

From the Desk of Chairman**Environment Accounting:****Part 13 - 19**

To effectively address the issue of climate change, the global strategy demands enhancing energy efficiency and increasing renewable energy use. Since the importance of fossil fuels for ensuring energy security will always remain, their carbon dioxide emissions have to be brought down successively and considerably. The key mechanism for mitigating climate change that is gaining currency is carbon sequestration, involving carbon capture and storage (CCS). CCS means CO₂ capture from emissions, its transport and geological storage in an environmentally acceptable manner for hundreds of years.

The Parliamentary Office of Science and Technology of UK had recently issued an energy white paper that sets targets for reducing emission by exploring a range of capture and storage technologies. The Special Feature in the present issue of **WISTA : Environment Accounting** covers the feasibility of CCS technology as related to geological storage, and taking into account such relevant parameters, as environmental impacts, cost, public perception, and legal issues.

The 'Perspective', based as it is on "The Corporate Communications Report-2007" published by Corporate Register. com, covers climate change disclosures by world's largest companies and attempts to know how these companies acknowledge and address the problem of climate change. The companies studied represent a very high proportion of global capital and are regarded leaders within respective business sectors.

The 'Case Study' pertains to the assessment of the carbon impact of bottling Australian wine in the UK in PET and glass bottles. It compares relative CO₂ emissions attributable to shipping wine in bulk from Australia to the UK, the manufacture and transport of PET and glass bottles, as also with respect to end-of-life cycle.

Other features covered are : Green & Noteworthy; Accounting for Air, Water, Waste; In Focus; Energy Scene; Experts Converge; and Knowledge Spreads.

We welcome comments and suggestions.

*Dr K V Swaminathan***CONTENTS**

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This publication aims at disseminating information on pertinent developments in its specific field of coverage. The information published does not, therefore, imply endorsement of any product/process/producer or technology by WITT.

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GREEN & NOTEWORTHY

Stinking Beaches

Mismanagement has led to conversion of South Africa’s beaches into cesspools of human waste. They have posed a threat to health and environment. It is not safe for public or tourists to swim in water at the beaches, that are being contaminated with 18 million human faeces everyday.

Durban City lost four of its six “Blue Flags”, an internationally accredited rating, after the Council failure to improve condition of these beaches. North Beach, South Beach, Bay of Plenty and Addington Beach, all have lost the Blue Flag status.

While head of eThekweni's water and waste department admitted that due to a leak in pipelines, an estimated 18 million litres of sewage flowed into the sea per day, the Durban city manager denied if there was a crisis. Tests for water quality have failed at most of the beaches. The environmentalists believe that water quality has spelled disaster for thousands of tourists who planned to gather at Durban’s most famous attraction.

While priorities must be human and environmental health, losing domestic and international tourism revenue is a result of canoe race.

Umhlanga’s main beach and Westbrook beach still carry the 'Blue Flag' letter and may lose heir status soon if things do not improve. Hibberdene beach was compliant with world-class standards and Marine beaches along the South Coast, were prime example beaches.

(Africa-The Times, Mar 25, 2008)

Protecting Endangered Rainforest

Marriott International and the sate of Amazons, have entered into an agreement aimed at protecting the endangered rainforest in the Brazilian states of Amazons. The company will spend \$ 2 million to protect 1.4 million-acre Juma Sustainable Development reserve from deforestation. The amount will go to Amazons Sustainable Foundation that would monitor and enforce protection of the reserve and also support employment, education and healthcare for the reserve’s 500 resident.

Marriott guests will be able to contribute to the fund that will be billed as a carbon offset. They will be able to calculate and pay the cost of greenhouse gas emissions associated with their hotel stays. The company also plans to reduce water and fuel use by 25% per available room by 2018 and install solar power systems in 40 hotels by 2017. It will work with its top 40 vendors for supply of price-neutral greener products like recycled plastic pens, towels that don’t need an initial wash cycle, compostable key cards and recycled carpet. To promote green building, the company aims to have new hotel sites designed and constructed in line with LEED standards by the end of 2009 and hopes to gain LEED- Existing building status for its Bethesda, Md., Headquarters.

(Brazil - GreenBiz.com, Apr 8, 2008)

Forests GHG Sources

British Columbia’s vast pine forests are being transformed into a major source of greenhouse gases by the rice-sized pine beetle infestation. As this beetle bores under the bark and into the wood below, the trees’ green

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needles turn red and eventually drop off creating a serious fire hazard.

Forests, along with oceans and grasslands, are critical sinks that soak up carbon dioxide from the atmosphere but dead trees release extra billion tonnes of CO₂ as they rot and burn. By the end of 2006, 130,000 square kilometers of forest had been attacked, and by the time, this infestation is over, the pine beetle will have been responsible for the release of 990 million tonnes of CO₂. Within next few years, “the beetle will have eaten itself out of house and home and the forest will begin to recover, at least in British Columbia”.

This pine beetle already moving to greener pastures in mild winter, could spread across Canada’s north boreal forest which is one of the most important stores of carbon on the planet. It is certainly feasible that a future outbreak later this century could go across the boreal. Basically, the warmer the climate gets, the greater the chances that this would occur.

(Canada-National Post, Apr 23,2008)

Protest Against GM Foods

There has been massive protest against the genetically modified food. About 5,000 activists marched through the German city of Bonn with colourful flags and banners with slogans such as “Biofuels create Hunger”, and “Good Food Instead of GM Food.”

Their protest was staged at the start of UN conference that was to discuss risks linked to the technology and global protection measures for the transfer of genetically modified plants, including rice and soya whereas experts were expected to find ways to help implement a UN agreement on the trading of living genetically modified organisms, called the Cartagena protocol.

Consumers in Europe are skeptical about GM crops while biotech industry thinks that GM products are as safe as non-GM equivalents.

“We demand that all other activities, which probably boost industry’s profits, do not endanger food security for future generations”, said a protestor.

(Germany- Reuters, May 13,2008)

Cap-and-Trade

Tokyo Metropolitan Government is contemplating to introduce in the city assembly a bill to limit greenhouse gas emissions from offices and factories in five years

from April 2010. If passed, it will enable the capital to become a pioneer in Japan by applying a mandatory cap-and-trade scheme of emissions on individual firms. It will also make Tokyo an advanced environmentally friendly city. This is a necessary step for Tokyo to achieve greenhouse gas emission cuts by 25% by fiscal 2020/21 from 2000/01.

Tokyo has set a target to cut emissions by 6% on average from 1990 levels by 2008-2012, which is a tough one.

The emission caps will be placed on 1300 Tokyo-based offices and factories, based on their average annual emission. Compulsory steps to clean up emissions from diesel burning vehicles from fiscal 2004/05, are already in place. This is a rarity in Japan where central government usually takes a lead in industrial policy.

(Japan-Environmental News Network, May 18, 2008)

Carbon Footprint

By working with the Carbon Disclosure Project’s (CDP) Supply Chain Leadership Collaboration, Fiji Water has calculated the carbon footprint of its entire supply chain from raw materials and packaging to distribution and recycling,

Carbon footprint of its products for July 2006-June 2007, was 85396 tonnes of carbon dioxide equivalents. This footprint comes from main areas : emissions from producing raw materials for packaging (29%), ocean freight (23%), bottling (20%) and distribution (17%). The rest comes from transporting raw materials and equipment, trucking to ports, refrigeration, disposal or recycling of waste, sales and administration. The company estimates that 75-80% of its emissions come from supply chain operations.

To lessen impact of its operations, the company is partnering with Conservation International on a refrigeration project in the Yaqara Valley in Fiji where degraded grasslands and native forests will be reforested using native species.

By 2010, the company aims to reduce its greenhouse gas emissions by 25%. It also plans to become carbon neutral by offsetting 120% of its emissions starting 2008. It will also invest in renewable energy to address its footprint beyond 2008. The offset realized after 30 years, would be enough to make Fiji water carbon negative in 2008.

(USA-GreenBiz Com, Apr 11, 2008)

ACCOUNTING FOR AIR

Dust Clouds Mar Air Quality

Parched farmland left to gather dust in Ukraine, is said to be responsible for the soaring concentration of hazardous fine particles in Central Europe. In March 2007, concentration of particulate matter (PM 10), were measured between 200 and 1400 micrograms per cubic metre against the EU daily average limit of 50 micrograms per cubic metre. In Spring 2007, levels of this particulate matter reached almost 30 times the European average in parts of Slovakia, Poland, the Czech Republic and Germany. It is believed that dust originating from fallow land in Ukrainian farms, was carried west by unfavourable winds.

Elevated levels of particulate matter previously recorded as far west as the UK following widespread burning on the Russian steppe, suggest that agricultural practices and burning can have far greater impact on regional and even global air quality.

(edie.net/news, May 8, 2008)

Flying Green

US airlines not paying for their carbon dioxide emissions will face curbs in Europe. The US carriers, would either join the EU emission trading scheme or set up an equivalent system in the US.

The decision is likely to brew environmental dispute between the EU and the US because the latter has refused to let her airlines join for a carbon trading scheme. The International Air Transport Association, representing 170 countries have also gone the US way to oppose the carbon trading scheme. A solution is possible after the end of Bush administration.

EU airlines will join the emissions trading scheme in 2012 which would result in increase of price of a return flight. These airlines want foreign airlines follow the same environmental standards they have to meet. EU says that all airlines flying in and out of the continent, must get carbon credits.

(Down To Earth, Apr 15, 2008)

Reverse Global Warming

To reverse the effects of global warming by the proposed spraying of sulphate particles into Earth's stratosphere, could make matters worse, because such cooling would come with unintended side effect. Sulphate injection could react with chlorine gases in cold polar regions, triggering a chemical reaction that would further deplete atmospheric ozone. So in trying to cool off the planet by creating a kind of artificial sun block, recovery of the Antarctic ozone hole will get delayed by 30-70 years and create a new loss of Earth's protective ozone layer over the Arctic.

(Reuters, Apr 25, 2008)

Warming Suffocating Marine Life

Ocean's regions lacking oxygen are called death zones. They are spreading across world's tropical oceans. In the central and eastern tropical Atlantic and equatorial Pacific, these oxygen-minimum zones appear to have expanded and intensified during the past 50 years. Not only this, such regions now extend deeper into the oceans and closer to the surface. This change is closely linked to rising seawater temperatures.

About 250 million years ago when average oxygen levels in oceans fell almost to zero, there was dramatic change in climate that resulted in the extinction of 95% of the world's marine species. Thus warming of seawater can be the cause of this as it reduces ability to carry dissolved oxygen, potentially turning swaths of the oceans into marine graveyards.

As surface water gets heated up, it becomes less dense and forms an insulating layer that stops oxygen's penetration into the colder layer beneath. That is why most life has been unable to survive in a layer of water 1000 feet deep in a stretch of the Pacific about 5000 miles wide off the west coast of south America.

At 0°C, 1 kg of sea water can hold about 10 ml of dissolved oxygen but at 25°C, that falls to just 4 ml. Hence, if global warming keep on rising, there would be dramatic consequences for marine life and human communities surviving on the sea. Organism, such as fish, crabs, lobsters and prawn will die in such oxygen-low death zones.

(Sunday Times, London, May 19, 2008)

ACCOUNTING FOR WATER

Coastal Waters Less Toxic Now

Coastal waters need safety in view of the rich resources they offer. In spite of elevated levels of toxic metals and oils existing near urban and industrial areas of the US coasts, scientists at the National Oceanic and Atmospheric Administration (NOAA) believe that US environmental laws enacted in the 1970s, have helped reduce overall contaminant levels in coastal waters of the US. According to them, oil related compounds, known as polycyclic aromatic hydrocarbons or PAHs and shipping activities continue to flow into coastal waters daily, causing its degradation and some of these compounds may be carcinogenic even.

The NOAA Mussel Watch scientists who analysed 140 different chemicals in US coastal and estuarine areas, including the Great Lakes, in their report NOAA National Status and Trends Mussel Watch Program: An Assessment of Two Decades of Contaminant Monitoring in the Nation's Coastal Zone from 1986-2005', revealed decreasing trends nationally of the pesticides DDT, industrial chemicals, polychlorinated biphenyl's (PCBs), and tributyl-tin, along majority of sites monitored. Even Hudson-Raritan Estuary in New York and New Jersey, once having high concentrations of these chemicals, now show an 80% decreasing trends for the pollutant.

(Environmental News Service, May 13, 2008)

Less Water Less Food

Rainfall has sharply gone down from the 1970 in India and other tropical and sub-tropical countries. This reduction is attributed to global warming, says the Inter-governmental Panel on Climate Change (IPCC) that predicted that food supplies would also go down in these regions.

Climate change means more evaporation of fresh water, changing rainfall patterns, reducing snow cover and widespread melting of ice and changes in soil moisture and run off, all becoming highly probables.

Over the 20th century, precipitation has mostly increased over land in high northern latitudes while decreases have also dominated.

(Thaindian News, Apr 12, 2008)

Water Trading for Sustainability

Scarcity and pollution of water are paramount environmental woes in China. Its per capita availability of fresh water is only one-quarter of world's average. It suffers from its black running river and dried-up water ways. In such a scenario, new regulation, 'The Interim Measure for Water Quantity Allocation', may help achieve water sustainability in this thirsty country.

The measure, effective February 1, provides a framework for allocating water rights, across areas that are under direct jurisdiction of the central government. Its 17 stipulations lay out the principles, mechanisms, and practices for water allocation, potentially opening Chinese markets for water trading and enabling the use of market tools to promote conservation.

The need for better delineation of water rights in China has become very urgent in view of frequent conflicts over sharing river basins. Industrialisation and urbanization has added to the problem. During the drought of 2006, Chongqing municipality saw a dramatic decline in flows from the Jialing River, in spite of the fact that river's upper reaches had received plenty of rain. The shortage of water, in fact, was triggered by more than 50 dams upstream, which had retained the water for power generation.

With demand for water rising, wastewater remains pervasive due to the current 'open-access' nature of its water resources. In 2003, China's utilization coefficient for agricultural irrigation was only 0.4-0.5 compared to 0.7-0.8 in industrial countries. Water-use per unit of gross domestic product was as high as 413 cubic metres four times the world average, while water-use per value added of industry was 218 cubic metres, 5 to 10 times the level in industrial countries. China's industrial water recycling rate was only 50% compared to 85% in other industrial countries.

So, by allocating water rights and introducing market-based tools, the new measure may accelerate progress towards water saving, protection and pollution control. Water trading has already been successfully tried over the past eight years.

Success of many projects launched in China, has given confidence to explore bolder national schemes, and the result is the recent water-right regulation which if enforced effectively, could be very much significant for China. It is a bold first step towards sound water management in China.

(Worldwatch Institute, May 13, 2008)

ACCOUNTING FOR WASTE

E-Waste Recycling by Postal Service

To improve electronic recycling in the United States, a free national collection program for small electronic items, has been started by the US Postal Service. A de facto electronic recycling program, the first of this kind in the United States that had refused to ratify the 1989 Basel Convention, will provide courtesy envelopes with pre-paid postage for patrons to deposit their unwanted articles like digital cameras, printer cartridges, cell phones etc.

American discard at least 2 million tons of household electronics each year and only 20% of it is recycled. E-waste is frequently sold to brokers who ship it to the developing world where it is dismantled with little regard for worker safety and then burnt in the open air or dumped into bodies of water. In this respect, the postal service recycling program would help avoid e-waste going to developing countries.

International recycling company Clover Technology Group will pay for the postage on the envelope and process the devices and then refurbish and resell the products if possible. The program presently limited to a few select cities, including Chicago and Los Angeles, may expand nationwide later.

The postal service hired environmental consulting firm MBDC, which is led by 'cradle-to-cradle' visionary William McDonough, to oversee Clover's procedures, made a visit to Clover's facility in Mexico and saw everything exceeding traditional global practices for responsible recycling. If a product was not recycled, it was shipped internationally to smelter who stripped the item of its plastics and metals and the remaining waste (as half of 1%) was burnt as fuel.

Sarah Westervelt, e-waste coordinator with the Basel Action Network, a waste watchdog group, however, has criticized the program that encourages guiltless consumption of more electronics.

"Consumers need to pay for hazardous waste to be managed", Westervelt said. "Free programs allow the US to continue externalizing the impact on human health

and the environment by not solving the problem upstream where it has to be solved."

(Worldwatch Institute, May 21, 2008)

Garbage Patch

A swirling floating garbage dump, called the 'Great Pacific Garbage Patch' of size twice that of the United States can be seen in the North Pacific Ocean. The number of plastic pieces in the Pacific Ocean, had tripled in the last 10 years and size of this accumulation, is set to double in the next 10 years.

Undesirable wind patterns compelling most sailors have avoided this area and a natural lack of nutrients in the ocean region has given fishermen reason to look for fish elsewhere; and translucent quality of plastic just below the water's surface prevents satellites from detecting it. These two factors have prevented vastness of the garbage accumulation from being noticed.

This region of ocean is called North Pacific Gyre. Its nature has crated two garbage patches on either side of the Hawaiian Islands. The Eastern Pacific Garbage Patch between California and Hawaii, is twice the size of Texas, and Western Pacific Garbage Patch on the other side of Hawaii is smaller and massive.

The world produces at least 100 million tons of plastic each year and about 10% makes it to the ocean. About 70% of plastic products sink to the bottom and 30% float and aggregate into patches within the gyres.

As nothing in the Ocean can biodegrade plastic, plastics from 1950s that floated out to the ocean, is still there in pieces whose concentration may reach a million pieces per square mile of this "trash continent". The plastic broken into these pieces by sea forces of the sun, the waves and collisions with other solids, is more harmful because the pieces act like sponges for many chemical toxins, such as DDT and PCBs and concentrate the toxins upto million times the levels found in surrounding water. These plastic pieces are consumed by sea-birds and fish and can have disastrous effect for food webs and human health. Many of these chemicals have hormone depleting properties that affect both animals and humans.

(Natural News, Mar 27, 2008)

IN FOCUS

Global Warming and Agriculture

Climate change may be global in its sweep, but not all of globe's citizen will share equally in its woes. The truth is evident or more worrisome in its projected effects on agriculture. The higher temperatures expected in coming years – along with salt seepage into ground water as sea levels rise and anticipated increases in flooding and draughts – will disproportionately affect agriculture in the planet's lower latitudes, where most of the world's poor live.

World agriculture faces a serious decline within this century and developing countries, many of which have average temperatures that are already near or above crop tolerance levels, are predicted to suffer an average 10 to 25 percent decline in agricultural productivity by the 2080s, assuming a so-called "business as usual" scenario in which greenhouse gas emissions continue to increase. Rich countries, which typically have lower average temperatures, will experience a much milder or even positive average affect, ranging from an 8 percent in productivity to a 6 percent decline.

Individual developing countries face even larger declines. India, for example, could see a drop of 30 to 40 percent. Some smaller countries suffer what could only be described as an agricultural productivity collapse.

Africa, where four out of five people make their living directly from land, could experience agricultural downturns of 30 percent, forcing farmers to abandon traditional crops in favour of more heatresistant and flood-tolerant ones, such as rice. Worse, some African countries, including Senegal and war-torn Sudan, are on track to suffer what amounts to complete agricultural collapse, with productivity declines of more than 50 percent.

China, further from the equator than most developing countries, could escape major damage on average, although its south central region would be in jeopardy. Similarly, in the United States, the projected reductions are 25 to 35 percent in the Southeast and the Southwestern plains but significant increases in the northern states.

Overall, agricultural productivity for the entire world is projected to decline from levels otherwise reached between 3 to 16 percent by 2080s as a consequence of global warming. The projections are the work of

William Clime, a senior fellow at the Center for Global Development (CGD) and the Peterson Institute for International Economics.

The above estimates do not count the effects of new plant pests and diseases, which are widely expected to come with climate change and could cancel out the positive "fertilizing" effects that higher carbon dioxide levels may offer some plants.

Scientists are busy in preserving seeds from thousands of varieties of the 150 crops that makeup most of the world's agricultural diversity as well as wild relatives of those crops that may harbor useful but still unidentified genes. "For agriculture to adapt, crops must adapt," said Ren Wang, director of the Consultative Group on International Agricultural Research, have a wide pool of genetic diversity from which to develop crops with these unique traits.

The work of developing adaptive plants has begun to pay off. Researchers have discovered ancient varieties of persian grasses, for example, that have a remarkable tolerance for salt water. The scientists are breeding the grasses with commercial varieties of wheat and have found they are growing well in Australia's increasingly salty soils. Other research is building on the recent discovery of a gene that helps plants survive prolonged periods underwater.

"Crops grow in weather, not in climate," said Robert Zeigler, director general of the International Rice Research Institute in the Philippines, meaning they must be able to survive not only the anticipated average rises in temperature but also the day-to-day extremes that come with climate change.

Will better agricultural technology offset climate losses? With additional investments in technology and adaptation, the effect of climate change on actual agricultural production could be reduced. But because these inputs raise the cost of production, prices would also rise. Similarly, increased irrigation could help farmers cope with droughts and excessive heat but water shortages and high cost of irrigation systems mean it will not solve the problem, Cline said.

In conclusion, it can be stated that policy makers in rich countries and developing countries, are now beginning to understand that the impact of climate change will be profoundly unequal. The above projections are yet another indication that people who are concerned about global poverty also need to be deeply concerned about global warming.

SPECIAL FEATURE

CARBON CAPTURE AND STORAGE

Introduction

Whenever we burn fossil fuels-coal, oil or gas-carbon is emitted into the atmosphere as carbon dioxide (CO₂). To prevent the carbon dioxide building up in the atmosphere and possibly causing global warming, we can catch the CO₂ and store it. Carbon Capture and Storage (CCF) refers to the capture of CO₂ from emissions, followed by storage, thereby preventing it from entering the atmosphere. To be useful for climate change mitigation, storage should be for at least many hundreds of years until well past the end of the fossil fuel era. There are several potential options for storing captured CO₂. These are:

- ***In the deep ocean*** – there are uncertainties about how long CO₂, injected into the deep ocean will remain there and the potential impact on marine eco systems.
- ***As a solid carbonate precipitate***-although research continues, an energy efficient, cost effective and practical technology to process CO₂ to form carbonate on a large enough scale for climate change mitigation has yet to be developed.
- ***In geological structures*** - so far the most viable and environmentally acceptable storage of CO₂.

CCS involves three stages: CO₂ capture, transport and storage.

Carbon Dioxide Capture

Carbon capture is best applied to large stationary sources such as power stations and industrial plants, where CO₂ can be separated from the flue gases at some stage of the process. In 2002, nearly 35 percent of UK's CO₂ emissions were from energy industries compared with about 2 percent from the chemical industry.

There is a range of capture technologies at different stages of development. The most developed has been used in the petroleum and gas industry for almost a century. In the case of "Enhanced Oil Recovery" (EOR) Scheme CO₂ which is pumped into a near-depleted field dissolves in the oil, making it more mobile and easier to extract. This can lengthen the life of the field and is an established onshore technologies, although not so far

used offshore. Although some of the CO₂ returns to the surface with the oil, this is recaptured and added back to the CO₂ being injected. As a form of EOR, CO₂ is being pumped into near-depleted oilfields in the US and else-where to extend their lifetime, "It is always going to cost money to capture something. It isn't a free exercise," points out Harry Audus, a chemical engineer who headed the International Energy Agency's greenhouse gas programme in Chettenham. Carbon dioxide, unfortunately, is just one ingredient in the cocktail of waste gases that emerge from the business-end of a Power Station.

Carbon Dioxide Transport

CO₂ is captured as a gas. Its transport generally needs it to be compressed and/or cooled requiring energy input decreasing net CO₂ emission reduction. Bulk transport may be by tanker or pipeline. Tankers may have a role in smaller projects, but for larger volumes, pipelines are the only practical option. CO₂ transport by pipeline is an established commercial technology. Over 3000km of pipelines are currently used to transport several million tons of CO₂ per year for EOR in the US and Canada.

Carbon Dioxide Storage

CCS in geological formations involves capturing CO₂ and then injecting it into rock layers. There are three main storage options:

- (i) Depleted or near-depleted, oil and gas fields
- (ii) Deep saline aquifers (porous rock layers containing salty water deep underground)
- (iii) Unmineable coal seams.

Under most storage conditions in permeable rock, CO₂ is buoyant and moves to the top of the rock layer. If the rock above offers an effective seal it is trapped and stored. There are also other processes that result in efficient long-term storage in geological structures. For example, permeable rocks commonly have their pore spaces filled with water in which injected CO₂ may dissolve and/or CO₂ may react chemically with water or minerals in the rock and be immobilized.

The key issue is the ability of geological structure to retain CO₂ over hundreds or thousands of years without it leaking out (called here "tightness"). This is important in terms both of the inclusion of CCS in emissions trading and in any environmental impacts. Technology for

CO₂ storage in coal seams is at an early stage, but there is greater understanding of storage in oil and gas fields and saline aquifers. The oil and gas fields and aquifers in the UK sector of the North Sea have large potential (estimated 20,000 to 2,60,000 M tons CO₂).

Depleted oil and gas fields: Oil and gas has been 'stored' underground for millions of years demonstrating that buoyant fluids can certainly be retained in these structures over long time scales. While depleted oil and gas fields obviously had this 'tightness', the extraction process may have damaged it. This is mainly due to potential leakage through abandoned production and exploration wells, but the possibility that the rock structure itself may have been weakened has also been suggested. The effective capping of wells is a mature technology although it might need some optimizing to seal CO₂.

Saline aquifers: Although saline aquifers do not have proven 'tightness', the Norwegian Sleipner project results are promising. In Norway, Statoil has been re-injecting CO₂ co-produced with natural gas into a deep aquifer overlying its offshore Sleipner field, solely for storage. Since 1996, around one million tons CO₂ per year has been stored here. It is found that CO₂ volumes estimated from monitoring measurements are consistent with the known injected volume.

Reporting on CO₂ Inventories

The IPCC guidelines give guidance for reporting on annual emissions by gas and by sector. The amount of CO₂ captured and stored can be measured, and could be reflected in the relevant sectors and categories producing the emissions, or in new categories created specifically for CO₂ capture, transportation and storage in the reporting framework. In the first option, CCS would be treated as a mitigation measure. For example, power plants with CO₂ capture or use of decarbonized fuels would have lower emissions factors (kg CO₂/kg fuel used) than conventional systems. In the second option, the captured and stored amounts would be reported as removals (sinks) for CO₂. In both options, emissions from fossil fuel use, due to the additional energy requirements in the capture, transportation and injection processes, would be covered by current methodologies. But under the current framework, they would not be allocated to CCS.

Information on pollutant emissions is usually compiled in 'emission inventories.' Many different emissions

inventories have been prepared for different purposes. Among the commitments in the United Nations Framework Convention on Climate Change (UNFCCC) all parties, taking into account their common but differentiated responsibilities, and their specific national and regional development priorities, objectives and circumstances, shall: "Develop, periodically update, publish and make available to the Conference of the Parties, national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by Montreal Protocol, using comparable methodologies to be agreed upon by the Conference of the Parties."

At present, CCS is practiced on a very small scale. CCS projects have not generally been described in the national inventory reports of the countries where they take place. An exception is the Sleipner CCS project, which is included in Norway's inventory report.

In the draft 2006 IPCC Guidelines for National Greenhouse Gas Inventories, CCS is mentioned in a footnote in the Energy Sector: "It is recognized that CO₂ capture and storage is an important emerging issue in inventory development. The coverage of CO₂ storage in this report will be closely coordinated with progress on IPCC SR on CO₂ capture and storage. CO₂ capture activities will be integrated as appropriate into the methods presented for source categories where it may occur."

Environmental Issues

There are concerns that CO₂ could be released during transport and injection or overtime from geological storage. CO₂ release would need to be carefully monitored for human and environmental safety. Even using pessimistic assumptions, it has been estimated that it is unlikely that more than 0.03% of the CO₂ would be released during transport and injection. Seepage out of geological CCS projects into environments not adapted to CO₂ could lead to hazardous accumulations or have other detrimental effects. Dissolved in water, CO₂ forms a weak acid, familiar as carbonated water, which could affect sea water or water in aquifers (with potential impacts on drinking water). It has been estimated that such leakage might release 0.004-2.4% of the CO₂ stored on a 1000-year timescale. Concerns have been raised as to who would undertake impartial monitoring of storage sites and have long-term responsibility and liability for them, especially once

a particular project was complete. The need for intervention strategies in the event of unexpected CO₂ releases has also been highlighted.

Public Awareness of CCS

A survey was conducted in October 2003 to determine public attitude towards global warming and climate change mitigation technologies, the level of public understanding of global warming and carbon cycle, and public awareness of carbon dioxide capture and storage or (carbon sequestration). These results suggest that there are serious gaps in public understanding of the source that release CO₂ to the atmosphere and that these gaps affect not only a new technology such as CCS but also such longstanding, visible technologies as nuclear power plants. The important conclusions from the survey are:

- (i) The environment is not a pressing concern for majority of the public.
- (ii) Global warming is not the top environmental concern (even among those who are concerned about the environment).
- (iii) Very few people in the United States have heard of CCS.
- (iv) Those who have heard of CCS are no more likely to know what environmental concern it addresses than those who have not heard of CCS.
- (v) A large portion of the public supports investment in renewable energy technologies but that support decreases when cost information that suggests that they are more expensive than other climate mitigation technologies is provided.

CCS and Developing World

Predicted increases in global energy demands and continued reliance on fossil fuels suggest related CO₂ emission increases of 62% by 2030. Two-thirds of this growth is expected to be from developing countries, especially India and China. Coal is likely to be the preferred fuel for power generation. This increased demand will require many new plants which will operate for 40-60 years, strongly influencing future CO₂ emissions. It is not currently economically realistic to include CCS in new plants. However, building 'capture ready' plants (so CCS technology can be easily added in the future) could be encouraged. Several developing

countries, including India and China, are already engaging with CCS through the Carbon Sequestration Leadership Forum. The Department for International Development (DFID) is tracking developments in CCS but has yet not provided direct funding for carbon capture and storage projects.

Costs

Assessing the current and future cost of carbon emission reduction by CCS is complicated and depends on many factors. These include: the type of power station or other plant involved, the technology with which costs are compared, economies of scale, transport distances and, for EOR future oil prices. It is generally agreed that the biggest cost element is capture but these costs should reduce with further research and development.

Estimated costs per tonne of CO₂ emissions reduced by CCS vary but range from about £30 to £90 without EOR. If the CO₂ is used in EOR to recover more oil, these costs are reduced by amount dependent on the oil price (£6-12/tCO₂ for oil at \$ 20/bbl).

Knowledge Gaps

The following gaps in knowledge have been identified:

- Methodologies to estimate physical leakage from storage, and emission factors (fugitive emissions) for estimating emissions from capture systems and from transportation and injection processes are not available.
- Geological and ocean storage problems, such as:
 - uncertainty on the permanence of the stored emissions;
 - the need for protocols on transboundary transport and storage;
 - accounting rules for CCS;
 - insight on issues such as emission measurement, long term monitoring, timely decision and liability/responsibility.

Methodologies for estimating and dealing with potential emissions resulting from system failure, such as sudden geological faults and seismic activities of pipeline disruptions need to be developed.

Methodologies for incorporating CCS into national and accounting schemes are under development and a number of experimental and demonstration projects as well as commercial CCS projects are already underway in parts of the world.

LEGAL SCENE

Asbestos Related Guilt

Alstom Power Boiler, a power generation equipment manufacturer, in a civil proceeding in December 2007, was held guilty of causing asbestos pollution.

The workers at Lily-lez-Lannoy, an Alstom's site, had been exposed to asbestos dust from 1980 to 2001 and due to this sustained exposure to asbestos dust, seven of company's employees died while 30 percent of its workforce, developed some form of asbestos related disease. The civil court described this negligence of the company as a deliberate violation of the firm's health and safety obligations.

Thereafter, the court of Appeal of Douai, northern France upheld the decision to fine the said firm and imposed a maximum fine of US \$ 116760 on the firm. The court also directed the company to pay damages, ranging upto US \$ 15568 to each of the employee exposed to asbestos dust, regardless whether they had been directly affected or not.

(Down To Earth, Apr 15, 2008)

Hazardous Waste Dispute

Thousands of 55-gallon drums containing hazardous waste and lying buried for more than three decades beneath dirt and clay at a landfill east of Austin, have triggered a conflict between Waste Management of Texas Inc., the landfill operator and Travis County facility.

The landfill, a 9-acre industrial waste site and Waste Management's property since 1981 and covered with soil and partially ringed by groundwater monitoring wells, is being monitored by it for years in conjunction with the city of Austin.

In 1997, the Waste Management company decided to exhume much of waste and move it for storage to a different area lined with synthetic material to prevent any leakage and also create space to bury municipal garbage. Several neighbors and environmentalists, distrustful of the plan and state's oversight, unsuccessfully petitioned the federal government in 1998 to designate the area as a Superfund site, which would have brought millions of

dollars for clean up. While Travis County officials alleged that the landfill was quietly trying to redraw its boundaries in a way that could leave the drums in legal limbo, the Waste Management company contended that the Travis County was misreading complicated documents and farmer's intentions.

The said landfill is not designated to handle industrial waste, and with the amount buried, there can be a real disaster.

The trouble was fomented by Bob Gregory, the owner of the landfill who competed with Waste Management company for trash disposal contracts and who earnestly wished his competitor's Travis County facility trounced out.

The Waste Management company had proposed changes for expansion of the landfill through an application filed with the Texas Commission on Environmental Quality. The Travis County opposed the expansion because they feared it was not compatible with an area that had a growing residential population.

Gregory, the landfill owner made the county officials believe that there would be a declaration from the Commission that the Waste Management company was no longer responsible for the drums. These officials were apprehensive that the changes could shift responsibility for monitoring the drums to local governments and expose taxpayers to lawsuits if the contents leaked into surrounding soil and creeks. They were also worried at the maps showing that Waste Management company would not place monitoring wells between the industrial waste and the county's landfill, creating the possibility that a leak could spread into county's property and beyond.

The waste management company, however, has rubbished the concerns as "unfounded". The company assured that no leak would go undetected because wells were placed along the path where water flowed on the property.

Dispelling fears, the Environmental Commission has assured more monitoring wells placed around the industrial waste than they were presently there. It also decided to direct the Waste Management to address any future release of waste and ensure that corrective measures were taken.

(Austin American-Statesman, Apr 06, 2008)

PERSPECTIVE

CORPORATE REPORTING ON CLIMATE CHANGE

Background

Sustainability and CSR reports are published by more than 2500 companies every year. These reports are a highly relevant source of information on climate change at the corporate level. Until now there has been little attempt to examine these reports and extract information on climate change disclosure, methodically and consistently, and publish the findings. SGS, world's leading inspection, verification, testing, and certification company, and as a lead sponsor, have taken up those Global FT 500 companies researched which of these published a relevant report, and used these reports as the basis of the study titled "The Corporate Climate Communications Report 2007". The CSR reports published between September 2006 and December 2007 by Global FT 500 companies made the basis of the study. A total of 29 specific issues across the following 5 climate change themes were evaluated:

- (i) General discussion
- (ii) Performance disclosure
- (iii) Mitigation disclosure
- (iv) Target setting disclosure
- (v) Assurance/Guidelines disclosure.

Methodology

General discussion: This theme looks at whether the CSR (Corporate Social Responsibility) reports even address climate change, and examines management commitment on the issue.

Performance disclosure: This theme covers how do companies choose to discuss their performance on climate change, in terms of greenhouse gas emissions?

It was examined whether the reported data covered:

- Absolute emissions (the tonnes of CO₂ equivalent produced during company operations)
- Relative emissions (the tonnes of CO₂ equivalent produced during company operations, divided by some measure, such as product throughput, revenue, number of employees)
- Both.

SGS also investigated whether the emissions data was aggregated or disaggregated. Many companies give an overall emissions figure for all operations, while some companies go further by disaggregating this overall figure into different regions or elements of their operations.

Study also reviewed whether companies arrived at their emissions figure by aligning with WBCSD (World Business Council for Sustainable Development)/WRI (World Resources Institute). It was also examined whether companies aligned with the different scopes of the Green House Gas Protocol (GHG) Protocol.

Scope 1: Direct emissions through fuel combustion of company owned vehicles;

Scope 2: Indirect emissions through purchased electricity;

Scope 3: Indirect emissions through employee business travel, contracted vehicle use, waste disposal, production of purchased materials and only outsourced activities.

It was studied whether companies made a qualitative statement on greenhouse gas emissions, even if they do not report quantitative data. For example the statement "We significantly reduced our greenhouse gas emissions over the past year" would be classified as qualitative performance disclosure in the study.

Mitigation disclosure: It concerns the measures companies are taking to reduce their GHG emissions. The following four were focused:

- (i) Which reports refer to energy efficiency initiatives?
- (ii) Which reports refer to renewable energy initiatives?
- (iii) Which reports refer to transport initiatives?
- (iv) Which reports refer to emission trading?

Target setting disclosure: The study covered the way companies are looking to the future, committing themselves to specific action on climate change and looked for SMART targets (Specific, Measurable, Achievable, Realistic, Time-Scaled). It also classified the targets as relating to absolute or relative emissions.

Assurance/Guideline disclosure: It was examined whether the climate change disclosures are specifically assured by an independent external organisation, or are included under a more general external assurance statement covering the full CSR report. Also whether companies followed one of the most widespread non-financial reporting framework, the Global Reporting Initiative (GRI) Framework and Guidelines.

Two versions of guidance from the GRI, issued in 2002 (G2) and 2006 (G3) respectively are currently in use.

Findings

Of the global FT 500, 335 (67%) companies publish CSR reports, which were examined for this study and to which the following statistics apply:

- 87% of CSR reports addressed climate change of varying degrees.
- 78% of the reports include qualitative disclosure.
- 65% of the reports include a specific climate change section within CSR reporting.
- Climate change was addressed in the CEO/Chairman's introduction in 41% of the reports.

Data disclosed: Quantitative data was disclosed in two ways:

- (i) In absolute numbers
- (ii) In relative numbers—adjusted using other key metrics, such as turnover, product throughput or employee numbers.

Combining both ways provided firm numbers and also a contextualised view, 78% of the reports provide qualitative data on GHG emissions, of which 40% include both absolute and relative numbers.

Aligning with GHG Protocol: The GHG Protocol is a tool for calculating an organisation's greenhouse gas emissions, as a form of common reporting language. Using the methodology, a company can calculate and report its greenhouse gas emissions in a standardised, complete manner. 63% of the reports align with the GHG protocol. Of these reports, 45% include the most comprehensive and demanding level of the protocol – Scope 3.

Mitigation measures: Reports were examined for four major measures for GHG emissions reduction: energy efficiency initiatives, renewable energy initiatives, transport initiatives, and emissions trading. Energy efficiency initiatives are by far the most widely reported emission measure, referenced in 74% of reports.

Setting targets: Only half of the reports include commitments to reduce emission, with 37% setting SMART targets and 14% opting for broad objectives.

Credibility: While many companies allow the reported data and statements to speak for them selves, others go further by including an external assurance (verification) statement. This adds credibility to the report and is

important to many stakeholders. Of the 44% assuring their data, 37% include a general assurance statement covering the entire report, which may or may not include climate change disclosure. Very few companies (7%) went the last mile by having their climate change disclosures specifically and separately assured by an external body.

GRI indicators: Around 700 of the world's current 2500 CSR reporters follow GRI guidelines in varying extents. Both G2 and G3 versions are currently in use. Of the reports in this study, 54% include a GRI contents index.

Conclusions

Of the world's 500 top companies, one-third do not publish CSR reports. This does not mean that relevant CSR information is missing completely. It means that one-third of top companies has chosen not to produce the form of publication which is acknowledged best practice for non-financial issues. Of the two-thirds majority publishing CSR reports, the study reveals that nearly all discuss climate change (87%), most publish quantitative emission data (78%) and well over half (65%) devote a specific section to climate change issues. The results of the study reveal that we are witnessing the beginning of the climate activism.

To maximise the effectiveness of climate change reporters in addressing business change, reporting tools need further development and refinement. There is need to encourage alignment with WBCSD/WRI GHG Protocol, the settling of SMART targets and use of external assurance.

Corporate reporting sets a precedent. The more public interest in these reports, the more the data is assimilated and comparisons made then the greater demand for disclosure and greater the resulting accountability. This study shows that leading global business appears ready to supply the demand—but stakeholders should also play part in growing the momentum.

Finally, it could not be learnt why one-third of global FT 500 companies have decided not to produce a CSR report, whether they are averse to CSR disclosure per se, or only reluctant to produce a report (while perhaps disclosing by alternative channels). Unfortunately, these non-reporters don't publish reports setting out why they don't report, so we may need to ask the question more directly.

CASE STUDY

CARBON IMPACT: PET OR GLASS BOTTLING

This case study was undertaken for Amcor PET packaging (now known as Artenius PET packaging) as part of a project part funded by the UK governments WRAP programme. The study analyses the carbon dioxide (CO₂) emissions attributable to bottling wine in Amcor-designed PET bottles versus conventional glass bottles. The wine is produced in Australia and shipped in bulk using 24,000 litre Flexitanks to the UK where bottling occurs. Two types of bottles have been used in this analysis: average glass bottles weighing 496 grams and a newly developed wine PET bottle weighing 54 grams.

CO₂ Emissions Per Bottle:

In the comparative study, several variables were considered but the core comparison was between:

- Amcor-produced PET bottle = 54g with 0% recycled content
- Typical glass bottle available in UK = 496g with 81% recycled content
- Lightweight glass bottle available in UK = 365g with 81% recycled content

The overall results are shown in Table 1.

CO₂ Emissions from Wine Shipment from Australia to UK

The most common container used for long-distance wine bulk transport is the Flexitank. Flexitanks are soft disposable plastic bags with a nozzle opening for filling and emptying operations. They are inserted into typical

20-foot rigid containers and are used for transporting non-hazardous liquids. The Flexitanks used in this study weigh 80kg each and have a carrying capacity of 24,000 litres. When empty 20 Flexitanks fit in a 20-foot container. It was assumed that bulk transportation of wine was consistent for glass and PET bottling. It was revealed that between 42 and 50 percent of the CO₂ emissions identified in this study arise from bulk shipping Australian wine to the UK. This accounts for 235g CO₂/bottle.

CO₂ Emissions Using PET Bottles

(i) During manufacture of PET bottles: The Association of Plastic Manufacturers in Europe holds data on the average fuel mix and fuel quantity used to obtain the energy required to make PET bottles within Europe. These data were used to determine the amount of CO₂ emissions arising from the manufacture of 54g PET bottle. On average, the production of a 54g PET bottle in Europe emits 222g CO₂. This includes extraction and transport of raw materials as well as material and energy inputs and outputs in the form of emissions to air.

(ii) During road transport: Amcor had developed a 75cl PET bottle which protects wine from UV light and other damaging agents, in a manner similar to glass wine bottles. The benefit of PET wine bottle is that it is lightweight compared to traditional glass bottles, thus saving fuel in transport and consequently CO₂ emissions arising from burning those fuels.

CO₂ Emissions Using Glass Bottles

(i) During manufacture of glass bottles: Traditionally, glass has been used to package wine because, being an inert material, it does not alter the chemical properties of wine. The following three key

TABLE -1

Bottle Type	Emissions per Bottle (g CO ₂)	
	Average	Range
Without End-of-Life Recycling		
54 g PET	474	474 - 474
365g glass	493	450 - 517
496 g glass	578	519 - 610
With End - of - Life Average Recycling Rates		
54 g PET	446	446 - 446
365 g glass	453	416 - 472
496 g glass	523	476 - 550

variables have been taken into consideration in the study:

(a) **Bottle weight:** Wine glass bottles vary in weight. In this report, glass wine bottles weighing 496g (heavy) are analyzed for the main comparison of the study as this is the weight of the UK average wine bottle. Additionally, 365g (light) bottles were analyzed as this is the weight of the lightest bottle used at Corby Bottlers.

(b) **Location of manufacture:** The carbon intensity of fuel and electricity varies between countries as does the efficiency of the manufacturing process and transport distances of materials and finished products. Corby Bottlers use bottles from several European suppliers. On average about 55% of the bottles are sourced from France, 15% from Belgium, 20% from Bulgaria and the remainder from the UK.

(c) **Recycled content:** The recycled content of glass also varies by region. Average green glass bottles manufactured in Europe have a weighted average recycled-content of about 80.9%, ranging from 30% in Bulgaria to 99% in France. Based on the above analysis it was revealed that the manufacture of 496g glass bottle releases 293g CO₂ and the manufacture of 365g glass bottle releases 216g CO₂.

(ii) **During road transport:** It was found that reducing glass bottle weight from 496g to 365g saves about 17% of CO₂ emissions per bottle attributable to transporting glass wine bottles within the UK.

Comparison of PET vs Glass Bottling

The production of the different types of bottles and

bulk shipping Australian wine to the UK are the two most significant contributors to the overall CO₂ emissions analysed in this case study. Changing bottle material composition from a heavy and relatively low carbon intensive materials (glass) to a light but relatively carbon intensive material (PET) actually has little impact on the final results as the savings from light-weighting are balanced by the higher emissions for manufacturing.

Table 2 gives the total emissions from bulk shipment bottle manufacture and domestic transport of Australian wine bottled in 496g glass bottles (produced in Europe and the UK), 365g glass bottles (produced in Europe), 356g glass bottles (produced in the UK), and 54g PET bottles (produced in the UK).

Conclusions

Light weighting bottles is a proven method to reduce CO₂ emissions arising from transport of bottle loads. For the light glass bottles (365g) and the PET bottles, the largest contributor for CO₂ emissions from bulk shipped Australian wine for UK bottling is shipping the wine from Australia. For heavy (496g) glass bottles, CO₂ emissions arising from the manufacture of the bottles are slightly more significant than bulk shipping the wine.

This case study clearly illustrates that the CO₂ emissions for a lightweight glass container with a high recycled content and a PET bottles are almost equivalent. What is even more apparent is that by light weighting and increasing recycled content, significant reduction in CO₂ for both PET and glass can be achieved.

Table 2
Total CO₂ Emissions

Weight of Bottle (g)	Recycled Content	gCO ₂ / Bottle	Bulk Transport gCO ₂ / Bottle	Domestic Transport gCO ₂ / Bottle	Recycling Savings gCO ₂ / Bottle	Total gCO ₂ /Bottle	
496 (glass) from Europe	81% (low estimate)	235	235	49	44	524	
	81% (medium estimate)	294			54	524	
	81% (high estimate)	326			60	549	
496 (glass) from UK	82%	290		22	54	494	
365 (glass) from Europe	81% (low estimate)	174		41	19	33	417
	81% (medium estimate)	217				40	453
	81% (high estimate)	241				45	472
356 (glass) from UK	92%	125		19	23	356	
54 (PET)	0%	222		16	16	27	446
	50%	154				19	386
	100%	86				11	327

ENERGY SCENE

Biogas Power Generation

As it reduces the negative impact of greenhouse gas emissions and also helps in effective waste disposal, the biogas power generation is fast catching on in the Asia Pacific region. The soaring number of biogas projects proposals awaiting approval, is indicative of the growing interest for biogas power generation markets in the Asia Pacific.

GHG emissions, especially methane that is emitted from the waste disposed, are paving way for the utilization of biogas for power generation in Southeast Asia and in Australia and New Zealand (ANS) where local authorities and governments are under tremendous pressure to streamline the collection, disposal and treatment of waste so that it is made socially accountable to their environment and community at large.

There is growing momentum towards using the organic waste disposed by agriculture and industrial processing units, livestock farms and landfill sites to generate power: while large scale biogas plants about 500kW capacity are generally installed in landfill sites and sewage (wastewater) treatment facilities there, small scale power plants below 500kW capacity are largely in demand from livestock farms and agricultural residue processing sectors.

However, very high installation costs and unattractive fee-in-tariff offered by the initiatives, are harming large scale commercialization of biogas power generation in the regions where developed power infrastructure and low electricity tariff are curbing the need for an on-site captive power among the industrial end-user segment.

Lengthy approval processes and bureaucratized delays are also impacting the economic feasibility of projects. Hence, project developers need to be guided on suitable technology, feedstock availability, identification of potential opportunities for development.

(Business Wire, May 20, 2008)

Emission Reduction

PART (Platform for Aerodynamic Road Transport), a public-private partnership between TU Delft and others, aiming at emission reduction, is creating an improved aerodynamic shape for truck trailers by mounting Ephicas sideskirts or boat tails can lead to reduction in air resistance upto 30% which translates into a reduction in fuel consumption and emission of as much as 15%.

The sideskirts can be fitted to approximately half the trucks currently in use in the Netherlands as the skirts can also be retrofitted. By this, fuel consumption can be cut by 5% or more for 50% of those trailers which means a reduction of 50 million tons of CO₂ emissions a year.

This research can result in a substantial structural contribution to cutting fuel consumption and an annual saving of ten millions of Euros.

(Delft University of Technology, Apr 18, 2008)

Problematic Target

Wind farms in Ireland are facing multiple and time consuming problems in meeting EU proposals to cut CO₂ emissions by 20% and increase renewable energy to 16% by 2020.

Ireland wind industry needs to invest Euro 6 billion over next decade to meet its targets by 2020 and for that 300-400 MW are needed to be connected to the grid annually. But last year, only 58 MW of wind energy could be added.

The Irish Wind Energy Association (IWEA) disclosed that costs, planning permissions, price per kilowatt, securing finance and consent from landowners for overhead lines, are some of the biggest hurdles being faced by potential developers in the wind energy market. The cost of wind turbines alone has increased by around 60% in the last three years. Now they cost around Euro 1.3 million per MW but after associating construction costs of building a wind farm, they could be rounded up to an average of Euro 2 million each.

(edie newsroom, May 6, 2008)

EXPERTS CONVERGE

European Biomass Conference

The 16th European Biomass Conference and Exhibition, titled "Biomass for Energy, Industry and Climate Protection-From Research to Industry and Markets", is scheduled for 2-6 June 2008, at Ferial Valencia, Spain.

The European Commission; Spanish Ministry of Industry, Tourism and Commerce; IDEA Institute for Energy Diversification and Saving, WCRE World Council for Renewable Energy and EUBIA European Biomass Industry Association and other organisations, are supporting the said conference.

Over 1500 participants from more than 80 countries are expected to attend and learn about latest break-through in the field of renewable energies.

The conference will be accompanied by workshops and fora, which together with an attractive social programme will compete this international event.

(ETA-Renewable Energies)

Sustainability Live!

Sustainability Live! 2008, a trade show organised by edie's parent company the Faversham House Group, held at Birmingham's NEC from May 20- May 22, 2008, consisted of four shows namely, Environmental Technology & Environmental Services (ET&ES), International Water % Effluent Exhibition (IWEX); Brownfield Expo (BEX) and National Energy Management Exhibition (NEMEX), each catering for a particular section of the environmental sector.

Over 400 exhibitions and more than 100 hours of seminar content, tackling issues such as government new green business strategy, 8th annual climate change conference, building certificates and many more topical and insightful issues were expected to be discussed.

(edie newsroom, May 1, 2008)

Workshop on Environmental Protection Law

The University of Western Australia will witness a humming activity at its premises in June 2009 when a workshop on Environmental Protection Law in Western Australia is held there.

The workshop will provide an intensive course of study on Environmental Protection Law.

The three-day workshop, of importance to lawyers and other professionals working with Environmental Protection Law in the business and public sectors, including in NGOs, will give a thorough insight into the state and Commonwealth laws regulating pollution and environmental harm in Western Australia. It will review current (recently amended) state legislation, environmental impact assessment under the Environment Protection and Biodiversity Conservation Act 1999 (Cth), and relevant case law.

Proposals of different state governments with respect to establishing their own carbon trading regime in the absence of any Commonwealth action, will be a hot subject for discussion at the workshop.

Inclusion of GHG emissions in reporting for the National Pollutant Inventory, is being proposed.

(Center for Mining, Energy and Natural Resource Law)

Workshop on Reducing GHG Emissions

A workshop on "Reduction of Greenhouse Gas (GHG) Emissions", is being held from 13-17 October 2008 at Taipei, Republic of China.

China Productivity Center, Republic of China, is organising the workshop.

Objectives of the workshop include: discussing on latest trades and development concerning the impact of greenhouse gases on global climate and its seriousness; identifying solution for reduction of GHG emissions by industries and municipalities and discussing GHG emission reduction technologies; examining policy instruments that government should use to promote the reduction of GHG emissions; and preparing set of recommendations with the aim of reducing GHG emissions for industrial associations, municipalities with large carbon area and governments.

Meant for persons between 30 and 50 years of age having university degree or equivalent qualification and associated with environmental activities, preferably GHG reduction activities, the workshop is expected to be very interactive and involve a combination of presentations by experts, group discussions and sharing of experience etc.

(National Productivity Council, Delhi, May 12, 2008)

KNOWLEDGE SPREADS

Climate Confusion

Brought out by M/s Encounter Books, the 184-page book titled 'Climate Confusion', is authored by Roy Spencer. The book is an entertaining and easily understood primer on how weather and climate works, showing why manmade global warming is unlikely to be a serious problem for humanity.

Roy Spencer shows that fears about global warming are vastly exaggerated and driven by politics, not truth. He says that a global superstorm has already arrived, but it is a storm of type and hysteria.

It is a ground-breaking book that combines impeccable scientific authority with great wit and literary panache to expose the hysteria surrounding the myths of global warming and climate change.

(Encounter Book)

Guide to Global Warming

Authored by Bjorn Lomborg and published by Knopf Publishing Group, the 272-page book titled "Cool it : The Skeptical Environmentalists' Guide to Global Warming" argues many of the elaborate and expensive actions now being considered to stop global warming.

But these arguments are often based on emotional rather than strictly scientific resumptons, and may have very little impact on the world's temperatures for centuries.

(Wikipedia)

Sustainable Legal Mechanisms

The 132-page book titled 'Developing Sustainable Legal Mechanism for Private Sector Participation in the International Water and Wastewater Sector', is authored by Clean Mandri-Parrot. It provides practical guidance on how to achieve compliance with EU law, principles of competition and the Water Framework Directive.

In fact, the book is a comprehensive assessment of the tools required to engage the private sector as a partner in helping countries meet one of the most important criteria for accession : the Water Framework Directive.

There are discussions on viable international legal structures in the management, distribution, treatment of the most vital element for the sustenance of human kind and water utilities sector, as well as privatisation agencies and other public and private individuals seeking to partner with the private sector.

(Environmental-expert.com)

What's Your Business Strategy?

Harvard Business Press has brought out a new book titled 'Climate Change : What's Your Business Strategy?' It is written by Andrew Hoffman and John Woody.

Whereas Andrew J Hoffman hold multiple appointments at the University of Michigan, John G Woody is Deal Associate at MMA Renewable Ventures, a renewable-energy firm in San Francisco, California.

The authors have folded their comprehensive analysis of the interaction of business strategy and environmental issues into a succinct memo designed to help executives prepare for, manage and capitalize on this market transition.

The book underlines three steps that provide framework for executives to strategically assess their business in the face of current and forthcoming climate change regulations.

The frameworks and glossary in the book provide executives with the understanding and literacy necessary to deal effectively with the climate change market issue and be conversant in the myriad issues that surround it.

Climate Change in fact is the playbook for strategically addressing a complex problem that no company can afford to ignore.

(Harvard Business Press, Jan 5, 2008)