estimated to have responded in some way to climate change”

Sea level rise may also affect water quality because increased salinity in coastal rivers and bays and cause saltwater intrusion, moving saline water into fresh groundwater resources in coastal areas.

Figure 1. Mean annual surface water lake temperatures over time for long-term monitoring stations in Europe, Asia, Africa, and the Americas. Lines are 'best fit' linear regressions.



Source: UNEP GEMS/Water Programme

WATER-RELATED CONSEQUENCES OF CLIMATE CHANGE

Temperature increases, along with changes in the frequency and duration of precipitation are expected to alter the intensity, frequency and duration of both floods and droughts. As observed by the Intergovernmental Panel on Climate Change (IPCC), the results for inland water sources will be altered water temperatures, flow regimes and water levels. As shown in Figure 1, long-term data records about lakes around the world indicate significant increases in temperature. See Figure 1.

There will also be impacts on aquatic biodiversity. Over the last century, fifty per cent of species are estimated to have responded in some way to climate change. The level of species loss will be directly related to the extent to which we can limit global warming. If we manage to contain global warming to two degrees Celsius, then there will be some species loss but there are conceivable management options for the conservation of global biodiversity. At four degrees Celsius, there will be many species lost, with few management options and enormous financial cost. At the uppermost predictions of around six degrees Celsius temperature rise, the outlook is dire. Many species are sensitive to water temperature, and even marginal changes can drastically affect reproduction of fish and other aquatic organisms. As a result, the *Millennium Ecosystem Assessment* stressed that climate change is likely to become the dominant direct driver of biodiversity loss by the end of the century.

There are significant uncertainties about the relationships of species distribution and climate change, and about species' abilities to migrate and re-distribute. Habitat fragmentation is a key factor affecting the ability of species to respond to climate change, and water sources are often an integral feature of many ecosystems.

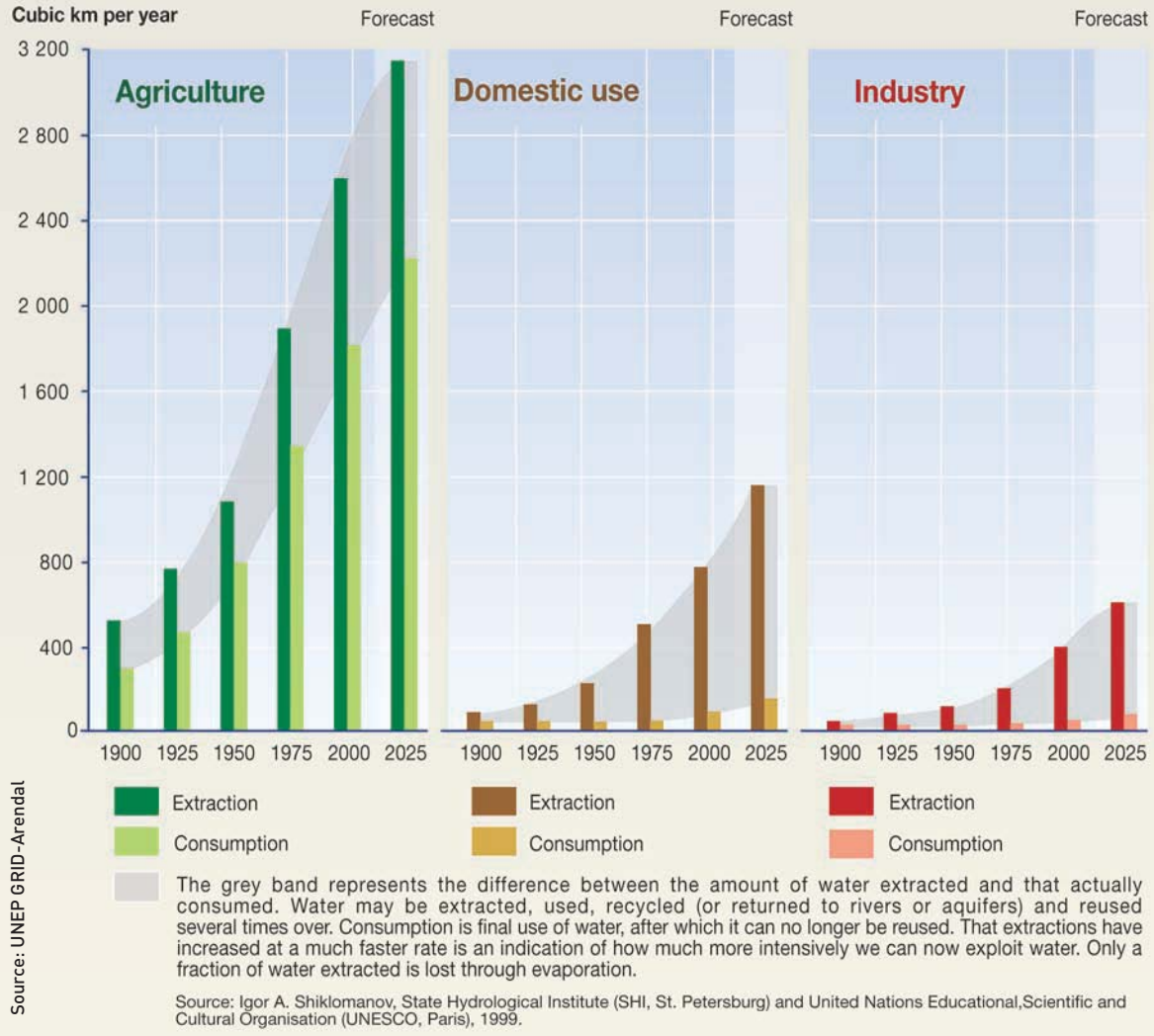
For scientists to be able to provide accurate and timely predictions and models of how climate change will affect water quality around the world, more data and information are needed. In *Climate Change and Water*, the IPCC calls for a better understanding and modelling of climate changes related to the hydrological cycle, which in turn requires better and more observational data. Information about the water-related impacts of climate change is inadequate "especially with respect to water quality, aquatic ecosystems and groundwater, including their socio-economic dimensions."

Because of increasing concerns about water quality for human use and ecosystem sustainability, there is an emerging need to assess the impacts of climate change on the quality of inland water resources on a global scale.

THE IMPACT ON INLAND WATER RESOURCES

For over 30 years, the UN's GEMS/Water Programme has been a leading source of global water quality data, with more than 3,000 monitoring stations in 100 countries worldwide. The Programme is well positioned to undertake research and assessment activities on

Figure 2. Trends in global water use.



climate change and water quality, and can make a valuable contribution to measuring the achievement of the Millennium Development Goals (MDGs) on water, sanitation and biodiversity. GEMS/Water's global data set can be used to assess the quality of water for uses including irrigation, recreation, industry, and ecosystem health. This provides the scientific basis for decision-making at all levels, which is critical particularly in the face of increasing water stress.

It is estimated that by 2020 around two-thirds of the world's population will be living in water-stressed countries. Global water use for human purposes can be split into three major categories: around 70 per cent is used for agriculture, 20 per cent for industry and the remaining ten per cent for domestic activities. As shown in Figure 2, demand for water will increase in all three of these areas as populations grow and as countries become more industrialised.

Logically, water must be managed sustainably to meet these needs. At the same time, responsible management also contributes to achieving social and economic development, as well as the MDGs.

The private sector is important for implementing solutions and contributing to community development. Industry needs reliable water supplies to manufacture products and deliver services to its customers. It also needs safe sanitation systems for the health of its employees and to treat and recycle used water.

However, much industrial activity in developing countries is undertaken using unnecessarily high levels of water consumption and water pollution. Cost reductions offer the strongest incentive for action and open new market opportunities.

> "It is estimated that by 2020 around two-thirds of the world's population will be living in water-stressed countries"

Industrial and agricultural demand for water must be considered against the backdrop of inadequate water supply and sanitation in many areas of the world. Each year there are hundreds of millions of cases of water-related diseases and more than five million deaths caused by unsafe drinking water and inadequate or nonexistent sanitation. New or "smart" technologies

offer opportunities to mitigate such problems and are proving to be very economical.
"Smart" water management includes sensor networks that can track water flow and quality, water meters that can give utilities and customers up-to-date information on water use and price, and complex "predictive" modeling to let water managers plan for the future.

WATER AND ENERGY MANAGEMENT

There is a close connection between water and energy supplies and use. Globally, about one-fifth of all the electrical power goes toward pumping and treating water, for example, and electricity generation plants use huge amounts of water for cooling.
Considering water management with energy management can enable significant increase in productivity in the use of both resources. Water conservation can lead to large energy savings, as can taking full account of energy efficiency in water management.

> "Each year there are hundreds of millions of cases of water-related diseases and more than five million deaths caused by unsafe drinking water and inadequate or nonexistent sanitation. New or 'smart' technologies offer opportunities to mitigate such problems and are proving to be very economical"

Like the carbon footprint and the ecological footprint, there is also a water footprint, designed to give a snap shot of various water uses. Created by the Water Footprint Network, it is an indicator of water use that looks at both direct and indirect water use of a consumer or producer. It gives the total volume of water used to produce goods and services consumed by an individual or community, or produced by a business.
The corporate water footprint refers to the total volume of water used directly and indirectly to run and support the business. It consists of two components: the operational water footprint, the direct water use by the business in its own operations; and the supply-chain water footprint, the water use in the business's supply chain.

Many companies collect water quantity and quality data for their own needs.

Although these footprint indicators are not universally accepted by the science community, because of their lack of robustness, they still offer a quick and easy measure of water consumption and use.
Over and above profit-maximising goals and efficiencies sought by most businesses, there is a need for corporations to be socially responsible. To return to the issue of monitoring, many companies collect water quantity and quality data for their own needs. Sharing these data with global initiatives such as GEMS/Water (water quality) and the Global Runoff Data Centre (water quantity) would increase their utility and contribute to meeting the needs of monitoring climate change.

Author

Sabrina Barker was the senior policy advisor to GEMS/Water for six years. Prior to that she was a senior advisor in the Canadian government, and worked for many international development NGOs. Her academic background focuses on international political economy, and she publishes on a range of environmental water quality issues.

Organisation

Since 1978, the UN GEMS/Water Programme has been the primary source for global water quality data. Key activities include data collection, research, assessment and capacity building. The twin goals of the programme are to improve water quality monitoring and assessment capacity in participating countries, and to determine the state and trends of regional and global water quality.

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Torrevieja's desalination plant.

Desalination, an efficient solution

GOBIERNO DE ESPAÑA
MINISTERIO DE MEDIO AMBIENTE, Y MEDIO RURAL Y MARINO
acuaMed
UNIÓN EUROPEA

Water is essential for life. Therefore, phenomena such as climate change and the progressive growth of the population all over the world, force us to look for intelligent and innovative solutions to solve water shortage problems. Facing this challenge, the Government of Spain has re-oriented water management in all its main aspects – environmental, economic and social – considering it as a high value device in development cooperation policies.

FACING THE CHALLENGE

In order to provide a competitive and durable solution to the current hydrologic imbalance in the Mediterranean basins, the Government of Spain, through the Ministry of the Environment, Rural and Maritime Affairs, is developing in this area over one hundred initiatives. All of them are based on efficient investment and sustainable development in compliance with the highest standards of the European Union. As such, the infrastructures under construction guarantee a higher equity and wellbeing for the population, taking advantage of the best available state-of-the-art technologies and promoting the maximum social agreement in all cases.

These infrastructures allow guaranteeing the availability and quality of water through technologies such as the reuse of sewage water, the modernisation of irrigation systems or seawater desalination.

The State Society Aguas de las Cuencas Mediterráneas, Acuamed, is the main instrument of the Ministry for the Environment, Rural and Maritime Affairs when it comes to developing the infrastructures necessary to ensure, now and in the future, a sufficient water supply in the Mediterranean Basins, from Tarragona to Málaga.

Acuamed is in charge of over 80 projects representing a total investment of €3,400 million. These solutions are focused on reaching goals such as generating new resources through desalination and reuse, the improvement and management of existing infrastructures, and the modernisation of irrigation systems and environmental recuperation of deteriorated areas.

THE DESALINATION PROGRAMME

Water desalination appears as part of the scope of solutions proposed within the framework by the Ministry for the Environment, Rural and Maritime Affairs. This technology, present in Spain since the 1960s, has notoriously increased its competitiveness thanks to technical advances and also to the leadership of Spanish desalination companies worldwide.

It allows obtaining, via an unlimited resource such as seawater, the quality water needed for human consumption and for irrigation in coastal areas – regardless whether or not it rains. Therefore, it also makes it possible to improve the natural hydric resources management, avoiding the overexploitation of aquifers or marine intrusion, and all of it conducted under the strictest criteria for land and marine environmental preservation, since all the desalination plants comply with a rigorous Environmental Impact Assessment.

The desalination programme of the Ministry for the Environment, Rural and Maritime Affairs, consists of a total of 32 plants, which generate a total amount of 860hm^3 quality water per year, which is enough to meet the requirements of more than 10 million people. Likewise, the irrigation of over 250,000 agricultural hectares, most

The Águilas desalination plant.

of which are dedicated to high performance crops, is ensured with the use these new resources.
From the 32 desalination plants foreseen, 11 are already in service, representing an investment of €795 million and a production of 325hm^3 of water. The most recent example is Barcelona's desalination plant – promoted by the Ministry for the Environment, Rural and Maritime Affairs, and carried out by the Autonomous Community – that started its production of 200,000hm^3 a day (60hm^3 per year) last summer in order to supply drinking water for the city's inhabitants as well as those in its surrounding areas.

DESALINATION IN ACUAMED

Acuamed invests almost a third of its budget, which means more than €1,000 million until 2011, in the development of 18 desalination projects that are to reach a total production of 479hm^3 per year. All of these projects are carried out with European Union funds, only given to projects that fulfil the highest standards of environmental caring.

> **"The desalination programme of the Ministry for the Environment, Rural and Maritime Affairs, consists of a total of 32 plants, which generate a total amount of 860hm^3 quality water per year, which is enough to meet the requirements of more than 10 million people"**

The plants managed by Acuamed use the desalination procedure known as inverse osmosis. It consists in taking the seawater and filtering it by using sand filters and very fine membranes, which separate drinking water from seawater. Seawater, with higher salt concentration levels, is returned back to the sea once it is diluted by diffusers in order to prevent harm to the marine environment. Technological developments, amongst other efficiency improvements, have led, in only ten years, to the reduction of energy consumption in these plants by half.
The high quality of water obtained through these procedures allows it to be used for human consumption or irrigation of all kinds of crops, especially those with a high demand for water supply. For this reason, these procedures are also the adequate solution for guaranteeing the continuity of economic activities such as specialised intensive agriculture or tourism, since coast settlements with the highest flow of summer visitors also face a high water supply demand.
Amongst the most relevant projects that Acuamed is currently developing are: Torrevieja (Alicante); Águilas/Guadalentín (Murcia); and Cuevas de Almanzora (Almería) – all of which are in the advanced construction phase. Likewise in process are the works at Cabanes/Oropesa(Castellón); Sagunto (Valencia); Mutxamel/El Campello (Alicante); and Campo de Dalías (Almería).
The desalination plants in Torrevieja (Alicante) and Águilas/Guadalentín (Murcia) will be, once completed and as soon as they start functioning, the largest in the Mediterranean European region. They both represent a total investment of €567 million, and they have a production capacity – altogether – of 420,000m^3 per day (80hm^3 per year for the Torrevieja plant – designed to produce 50 per cent more if needed – and 70hm^3 per year for the Águilas/Guadalentín plant). The Torrevieja plant directs half of its production to the drinking supply and the other half to irrigation. This plant is conceived with two main goals in mind: to guarantee the water needs in the Segura Basin, complementing the contributions made from the Tajo Segura transfer; and to relieve the current overexploitation of underground water sources.
Likewise, the new plant of Águilas/Guadalentín (Murcia) guarantees the water supply in the Alto Guadalentín region as well as correcting the overexploitation, nowadays unsustainable, of the area's aquifers.
In a nutshell, it is all about providing more efficient, sustainable and agreed upon solutions for more rational water consumption, something that belongs to society as a whole.

ACUAMED DESALINATION INVESTMENTS

- Performing framework: Mediterranean basins
- Desalination investment: €1,000 millions until 2011
- Total projects: 18
- Water production: 479hm^3 per year.
- European Union: co-finances all projects.
- Torrevieja and Águilas, major plants in the Mediterranean European region: €567 millions in investment, 420,000m^3 desalination water per day

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Pumping groundwater for agriculture, Middle East.

© IUCN/Megan Cartin

Averting the next global credit crunch: water

DR MARK SMITH
HEAD OF THE IUCN WATER PROGRAMME

The sudden absence or overabundance of water makes the abstract and invisible forces of climate change painfully clear: torrential rains wash away fertile soils and dried up rivers no longer water lush gardens and wetland beauty.

INTRODUCTION

Water scarcity has long been somebody else's problem. Yet we all depend on water to grow our food, produce our goods, and generate our energy. The reality is that we have outsourced our security until we feel utterly insulated from the risks of water scarcity, depending on political leaders who must *surely* have everything under control. Continuing to do so could be a painful mistake.

> "The fact is that our failure to curb climate change is destabilising our water resources and could push nations to the verge of aquatic bankruptcy"

FACING THE PROBLEMS OF TOMORROW

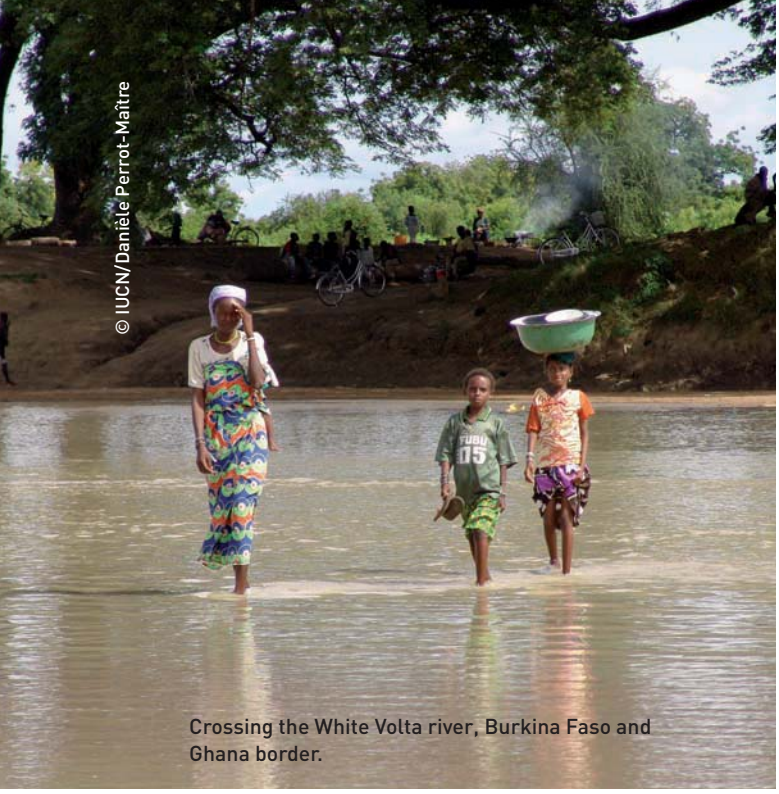
Little has prepared us for tomorrow's extremes. In hindsight, should we have entrusted our wealth to omniscient financiers who promised to save us from meltdown? Of course not, we should have trusted more in our own instincts about what constitutes sustainable finance. And now, amid the economic hardship that resulted from financial mismanagement, a new challenge looms large even as, once again, many leaders around the world appear to be ignoring the obvious danger signs.

The fact is that our failure to curb climate change is destabilising our water resources and could push nations to the verge of aquatic bankruptcy. We do not only suffer from shrinking federal reserves but dwindling federal reservoirs. We also see uncomfortable parallels between toxic debt and polluted aquifers, as well as dried up bank accounts and desiccated farmlands. In fact, some parts of the world are literally insolvent.

SAVING EARTH'S RIVERS

From the Yellow and Colorado to the Ebro and Murray Darling, failures in water management mean major rivers are drying up and losing their connection to the sea; even Amazonian tributaries are running dry. Lake Chad and the Aral Sea have withered into little more than giant shallow puddles. Water tables beneath Beijing, Bangalore and Barcelona are lower each year.

We are already borrowing water from banks deep in debt. Yet, by 2050 we will have added another 2.5 billion thirsty shareholders. An unstable water supply will not correct itself, nor can anyone afford to ignore it. Nearly one billion humans lack access to clean water and



Crossing the White Volta river, Burkina Faso and Ghana border.

a child dies every 20 seconds as a result. Yet scarcity affects more than the poor.

According to a recent study by the Marsh Center for Global Risk, two in five global industries say water shortage would prove "severe" or "catastrophic" for their business; fewer than 17 per cent are prepared for that calamity. In October 2007, Atlanta, the fastest growing US city and home to multinational firms, was left with 87 days of drinking water. Never mind capital chasing cheap labor, finding secure water may drive companies to relocate.

GOVERNMENT RESPONSES

Government responses to the financial crisis follow a pattern: print more money, pump it into banks, and jumpstart the economy on government credit. We hope the plan works.

But what can governments do to avert the water crunch? Just open the gates and pump ever more water? With rainfall drying up and evaporation soaring, more reservoirs are unlikely to meet growing demand. Drilling deeper to tap new sources will need to be matched by deeper pockets to pay the bill, bring up the water and deliver it.

Shielding a nation from global water woes will not work either. To be sure, climate change is global while water stress is local. Yet we live in an increasingly water-interdependent world, in which more than 260 rivers are shared by two or more countries. Droughts in Australia and farm policy in North America, combined with hunger in Asia, create spikes in food prices and in energy cost everywhere.

Shifting to another source? Food can be grown without soil or even sunlight, but not without water. And while there are a dozen energy alternatives to fossil fuel, there is no water substitute. Everything of value, living or mechanical, depends on water.

WHAT WE CAN DO

Becoming resilient to climate change requires us to adapt and water is a frontline issue for us all. We have to adjust the way we use, distribute, allocate and make decisions on water. Rather than continue to deplete our water resources, we must adapt our demands to a finite, shrinking and unstable water supply.

Governments must align their climate policies with these new and intensifying water realities. A strategic decision is required to move away from ever expanding supplies to curbing demand. Commitments need to be made to finance 'soft-infrastructure' governance approaches that empower local decision-making so people can negotiate water saving and water sharing. The route-map is not a mystery: agreement should be reached on wisely-managed forested watersheds and floodplains that are the underlying infrastructure of the way nature delivers water. These policies should be a central pillar of the climate talks in Copenhagen at the end of this year.

Perhaps we could have avoided the global economic crisis if we better understood our real exposure to risk. That wealth was largely on paper and we may yet regain it. But to prevent a deadlier and far less reversible form of damage, let us now take measures to secure our water – the liquid asset on which all life depends.

Author

Mark Smith is the Head of the IUCN Water Programme. Prior to joining IUCN, he was a scientist with areas of specialisation in agriculture, forestry and hydrology. Between 1991 and 2000, his work focused primarily on agroforestry in West Africa, then in Kenya, while working at the UK Centre for Ecology and Hydrology. From 2001 to 2004, he was leader of the Livelihoods and Environment research group at CSIRO Sustainable Ecosystems in Australia. Mark spent 2005 as policy advisor on climate change and poverty at the UK development NGO Practical Action, and was author of the book ' Just One Planet: Poverty, Justice and Climate Change'. He holds an undergraduate degree in agriculture, Masters in climatology and a PhD in ecology.

Organisation

IUCN, the International Union for Conservation of Nature, is the world's oldest and largest global environmental network – a democratic membership union with more than 1,000 government and NGO member organisations, and almost 11,000 volunteer scientists in more than 160 countries. IUCN headquarters are located Gland, near Geneva, in Switzerland.

IUCN's Water and Nature Initiative (WANI) is an action-oriented programme which brings together stakeholders and members for sustainable management of water resources. Through worldwide field projects IUCN demonstrates how stakeholder participation, building capacity, improved water governance and innovative financing can improve livelihoods and maintain healthy ecosystems. Learn more about IUCN work on water at www.iucn.org/water.

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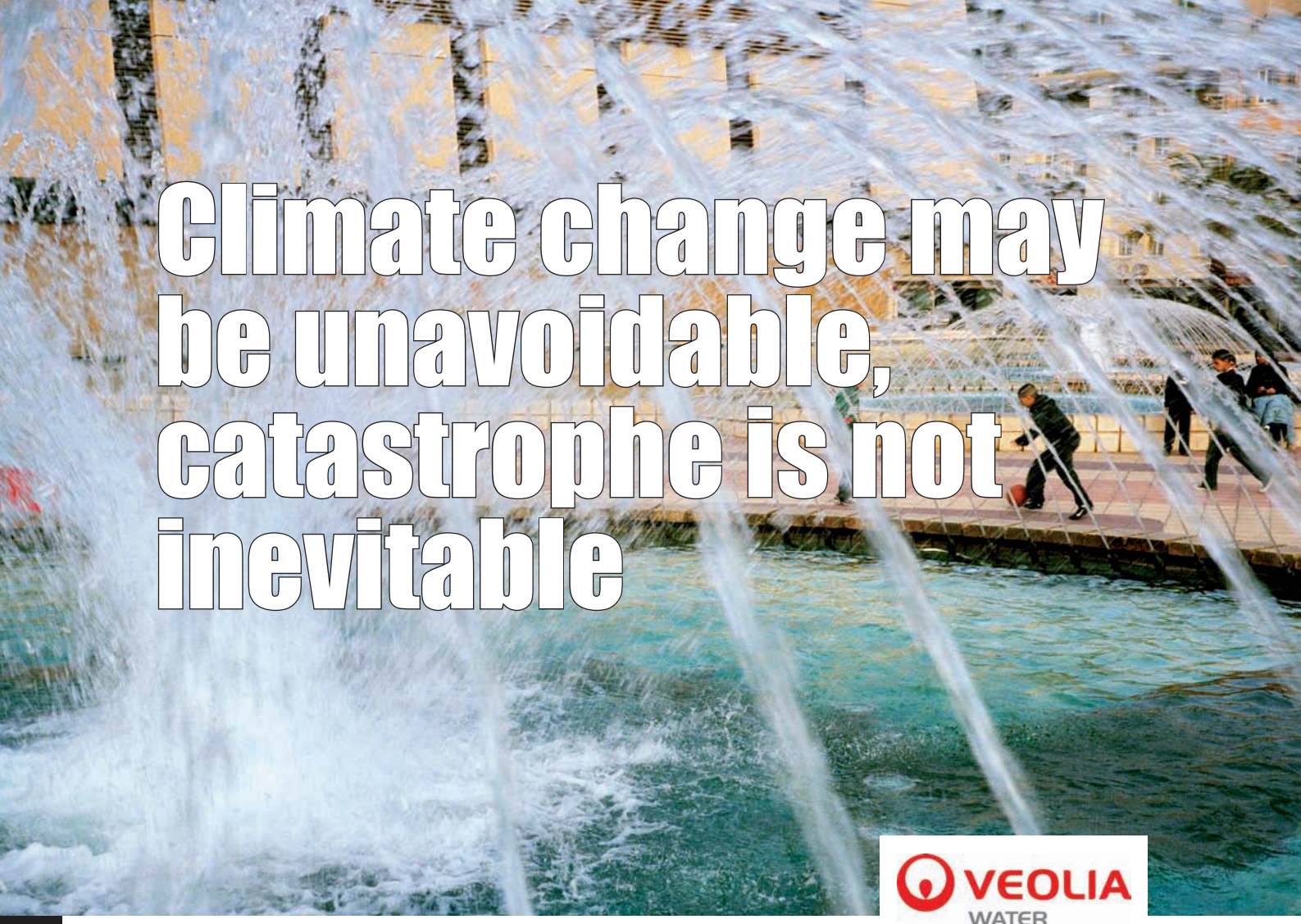

Climate change may be unavoidable, catastrophe is not inevitable

Businesses and organisations can and must play their part in reducing carbon emissions and start to adapt right now to future climate conditions.

MANAGING WATER

We cannot master the climate but we can manage the water. It is not a question of fighting against nature, but of allying ourselves with nature in order to escape from the climate change trap. We must not forget that providing access to potable water and sanitation services to the billions of people on the planet who lack them is the main water challenge today, and one of the most vital Millennium Development Objectives. So while we can work on analysing and managing the coming effects of global warming, we must mobilise our energy and funds now to solve the real, immediate and ancient human tragedies such as the lack of drinking water that kills hundreds of people every day. Climate change makes the water question even more crucial than before. Climate change is a real issue that we have to address but there is no shame in first prioritising the solution to known problems that fatally affect huge numbers of people today.

Water is at the heart of climate change adaptation. It also has to be at the heart of mitigation policies. The conclusions are stark for our planet's future. By 2080, 3.2 billion people will suffer severe lack of water, and 600 million will suffer from famine caused by drought and soil degradation. A decrease in water resources across much of Asia is forecast. At the same time, population growth and higher living standards will require ever-increasing quantities of water. In Europe, nearly all regions will be negatively affected through floods, erosion, ecosystem degradation, thawing of glaciers and the disappearance from the continent of 60 per cent of species between now and 2080. Southern Europe will be the worst affected: there will be a reduction in water provision and hydroelectric potential, an impact on tourism and a reduction in agricultural productivity.

> **"Water is at the heart of climate change adaptation. It also has to be at the heart of mitigation policies"**

We must first remind ourselves that most countries have sufficient water to meet human needs and environmental concerns. The problem of water scarcity lies primarily in its management. This means that we can start facing these challenges with methods that we can quickly develop ourselves. One that makes sense is saving water.

SAVING WATER

Reducing leaks and consumption can reduce withdrawals of water or satisfy greater needs with the same amount of raw water. Savings obtained over a period of five years in Veolia Water's Moroccan concessions represent the consumption of nearly a million inhabitants.

Avoiding water wastage – and there is a real revolution in motion driven by this necessity – means that we need to move from the currently predominant culture of supply management, to a culture of managing demand. In many parts of the world, change is needed to move out of the consumerist logic in which we are caught, a logic that has shown its limits in managing water scarcity.

> "Savings obtained over a period of five years in Veolia Water's Moroccan concessions represent the consumption of nearly a million inhabitants"

How can we do this? We cannot succeed without the involvement of consumers by providing them with the means, thanks to new technologies in particular, to control their consumption. Therefore, the consumer can actively contribute to protecting his environment and the water supply.

VEOLIA WATER

Going beyond this behavioral change will depend on our collective capacity to bring forward policies and technologies designed to mitigate its effects (policies designed to limit greenhouse gas emissions) and policies to adapt to a changed climate. The water sector has its role to play by putting forward low carbon technologies and rigorous and professional management practices of the water cycle. Veolia Water recognises this need and is dedicated to providing long term solutions, anchored in sustainability, to meet the changing availability and quality of water resources. The company builds on its long standing experience in drinking water and sanitation systems to develop advanced technologies with a low carbon footprint for both municipal and industrial clients around the world. An example of this is the development of the energy self-sufficient wastewater treatment plants which will come into operation from next year.

We can and must go further. From energy efficient water and wastewater treatment plants, to leading-edge water reuse technologies for industry and agriculture, aquifer recharge, desalination expertise, and the self-production of renewable energy, including the company's intense research and development programme on alternative water resources, Veolia Water can help their clients deal with the evolution of the climate. But let us also get back to some of the basics and use the water we have available to us now as wisely as possible.

Organisation

Veolia Water, the world's leading operator of water services, provides water and wastewater services for public authorities and industries. The company also designs technological solutions and builds the requisite facilities.

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Do you see dolphins?
We also see a challenge to find solutions which guarantee good quality water.
Veolia Water purifies and supplies more than 17 billion litres of drinking water every day in the world, for more than 80 million people every year. As the world's leading water services company, we also implement innovative solutions to recycle wastewater for business and industry, and try to balance the needs of people whilst caring for our environment.
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The world's first carbon neutral, zero waste city:

THE TALE OF MASDAR CITY

Masdar City, the world's first carbon-neutral, zero-waste city.

DR. RASHID AHMAD BIN-FAHAD
MINISTER OF ENVIRONMENT AND WATER,
UNITED ARAB EMIRATES

Over the last couple of decades, anthropogenic emissions have resulted in the gradual increase in global temperature. Without the concerted efforts of governments and civil society worldwide, we would approach a point of no return. Moreover, and as per Maslow's hierarchy of needs, habitat is the most basic human need. Consequently, humanity needs urgent and environmentally-friendly urban solutions to the growing world population.

This paper addresses the United Arab Emirates (UAE) Government's initiative in establishing Masdar, a break-through solution to the world's urban development challenges. Skeptics may argue that the costs of establishing Masdar city far outweigh what governments around the world can muster. We counter this argument by saying that Masdar city is first of its kind, and therefore costs are naturally high, but that, one day, and due to the severity of the challenges ahead of us, more cities would be built like this.

MASDAR CITY AND SUSTAINABILITY

Masdar city is a unique integrated Green Community in the heart of Abu Dhabi. It is currently under construction and is expected to be complete in 2016. The city will be entirely powered by renewable energy, is situated on seven square kilometres of land, and will host the Masdar Institute of Science and Technology, the Masdar Research Network, light industry, development units and laboratories, and local and international tenants.

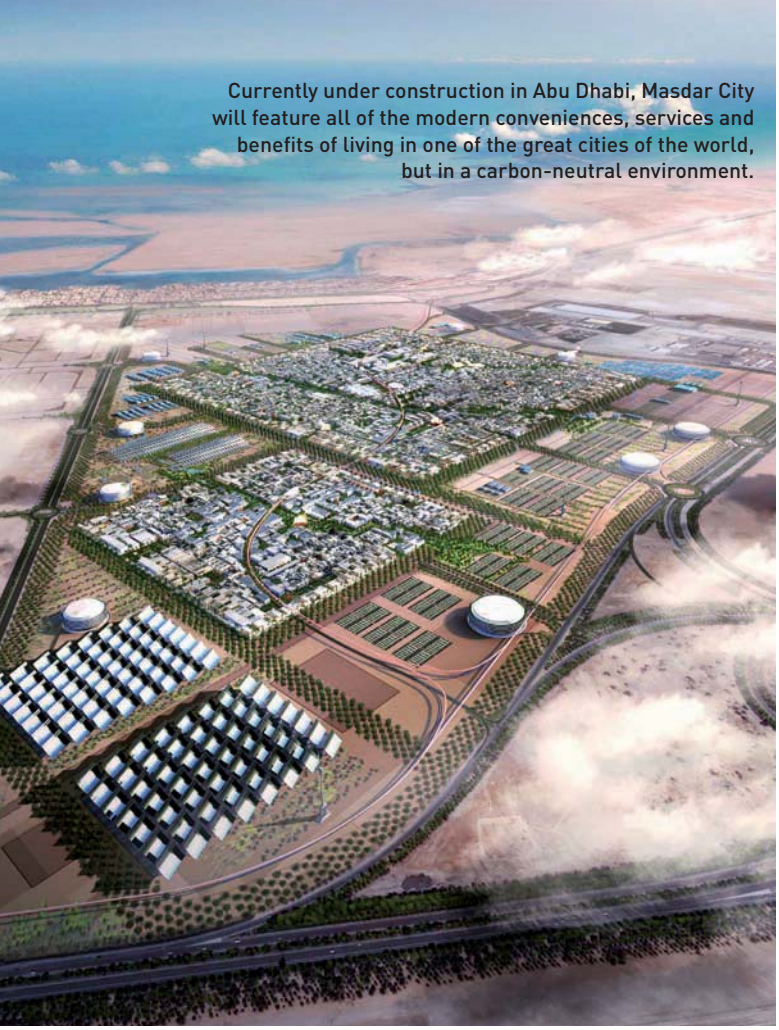
Masdar city will strive towards a zero waste objective and will contain pioneering public transportation systems – there will be no cars or internal combustion engines of any sort inside Masdar; rather, an innovative personal rapid transport system will move people within the city.

Realising that the amount of power available will be significantly less than can be obtained using conventional hydrocarbon technologies, integration within the city would therefore be utilised. This would allow for benefits which, added together, can make a significant difference. One example is the use of carefully designed and shaded streets and buildings in Masdar city, which will reduce the need for air conditioning, and cut electricity demand. Moreover, Masdar city's power infrastructure will feature a range of renewable energy technologies, including photovoltaic plants; a concentrating solar thermal power plant; evacuated thermal tube collectors; and a waste-to-energy plant. Intelligent design and pioneering urban planning will allow energy consumption to be reduced by about 70 per cent from that needed for a conventional city of the same size, under Abu Dhabi's current conditions.

Underground PRT System.

Table: OPL's 10 holistic principles and Masdar's targets.

GLOBAL CHALLENGE	OPL PRINCIPLE	OPL GOAL	SOME OF THE MAIN MASDAR TARGETS
Climate change due to human-induced build-up of carbon dioxide (CO_2) in the atmosphere	Zero Carbon	Achieve net CO_2 emissions of zero tonnes from operation of buildings in OPL developments	• 100 per cent renewable energy sources • Net zero tonnes of carbon release in generating the power consumed for operating the site (CO_2 released in energy from waste will be offset) • (Construction) Track embodied carbon of construction activities to offset through on-site renewable generation or Masdar-specific carbon trading scheme • (Operation) Reduction in consumption of energy in buildings of approximately 80 per cent
Waste from discarded products and packaging create a huge disposal challenge while squandering valuable resources	Zero Waste	Promote recycling and eliminate waste flows to landfill and for incineration	• Volume of construction waste generated not to exceed 13 m^3/100 m^2 of floor area for phase 1 of project, to be reviewed following monitoring data collection for later phases. • Over 99 per cent diversion of waste from landfill by 2020 • 30 percentage waste minimisation from baseline
Travel by fossil fuel based car and airplane can cause climate change, air & noise pollution, and congestion	Sustainable Transport	Reduce reliance on fossil fuel based transport, and achieve major reductions of CO_2 emissions from transport	• Transport within the city: 0 kg CO_2/year (reliance on Personal Rapid Transport system) • Percentage of land-based journeys to and from Masdar: 55 per cent by private car and 45 per cent by public transport by 2020
Destructive patterns of resource exploitation and use of non-local materials in construction and manufacture increase environmental harm and reduce gains to the local economy	Local and Sustainable Materials	Transform materials supply to the point where it has a net positive impact on the environment and local economy	• Track embodied carbon of construction and offset through on-site renewable generation or specific carbon trading scheme • 100 per cent timber from most environmentally appropriate and/or sustainably certified sources
Industrial agriculture produces food of uncertain quality and harms local ecosystems, while consumption of nonlocal food imposes high transport impacts	Local and Sustainable Food	Transform food supply to the point where it has a net positive impact on the environment, local economy and peoples' well-being	• Ecological footprint of food consumed in shops and restaurants will be consistent with achieving overall personal consumption of 0.6 global hectares/person • Minimum 75 per cent (by weight) of total food consumed by 2020 to be low environmental impact • One farm shop sourcing regional produce by phase 4
Local supplies of freshwater are often insufficient to meet human needs due to pollution, disruption of hydrological cycles and depletion of existing stocks	Sustainable Water	Achieve a positive impact on local water resources and supply	• 140 litres/person per day (37 l/p/d 'new water', remainder supplied from on-site recycled sources) • 3.85 litres/m^2/day (reduced to 2.35 with greywater recycling)
Loss of biodiversity and habitats due to development in natural areas and overexploitation of natural resources	Natural Habitats and Wildlife	Regenerate degraded environments and halt biodiversity loss	• If valuable species are identified through EIA process, then any valuable species to be relocated • Budget to be agreed to invest in at least one UAE biodiversity project by 2015 • Budget to be agreed to invest in one regional project in biocapacity to support increasing local biocapacity by 2015
Local cultural heritage is being lost throughout the world due to globalisation, resulting in a loss of local identity and wisdom	Culture and Heritage	Protect and build on local cultural heritage and diversity	• Build the city using narrow streets for shading and use wind catchers in the city for passive ventilation • Integrate renewable technologies into the cityscape • Provide segregated waste collection facilities throughout the city • Door knocking and poster awareness raising programmes about recycling, combined with recycling infrastructure in the city
Some in the industrialised world live in relative poverty, while many in the developing world cannot meet their basic needs from what they produce or sell	Equity and Fair Trade	Ensure that the OPL community's impact on other communities is positive	• Everyone employed during construction and operation of Masdar from day one of their employment • Identify target project e.g. Al Ghadeer women's project, affiliated with the Red Crescent Authority. Set target for increasing capacity of that project by 100 per cent by target group compared to their current baseline by 2015 e.g. number of disadvantaged people accessed, number of outreach staff employed
Rising wealth and greater health and happiness increasingly diverge, raising questions about the true basis of well-being and contentment	Health and Happiness	Increase health and quality of life of OPL community members and others	• Zero emissions zone to improve health • Provide walking and cycling lanes throughout the city • Natural daylight to buildings from courtyards and streets, solar control glazing with daylight transmission >65 per cent • Build library and community centre • Annual celebration or event provided for all major festivals for all countries represented at Masdar • 70 per cent of residents reporting that they have a higher quality of life than where they previously lived



Currently under construction in Abu Dhabi, Masdar City will feature all of the modern conveniences, services and benefits of living in one of the great cities of the world, but in a carbon-neutral environment.

UNDERGROUND PRT SYSTEM

The One Planet Living (OPL) vision is a world in which people everywhere can lead happy, healthy lives within their fair share of the earth's resources and leave space for wilderness and wildlife. OPL has been developed to communicate the challenge we all face in reducing our environmental impact, and to facilitate change at local and global levels by working with partners. It is a global initiative based on 10 principles of sustainability developed by BioRegional and WWF International.

Masdar's Sustainability Action Plan (SAP) incorporates the principles to exceed the standards of OPL into Masdar's development as it takes into account the total carbon footprint and not merely lifetime operational carbon.

THE OPL APPROACH AND ECOLOGICAL FOOTPRINTING

Global Footprint Network and WWF's Living Planet Report show the rate at which people are consuming natural resources and polluting the environment. Our 'ecological footprint', is rising rapidly. In the last 40 years our ecological footprint has increased by around 150 per cent. According to the report, overall trends in populations of wild species around the world have declined by around 30 per cent between 1970 and 2003.

Human beings – especially the rich – consume and pollute more than a planet can sustain by 25 per cent. If they keep on the way they are living, they will need between three to five planets to sustain it. On the contrary, poorer countries survive below the One-Planet level. We, as environmentalists, decline both ways of living and vow to achieve OPL by enjoying resources distribution equity throughout the world.

Such a way of living in the UAE, for example, gave rise to the footprint as a result of the carbon dioxide (CO_2) emissions from different sources. To tackle this environmental problem, the UAE government has already taken several initiatives in a bid to mitigate CO_2 emissions and achieve a sustainable use of resources. On the part of throttling the emissions of gases, especially CO_2, the government is conducting the zero flaring strategy in petroleum and petrochemical activities, looking to Compressed Natural Gas (CNG) as fuel for cars, and examining mass transport improvement and the metro project – all of which is in addition to implementing the green building strategy in the country. Abu Dhabi announced that it is setting a goal of seven per cent of power to come from renewable energy by 2020. Much of this will be created by the flagship Masdar initiative, with Masdar city recently having being named as the headquarters of the International Renewable Energy Agency (IRENA). Masdar city will be a home for IRENA.

Ecological footprinting provides a valuable tool for measuring consumption of renewable natural resources in a way that is easy to understand and communicate. The tool enables the measuring of the environmental impacts of a process, product, community, region, organisation or an individual's lifestyle. The methodology provides an accounting tool that represents environmental impact in terms of the area of biologically productive land required to produce a particular natural resource, absorb waste materials arising from consumption, and cope with the carbon dioxide emissions associated with the energy demands. The methodology can then be used to compare the calculated footprint with the actual amount of biologically productive land available on earth; this can tell us if individuals and populations are living within the earth's regenerative capacity.

Ecological footprinting allows calculation of the amount of biologically productive land and sea needed to support a particular lifestyle. From satellite imaging it has been estimated that the planet has a total of 12.6 billion hectares of biologically productive land and sea. Leaving 10 per cent of this land and sea for wildlife, we should then aim to live off 11.3 billion hectares as a global society. With a global population of six billion, the target should be for the average person to live within 1.8 hectares of biologically productive land, which with growing global population will need to be 1.5 hectares per person by 2020.

OPL'S 10 HOLISTIC PRINCIPLES AND MASDAR'S TARGETS

OPL is underpinned by the following sustainability principles. From the Masdar targets, one can discern that Masdar will either meet or even exceed these standards.

CONCLUSION

As illustrated, Masdar city will develop and apply innovative solutions at scale, the scale of an entire city. To address the enormous energy and environmental challenges facing the global community today, solutions must have meaningful scale. We need radical new solutions, and we need them today.

Masdar city at Sunset.

For the first time in history, more than half of the world's population lives in cities, with their traditional energy inefficiencies, waste and pollution. Sixty per cent of all global energy is consumed by buildings. This is precisely why Masdar city will literally re-engineer the way modern cities are built and how energy is used.

Such a concerted effort reflects the UAE's moral duty to honour the global partnership in confronting climate change as signatories to the convention, as well as doing so in a way that reflects the unique needs of an oil-dependent economy. We believe that Masdar city will be the first of many similar sustainable cities in the future.

Author

Dr. Rashid Ahmad Muhammad Bin-Fahad was appointed Minister of Environment & Water; United Arab Emirates. Previous roles have included Secretary-General, of Gulf Cooperation Council (GCC) Standardization Organization (GSO), Riyadh Saudi Arabia, Board Vice-Chairman, Emirates Authority for Standardization & Metrology (ESMA), Deputy Director General, Emirates Authority for Standardization & Metrology (ESMA). UAE., and Head, Food & Environment Laboratory, Dubai Municipality, Dubai, U.A.E. Organisation.

Organisation

The Ministry of Environment and Water's vision is to protect the Environment and the Natural resources for sustainable development. The goals of the Ministry are: the protection and development of ecosystems; development and sustainability of water resources; development and sustainability of agricultural and animal resources and fisheries; human resource development and upgrading their capabilities; access to the ranks of leadership in the application of international standards and best practices.

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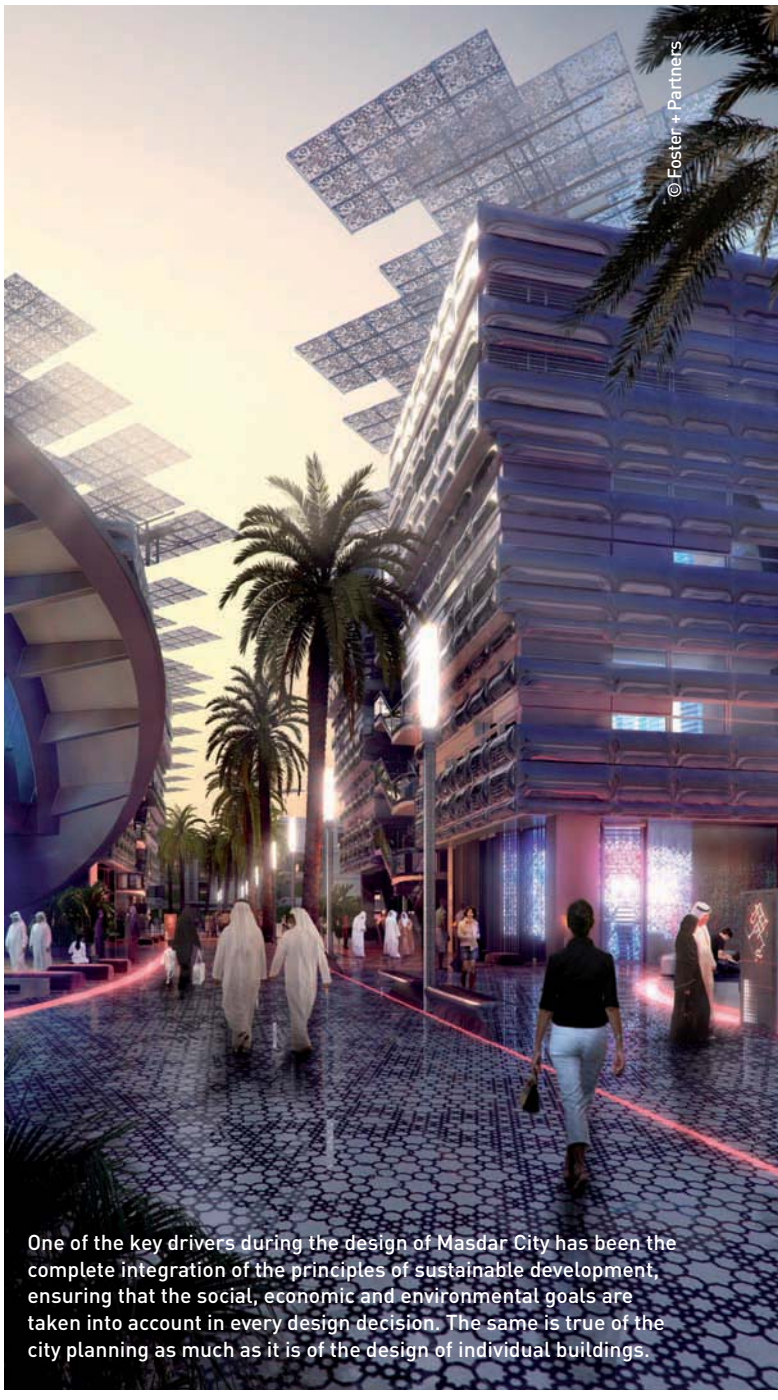

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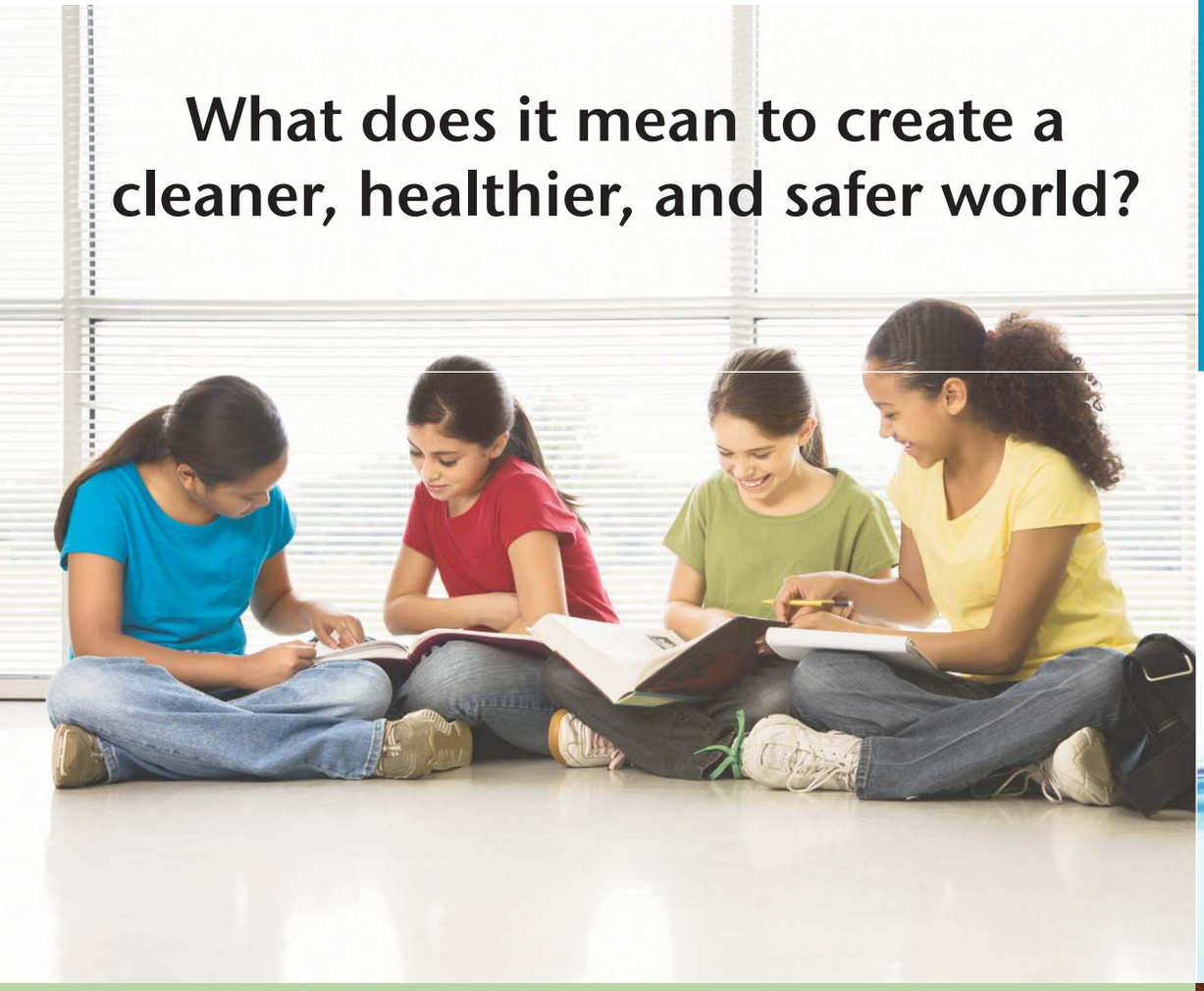
One of the key drivers during the design of Masdar City has been the complete integration of the principles of sustainable development, ensuring that the social, economic and environmental goals are taken into account in every design decision. The same is true of the city planning as much as it is of the design of individual buildings.

What does it mean to create a cleaner, healthier, and safer world?



TENNANT®

For Tennant Company, it means creating innovations that allow customers to decrease their impact on the eco-system, such as our chemical-free ecH2O™ cleaning technology.

ecH2O™ converts water into a powerful cleaning detergent, eliminating chemical production, usage, and disposal to reduce the footprint in seven environmental categories by as much as 98%*.

Each day we aspire to be stewards of everything we touch – people, places, and products... now and in the future.

Learn more about Tennant innovations that improve our world at www.tennantco.com

*Data supplied in footprint reduction study conducted by the independent environmental sustainability group EcoForm.

Does water alone have the power to change the world?

Chemical-Free Cleaning Saves Water and the Environment

Tennant Company, a world leader in designing, manufacturing and marketing solutions that help create a cleaner, safer world, has developed a cleaning technology called ec-H2O™ that electrically converts tap water to make it behave like a powerful detergent. Using this technology, organizations can clean their facilities with the same cleaning effectiveness as general purpose cleaners, without the environmental or health impacts of producing, packaging, transporting, using, and disposing of traditional chemicals.

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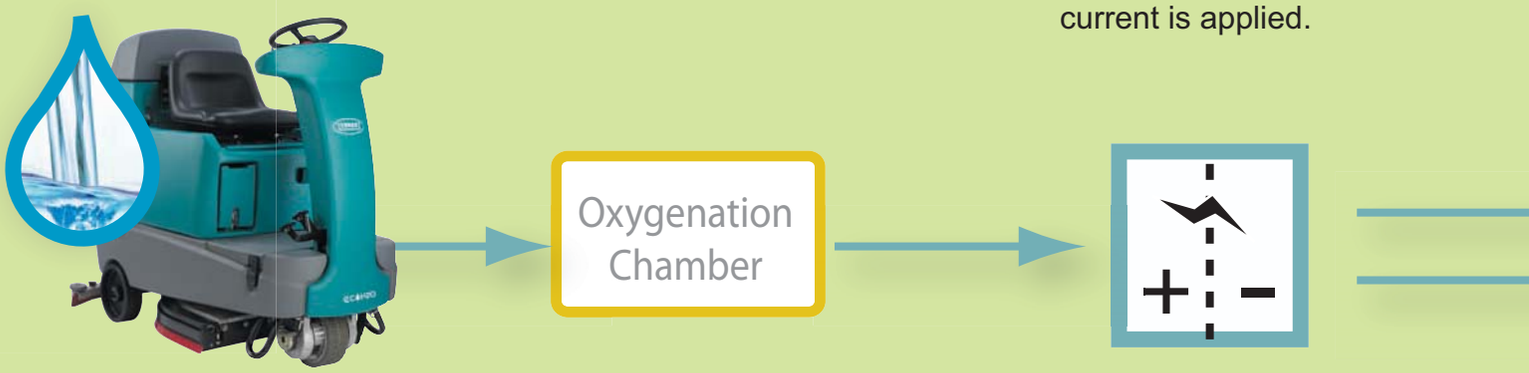
ec H2O™
ELECTRICALLY CONVERTED WATER

Uses 70 percent less water than traditional cleaning methods

Approximately 130,000 new floor scrubbing machines are sold annually, which consume nearly 1.35 billion liters of water per year. If all new scrubbers sold were equipped with ec-H2O technology, global water usage would be reduced by approximately 950 million liters annually.

How it works:

1. Plain tap water is poured into the cleaning machine.
2. Water is infused with oxygen bubbles to create highly oxygenated water.
3. The oxygenated water flows through a water cell where an electric current is applied.



In addition, ec-H2O would eliminate the need to treat 11 million liters of all-purpose cleaner in the wastewater stream which are released into treatment facilities. If the 130,000 machines sold each year were used five times a week and used 15 ml of detergent to 1 liter water, the packaging waste generated from these all-purpose cleaners consists of 4.4 million kg of cardboard, 1.1 million kg of HDPE, 33.000 kg of non-recyclable caps and 29.000 kg of non-recyclable label material.

Reduces packaging and production of chemicals

In less than a year ec-H2O has proven itself to industry experts, receiving prestigious certifications and awards not only for its performance, but its significance to safety, the environment and the industry. These include the European Business Award (EBA) for Business Innovation 2009, an independent awards program designed to recognize and promote excellence, best practice and innovation in the European business community. ec-H20 was also selected as one of the 2009 Top 10 Green Building Products winners by Sustainable Industries' Top 10 Green Building Products guide. In the health care industry, Premier's Innovation Celebration, honored ec-H2O technology for its impact on improving patient health. The technology also joined previous breakthrough innovations such as the ATM, fax machine and HDTV by being chosen in 2008 as a most technologically significant innovation by R&D Magazine.

Learn more: www.tennantco.com

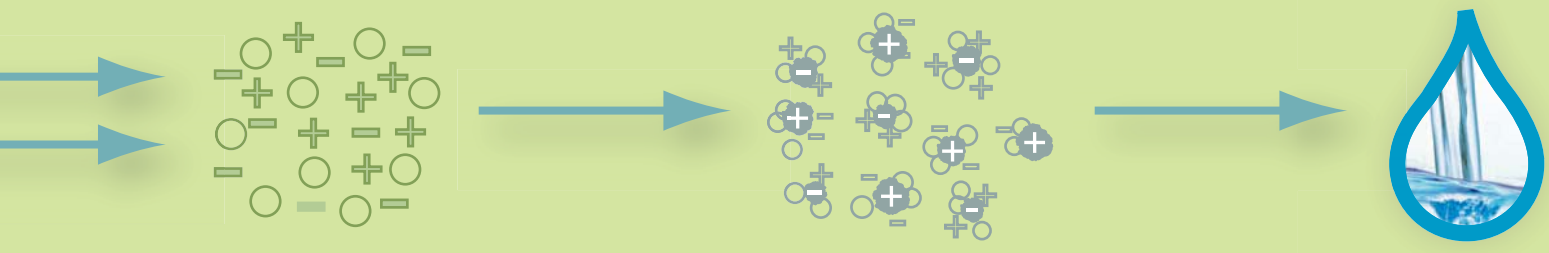
Creating a cleaner, safer world.

TENNANT®

4 Flowing out of the water cell is a blended stream of positively and negatively charged water with all the power of a general purpose cleaner.

5 The converted water attacks the dirt, breaks it into small particles, and pulls it off the floor's surface – enabling the scrubber's pads or brushes to easily scrub away the dirt.

6 After 45 seconds, the converted water begins to recombine into normal water. All that is left in the recovery tank is plain water and dirt.



Visible rainwater harvesting is part of the design.

New office facility at Gigiri, Nairobi

LOVA ANDRE' NILSSON
UNEP CLIMATE NEUTRAL STRATEGY OFFICER,
SUSTAINABLE UNITED NATIONS (SUN)

The United Nations Environment Programme, UNEP, became a climate neutral organisation in 2008. The next target is to build a new energy neutral UNEP Headquarters office in Nairobi, Kenya. The new office is developed together with the UN administrative organisation in Nairobi, UNON, and aims to apply many sustainable building features. Efforts are undertaken to reduce electricity consumption and a solar power installation will be installed on the roof of the building.

A 'GREEN LUNG' FOR THE CITY OF NAIROBI

The United Nations has five headquarters world wide – one of which is located in Nairobi, Kenya. The UN Nairobi location hosts the global headquarters of UNEP, the principal environment agency of the UN, the global headquarters of UNHabitat, the UN settlements programme, as well as over 30 regional offices of other UN agencies.

The UN Nairobi compound is a beautiful 140-acre 'green lung' on the outskirts of Nairobi. More than 600 indigenous tree species are found on the compound, as well as many species of birds and small mammals. Rainwater is harvested, wastewater is recycled, wetlands maintained and all the buildings are cooled by natural ventilation. Water is heated using solar water heaters and a waste separation and recycling system is in place.

CATERING FOR MORE STAFF WITHOUT COMPROMISING THE ENVIRONMENT

The UN staff in Nairobi is increasing (from 2,500 today to about 4,000 in the future) and the decision has been taken to build a new UNEP headquarters building on the Nairobi compound. The intention from the start was to create an office with natural ventilation, enhancing natural light and using local building techniques. The ambition was later expanded to include sustainability criteria in all aspects of the building and its operation.

The construction started in May 2009 and is planned to be completed by end 2010. The building will have 16,500 m^2 of tenable space and will cater for 1,200 staff members. The building will consist of four blocks connected to one another, arranged in two parallel wings with a central atrium. The central atrium will be covered with a translucent roof to allow daylight into the building. Examples of sustainability features incorporated in the new office include:

- the promotion and use of local building materials
- rain water harvesting
- water recycling and re-use in an artificial wetland
- water efficient dual flush toilets (three versus six litres)
- green zones inside the building
- guidelines for the users of the building
- light wells to enhance natural lighting indoors

Orientation and design for maximum natural light indoors without heating or glaring problems.

Zero Net Energy Building:

A building that consumes no more energy in operation that it can generate. The focus is on minimising base-building energy consumption and then meeting energy demand with renewable energy generated on-site. Theoretically, an appropriately designed building can operate as zero net energy from its first day of operation.

- natural cooling – no need for air conditioning
- energy neutrality through an integrated PV system

ENERGY NEUTRALITY

The building aims to become energy neutral, where the electricity need of the building is met by the production from photovoltaic (PV) panels, on average over the year. Reviews of all areas of energy consumption in the building are being carried out to identify all possibilities to reduce the energy needs. The two main areas of energy need are lighting (indoor and outdoor/security lighting) and office equipment including IT-equipment such as workstations, servers and related air-conditioning and other IT infrastructure. The building will be connected to the national electricity grid and have no batteries for storage. The design will allow for excess electricity to be 'exported' to other buildings on the compound, and for the national grid to support the energy supply whenever the solar electricity production does not meet the demand, e.g. at night or during rainy days. "Energy neutrality" for the building has been defined as the situation where the total solar electricity production is equal to or exceeds the electricity use of the building, seen over a full year.

UNEP SUPPORTS SUSTAINABLE DEVELOPMENT IN MANY AREAS

UNEP is the United Nations' designated entity for addressing environmental issues at the global and regional levels. Its mission is to provide leadership and encourage partnership in caring of the environment by inspiring, informing and enabling nations and peoples to improve their quality of life without compromising that of future generations. UNEP's work focuses on six priority areas:

- Climate change
- Disasters and conflicts
- Resource efficiency – sustainable consumption and production
- Ecosystems management
- Environmental governance
- Harmful substances and hazardous waste

UNEP is also promoting and supporting green and low-carbon economies through its Green Economy Initiative (GEI). The GEI is aiming to mobilise and re-focus the global economy towards investments in clean technologies and 'natural' infrastructure such as forests to combat climate change and create new employment. The promotion of renewable energy and sustainable building and construction are key elements in UNEP's work.

The roof is prepared for a solar PV panel intallation.

Author

Lova Andre' Nilsson joined UNEP in September 2008 to be part of the Sustainable United Nations (SUN) team and to be based at the UNEP headquarters in Nairobi. She is coordinating the implementation of the UNEP Climate Neutral Strategy, preparing the annual UNEP greenhouse gas inventories and offsetting, and also coordinating the Greening of Gigiri, an initiative aiming at improving the environmental performance at the UN compound in Nairobi.
Prior to UNEP, Lova worked for consultancy organisations on environmental management, environmental impact assessment and strategic environmental assessment in Sweden, Zimbabwe, Vietnam and Kenya, including Scott Wilson Ltd, Ramboll and AF. She had also worked for the Swedish Government on environmental licensing and control of industrial operations and integrating environmental considerations in comprehensive planning, and for the UN Association of Sweden supporting implementation of Local Agenda 21.

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Coal-washing plant of Batán.

GRUPO HUNOSA: A NEW FUTURE

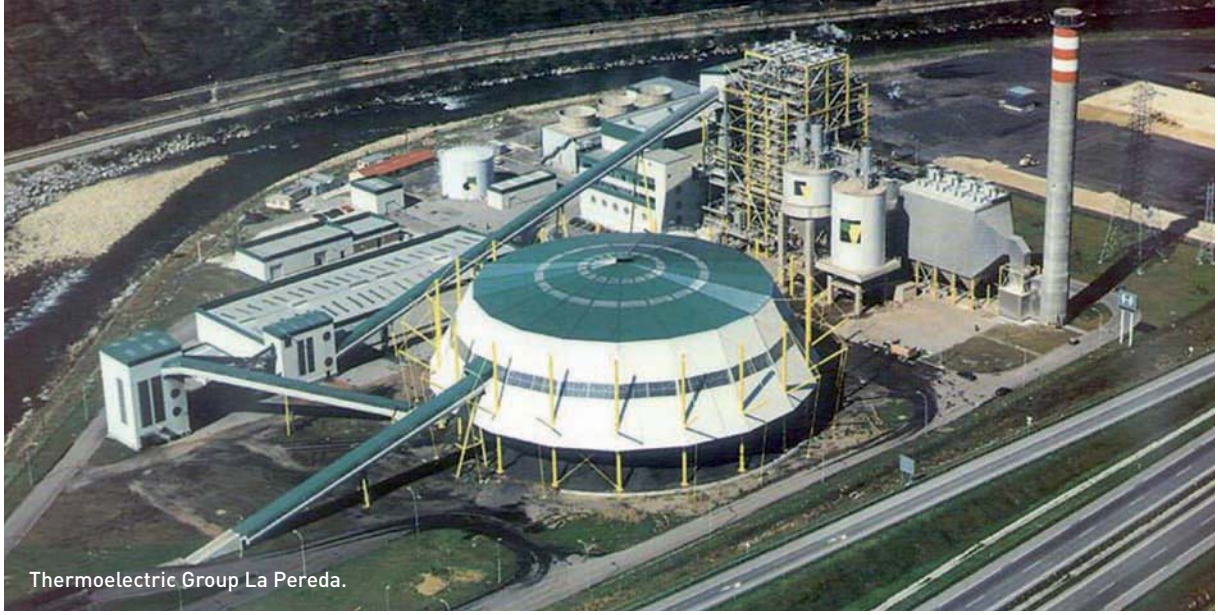
Grupo Hunosa's core activity is the coal production in the Asturian Central Carboniferous Basin in Spain. This article describes how, after successive and intense restructuring, Grupo Hunosa is finding a way to a better future through diversfying its business in the area where its mining activity is established. Specifically, Hunosa is acquiring a new dimension in order to fit into the present energy scenario and to adapt to the European regulations for the coal mining industry, while maintaining its contribution to the principle of security of energy supply in its geographical scope.

Hulleras del Norte S.A. (HUNOSA), was constituted in 1967. It is a subsidiary society, participated in 100 per cent by the state-owned holding company Sociedad Estatal de Participaciones Industriales (SEPI).
During the last few years, in line with the whole of the diversification activities undertaken by the company, Grupo Hunosa has been promoting the reduction of its principal activity at the same time as opening new business lines such as engineering and consulting, training and security. The Group is determined to do this with all the knowledge and experience it has acquired throughout its history. Through the industrial promotion field, Grupo Hunosa wants to contribute to the launch of new feasible managerial projects that generate stable and high-quality employment and enable entrepreneurship whilst mitigating, as much as possible, the job loss registered in the Asturias mining areas during recent years.

Grupo Hunosa is firmly determined to move forward to future options and, according to the business plan 2006-2012, tackles ambitious challenge and adds, within the diversification frame, new lines of prospecting and a boost in activities related to mining, energy and natural resources. All this includes proposals for forestry in the lands of ancient opencast mining, the use of the hydrological resources, the investigation of technology for CO_2 capture and storage, as well as the continuation and expansion of the electric energy generation business from the perspective of a sustainable development and environment protection.

THERMOELECTRIC ENERGY

Since 1994 Grupo Hunosa has run the Thermoelectric Group La Pereda, a power station of a 50MW circulating fluidised bed that generates electric power with waste material combustion fuelled by dumped materials. With the objective of intensifying this line of business, Grupo Hunosa has planned the construction of a cogeneration plant of 400MW of power in an area close to the La Pereda Plant that could be working by 2012.
The new power plant will be run by a new company, Pereda Power, constituted by the companies Hunosa and Endesa. On the other hand, and also within this field, Grupo Hunosa with the company Endesa Cogeneración y Renovables (ECYR), has executed an agreement of intent in order to establish a new company, Eólica de la Cuenca Central Asturiana (ECCA), focused on the



Thermoelectric Group La Pereda.

implantation and exploitation of wind farms. This project is currently under evaluation.

CO_2 CAPTURE

Global warming and climate change have been, and still are, the bases for the compromises that Grupo Hunosa is assuming related to coal combustion and therefore to the investigation of CO_2 capture and storage-technologies. Due to its involvement in the processes of CO_2 emissions reduction, Grupo Hunosa together with Instituto del Carbón (Consejo Superior de Investigaciones Científicas), Endesa and Foster Wheeler have taken the results obtained from the laboratory essays into account and have launched an experimental plant of 1 MW in La Pereda. This plant adds a post-combustion CO_2 capture process by means of carbonation-calcination that must be a precursor of plants at a semi-industrial and industrial scale.

METHANE CAPTURE AND CO_2 STORAGE

Grupo Hunosa is also involved in projects in collaboration with different organisations, institutions and associations for the prospecting and research of potential underground reservoirs suitable for safe CO_2 injection and storage.

Following this pattern, Grupo Hunosa has started, together with other institutions, the CARBOLAB project in order to create an underground laboratory for the investigation, technological development and demonstration of the carbon dioxide capture in unexploited coal layers while producing methane (enhanced coal bed methane).

GOETHERMAL ENERGY

Alongside this, Grupo Hunosa decided to direct all its available resources on launching new business lines.

Ancient opencast exploitation of S.Víctor before its reforestation.

Grupo Hunosa has analysed the possibility of using the mine water, outflowing to the surface with a range of temperatures between 18ºC and 23ºC, as an energy source for building heating and cooling by means of heat pump technologies. It will mean between 33 and 50 per cent reductions of CO_2 emissions to the atmosphere as compared to the emissions produced by conventional energy sources. For the application of this system, the supply for the new Campus building at Universidad de Barredo (Mieres) is under development as is the new building for Mieres Hospital.

MINING VOID MANAGEMENT

Grupo Hunosa is studying the possible use and management of water that fills the huge void created by underground mining exploitation. There is an available volume of over 80 million cubic metres that could be used for urban and industrial supplies.

FOREST PLAN

In addition, Grupo Hunosa has boosted the value enhancement of 3,000 hectares of land coming from the opencast mining industry. After a feasibility study, a forest plan for the reforestation of 900 hectares with a million trees has been elaborated. This plan is a decisive instrument to prevent erosion, contribute to biodiversity improvement, enrich the landscape and generate bio-mass, as well as to act as a CO_2 drain that will collect about 300,000 tons during the coming years. This forest plan began in 2009, and the first 50 hectares have already been reforested.

BIO-MASS

Connected to the forest plan, Grupo Hunosa is interested in the use of bio-mass coming from forest waste or energy crops. Grupo Hunosa is participating in the project entitled, 'Technological development in the whole value chain of equipments for the combustion of waste materials proceeding from the forest industry', and has made available land needed to investigate the growth of different willow species in order to prove its development and feasibility to serve as energy crops.

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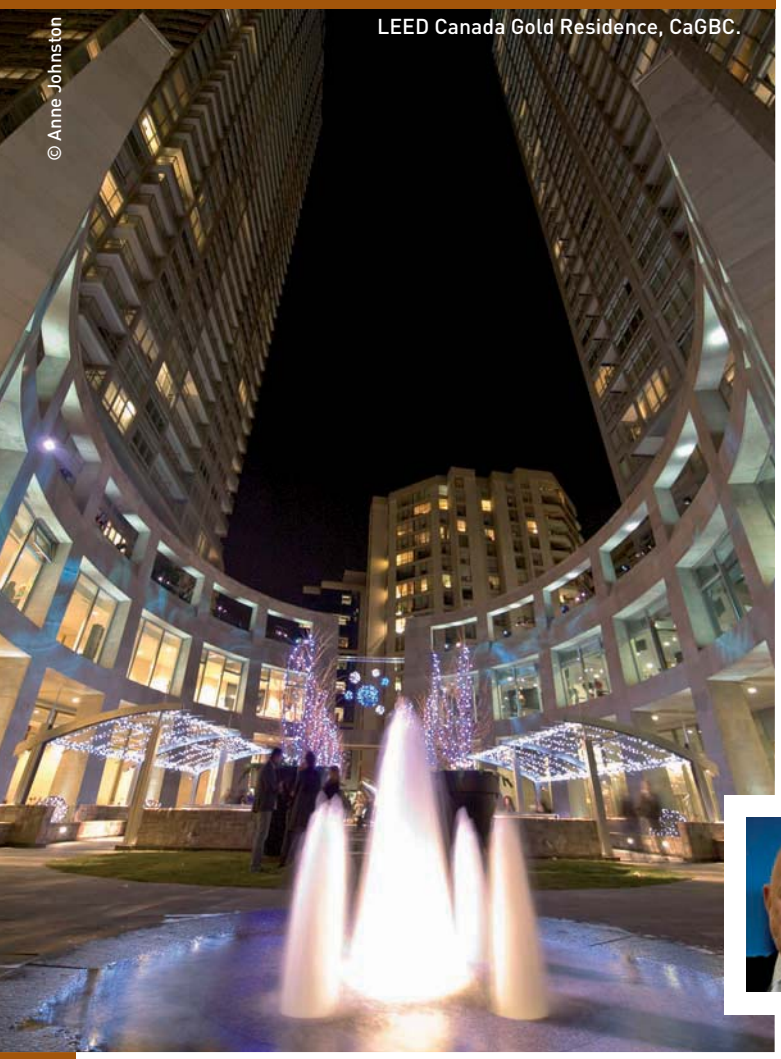

LEED Canada Gold Residence, CaGBC.

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World Green Building Council and market transformation of the global building sector

TONY ARNEL
CHAIR, WORLD GREEN BUILDING COUNCIL

Climate change is one of the greatest challenges of our time and will require global solutions. The building sector, which consumes more than one third of the world's energy and, in most countries, is the largest source of greenhouse gas emissions, is a major part of this problem. Fortunately, this sector can be an even bigger part of the solution, providing some of the most significant and cost-effective opportunities for change. Today, a global network of green building councils (GBCs), guided by the World Green Building Council (WorldGBC), is at the forefront of galvanising action. This coalition of more than fifty national GBCs is guiding the building industry onto a more sustainable path.

According to the Intergovernmental Panel on Climate Change (IPCC), building-related greenhouse gas emissions could almost double by 2030. However, the IPCC's Fourth Assessment Report has also found that, with proven and commercially available technologies, energy consumption in both new and existing buildings could be cut by an estimated 30–50 per cent without significantly increasing investment costs.

A number of independent studies confirm that buildings certified by green building councils (GBCs) can consume 85 per cent less energy, 60 per cent less potable water, and send 69 per cent less waste to landfill than non-certified buildings. Green buildings are a key aspect of sustainable development and also have important social benefits due to the holistic nature of their design.

Buildings must be central in any post-Kyoto framework, given their unique greenhouse gas abatement potential and the readiness of the global property and construction industries to act. Now is the time to lay the foundations of a low carbon economy, and secure a sustainable environment for generations to come.

GLOBAL GREEN BUILDING TRENDS

In partnership with McGraw-Hill Construction, WorldGBC released a Smart Market Report in 2008 on *Global Green Building Trends* that assessed the market activity, attitudes, motivations and challenges facing the green building movement in different countries and regions. Drawing on WorldGBC's global network of green building market leaders, the survey collected input from over 700 early market adopters in 45 countries.

Key findings of this study include the following:

- **The green building portfolio:** Within the next four years, 94 per cent of responding firms plan to be building green on at least 16 per cent of their projects, with more than half dedicated to building green on more than 60 per cent of projects.
- **Market growth:** The fastest growing green building market is in Asia, where the population of firms largely dedicated to green is expected to nearly triple between 2008 and 2013 (from 26 per cent to 73 per cent).
- **Alternative energy:** By 2013, 78 per cent of all respondents expect they will be using solar power and

Fifth Town Artisan Cheese factory (Picton, Canada): LEED Canada Platinum, CaGBC

62 per cent of North American respondents expect to be using wind power.

- **Top motivators for green building:** Reducing energy consumption was cited by 89 per cent of respondents as being the top environmental reason for green building, while encouraging sustainable business practices was cited by 90 per cent as being the top social reason, and "doing the right thing" was cited by 42 per cent as being the top business reason.

DRIVING THE GLOBAL GREEN BUILDING AGENDA

The WorldGBC is committed to accelerating the transformation of the built environment towards sustainability and drives the global green building agenda by facilitating the development of new GBCs, while supporting the work of its current member organisations. To guide efforts on this front, the WorldGBC has developed its mission statement to include the following objectives:

- To advocate the important role of green buildings in mitigating global climate change;
- To facilitate effective communication, share best practices, and promote collaboration between councils, countries and industry leaders;
- To create successful GBCs and ensure they have the resources needed to prosper within their respective markets;
- To support effective building performance rating tools and promote the development of mandatory minimum standards for energy efficiency in buildings; and
- To develop the capacity of the next generation of green building professionals by designing a unique internship programme and innovative university-credited course on green building.

GBCs are effective powerhouses of green building activity and raise the profile of green buildings to industry, government and the public within their respective country. GBC activities include training building sector professionals and providing rating tool accreditation, administering green building certification, co-ordinating networking conferences and advocacy events, and working with various levels of government to guide the development of effective policies on sustainability and energy efficiency in the built environment.

GBCs are created in response to various drivers in the marketplace, particularly the increasing understanding of the building sector's unique potential for reducing global energy consumption and GHG emissions. Furthermore, the growing desire to move towards a low-carbon economy, increased energy efficiency, and holistic sustainable design is largely complemented by the growing recognition of effective building performance indicators. Commonly known rating tools within the global marketplace include:

- Leadership in Energy and Environmental Design (LEED), developed by the United States GBC;
- Green Star, developed by the GBC of Australia;
- Building Research Establishment's Environmental Assessment Method (BREEAM), developed by the UK-based BRE; and
- The newly launched DGBN tool, developed by the German Sustainable Building Council (GermanSBC).

The WorldGBC global network includes green building council representation in the following countries:

Established (Full) Members: Australia, Argentina, Brazil, Canada, Emirates, Germany, India, Japan, Mexico, New Zealand, South Africa, Taiwan, United Kingdom, and USA.

Emerging Members: Colombia, Israel, Italy, Netherlands, Poland, Romania, Singapore, Spain, Turkey, and Vietnam.

Prospective Members: Chile, Costa Rica, France, Greece, Hungary, Indonesia, Jordan, Malaysia, Panama, Qatar, Saudi Arabia, South Korea, Sweden and Uruguay.

Associated Groups: Albania, Austria, Bahamas, Belgium, Bulgaria, Cayman Islands, China, Croatia, Czech Republic, Egypt, Georgia, Hong Kong, Kenya, Mauritius, Montenegro, Oman, Paraguay, Peru, Philippines, Russia, Thailand and Venezuela.

THE WORLDGBC'S GLOBAL NETWORK OF GREEN BUILDING COUNCILS

The strength and breadth of the WorldGBC network of cross-sector leaders has been developed through membership, the promotion of council development, and by engaging direct and indirect stakeholders in the building and construction sectors worldwide.

Over the course of the past seven years since its establishment, the WorldGBC has witnessed outstanding growth in its global network, currently reaching more than 55 countries. Since 2002, there has been a greater than six-fold increase in the total number of national GBCs.

Regional networks have been initiated in Europe, the Asia-Pacific, and the Americas/Caribbean to ensure that developing GBCs can receive market-appropriate assistance from experienced GBCs in their respective region. The Asia-Pacific network was launched on 23 September 2009, and is being co-ordinated under the leadership of the GBCAustralia. The European and Americas/Caribbean networks are currently under development.

To help guide the development of new councils, the WorldGBC has developed an extensive Council Creation Toolkit, a series of resources to help emerging groups,

Deutsche Bank (Frankfurt, Germany): DGNB Gold – Office and Administration Building, GeSBC.

as well as the Council Development Gateway, an online resource-sharing and networking tool that draws from the expertise of more established GBCs.

The annual WorldGBC International Congress brings together GBCs from around the world to network, share resources, and exchange best practices. The Congress also showcases emerging themes in energy efficient green building technology and case studies of exemplary projects and initiatives.

Transparent communication of GBC activities and green building developments is further reinforced through the e-newsletter that is sent biannually to all members and WorldGBC associates. The GBC network serves as a unique means to communicate globally with the building and construction sectors, providing the opportunity to disseminate information quickly and effectively.

AN INTERNATIONAL POLICY ADVOCATE

The WorldGBC promotes the values of its member GBCs by advocating the unified message of energy efficiency and green building principles at international forums such as the UNFCCC. The WorldGBC Policy Task Force (PTF) was established in September 2008 to develop and implement an international green building advocacy strategy to guide delivery of this message. The PTF is a collaborative initiative which includes representation from the WorldGBC Secretariat and GBCs from Australia, Germany, New Zealand, United Kingdom, and the United States.

The inaugural World Green Building Day was marked on 23 September 2009 – a commemoration dedicated to the advancement of the global green building movement. GBCs from around the world hosted a series of synchronised events on this day to advocate sustainability and energy efficiency in the built environment, while emphasising the important role that green buildings can play in reducing carbon emissions.

The WorldGBC PTF released a series of case studies in November 2009 which showcases global progress in green building. Each case study provides an assessment of the emissions from buildings within that country, an overview of the national government policy on sustainability in the built environment, and a review of that country's GBC's activities, including a summary of the preferred rating tool and estimated carbon savings from application of that tool in the marketplace.

The WorldGBC Policy Task Force is a contributing member to the Sustainable Buildings Construction Initiative of the United Nations Environment Programme (UNEP SBCI). Over the past year, the PTF has worked closely with the UNEP SBCI Secretariat and members to develop the 'Buildings and Climate Change Industry Call to Action'. This document was created to inform the Parties to the UNFCCC that the global building industry should be a top priority for achieving reductions in energy demand and GHG emissions, and has the full support of the global GBC network.

In March 2009, a Memorandum of Understanding was signed between the UK-based Building Research Establishment (BRE), GBCs in Australia, and the United States and the United Kingdom. The first of its kind, this agreement highlights the collaborative ambition of the parties towards the development of a common carbon metric across BREEAM, LEED, and Green Star rating tools. This metric will allow for measurement of carbon savings from green buildings that are certified by these tools.

The results are also aligned with a more recent collaboration project with UNEP SBCI and the Sustainable Buildings Alliance (SBAlliance), known as the Sustainable Buildings and Climate Index. This index is expected to build a truly worldwide platform, from which a common approach for measuring GHGs in the construction sector can be launched.

HELPING GOVERNMENTS MEET THEIR EMISSIONS TARGETS

Although GBCs are industry-led, they also collaborate with government bodies to assist with the development of sustainability policies for the built environment. GBCs around the world regularly meet with government officials in order to strengthen the green building agenda, as can be seen in the following examples:

- ArgentinaGBC often participates in seminars on climate change and sustainable development, organised by the City of Buenos Aires;
- As a result of GBCAustralia's collaboration with all tiers of government, Green Star for publicly owned or tenanted buildings is now mandated in a number of states and 11 per cent of commercial office space in central business districts is Green Star certified;
- Following BrasilGBC's collaboration with the Rio de Janeiro municipal government, the city has advanced its reference criteria for public building construction and retrofits. The group is also working with the cities Sao Paulo and Vitoria to develop better policies and green building incentives;
- Following the recent development of the GermanSBC's DGNB rating tool, the German government has mandated that it be exercised for all federal government buildings;
- MexicoGBC has participated in the Mexican government's Development Committee, towards the development of both the national 'Sustainable Low-Income Housing Programme' and the national 'Green Mortgage Scheme'; and
- The GBC of South Africa recently launched its first rating tool, which the South African government is seriously considering mandating for all new government offices.


5 Green Star – Office Design V1 certification, NZGBC.

© New Zealand GBC

- The United Kingdom government has accepted the UKGBC's recommendation of initiating a target for all new non-domestic buildings to achieve zero carbon status from 2019, and is also strongly considering UKGBC's recommendation to develop a Roadmap for Sustainable Building in the UK.

COLLABORATION IS KEY

The WorldGBC is a global leader in advocating energy efficiency and green building technology and is actively collaborating with numerous other organisations to further drive market transformation of the building sector. The WorldGBC's Global Partners Initiative brings together leaders from industry and government towards building a framework for effective collaboration and resource sharing. Global Partners support the mission and offer valued support which further drives the green building agenda. Industry partners include Philips Lighting, Colliers International, and McGraw-Hill Construction. The Toronto and Region Conservation Authority (TRCA), housed within Toronto, Canada's Living City Campus, has been instrumental in developing the capacity of the WorldGBC Secretariat.

A partnership is being developed with the Government of Canada Department of Foreign Affairs and International Trade (DFAIT), towards greening Canadian foreign embassies and consulates. The Canadian Embassy in Washington, DC, will be the first to be retrofitted with renewable energy technology and energy efficiency improvements. Next projects include the Canadian Embassies in Tokyo, Japan and London, England.

The WorldGBC is also partnering with the United Nations Environmental, Scientific, and Cultural Organization (UNESCO) Chairs Project, a global network of universities committed to research on renewable energy strategies and energy efficiency in the built environment.

BUILDING TOWARDS A SUSTAINABLE AND LOW-CARBON FUTURE

Looking ahead to the emerging challenges of climate change and the transition to a low-carbon economy, care must be taken to ensure that buildings are not only sustainable but are also adaptable to a new global climate.

The WorldGBC is working to transform the 'business as usual' approach to building and construction, transitioning instead towards the commonplace implementation of sustainability and energy efficiency in the built environment. The vision is to drive the global green building agenda and ensure that buildings around the world contribute to the climate change solution.

We now look to the delegates to the 2009 Conference of the Parties to openly recognise the potential for green buildings to deliver significant emissions savings and energy reductions. The next steps that are needed on the path to a low carbon and sustainable future are strict medium-term energy efficiency and GHG emission targets, the foundations of which will hopefully emerge from the December UNFCCC meetings. As is evident, the building sector is committed and ready to assist all levels of government in meeting these targets.

Author

Tony Arnel is Chair of both the World Green Building Council (WorldGBC) and the Green Building Council of Australia (GBCA). He is also Victoria's Building and Plumbing Commissioner. As a founding Director of the GBCA, Tony has influenced the national sustainability debate, firstly with his work with the City of Melbourne, particularly in the areas of energy efficiency and water conservation. More recently, Tony has been instrumental in delivering the 5 Star housing energy and water standard, the implementation of new residential and commercial sustainability standards into the national building code, and the accelerated uptake of Green Star rating tools for buildings. He is a Life Fellow of the Australian Institute of Architects, a member of the Planning Institute of Australia and a qualified company director.

Organisation

The World Green Building Council (WorldGBC) was established in 2002 to foster the development of a union of national councils around the world, whose mission is to accelerate the transformation of the built environment towards sustainability. WorldGBC is working to transform the 'business as usual' approach to building and construction through advocacy, educating the next generation of professionals and driving the development of the global green building council network.

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CANADA'S APPROACH TO CLIMATE CHANGE

The Government of Canada is committed to reducing Canada's total greenhouse gas emissions from 2006 levels by 20 per cent by 2020 and by 60 to 70 per cent by 2050.

Canada is also committed to:

- The G8 goal to support the reduction of global emissions by at least 50 per cent by 2050, and that developed countries reduce greenhouse gas emissions in aggregate by 80 per cent or more by 2050;
- The goal of having 90 per cent of Canada's electricity provided by non-emitting sources such as hydro, nuclear, clean coal or wind power by 2020;
- Introducing tough new regulations to limit greenhouse gas emissions from the automotive sector;
- Continuing to work towards a harmonised approach with the U.S. on greenhouse gas emissions reductions. This approach includes the Clean Energy Dialogue, a North American wide cap-and-trade system, and regulations for vehicle emissions;
- Providing several billion dollars in green investments through the Government's Economic Action Plan to protect the environment, stimulate Canada's economy, and transform Canadian technologies; and,
- Playing an active and constructive role at the UN climate change talks leading up to the Copenhagen conference in December.

As Canada tackles this challenge, the country is proceeding on three parallel pathways to address climate change with strong domestic, continental and international action.

FUNDING

The Government of Canada supports an approach to climate change that achieves real environmental and economic benefits for Canadians. Canada's approach is realistic, yet ambitious considering its growing population and energy-intensive industrial sector.

Canada's Economic Action Plan includes several billion dollars in green investments designed to protect the environment, stimulate Canada's economy and transform its technologies. This includes an investment of approximately CAN$1 billion over five years through a Clean Energy Fund for clean energy research and demonstration projects, as well as CAN$1 billion over five years for a Green Infrastructure Fund to support targeted investments in infrastructure that will contribute to improved air quality and lower carbon emissions.

Canada sees carbon capture and storage (CCS) technology as a significant opportunity to reduce greenhouse gas emissions from the production and use of fossil fuels, as well as a way to help balance Canada's energy needs with environmental protection. For this reason, the Government of Canada is making substantial investments towards CCS demonstration projects, including:

- upwards of CAN$3.5 billion for four to six large-scale fully-integrated CCS demonstration projects;
- CAN$240 million allocated from Budget 2008 towards a CAN$1.4 billion project to rebuild a unit at SaskPower's Boundary Dam coal-fired power plant;
- CAN$151 million through the ecoENERGY Technology Initiative towards the initial stages of nine engineering studies and small field trials;
- CAN$1 billion allocated from Budget 2009 for the Clean Energy Fund, CAN$650 million of which is specifically for large-scale CCS demonstration projects;
- CAN$12 million allocated from Natural Resources Canada for the International Energy Agency's Weyburn-Midale CO_2 Monitoring and Storage Project; and,
- funding from the Clean Energy Fund to support a joint federal-provincial partnership with the province of Alberta, in a project that will reduce emissions from Transalta's Keephills 3 plant near Edmonton.

CANADA'S CARBON FUTURE

Canada has already announced a Notice of Intent to regulate vehicle tailpipe emissions for the 2011 model year under the Canadian Environmental Protection Act. By the 2016 model year, these regulations are expected to reduce average fuel consumption and CO_2 emissions from new vehicles by 20 per cent compared with 2007. They have also introduced draft rules for Canada's Offset System for Greenhouse Gas which will form an important step towards setting up a carbon market in Canada.

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Email: enviroinfo@ec.gc.ca | Website: www.ec.gc.ca

CA3-35/Canada2_8


2009
ONTARIO'S GREEN ENERGY ACT ENABLES NORTH AMERICA'S FIRST FEED-IN TARIFF
2010
ONE OF NORTH AMERICA'S LARGEST SOLAR FARMS EXPECTED TO OPEN IN ONTARIO
2012
POTENTIAL FOR NEARLY 1,000 WIND TURBINES FROM CURRENT CONTRACTS
2014
UP TO 30 MEGATONNES OF GHG EMISSIONS REDUCED BY ELIMINATING COAL
2025
AT LEAST 6,300 MW CONSERVED IN ONTARIO
2050
80% GHG EMISSION REDUCTION FROM 1990 LEVELS
SERIOUS NUMBERS.
SERIOUS COMMITMENT.
Ontario
OPA
Ontario Power Authority

ONTARIO IS LEADING THE FIGHT AGAINST CLIMATE CHANGE

By eliminating coal-fired generation, encouraging energy conservation and efficiency, adding more green renewable energy, and taking an economy-wide approach to effective long-term energy solutions, Canada's most populous province, Ontario, is the North American leader in the fight against climate change.

Under its Climate Change Action Plan, Ontario is committed to reducing greenhouse gas (GHG) emissions to six per cent below 1990 levels by 2014, 15 percent below those levels by 2020, and 80 per cent by 2050. Initiatives to achieve these goals include legislating a new cap and trade system, expanding rapid transit, promoting green technologies, further enhancing the protection of Ontario's green spaces and moving off coal.

By the end of 2014, Ontario will eliminate dirty coal-fired generation from its supply mix as part of a comprehensive plan to modernize and green the provincial electricity system. Eliminating coal will be the single biggest contributor to reducing Ontario's greenhouse gas emissions. The net result to the atmosphere: a potential reduction of up to 30 megatonnes of GHG emissions. It will be the single largest climate change initiative in North America. Ontario is on track to become what is believed to be the first jurisdiction in the world to rid itself of coal-fired electricity generation.

In 2008, carbon dioxide emissions from Ontario coal plants were 33 per cent below 2003 levels and fossil plant emissions of acid-rain causing pollutants reached 25-year lows.

While phasing out coal, Ontario has aggressively added new sources of renewable supply. In 2008, nearly 80 per cent of Ontario's electricity came from non-emitting sources of power such as nuclear, water and wind. Since 2003, Ontario has increased its online wind capacity 80-fold, going from 15 megawatts (MW) of wind power to over 1,100 MW. That's enough capacity to power more than 300,000 Ontario homes. Earlier this year George Smitherman, Ontario's Deputy Premier and Minister of Energy and Infrastructure, accepted the 2009 World Wind Energy Award for his "outstanding achievements in making Ontario the leading wind energy jurisdiction in North America."

To further accelerate efforts to help Ontario go green and protect the environment, Ontario's Legislature passed the *Green Energy and Green Economy Act, 2009* this past spring, which includes a stand-alone Act known as the Green Energy Act, 2009 as well as amendments to several statutes. The new legislation is a bold series of coordinated actions with two equally important thrusts:

> **" ONTARIO'S GREEN ENERGY ACT REPRESENTS NORTH AMERICA'S MOST AMBITIOUS AND FAR REACHING ENABLING LEGISLATION AND WILL PLACE ONTARIO AS A WORLD LEADER IN RENEWABLE ENERGY DEVELOPMENT, INDUSTRIAL INNOVATION AND CLIMATE PROTECTION."**
>
> **DR. HERMANN SCHEER, GENERAL CHAIRMAN OF THE WORLD COUNCIL FOR RENEWABLE ENERGY, MEMBER OF THE GERMAN BUNDESTAG**

- Making it easier to bring renewable energy projects to life
- Fostering a culture of conservation by helping home-owners, government, schools and industry transition to lower energy use.

One of the cornerstones of the Green Energy Act, 2009 is North America's first comprehensive feed-in tariff program (FIT). It is designed to encourage new renewable energy projects from a diverse range of producers including First Nations and Métis communities, homeowners, cooperatives, schools, stores, factories, office towers and larger-scale commercial generators.

The FIT program offers attractive prices for renewable energy producers and long-term price guarantees to increase investor confidence and make it easier to finance projects. The Green Energy and Green Economy Act, 2009 will encourage billions of dollars in investment to help ensure Ontario's energy supply mix is one of the cleanest anywhere. Ontario achieved a running head start on achieving a sustainable and reliable electricity system with the establishment of the Ontario Power Authority in 2005 and its initial conservation efforts have produced tangible results. The first milestone for reducing peak demand by 1,350 MW was realized by the end of 2007 and future targets are to be accelerated.

BY THE END OF 2014, ONTARIO WILL END COAL-FIRED ELECTRICITY GENERATION – THE SINGLE-LARGEST CLIMATE CHANGE INITIATIVE IN NORTH AMERICA

The new legislation also creates the opportunity for consumers, public institutions and industry to better manage their energy use through a series of conservation initiatives, including:

- Establishing North American leading energy efficiency standards for household appliances
- Making energy efficiency a key purpose of Ontario's Building Code
- Requiring the development of energy conservation plans throughout the broader public sector, including municipalities, universities, colleges, schools and hospitals

Measures under the new legislation are expected to support the creation of 50,000 direct and indirect jobs over three years.

" We're doing our part to fight climate change and create good, green jobs for Ontario families," said Ontario Premier Dalton McGuinty. "To get there, we're renewing our electricity system, improving public transit and greening our cities to make them more liveable. We're working with Ontario's scientists, entrepreneurs and concerned citizens to create a more sustainable, next-generation economy for years to come."

Tackling climate change is a complex challenge, but also an important opportunity for people around the world to work together to protect our planet through a legacy of innovation, dedication and determination.

Ontario has not only started on the path to a more sustainable future, Ontario is a trailblazer.

FOR MORE INFORMATION ON ONTARIO'S EFFORTS TO COMBAT CLIMATE CHANGE, PLEASE VISIT:

Ontario Ministry of the Environment
Climate Change Information
www.ontario.ca/climatechange

Ontario Ministry of Energy and Infrastructure –
Green Energy Act, 2009:
www.mei.gov.on.ca/english/energy/gea/

Ontario Power Authority
www.powerauthority.on.ca/

Ontario

OPA
Ontario Power Authority

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Addressing regional economic variations while meeting a national cap

PIERRE SADIK
MANAGER OF GOVERNMENT AFFAIRS,
DAVID SUZUKI FOUNDATION

With strong national and regional government policies, Canada can meet a science-based greenhouse gas (GHG) emissions target in 2020 and have a strong growing economy, a higher quality of life than Canadians currently enjoy, and continued steady job creation across the country. However, the Canadian government needs to implement far stronger policies than it has proposed to date to meet even its current modest GHG emissions target in 2020.

CANADA'S ROLE

Like most industrialised countries, Canada is at a crossroads regarding the economy and climate change and how the two will intersect in the period leading up to 2020. With the UN climate negotiations in Copenhagen this December, and with the process of establishing meaningful climate policies well underway for Canada's major trading partner to the south, the David Suzuki Foundation and Pembina Institute conducted a study to raise the level of understanding and debate on the economy and climate policy.

Climate Leadership, Economic Prosperity is the first Canadian study of its kind to show regional impacts on employment and gross domestic product, and the first to examine comprehensively how Canada can meet a greenhouse gas reduction target for 2020 that goes beyond the federal government's target. We commissioned leading Canadian economic modelling firm M K Jaccard and Associates and struck an advisory committee comprising senior bank economists, federal government and federal agency officials, among others, to help guide the study.

Ultimately, the analysis brought forth credible answers to how Canada's economy would fare in the face of both a science-based emission reduction target of 25 per cent below 1990 levels by 2020 as well as the federal government's more modest target. The Government of Canada's current greenhouse gas (GHG) target of 20 per cent below the 2006 level by 2020 represents a modest reduction of three per cent relative to the 1990 level.

Figure 1. Absolute growth in GDP 2010-2020 under business as usual and with climate change policies.

	BC	AB	SK	MB	ON	QC	ATL & RoC	Canada
Business as usual	30%	57%	26%	20%	21%	15%	33%	27%
Science-based target	24%	38%	16%	22%	21%	14%	30%	23%
Government target	27%	44%	22%	22%	22%	15%	33%	25%

KEY FINDINGS

Climate Leadership, Economic Prosperity yielded significant findings, including:

- Canada's gross domestic product would continue to grow at 2.1 per cent per year on average between 2010 and 2020 while meeting the science-based target, compared to 2.2 per cent for the government's target and 2.4 per cent under business as usual.
- Canada's total number of jobs would grow by 11 per cent between 2010 and 2020 while meeting either target – essentially the same rate as under business as usual.
- The urgent need to address very high emissions in Alberta and Saskatchewan would reduce projected growth rates in these provinces. However, Alberta's per capita GDP would continue to be much higher than that of any other region, and Saskatchewan's per capita GDP would stay close to the Canadian average.
- To meet the two degrees Celsius target, a carbon price would start at CAN$50 per tonne in 2010 and reach CAN$200 per tonne by 2020. To meet the government's target, the carbon price would need to reach CAN$100 per tonne by 2020, or CAN$145 per tonne if Canada does not purchase any international credits.
- Almost half of carbon price revenue can be returned to Canadians through reductions in income tax. Revenue from carbon pricing can also fund major public investments to reduce greenhouse gas emissions, such as building smart grids and transit infrastructure.

- Technological approaches to achieve major reductions in Canada's greenhouse gas emissions range from increased energy efficiency and renewable energy to carbon capture and storage.

INTERNATIONAL COMPETIVENESS

The study examined two different scenarios under which Canada could achieve either emissions target in 2020. In the first scenario, "OECD acts together," other OECD (Organisation for Economic Co-operation and Development) countries implement GHG emission reduction policies at least as strong as Canada's. If Canada's major trading partners implement similar policies, their costs of production will change by a similar amount to Canada's, reducing the likelihood that customers of Canadian goods will replace their purchases with foreign equivalents.

In the second scenario, "Canada goes further," other OECD countries do not implement a meaningful price on GHG emissions, and Canada's GHG reduction policies are sufficiently stronger than the rest of the world that Canada can be considered to be "acting alone." In this scenario, the analysis shows some shifting of GHG-intensive activities to other jurisdictions. However, we ensure that no manufacturing sector experiences a decline in output (relative to today's levels) by returning some carbon pricing revenue to producers in proportion to production levels.

In both scenarios, developing countries are assumed to have considerably less stringent GHG reduction policies than OECD countries between now and 2020.

The results lend support to the notion that Canada can feasibly implement much stronger GHG reduction policies than the U.S. and other OECD countries without undue trade-related impacts.

INTERNATIONAL CREDITS

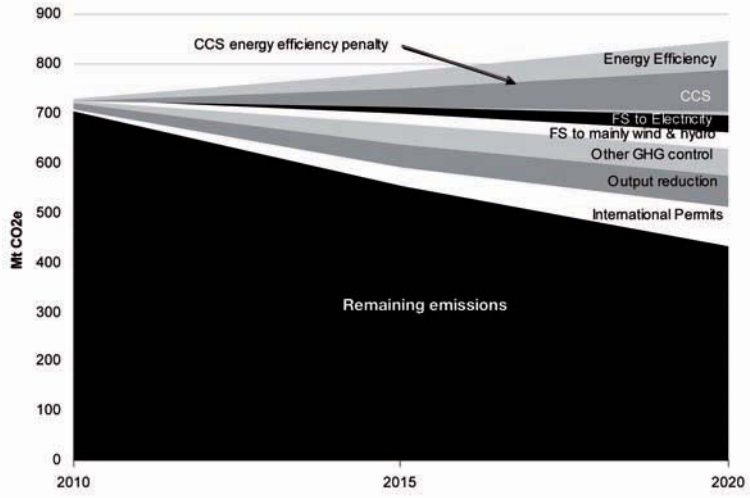
Canada's substantial delay in introducing a national climate change policy entails a price in achieving a meaningful climate change target by 2020. In our study, the federal government invests in substantial volumes of international emissions reductions to meet either of the two targets, thereby lowering the cost of meeting them. For example, if Canada purchased no international reductions, the carbon price would need to reach CAN$145 per tonne by 2020 to meet the government's target. Moreover, the analysis shows that Canada cannot meet a science-based target entirely domestically without forcing an unrealistic rate of capital stock turnover.

REVENUE RECYCLING

Under the carbon pricing policy modelled in our study, emitters would have to pay for every tonne they emit, either by purchasing emission allowances auctioned by government in a cap-and-trade system, or by paying an emissions tax. This would generate considerable government revenue. The analysis shows that the revenue from carbon pricing would be more than $70 billion per year by 2020 under the science-based target, and over $45 billion per year by 2020 under the government's target.

It is important to note that, in our approach, almost half of this revenue is returned to Canadians in the form of reductions in the rate of personal income tax, which provides a boost to job creation and take-home pay. Smaller portions are used to fund public investments to reduce GHG emissions, to make payments to individuals to compensate for regional variations in household energy cost increases, and to protect the international competitiveness of the most vulnerable manufacturing sectors.

Figure 2. Emission reduction technologies and actions taken to achieve science-based target.



CONCLUSION

Our analysis shows that with strong policies, Canada can meet a science-based target in 2020 and have a strong, growing economy, a quality of life higher than Canadians enjoy today, and continued steady job creation across the country. However, far stronger policies than the federal government has proposed to date must be implemented. Meeting Canada's GHG reduction targets requires a significant price on global warming emissions broadly across the economy, and backing this up with strong complementary regulations and public investments.

Author

Pierre Sadik holds a law degree and is the Manager of Government Affairs at the David Suzuki Foundation in Ottawa, Canada. Pierre has worked extensively in the environmental field in both Ottawa and Washington, D.C. His expertise lies in the area of market-based instruments for greening the economy as well as the use of sustainable development strategies to promote sound environmental governance.

Organisation

The David Suzuki Foundation is committed to protecting the diversity of nature and our quality of life, now and for the future. We work with government, business and individuals to conserve our environment by providing science-based education, advocacy and policy work, and acting as a catalyst for the social change that today's situation demands.

For further information: *Climate Leadership, Economic Prosperity* can be downloaded at www.davidsuzuki.org

University of Regina

Stronger together:

THE UNIVERSITY THAT IS BUILDING A GLOBAL NETWORK TO TACKLE CLIMATE CHANGE

Climate change is a global problem requiring global cooperation. For twenty years, the University of Regina located in Saskatchewan, Canada, and its industry and government partners worldwide have been developing a range of carbon capture and storage (CCS) technologies for reducing carbon dioxide (CO_2) emissions from large sources.

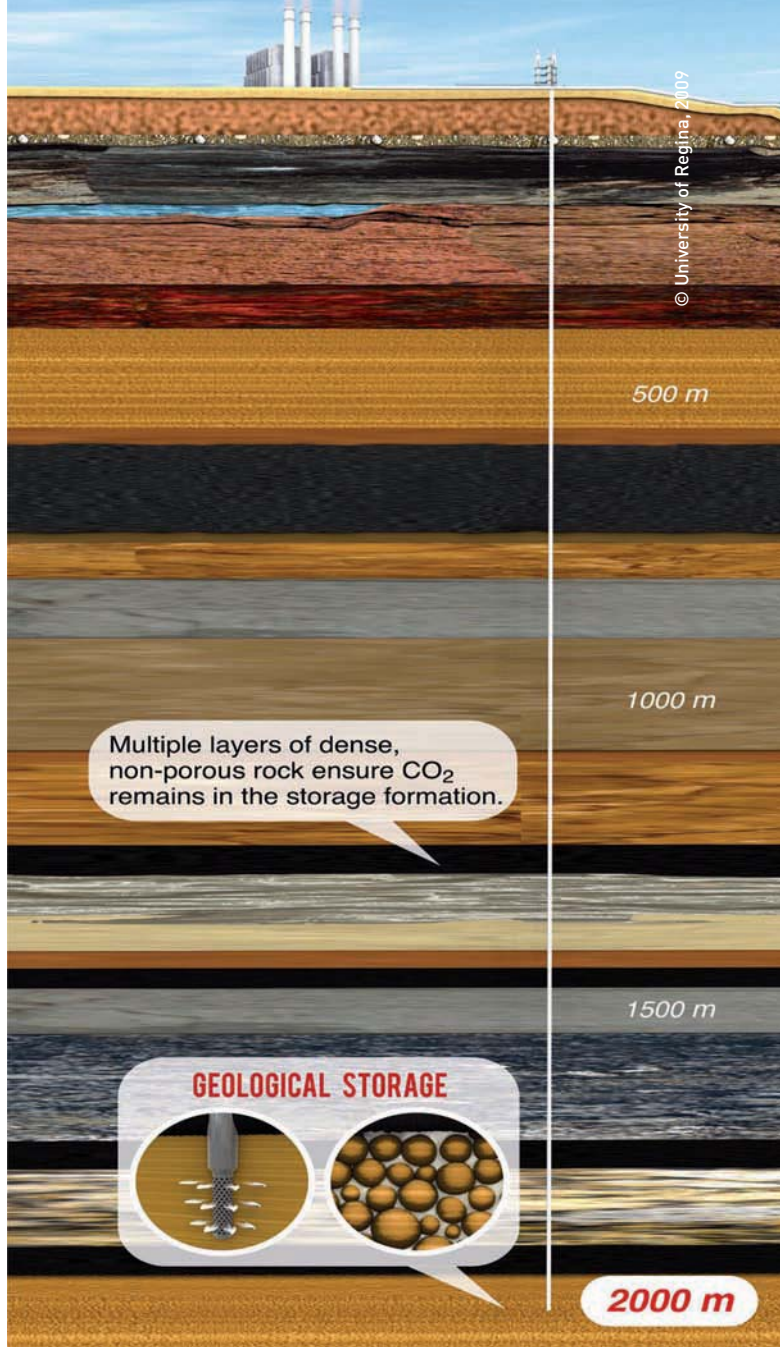
A successful solution to climate change requires strong partnerships around the world. That's why the International Performance Assessment Centre for Geologic Storage of Carbon Dioxide (IPAC-CO_2) was established a year ago as an independent, transparent organisation to provide peer review and objective advice on safe, effective geological storage of CO_2.

IPAC-CO_2 is a network of professionals dedicated to providing a solution to climate change through carbon capture and storage (CCS). The Centre, with a secretariat at the University of Regina, will help develop CCS projects worldwide. Work on building this community began this year with organisations in Brazil, China, India and South Africa.

IPAC-CO_2's Collaborative Community of Practice (CCP) will provide on-line knowledge management and research support services for information sharing, exchange and development of best practices, standards and tools for mitigating the risk of CO_2 storage. The CCP will offer mechanisms to track, prioritise and communicate community activities on key processes such as standards development and site permitting.

Public confidence in the safety of CO_2 storage is paramount to the technology's acceptance. When a site is considered for storage, an extensive range of testing and monitoring is conducted to develop a complete picture of the subsurface. Each individual site is carefully examined prior to injection to analyse the geological characteristics of the site, including all layers of the subsurface up to ground level. There must be effective multiple trapping mechanisms such as caprock, a dense rock that is impermeable to CO_2, which covers the storage area and acts as a seal to prevent any upward movement of CO_2. As well, sites must be isolated from overlying aquifers.

Groundbreaking studies in CO_2 storage have been conducted in Saskatchewan, Canada, over the past decade. The International Energy Agency Greenhouse Gas R&D Programme, Weyburn-Midale CO_2 Monitoring and Storage project, is the world's first and largest CO_2 geological storage project. This eight-year, $80 million international project studies CO_2 injection and storage underground in depleted oil fields.



As of January 2009, more than 14 million tonnes of CO_2 has been injected and stored in the Weyburn-Midale field. Due to the scale and scope of the Weyburn Project, researchers were able to conclude that geological formations such as the Weyburn reservoir are highly suitable for CO_2 storage. Canada, and Saskatchewan in particular, has the research capacity and support of government to dramatically reduce CO_2 emissions through our leading technology in CCS. Through our worldwide partnerships, we can use our research, experience and practical training to support CCS development in other countries, helping industrial and developing countries meet their CO_2 emissions reduction targets.

The technology is ready. Become a part of the solution for mitigating climate change.

Author

Malcolm Wilson, Director, Office of Energy and Environment, University of Regina

Enquiries

Website (IPAC-CO_2): www.ipac-co2.com

Website (University of Regina): www.uregina.ca/oee

Realize. It starts with you.

A Greater Tomorrow By Acting Today

Climate change is a global problem requiring global cooperation. For twenty years, the University of Regina and its industry and government partners worldwide have been developing a range of carbon capture and storage technologies for reducing CO_2 emissions from large sources.

In Saskatchewan, we realize that a successful solution to climate change requires strong partnerships around the world. That's why we're committed to leading-edge international initiatives such as the

- Saskatchewan-Montana Carbon Capture and Storage Project,
- IEA Weyburn-Midale CO_2 Monitoring and Storage Project, and
- Aquistore (a saline aquifer storage project).

As leaders in CCS technology development and organizations such as the

- International Test Centre for CO_2 Capture and
- International Performance Assessment Centre for Geologic Storage of CO_2,

we're working toward a new energy future.

JOIN US AND BE PART OF THE SOLUTION.
WWW.UREGINA.CA/OEE
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University of Regina

VECTUS
INTELLIGENT TRANSPORT

VECTUS is a leading supplier of personal rapid transit (PRT) systems. At a time when environmentally-friendly means of transport are essential, Vectus offers a feasible solution that is efficient, flexible and comfortable with high level of safety and security.

VECTUS is a leading supplier of PRT systems. At a time when environmentally-friendly means of transport are essential, VECTUS offers a feasible solution that is efficient, flexible and comfortable. This next generation PRT public transportation systems are being recognised more and more around the world as an alternative or supplement to today's conventional systems like metro, monorail or light rail transportation.
PRT is the abbreviation for Personal Rapid Transit, a concept that had been around for decades. It is now developed and extensively tested companies like VECTUS Ltd with its operations in Korea and Sweden. VECTUS is the first PRT system in the world to have a fully operational test track with complete railway authority approval, located in Uppsala, Sweden.
Typical PRT is composed of driverless personal vehicles that carry one to six people travelling on its dedicated guide-way elevated above the ground at a continuous 40km/hr directly and non-stop to the destination station without stopping in all the stations in between. PRT is hailed as the next generation mass transportation alternative because it is less costly to both build and operate. It is fully automated and can be operated on demand 24 hours per day, seven days a week.
While serving the transportation needs sufficiently, VECTUS PRT causes little disturbance to the surrounding environments and is recognised for its efficiency, safety and eco-friendly elements compared to other transportation systems. It runs on electricity and thus emits no pollutants including CO_2; it is silent; it does not create ground level barriers; and it only requires small infrastructure leaving minimal visual footprints.

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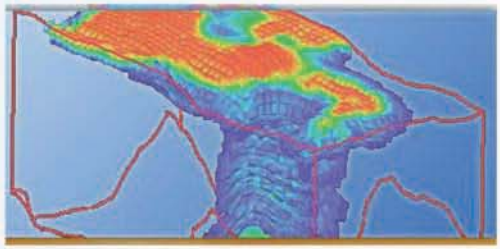
geogreen
Carbon Capture and Storage solutions



From
Strategy Advice

- Prefeasibilty study on the whole chain
- Storage site selection
- CO_2 valuation issues
- Life Cycle Analysis and Performance Analyses
- Economical and investment strategy optimisation

And
Storage Complex Engineering

- Site characterisation
- Storage and transport design
- Risk assessment and monitoring design
- Safety performance
- Project Integrated Development

To
Storage Operations & Maintenance

- Monitoring of injected volumes
- Operating Personnel training
- Maintenance of facilities
- Follow-up of storage parameters and safety control
- Follow-up of Authorities licensing and control

www.geogreen.fr

EcoEnergy
Scandinavia

EcoEnergy Scandinavia is a new company utilising the collectively gathered experience of incineration based Waste-to-Energy technology in Sweden. The business model covers the spectrum from project development, financing and EPC-contracts to facility owner and operator.

The experience from designing, building and operating the WTE facilities are gathered in our engineering teams. The team members has previously been involved in most of the recently build facilities in Sweden. The facilities are based on proven technology standardised and adapted to a modular and scalable solution.
EcoEnergy's WTE facilities use household and industrial waste as fuel in order to produce CO_2 neutral energy. This energy is delivered as electricity and thermal energy. In markets with district heating or cooling networks the thermal energy is typically used in order to feed those networks with hot or cold water. In markets without district or networks the facility can be fitted with a desalination add-on in order to desalinate sea water and produce drinking water in larger quantities. Produced electricity is normally feed to a national grid.
The facilities do not only submit to the EU regulations (the Waste Incineration Directive) but also the slightly stricter Swedish regulation in regards to emission levels.
The majority owner of EcoEnergy Scandinavia is GKL Growth Capital (www.gklcapital.se), a private equity fund with an investor network of strong international entrepreneurs.

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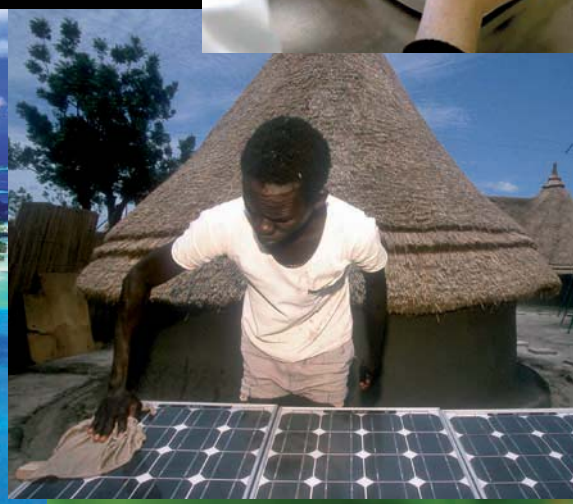
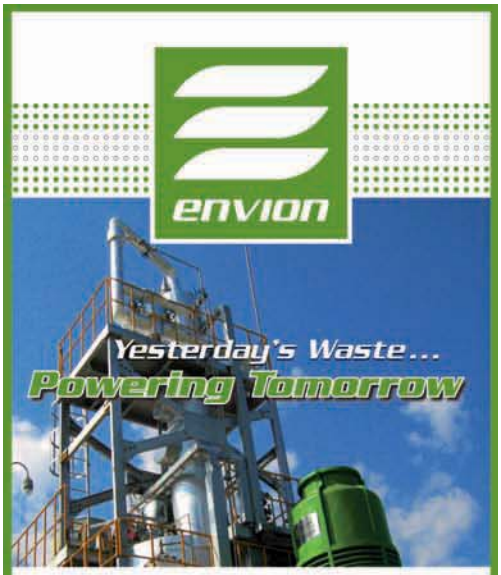




Company
Envion Inc., headquartered in Washington, DC, provides "Waste to Resource" plastic waste remediation and renewable energy technology that fundamentally alters the entire application of environmental science through a paradigm shift at the source.

Vision
Envion's technology is a "shovel-ready"active solution for fossil fuel conservation and is the definitive, sustainable, safe, and cost beneficial solution for all plastic waste disposal.

Mission
Reduction of carbon footprint through the use of a groundbreaking proprietary technology that provides a complete disposal solution for all plastic waste.

Market
Waste management industry, energy, defense industry, and the public municipal sector.

Envion Products
The Envion Oil Generator™ is capable of producing four to six barrels of oil (dependent on feedstock composition) per ton of plastic waste processed.

Why Envion?
We are the first-to-market solution worldwide.

What is Envion?
Envion Inc. is a renewable energy technology company focusing on waste reduction through immediately available plastic waste to oil conversion with other applications, such as tire/rubber conversion to heavy oil and "soil to oil" (landfill mining) technology under current development for virtually immediate deployment.

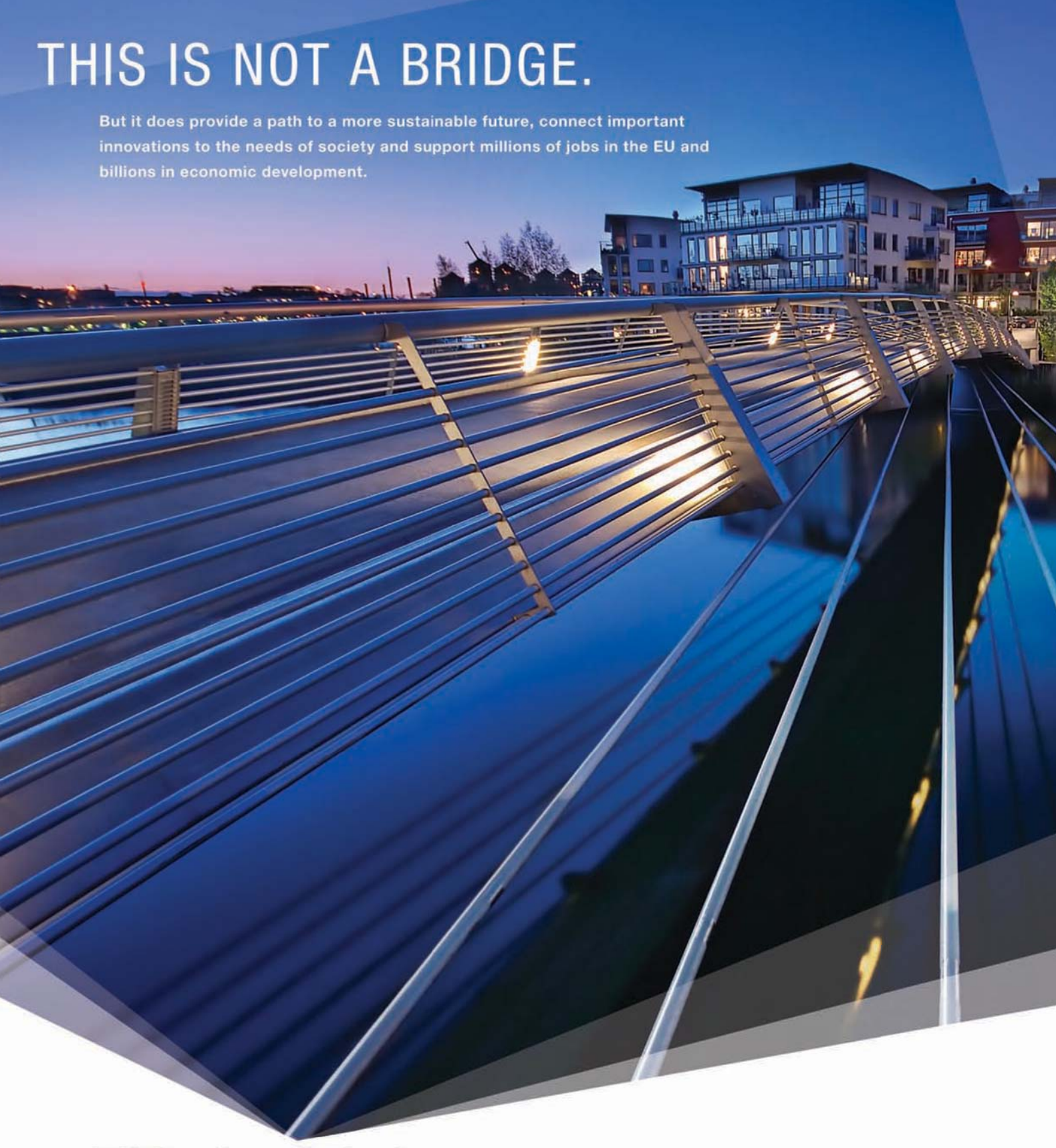
What environment does Envion operate in?
The intersection of all environmental technologies that focus on sustainability, i.e., recycling, environmental remediation, solid waste management, renewable energy and energy conservation.

What single thing does Envion do better than any other?
We are the first company to commercially convert plastic waste to oil – a true breakthrough "GreenTech" globally.

www.Envion.com

THIS IS NOT A BRIDGE.

But it does provide a path to a more sustainable future, connect important innovations to the needs of society and support millions of jobs in the EU and billions in economic development.



This is nickel.

Look closely at nickel stainless steels and you'll see both their brilliance and their beauty. But nickel's role in sustaining our planet is also well worth looking at. Most importantly, nickel in all its forms is recyclable. Beyond that, nickel improves the corrosion resistance of alloys like stainless steels. This means less maintenance and less expensive rehabilitation. And nickel's strength and ductility make it ideal for creating superalloys for turbines that burn biogases—from landfills, for example—to generate electricity.

Nickel also helps to reduce greenhouse gas emissions in many ways. Hybrid cars use nickel metal hydride batteries; waste-to-energy plants use corrosion-resistant nickel alloys for a long, maintenance-free operating life; and wind turbines use nickel alloy castings because they perform so well under cold operating conditions.

Nickel. Take a closer look. You'll see so much more.

Nickel
An Element of Quality

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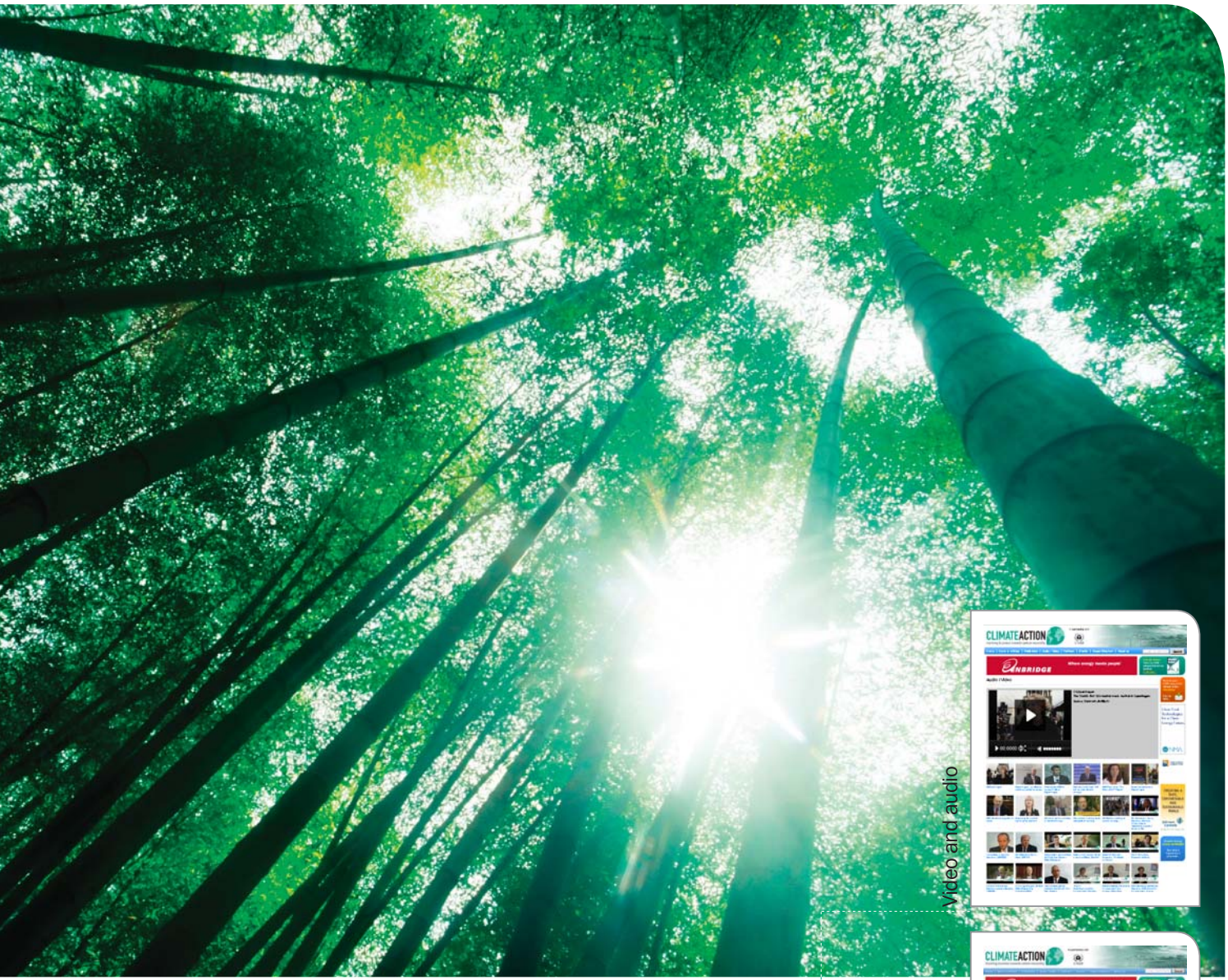
knowledge for a brighter future
nickelinstitute.org

CLIMATEACTION
Assisting business towards carbon neutrality



Video and audio

Daily updated news

Green directory

www.climateactionprogramme.org

Invaluable news and information putting forward the business case for climate change and encouraging businesses and large organisations to reduce their carbon footprint.

- Video and audio resources including interviews, country activities, how to green your business and lower your carbon footprint
- Daily updated news, special features and events calendar
- Green directory of organisations working to mitigate against, and adapt to, the effects of climate change
- Free monthly e-bulletin. Register at www.climateactionprogramme.org

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Copenhagen 2009
It's time to take control.

It's time to stop thinking there is a choice between climate change and business. We, the companies of Business for Innovative Climate and Energy Policy (BICEP), know that climate change IS our business. We need global leadership to solve this global crisis. The COP15 must seal a deal that will protect our environment, stimulate innovative solutions and move us toward a prosperous, clean energy economy. **We are ready.**

To learn more, visit www.ceres.org/bicep

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