



EDITORIAL

The Conference of Party of the of the UNFCCC appears to have become an annual event. No one expects a major breakthrough or a great stride forward and major earth shattering decisions from COP5 in Bonn. However, there is a hype building on towards COP6 in The Hague in late 2000 or early 2001.

But low key events have tremendous opportunity to resolve many outstanding issues and make real progress without a big bang. COP5 could focus on a number of substantive issues particularly relating to the flexible mechanisms. It could also make substantive progress on issues relating to ratification.

The greatest success in this process would be to demonstrate that the low emission pathways are not only environmentally sound but also cost effective in the short and the medium term and can also be profit guaranteeing in many cases. Where is a better place to do this than in the USA? European countries can definitely lead the way also.

Capacity building and developing appropriate institutional mechanism both in Annex 1 and non-Annex 1 countries is vital to the progress in implementing UNFCCC and KP and their mechanisms. Government is only part of the equation. Private sector, NGOs and research community, particularly in the developing countries, must be brought in with the best possible support to aid UNFCCC and KP process.

Let us remember CDM stands for Clean Development Mechanism and the key ingredients of CDM are low emission technologies, technological empowerment, new and additional investment, resources for sustainable development and adaptation. CDM must not stand for Carbon Dumping Mechanism!

Clean Development Mechanism And Not Carbon Dumping Mechanism

As the negotiators of the United Nations Framework Convention on Climate Change (UNFCCC) converge in Bonn for the Fifth Conference of the Parties (COP5) during October 25 to November 5, 1999 there are serious doubts about the future of the Kyoto Protocol (KP). KP was essentially a negotiations between members of the Industrialized (Annex-1) Countries to reduce their combined Green House Gas (GHG) emission to stabilize at 1990 level by the period 2008-2012.

KP thus was a negotiated agreement to undertake their emission reduction commitment under the principle of "common but differentiated responsibility". The agreement again demonstrated the seriousness of developing countries who committed to a set of three flexible mechanism of (a) the Clean Development Mechanism (CDM), (b) Joint Implementation (JI), and (c) International Emission Trading (IET) which enable parties to undertake their reduction commitment beyond their geographical boundaries, mainly on the justification of economic efficiency.

The Fourth Conference of the Parties (COP4) held in Buenos Aires in November 1998 agreed on the Buenos Aires Plan of Action to give new impetus to these Kyoto Mechanisms.

Kyoto Process Hostaged by USA

United States, the greatest emitter of GHG has virtually taken the whole process of climate change negotiations and the future of the planet hostage to their intra-national

The developing countries are justifiably suspicious that CDM does not become another excuse of "carbon dumping" and "carbon colonialism"

politics. The US Congress having put spanners in the Kyoto Protocol Ratification Process threatens the overall progress of UNFCCC and KP and whatever little progress has been achieved by the global community to initiate the process of reducing the threat of climate change.

Contd. on page 2

Incidents Worldwide Suggest Something is in the Air

The last decade of this century has been quite different than the other decades. It witnessed the worst ever cyclonic havocs in Bangladesh and South Carolina, USA in 1991; the most talked about Earth Summit in mid-1992 and signing of the UNFCCC; huge earthquakes in Kobe city, Japan; the eruption of the Mount Pinatubo; the greatest forest fire in Indonesia; more hurricanes in South China sea, northern Bay of Bengal and along the coasts of eastern United States; highest ever (monthly average) temperatures for nine straight months in 1998; unprecedented floods in the recorded history in Mississippi river basin (USA), Ganges-Brahmaputra-Meghna river basins in South Asia, Yangtze river basin (China) all

Contd. on page 4



Produced by : BANGLADESH CENTRE FOR ADVANCED STUDIES (BCAS)

House # 23, Road # 10A, Dhanmondi, Dhaka-1209, Bangladesh

Tel : 9113682, 9119823, 8115829, 8113977

Fax : (880-2) 8111344, E-mail : info@bcas.net

"If one organ of our government threatened the progress of such a global negotiation" said the head of leading developing country party "we would be accused of irresponsibility, ravaging the good governance practices in global environmental negotiations and renegeing on international commitments. The US has taken the planet hostage and threatens the Kyoto Protocol and all its mechanisms".

The Missing Linkages Are being Sought

Despite these threats the global community is making some progress on many fronts. The Intergovernmental Panel on Climate Change (IPCC) is moving ahead with its Third Assessment Report (TAR). Although late, there is an initiation of addressing article 4.2 of UNFCCC by incorporating "Development, Sustainability and Equity (DSE)" as a cross-cutting issue in the TAR of IPCC. The UNFCCC Secretariat held workshop on the "Implementation of Article 4.8 and 4.9" to address issues of countries with special needs. UNEP has initiated the process of developing a vulnerability index. A large number of meetings, discussions and workshops are being held to focus on CDM to look at modalities of developing a functional mechanism. Even in the US, some corporations, universities and churches are demonstrating through their initiatives that carbon reduction means not only energy reduction but also economic efficiency. Several other Annex I countries are developing mechanisms and institutions to further CDM.

CDM: The Leading Mechanism

As the discussions are progressing it appears that CDM is the leading contender amongst the Kyoto Mechanisms. Though many problems remain, particularly the developing countries are justifiably suspicious that CDM does not become another excuse of "carbon dumping" and "carbon colonialism" where Annex I parties through their private sector does not transform "Clean Development Mechanism" into a "Carbon Dumping Mechanism".

There has been many workshops on CDM across the world. Recently the Consortium on North-South Dialogue

on Climate Change held their first meeting in their phase 2 activities in Rio De Janeiro, 1-3 September 1999 participated by leading negotiators, policy makers, representatives from private sector, Environment Development NGOs and researchers. The meeting focussed on Financing the CDM Activities. A set of questions were addressed. These are reported in this issue of Clime Asia. The issue of Compliance Regime and Global

The worst or nightmare scenario is that there may be CDM projects and regimes when some money and certified Reduction Units may be transacted without having any real and significant reduction in carbon in the process. Many fear that project baseline manipulation could threaten the whole of CDM as an enterprise.

Participation have also been raised in another companion article.

CDM Criteria: Investment, Additionality, Fairness Inclusion and Capacity

What appears critical is how to ensure that any future CDM funding in additional i.e. meets the additionality criterion. Further the principal motive of private sector investment will be their profit. The key questions remain : How would private sector profit for investing countries enterprises? How countries sustainable development objectives and carbon reduction objectives of the UNFCCC and KP be met simultaneously. These issues are yet to be resolved.

Many experts contend that due to the lack of capacity in developing countries governments and even in some countries poorly developed private sector much of the initial CDM transaction would be between multinational companies and their own subsidiaries in developing countries. These may create too much of incestuous transactions where carbon regimes will just be used for industrialized country companies to make profits.

Another two issues of contention is the (a) fairness and (b) geographical coverage. Concerns are being raised that the existing international trading regime is not only imperfect but is stacked against poorer countries. Imposing a more iniquitous carbon regime will enhance the inequity in an existing iniquitous trading and financial regime. The answer to this lies in the appropriate and significant capacity building in developing countries.

The geographical distribution remains a major threat for effective CDM implementation. Presently over 80 percent of global foreign direct investment (FDI) is confined within only 7 or 8 large developing economies each with huge market potential. When market remains the dominant criteria of investment most of the developing countries will remain out of a future CDM regime. Thus all efforts must be made to enhance fair geographical coverage and the principle of inclusion.

The Nightmare Scenario

The worst or nightmare scenario that is being seriously discussed as a possibility is that there may be CDM projects and regimes when some money and certified Reduction Units may be transacted without having any real and significant reduction in carbon in the process. The root of this lies in establishing and monitoring the correct and accurate baseline. Many fear that project baseline manipulation could threaten the whole of CDM as an enterprise.

Adaptation Fund

In an interview with the 40 key negotiators just after KP was decided in Kyoto, 80 percent of developing countries representatives asserted that their main reason for supporting KP was its Article 12.8 which enabled them to have, what they perceived as significant fund for adaptation and sustainable development supportive activities. Recent analysis shows that there is likely to be little money available for Adaptation Fund based on Certified Emission Reduction Units. Besides all these challenges, "CDM is the only game in town" as asserted by the head of a major multinational company.

CDM: Not Carbon Dumping

CDM must not become a carbon dumping mechanism nor a China Development mechanism but a fairer and more ecologically sound way of protecting the earth's climatic system from anthropogenic GHG induced instability.

FINANCING CDM ACTIVITIES: Some Key Questions

The following are a few questions to all the panelists on how CDM activities will be financed in future. The common questions are as follows:

- ? Will the development of the CDM compete with or be influenced by other forms of financing for international joint ventures?
- ? Under what types of conditions might CDM projects create attractive investment opportunities in countries with small markets?
- ? How might the planning, development and finance of CDM activities be linked to domestic incentives in Annex 1 countries?
- ? How will the financing of CDM projects differ in countries at various stages of market development or with different types of markets?

The following key questions are aimed at answering the basic query: what makes the CDM regime special?

- ? How is the CDM regime different from the other Kyoto Mechanisms?
- ? What is special or unusual about the "product" of the CDM regime, i.e., CERs?
- ? How can the CDM regime be structured in ways that ensure the benefits of sustainable development and the provision of cost-effective emissions reductions?
- ? What are the key factors that will affect the production costs of CERs (e.g., requirements for monitoring, reporting, certification, and verification; adaptation fee, and administration fee)?

Key questions that will seek justification concerning the uniqueness about the CDM projects.

- ? What are the unique elements or characteristics of CDM projects?
- ? What would need to have been done differently in the projects you examined to make them more appropriately CDM activities (e.g., emphasis on sustainable development, capacity building, monitoring and evaluation)?
- ? How would the project development process have been different if the project you examined had been designed as a CDM project from the start?

The next key questions are on financial issues.

- ? Will CDM affect the size, timing, or distribution of ODA? If so, how?
- ? Can or should ODA be linked to capacity building or to the creation of enabling environments that are attractive to CDM investments?
- ? Should ODA applied to CDM activities earn for the "donor" country government a share of the CERs produced by CDM projects?
- ? Will investments dedicated to the creation of enabling environments be eligible to earn CERs?
- ? Can or should bilateral or multilateral development finance be linked to the creation of enabling environments that are attractive to CDM investments?
- ? How might mainstream operational lending of the regional and multilateral development banks be

affected by the opportunities created through the CDM?

- ? Under what circumstances will mainstream lending projects of the regional or multi-lateral development banks be eligible to earn CERs under the CDM?
- ? How will the availability of investments in CDM activities affect the funding available for GEF projects?
- ? Should bankable projects that are financed in part with funds from the Prototype Carbon Fund (or similar fund portfolios) be eligible to earn CERs through the CDM?

On private financial issues of CDM we would like to have answers to the following key questions.

- ? What new or additional types of risks will be associated with CDM activities, compared to conventional joint ventures? What types of insurance or risk management instruments will be needed to make CDM projects competitive with conventional joint venture projects earning the same internal rate of return?
- ? Will the criteria for CDM projects differ between countries? If so, how will this affect their attractiveness for FDI and the distribution of FDI among countries?
- ? Should foreign direct investment in non-Annex 1 countries by companies whose headquarters are in developing countries be eligible to earn CERs under the CDM?
- ? What criteria or conditions are most important for developing country companies in deciding whether to participate in CDM projects.

Too Late to Stop Global Warming

The Kyoto Protocol, the international treaty to combat climate change, is failing, and it could already be too late to stop global warming, the world's most senior environmental official warned yesterday.

The targets in the treaty for cutting greenhouse gases such as carbon dioxide, agreed by the countries of the industrialised world, may not be met, said Dr Klaus Topfer, head of the UNEP.

Dr Topfer pointed to Hurricane Floyd as a typical example of the increased climatic instability that global warming is predicted to bring. "I'm

not pessimistic, I'm realistic," he said. "We should be honest in analysis, in the question of where we are. But I'm not giving any signal of resignation."

However, his gloomy prediction, remarkable from a man in so senior a position, is a significant puncturing of the euphoria engendered by the agreement put together in Japan nearly 2 years ago.

Under its terms, Britain and the other leading industrial nations, including the EU members, the USA, Canada and Japan, agreed to make significant reductions in their

emissions of six of the industrial gases (GHGs). All the countries agreed to meet precise targets by 2010.

But the former German environment minister said that the programmes of action that had now been agreed were simply not enough. "Indications are that it is too late to prevent global warming," he said. The protocol had started "in a very positive direction," he said, but what had been decided in the various countries "does not seem to be enough to reach the targets".

Contd. on page 11

Incidents Worldwide Suggest

in 1998; the greatest El Nino event in the Pacific disturbing economies in many countries along the globe (1997-98); destruction of Dominican Republic and other neighbouring islands in the Caribbean (1999); and unprecedented droughts in western USA (1999) all happening around the corner. The worst thing is, it is not finished yet! And the scientists warned it might just be the beginning.

Those who don't seem like believing it yet, wait for your turn. It is coming right next to, or perhaps, inside your courtyard.

Let us quote here some of the incidents that shook the world media during the past few months.

"Antarctic Ice Shelves in Retreat" reported ENS on 18 May, 1999. Two ice shelves in the Antarctic Peninsula are in 'full retreat' and have lost nearly 3,000 square kilometers of their total area in the last year, according to scientists in Colorado and the United Kingdom. Satellite photos monitored by the National Sea Ice Data Centre at the University of Colorado show that the Larsen B Ice Shelf, which began to retreat in 1998, has continued to crumble and over 1,700 sq. km of the shelf have caved away starting November 1998. In early March 1998 the Wilkins Ice Shelf, located in the other side of the peninsula, retreated nearly 1,100 sq. km. Scientists claimed that a large area of completely shattered ice was detected by radar images, indicating an ice front 35 Km back from its previous extent.



Ice crack in the Larsen B ice shelf; Antarctica

"Mexican Drought May be Worst Ever" reported CNN on May 24, 1999. Along the border of Texas state, USA the Mexican reservoirs and rivers are drying up due to a drought that is recognized as the worst in the history. As a result, crops are wilting and cattle are dying by the thousands. The farmers had to resort to untreated sewage as alternative to irrigation water. Although it is only the second consecutive dry year across northern Mexico, for some states it is the fifth consecutive drought. Several affected states are declared disaster areas by the Federal authorities. In those areas 20 big dams and water reservoirs are down to an average of 19 percent capacity. Rainfall in Sonora state is 92 percent below average this year while there was no rainfall in Nayarit state. The Rio Grande river bordering Mexico with the USA have gone dry along a long stretch. A heat wave, in the mean while, is sweeping the areas and temperatures in two states hovered around 110°C.

"Floods in Peru's Amazon Jungle" reported CNN on the very next day, May 25, 1999. Three weeks of heavy rains caused flooding in the Amazon and its two tributaries Nanay and Itaya in Peru that inundated the Amazon jungle. Four people died and forced thousands to leave their homes. People had to wade through waist-deep water in the streets of the jungle capital of Iquitos. About 7,000 homes were damaged by the flood. The local level adaptation to frequent flooding, i. e., settling on raised platforms in anticipation of seasonally changing river levels have apparently failed and the local people fell victim to the roving waters.

"Bad Weather Takes Toll on Businesses" Economic Times reported in its May 31 issue, 1999. Worldwide climatic hazards damaged an astounding total of US\$92 billion in 1998, up a staggering 53% from the previous record of US\$60 billion in 1996. This was quoted from a new Worldwatch report Vital Signs 1999. The Worldwatch president Lester Brown said "in 1998, the earth's average temperature literally went off the top of the chart". Storms and floods drove over 300 million

people from their homes in 1998. Drought threatened food security in many countries.

While the earth's temperature was accelerating, the growth of the global economy was decelerating. Economic turmoil in East Asia, Russia and Brazil slowed economic growth from 4.2% in 1997 to 2.2% in 1998, the slowest of rates in seven years. The economic turmoil took its toll on international trade, forcing a 4% drop from the previous year. Although climate induced agricultural production losses were high, international grain prices in the latter half of 1998 dropped to the lowest level in two decades.

"Increasing Disasters Threaten Poorer Countries" reported Science Daily on its June 24, 1999 issue. Driven by changes in climate systems natural disasters are increasing, threatening economically vulnerable countries, a Red Cross report revealed recently. "Everyone is aware of the environmental problems of global warming and deforestation on the one hand and the social problems of increasing poverty and growing shantytowns on the other," the president of the Red Cross International Federation, Dr. Astrid Heiberg, said. "But when these two factors collide, you have a new scale of catastrophe."

The annual World Disaster Report of the international organization mentioned that in six years, the number of people who needed aid after disasters such as floods and earthquakes had risen, from fewer than 0.5 million to more than 5.5 million a year. The report said that in 1998, natural disasters left far more people needing aid than armed conflicts did. Drought, flooding, deforestation and soil problem drove more than 25 million people from their houses, the study found. The disaster response coordinator for the Red Cross federation, Ms. M. Wahlstorm said, "both climate change and environmental change are forcing people into more vulnerable areas".

It appears from the report that poorer countries are the major victims of such climate induced disasters. The poor within the poorer societies often cluster in urban or coastal areas to

Best Something is in the Air

seek employment. One billion people live in unplanned shantytowns, and 40 of the 50 fastest growing cities are in earthquake zones, the report stated. An additional 100 million people are vulnerable to flooding because they live in low-lying areas. The study also estimated that about 96% of the deaths from natural disasters were in developing countries.

"US Plains Battered by Floods, High Wind" reported MSNBC on 29 June, 1999. Heavy rains pelted the South and Midwest, swelling rivers, slicking high ways and causing at least four deaths, safety officials said Tuesday. Three deaths in Alabama and one in Georgia were blamed on torrential rains Monday, while runoff flooded basements in Kansas City, Missouri, and slowed the wheat harvest in neighbouring Kansas. Heavy storms dumped almost a foot of rain on Savannah, Georgia, causing floods that washed away cars and knocked out power to 3,000 homes. More than 50 people had to be rescued from their homes as floodwaters rose.

Meanwhile, in the East, afternoon temperatures were warm and humid, ranging from the 70s and 80s (°F) in the Northeast and mid-Atlantic to the upper 80s along the Gulf Coast. Showers and thunderstorms struck the northern Plains from eastern Montana and the Dakotas into Nebraska. Skies were cloudy in most of the nation's midsection. Oklahoma and the Texas Panhandle were hit with severe thunderstorms that brought large hail. In the West, light rain fell in the mountains of Montana. The central Rockies and Desert Southwest were under clear to partly cloudy skies. The afternoon high in the Lower 48 states was 98°F in Phoenix, Arizona. The low was 35°F in Jackson, Wyoming.

"Iran Drought Causes Crisis" reported CNN on July 5, 1999. Lack of rain in Iran has parched crops nationwide, causing billions of dollars of damage, the official Islamic Republic News Agency reported. The news agency quoted Deputy Interior Minister Ahmad Khorram as saying that Iran had 40 percent less rain this year than last year. "The drought crisis is unprecedented in the past 40 years" and the damage so far is about US\$3.3 billion, IRNA quoted

Khorram as saying.

He said that in northern Gilan province alone 6,000 hectares (14,820 acres) of rice plantations had dried up, and another 3,000 hectares (7,410 acres) are nearly dry. Water levels in the country's reservoirs have dropped by 3 billion cubic meters compared to last year, the Iran Daily newspaper reported.

"Northeast US Sizzles in Record Temperatures" reported ABC News on July 6, 1999. From Illinois to the East Coast, from Massachusetts to North Carolina, the mercury has been soaring. In New York, they're baking at a heat index 112 degrees F. Newark, New Jersey, hit 103°F Monday. Bridgeport, Connecticut, and Raleigh, North Carolina, both broke into triple digits. Even Portland, Maine, has wandered into the 90s.

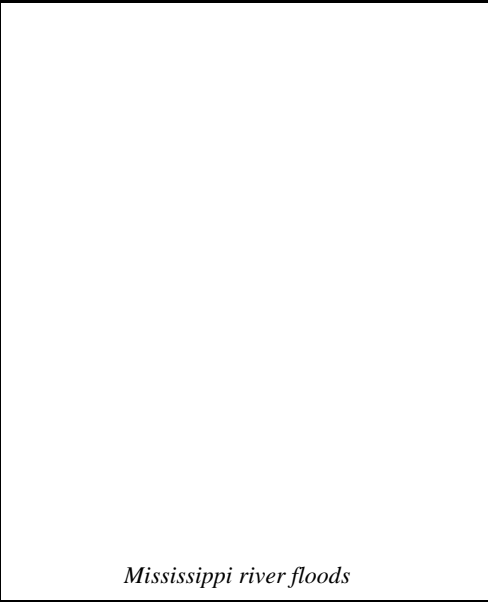
"Death Toll Rises in China Floods" reported BBC News on July 6, 1999. The latest death toll in floods along the Yangtze river has risen to

million buildings have sustained heavy damage. The ministry said that over \$3bn of direct material damage had been caused by the floods. Government rescue teams have evacuated almost 2m people from inundated areas and distributed 5,000 tents. Emergency medical teams have been sent to 46 severely flood-hit towns in Anhui Province, where 150,000 were evacuated from their homes.

Flooding ravages parts of China every summer, a disaster season made worse in recent years by rapid development and the clear-cutting of forested hillsides. Last summer saw China's worst flooding in 44 years, with 4,150 deaths.

"Great Lakes in Dire Straits" Ottawa Citizen reported in its July 9 issue in 1999. Water levels in some parts of the Great Lakes are lower than they have been in a lifetime. That means big trouble for everyone and everything that lives along the shores of the world's freshwater giants. On Lake Superior, water levels are at their lowest point in 70 years, mostly because this year's spring melt was quick and the weather has been dry, with an abundance of sunshine to suck up water from the lake's surface. Water level on Lake Erie were at the lowest level since 1967. Lakes Michigan and Huron were at their lowest point since 1990.

During this decade Climate Change issues have become the most talked about issues globally. The same decade also witnessed the signing of the Kyoto Protocol, a legally binding document aimed at reducing the emissions of GHGs, in December 1997. Unfortunately, after having several rounds of negotiations and another Conference of the Parties to the Kyoto Protocol in Buenos Aires (COP 4), all the industrialized nations (Annex I countries) have not yet ratified the Protocol. COP 5 has just given another opportunity to take firm actions at home to arrest GHG emissions. If the negotiators fail to ensure that, the most vulnerable ones would perish alright, but it would not be without costs that would affect the entire humanity. And everyone should remember that the same would eventually appear in their own courtyard, like it or not.



Mississippi river floods

240, and another 60 million people are now threatened by flooding. The figures were announced by China's Civil Affairs Ministry on Tuesday. The flooding, caused since late June by heavy rain, has damaged 3.5m hectares of land and totally destroyed 660,000 ha of crops, with Anhui, Zhejiang, Hubei and Jiangxi Provinces the worst affected.

Thousands of houses have been destroyed and an additional 1.67

UN Has a Problem : Members



SEYCHELLES Seventy per cent of the 115 islands in this tropical paradise of 77,000 people could be submerged if changes in the world's weather patterns force the sea levels to rise

To the unsuspecting onlooker the scene of coconut palms bending in the gentle warmth of the Pacific trade winds and turquoise surf breaking on distant coral reefs is an image of paradise.

But the wind and surf of the tropical idyll are slowly attacking the ancient burial grounds of the Marshall Islands and everything around them. Storms, rogue waves and unusually high tides have destroyed sea

defences, eroded the burial plots and carried flotsam from the ocean on to the white marble headstones.

The entire coastline of the Republic of the Marshalls, a group of 34 coral islands in the west central Pacific, is under attack from rising sea levels and storms of increasing ferocity as the phenomenon of global warming intensifies. It is a terrifying prospect not only for the 60,000 people of these

reefs, but also for a constellation of low-lying island nations scattered throughout the tropics. Across the Caribbean and the southern and western Pacific, rising waters are already inundating the lowest-lying areas, bringing environmental and economic catastrophe.

The crisis facing these island communities will be centrestage next week when a special session of the United Nations General Assembly (UNGA) addresses their plight. From the time of Defoe these island nations have been the repository of escapist fantasies. Now that they are experiencing first-hand the consequences of global warming and the melting of the polar icecaps, they are literally drowning, and waving furiously for international attention.

On present projections, sea levels around the world could rise by up to a foot over the next 100 years – not much it would seem, but enough to submerge 80 percent of the 1,087 islands that make up the Maldives, not one of them more than five square miles in size. Enough, too, to wipe out 70 percent of the Seychelles, and to lay waste the coastal areas where most of the population and agriculture is concentrated in a host of other island countries.

In the Pacific archipelago of Kiribati, straddling the Equator, two *motu*, or islets, have already disappeared from the face of the Earth. In the aspiring UN entrant of Tuvalu, ground reserves of fresh water have been so badly spoilt by rising seawater levels that the island has to rely on rain for its drinking water. On several Pacific islands, staple food crops have to be grown in kerosene cans, so contaminated by salt is the local soil.

In global GNP indexes, they may not feature at the top. But then again, neither are they at the bottom, and is not a mite of material privation part of the package? Ask those who live in some of these places 365 days a year, however, and the perspective is a little different.

As measured by the Alliance of the Small Island States (AOSIS), their self-appointed bloc within the United Nations, there are 43 such countries. Of them, 36 are full members of the UN, accounting for a fifth of the recognised sovereign nations on this

May Soon Start to Disappear

planet, and for a quarter of all developing states which belong to the world body. In reality, of course, they are too weak, too scattered and simply too small to make much of a difference.

Next week, however, they will have their moment in the diplomatic sun when the general Assembly gives over two full days to a discussion of their situation. Officially, it is an occasion for stocktaking, to measure what has been achieved since a ground-breaking 1994 UN Conference in Barbados, which first focused attention on the development problems of small island states. There will be some cause for self-congratulation, but rather more for apprehension.

The size, remoteness and exposure of many island states place them at the mercy of nature's mightiest forces. But nature's destructiveness, as usual, has its human accomplices. The paraphernalia of late 20th-century syberitism – five-star hotels abutting on pink sands, the yacht marinas, the manicured golf courses alongside beaches where coconut palms shade their greens – are already leaving their own legacy of degraded fishing grounds, half-destroyed mangrove swamps and ruined coral reefs. In Nauru, like Kiribati admitted to the UN this year, phosphate mining has wrecked the interior of the island and destroyed entire ecosystems. In Micronesia, two-thirds of the surviving forests on the island of Pohnpei have been wiped out in barely 20 years.

And what is being done? Words, words and more words, the cynic And what is being done? Words, words and more words, the cynic will say, pointing to the tens of thousands more that will echo around the UNGA next week. But practical steps are being taken. Sewage and recycling facilities are being improved in a score of AOSIS members; fisheries and land management programmes have been set up; money has been spent on improving communications and freshwater supplies. tourism conventions have been signed. But in the end the fate of the island states is in the hands of others.

But the US and its colossal industries are hardly likely to be moved to reduce emissions of GHG held responsible for global warming by the

lobbying efforts of a clutch of mini-countries whose combined GNP is barely that of Birmingham? Even tourism, the mainstay of prosperity for so many, can be a fickle friend. A devastating hurricane, and the tour operators will quickly direct their discerning customers elsewhere.

Then there is the relative prosperity of the islands. It is hard to make case for Trinidad and Tobago or the Maldives as a more urgent case for assistance than far poorer parts of sub-Saharan Africa, say.

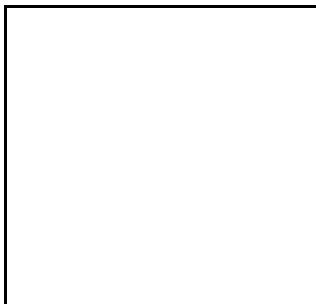
"We need a vulnerability index," Leo Falcam, president of the Federated

States of Micronesia, told the UNGA last week – in other words, a system under which states qualify for assistance by the risks they face. It will cost Caribbean islands, for instance, more than US\$1 billion a year for decades to protect themselves from rising sea levels. For even more threatened India and Pacific Ocean islands, the bill may be higher.

The problem may solve itself: a few decades of global warming, ever fiercer El Ninos, hurricanes and the rest, and some AOSIS members may settle gently beneath the warm tropical waters, never again to raise their voice in protest.



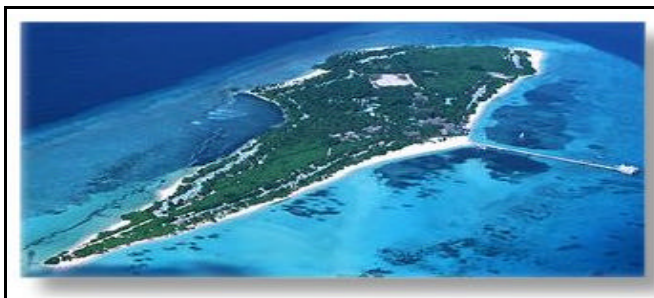
SAMOA Samoa is one of the small island states that the lead in pressing for legally binding measures to curb greenhouse gases, which are blamed for global warming. Rising seas threaten these South Pacific Islands - population 174,000



KIRIBATI Sacred sites are threatened by rising water level; two islets are submerged. Roads have been moved inland as the Pacific Ocean erodes the shoreline of this land of 81,000 people



FUJI Family graves have been swept away by the rising waters on the island of Kadavu. The 800,000 inhabitants of the Fiji islands fear the global warming may mean an end to their way of life



THE MALDIVES A seawall has been built around the main atoll of Male but 80 per cent of the 1,087 islands, some with breakwaters, are only 3ft above sea level

Courtesy: The Independent, Saturday, 25 September 1999

India's achievements in energy efficiency

R.K. Pachauri

Introduction

The United States has made its ratification of the Kyoto Protocol contingent on 'meaningful participation' by key developing countries, especially India, China, and Brazil. The US has argued that although the developed countries are now the major contributors to GHG emissions, increasing emissions from developing countries would make their contribution larger in the not-too-distant future. Therefore, without the participation of the developing countries, global progress towards GHG emissions limitations would be severely restricted.

The need for developing countries to improve living standards and reduce poverty is well understood. The average per capita GNP for developing countries was US\$982 in 1992 in comparison to US\$16,065 for industrialized countries (UNDP, 1995). A large percentage of developing country populations live in poverty. A sizeable fraction of the population does not have access to basic amenities such as health services, drinking water, and sanitation. Therefore, the immediate priority of these countries is to address the basic needs of their populations. Energy is the key driving force in the process of development. Though the total energy use, one of the major sources of emissions, is increasing in developing countries, their per capita energy consumption remains far below that of the developed world. Commercial energy consumption for the year 1992 was 527 kgoe per capita in developing countries compared to 4,834 kgoe per capita in developed countries (UNDP, 1995). Commercial energy consumption in India was 235 kgoe per capita compared to 7,662 kgoe per capita in the USA (UNDP, 1995).

A number of developing countries have undertaken structural reforms with the aim of globalising their economies and making them competitive in the international market. These include fuel price reforms, energy sector deregulation, the promotion of energy efficiency,

meet national development objectives. Although the developing countries have not undertaken specific commitments to mitigate CO₂ emissions, these measures have had significant ancillary benefits with regard to climate change. This article is an abridged version of the account of India's recent advances towards reducing its GHG emissions, despite having no obligation targets under the Kyoto Protocol.

Improving Energy Use Intensity

Energy is a major and essential input in the early stages of economic development. The importance of the energy sector in India is highlighted by the fact that 30% of the government's budget has generally been earmarked for energy. One of the constraints to healthy future growth is the capacity of the economy's infrastructure, which is now identified as inadequate. Energy is the most important element of this infrastructure. Large investments in the energy sector are required to support its desired rates of economic growth.

The strategy of increasing the efficiency of resource use and productivity of the economy is an important complement to efficient development of infrastructure. Although environmental and sustainability issues are critical in defining economic policy and energy-related initiatives, the problem of widespread poverty requires that primacy be given to rapid economic growth. Nevertheless, India has taken major steps to improve overall use of energy in the economy.

The share of electricity use in the economy has grown steadily over the past decade and a half. India's average transmission and distribution losses are 21% (TERI, 1997), and auxiliary power consumption is estimated at 8% (MOP, 1996). As a result, losses in conversion account for a sizeable fraction of total primary energy use. To increase the efficiency in

electricity generation and increase capacity utilization, in 1984 the Government of India launched a centrally sponsored programme for renovation and modernization of thermal power stations. A similar plan was launched for hydroelectric power stations in 1987. In phase I of the scheme, 37 power stations, with a total capacity of 13,570.5 MW, were targeted to generate an additional 7,000 million kWh per annum. Against this, the actual additional generation from such measures was 52.7 billion kWh for the period 1988-1993. Phase II of the programme will cover 46 thermal power stations with total capacity of 21,664 MW. The hydropower initiative will cover 55 hydro plants with installed capacity of 9,658 MW. To make the electricity sector commercially viable, the government has established the Central Electricity Regulatory Commission (CERC). State Electricity Regulatory Commissions (SERCs) are expected to regulate electricity prices and handle other matters covered by the Electricity Regulatory Commissions Act of 1998.

India has been at the forefront of renewable energy use. Renewable energy sources are generally an commercially viable option for decentralised energy supply in remote areas. The importance of renewables is reflected in the fact that India has had a full-fledged and independent Ministry of Non-conventional Energy Sources (MNES) since 1990. It was initially set up as a separate department in the government in 1982. In 1992 the government moved away from state-sponsored programmes to commercialisation of renewable

Table 1 showing expansion of RET capacity in India

Device	Achievements		
	1993	1994	1997
Biogas plants (in millions)	1.8	2.2	2.5
Improved cooking stoves (in millions)	14.5	19.6	23
Solar cookers (in millions)	0.29		0.43
Wind farms (MW)	53.9	350.51	900
Small hydro (MW)	93.4	119.56	141
Biomass power (MW)			83
PVs (MW)			28

Source: TERI, 1997

Efficiency and reducing CO2 emissions

I.S. Sharma

energy technologies (RETs). A separate financial institution – the Indian Renewable Energy Development Agency (IREDA) – was set up in March 1987 to promote, develop and finance RETs. During 1995, IREDA offered loan assistance of Rs 6,022.2 million for 265 projects. The cumulative loan commitment of IREDA through 31 March 1996 was Rs 11,074.8 million. All these efforts resulted in generation capacity of approximately 1,400 MW of power through renewables by March 1997. Table-1 quantifies the increase in various renewables.

The Government of India provides an explicit subsidy to a range of renewable energy technologies. In addition to these direct subsidies, it offers other indirect benefits in the form of accelerated depreciation schedules and other tax breaks. These efforts are supplemented by institutional measures to promote private investment in this sector. For instance, the government is considering establishment of a national certification and testing centre for wind turbines. A National Bio-energy Board (NBB) has been set up to direct policy and guide energy recovery from urban and industrial wastes.

Whereas several of the current initiatives apply to urban locations and to grid-based supply, NBB's efforts primarily address the energy requirements of rural communities through decentralised generation. Because they replace centralised power generation and have zero emissions, they reduce the carbon emissions that would otherwise have been produced. India's average transmission and distribution losses are 21% (TERI, 1997), and auxiliary power consumption is estimated at 8% (MOP, 1996). This implies that 1.3 units of electricity must be generated to supply 1 unit of electricity for consumption. Assuming a 30% availability of renewable power generation capacity, the total amount of electricity generated in a year from installed capacity is 3 billion kWh. Estimated CO2 emission per kilowatt-hour of electricity generated from coal based power stations is 1.3 kg (ALGAS, 1998). Thus, the generation of electricity through

renewables means that 1.44 million tonnes of carbon emissions per annum are avoided.

A major factor in inefficient use of energy has been its sub-optimal pricing. Almost all the commercial fuels in India in the past were subjected to pricing mechanisms, other than purely economic or commercial reasons. Government pricing had an adverse effect on organisations responsible for energy supply, leading to inefficient patterns of energy use throughout the country. Since 1990, policy had shifted towards market-driven pricing. In 1996, the GOI de-regulated prices of certain grades of non-coking coal and all grades of coking coal. A policy decision also stipulates that the pricing regime for other grades of non-coking coal too would be de-regulated beginning 1 January 2000.

The government pricing regime in the hydrocarbons sector also has started undergoing major changes. Parallel marketing has been approved for kerosene, liquefied petroleum gas

A high degree of destabilisation still exists in electricity pricing, although a number of states are also in the process of changing the existing structure to make this sector market-driven as well. Subsidised prices have diminished the ability of the state electricity boards to generate resources for expansion and improvements both internally and from private sector sources. They also promote inefficient use of energy. A number of states have undertaken tariff reforms to make state electricity boards more viable. The State of Orissa was the first to initiate reforms in the state's power sector. The Orissa State Electricity Board, a state monopoly combining all the functions relating to generation, transmission, and distribution of electricity, has been replaced by separate corporate entities: the Grid Corporation of Orissa, Orissa Hydro Power Corporation, and Orissa Power Generation Corporation. An independent regulatory authority has been established to determine prices

(LPG), and lubricants. Also, private parties are now allowed to import these products and sell them through their own marketing networks at market-driven prices. Imports of naphtha and jet fuels have been dechannelised for their own use by the importers. A number of other measures are under consideration that could significantly change the pricing regime or eliminate it altogether.

electricity consumers. The Haryana State Restructuring Bill (1997) has been adopted by the state assembly and has received Presidential assent.

Such efforts would build further on the recent changes in energy prices. An analysis on the price indices of coal, electricity and petroleum

Contd. on page 10

India's achievements in energy efficiency and reducing CO2 emissions

products for the period 1984-1994 shows that, except for coke, the prices of all grades of coal have increased in real terms since 1990. The increase has been steeper since 1990 – a trend to which the price of coke conforms as

commitment to reduce the energy intensity and the CO2 emissions per unit of output in the Indian economy. The annual budget of the GOI approved by Parliament provides a substantial increase

energy technologies as well as to more efficient use of other energy resources. The fact that he made these pronouncements after less than a month in office underscores that India's partnership with the rest of the world in limiting CO2 emissions is not simply an act of global responsibility but is also undertaken to meet national goals. However, given their clearly defined 'common but differentiated responsibility' (Article 4, UNFCCC, 1992), the developed countries must assume ambitious commitments and discharge them with conviction. The US emphasis on the 'meaningful participation' of key developing countries not only attempts to bypass this responsibility but also ignores the enormous changes already taking place in the right direction in India – changes that require no imposition of unfair commitments on this country.



well. The price of petroleum products remained almost unchanged throughout the 1980s. Except for crude oil and naphtha, the prices of petroleum products have increased sharply since 1990. The prices for liquefied petroleum gas, petrol, and diesel increased in real terms after 1990.

(100%) in the outlay for IREDA as well as a significant increase in the allocation for the Ministry of Environment and Forests. In addition, several other incentives have been provided for conservation of waste energy. Similar initiatives are also being taken by state

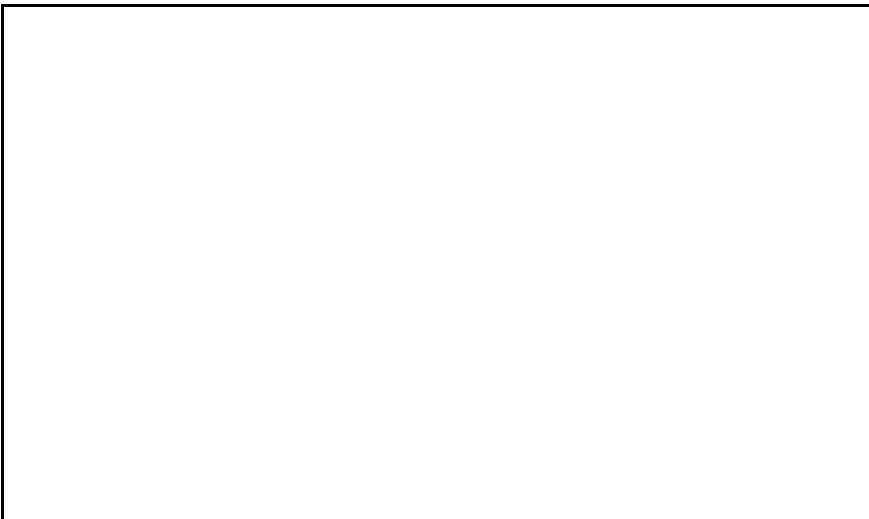
References

- ALGAS, 1998. India: Asia Least Cost Greenhouse Gas Abatement Strategy. Asian development Bank, 1998.
- MOPower, 1996. India's Electricity Sector – Widening Scope for Private Participation. Ministry of Power, Government of India, New Delhi.

The price of electricity for domestic and agriculture sectors has also decreased in real terms. However, with pricing reforms expected in most states, consumers will also probably have to pay higher prices in the near future. The industrial sector has been bearing the major share of the total generation cost, which is reflected in the sharp increase in electricity price for industries. In the aggregate, the real prices of energy have grown at 2.3% since 1981 and at 3.7% since 1990.

Conclusion

Although development objectives and social priorities dictated the pricing of energy products in the past, the current trend reverses this pattern and is moving in the direction of market-driven pricing. The fiscal reforms and liberalisation measures adopted by the GOI in 1991 and consistently pursued by successive governments clearly demonstrate India's



governments and municipalities. At an assembly of the Global Environment Facility (GEF) in New Delhi in early April 1998, India's Prime Minister, A.B. Vajpayee, strongly reiterated the country's commitment to the promotion of solar energy and other forms of renewable

TERI, 1997. TERI Energy Data Directory and Yearbook. Tata Energy Research Institute, New Delhi, India.

UNDP, 1995. Human Development Report, 1995. United Nations Development Programme, New York.

Rice Research in South Asia Under Elevated CO₂

A. P. Mitra, National Physical Laboratory, New Delhi, India

There is agreement among the scientific community that the CO₂ concentration in the atmosphere has increased from around 280 ppm in the pre-industrial times to 358 ppm in 1994, primarily as a result of human activities [Houghton, 1995]. Enhanced levels of CO₂ in the atmosphere affect the carbon balance in the rhizosphere and photosynthetic carbon assimilation in plants, thereby affecting agricultural productivity. Although studies have indicated that increased concentration of carbon dioxide has beneficial effects [Kimball, 1983, Cure and Ackock, 1986], there is a variability in the response of plants to increasing concentration [Percy and Bjorkman, 1985]. South Asian countries have an agriculture based economy and their food security may be significantly affected by rises in CO₂. To adapt and benefit from these enhanced levels, fundamental knowledge of the responses of crop systems to such changes is required.

Predicting climate change and evaluating the effects of changing levels of CO₂ in the atmosphere on agrosystems, requires the use of models. However, these models must be developed and evaluated with data obtained under realistic field conditions. Rice is widely grown throughout South Asia and being a C3 crop, responds significantly to enhanced concentrations of CO₂. In order to develop a model, with the additional objective of tailoring rice genotypes and their management technologies, scientists of the SASCOM region have come together to study:

- ? the effect of atmospheric CO₂ enrichment on rice varieties grown under various cropping ecosystems and
- ? study biogenic emissions in rice crops using several Open Top Chambers (OTC) and Mid FACE (Medium sized Free Air Carbon Enrichment) facilities for a limited period.

Such studies on the effect of CO₂ enrichment in crop plants using OTCs are already in progress at the Indian Agricultural Institute, New Delhi, India. These studies are aimed at characterizing the possible effects of elevated CO₂ on photosynthesis, productivity and water relations of plants under adverse moisture stress conditions. The results from such studies at IARI have shown that CO₂ response is highly significant in mitigating certain adverse stress effects on plant processes [Upreti et. al., 1995; Upreti et. al., 1996a and b].

Open top chambers were developed to characterise the response of crop plants

to CO₂ enrichment under near natural conditions. These chambers measure dynamic changes in temperature, light and rainfall experienced by unenclosed areas with inexpensive and complex environmental controls. Open top chambers comprise of (a) a supply of pure and high concentration of CO₂, (b) system of valves, regulators and flow metres, (c) chambers which are CO₂ controlled, (d) appropriate gas analyser with feed back control, and (e) computed data acquisition and programming. The microenvironment of typical open top chamber has 57% less solar radiation, higher humidity and lower wind speed compared to open field and sometimes produces a measurable effect on plant growth. However, there is no systematic effect of the chamber on all aspects of growth. This indicates that major environmental effects are compensatory; e.g. production reduction of light is compensated by improved water balance and increased temperature. A disadvantage of open top chambers is that CO₂ concentration is more variable than with closed chambers but they are cost effective for meeting the requirements of field research on the CO₂ enrichment study. Open top chambers can be modified to periodically measure net carbon exchange. These are inherently simpler than other systems.

The limitations of the open top chambers are that chamber grown plants differ from field grown plants both physiologically and morphologically. Their rooting volume is limited. These experimental conditions are not presumed to represent the natural environment, therefore, studies done under natural environment give realistic biological data. In this regard therefore, Free Air Carbon Enrichment (FACE) technique plays an important role. This technique allows one to obtain data of carbon fixation under controlled and elevated CO₂ levels without confounding effects of growth chambers such as decreased light intensity, unnatural wind flow, elevated temperature and disturbed soil water patterns. A medium sized FACE facility (mid-FACE) is under construction at the IARI, New Delhi, India, which will simultaneously be used along with the Open Top Chambers.

The proposal approved by the Asia-Pacific Network for Global Change Research (APN) will enable the South Asian scientific community and the policy makers to:

- ? familiarize themselves with the consequences of future elevated CO₂ concentration on crop productivity, in particular rice;

? conduct a joint, multi-country, controlled paddy growth experiment under elevated CO₂ conditions over one cropping season to generate a data base on crop responses and biogenic emissions;

? and develop a method based on analysis of the experimental data to tailor rice plant types and their management technologies as applicable under various agroclimatic conditions in the South Asian region.

A judicious combination of field experiments at different places on rice cultivars using these CO₂ enrichment technologies will enable a more realistic characterisation of their responses to elevated CO₂, and a database thus obtained would be of immense help in policy consideration for regional food security issues for the future. Characterization of the responses of plants to elevated CO₂ will help in designing simulation models for rice productivity predictions.

Contd. from page 3

Too Late to Stop GW

He would not single out individual nations, but in an unmistakable reference to the US said: "I really believe that the main contributor of emissions of CO₂ must speed up its activities." America alone emits nearly a quarter of the world's CO₂, but the US is still arguing about what to do, or not do, about its Kyoto commitments. Much of its business community and many members of Congress are against any action at all, while the Clinton administration is actively pressing the possibility of buying more on-paper reductions of CO₂ from other countries, the so-called "hot air".

Real cuts in CO₂ would involve much less use of motor vehicles and much more use of renewable energy sources, such as wind, wave and solar power.

Britain's Kyoto commitment is to cut back on its emissions of CO₂ and other gases by 12.5 percent to below their 1990 levels by 2010. The Government has made its own commitment to make this a 20 percent cut by the same date. It is still consulting about its action plan to deliver the cutbacks. John Prescott, the Deputy Prime Minister, had no comment about Dr Topfer's Kyoto warning.

International negotiations on taking the protocol forward will resume in a major international meeting to be held in Bonn at the end of next month.

Five Issues to Look for in COP-5

There are five significant issues that will need to be discussed and clarified to enable progress to be made at the Fifth Session of the Conference of the Parties (COP-5) to be held from the 25th October to 5th November 1999 in Bonn, Germany.

The "Workshop" Culture

In seeking to operationalize the ambition of the Kyoto Protocol, Parties are experimenting with the "workshop route." Some of the more complex climate issues have been parceled-off to be discussed in workshops. In the run-up to COP-5, workshops are slated to occur on technology transfer, adverse effects, and compliance.

While these workshops are not intended to be negotiating sessions, the exchange in views that they facilitate are expected to improve the quality of the debate at COP-5. There is, however, a concern that the number and intensity of these discussion sessions could overwhelm certain developing countries with limited human and other resources to devote to the climate issue.

At Bonn. Developing countries repeatedly expressed a desire for "time to reflect" on the ramifications of various ideas emerging from the meetings. The workshop culture that the process seems to have embraced deprives the developing countries of valuable time for reflection.

Yet another concern relates to the inability of the G-77/China group to meet inter-sessionally. In Bonn, the G-77/China group spent several hours in closed regional meetings developing positions on the mechanisms and compliance. In response to the impatient non G-77/China group participants, they explained that since they did not have a chance to meet inter-sessionally they could not debate and formulate their positions except when assembled for negotiating sessions.

Until arrangements are made to facilitate inter-sessional G-77/China group meetings, workshops will not scratch the surface of the conflicts that need to be resolved to breathe

The Kyoto Mechanisms

Nearly two years after the hastily put together Kyoto Protocol, the G-77/China group is finally coming to terms with the financial and other ramifications of the Kyoto Mechanisms. Countries, face-to-face with the reality that the Clean Development Mechanism (CDM) will not have uniform benefits across countries, are emerging with new and interesting ways of shaping the CDM. COP-5 will likely see the issues of unilateral mechanisms, emissions avoidance and adaptation funding discussed and perhaps resolved. In Bonn, Parties agreed to produce a new synthesis of Party positions in time for COP-5 and there could be an attempt there to revise this new synthesis and create a possible basis for a draft negotiating text.

The compliance regime

The growing Annex-1 call for developing country participation in mitigation efforts under the Kyoto Protocol has been matched by a strong developing country emphasis on the creation of a strict compliance regime.

The Alliance of Small Island States (AOSIS), at the helm of the compliance ship, is, however, at a cross roads at this stage in the negotiations. If they strongly endorse compliance and insist that the CDM result in real measurable and long-term benefits, as they are wont to do, there will be an increase in the transaction costs of the mechanisms and a corresponding decrease in the potential to impose a high adaptation charge on the mechanisms.

It is the adaptation fund, however, that is of vital importance to the small island states. As countries with negligible emissions, they are unlikely to generate interest in potential investors under the CDM. Their hopes may rest on the CDM generating funds for adaptation. The small island states could use their share of the money to fund vulnerability assessments and adaptation measures in their countries, likely to be the first and worst hit by climate change.

Certain preliminary details relating to the creation of a compliance system

are likely to be ironed out in the run-up to and in COP-5.

Global participation

The issue of voluntary commitments is likely to rear its head at COP-5 and will probably do so again at COP-6. With Kazakhstan and Argentina sporting radically different ideas on the notion of "voluntary commitments" and what it entails, there will doubtless be a flurry of activity in the corridors at COP-5 with Parties seeking to sell their perception of the notion and its potential benefits. The long-standing resistance to the idea from certain powerful quarters, China and India among them, however, continues, so the idea is unlikely to take off at COP-5.

The Majuro Statement

AOSIS, in keeping with its image as the conscience-keeper of the climate negotiations, has produced the Majuro Statement on Climate Change. The Majuro Statement highlights the importance of domestic action in Annex-B countries and vulnerability assessment, adaptation and capacity building in the least developed nations and small island states. The Statement emerged out of a regional workshop on the Clean Development Mechanism held in July 1999, organized by the AOSIS in the Marshall Islands.

~~Source: L. Rajamani, *Tiempo*, Issue 99~~

SMRC research shows **Sea level along Bangladesh coast rising**

by Mostafa Kamal Majumder

The sea level along the Bangladesh coast is rising at about three millimetres a year, and the sea surface temperature is showing a rising trend, a latest research conducted by the SAARC Meteorological Research Centre (SMRC) shows. The findings confirm the forecasts made by scientists about sea level rises due to global warming that is caused by excessive emission of greenhouse gases including carbon dioxide and methane into the atmosphere. The work, done since early this year by Dr. O.P. Singh of India and Dr. Tarek of Pakistan under the supervision of Sazedur Rahman, Director, SMRC, forms the first phase of a study on global warming. See Page 16 Col 7

A Paper clipping suggesting disastrous future for Bangladesh under Global Warming

Falling Costs for Renewable Energy

Renewable energy resources offer enormous potential for producing electricity in developing countries, which often have an abundant supply of sun, water, wind, biomass, and other energy sources. This potential remains largely untapped, mainly because of lack of familiarity with renewable energy technologies and because of their relatively high upfront costs. But two trends indicate that the future may be brighter for

renewable energy sources in developing countries.

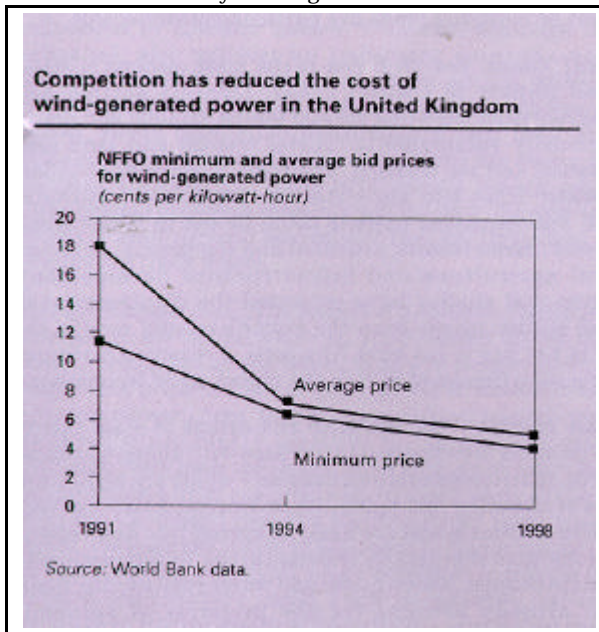
First, in certain niche areas, the cost of renewable energy are already competitive with conventional energy resources, even at the low fossil fuel prices of the late 1990s. Conventional power generation has two less costly competitors: minihydro power sites and biomass cogeneration facilities. These facilities are located close to population centers or to transmission lines (into which they feed their power). A

number of solar photovoltaic systems are feasible for off-grid power generation. These systems are most useful in rural areas far from the main power grid and in sparsely populated areas where low demand makes the cost of extending the grid prohibitive.

Second, it has become clear that creating competitive, market-type conditions significantly reduces the costs of using renewable energy technologies. In Indonesia, once it became known that the GEF and the

World Bank would finance a large renewable power project, potential vendors began to cut prices to secure their position in the emerging market. Competition also reduced the costs of wind-generated power under the United Kingdom's Non-Fossil Fuel Obligation (NFFO) scheme. Under the scheme, renewable energy projects are selected in competitive bidding are receive an output subsidy financed by a levy on electricity generated with fossil fuels that applies to all electricity consumers. By November 1998, five NFFO bidding rounds had taken place. As the figure shows, bid prices – the lowest as well as the average bid – for wind energy declined dramatically, falling from an average of around 18 cents per kilowatt-hour in 1991 to 5.1 cents per kilowatt-hour in 1998. (Declining prices for fossil fuels during this period meant that the relative costs of renewable energy technology fell more slowly.)

Although technological progress is clearly essential to reducing the costs of using RE technologies, sector reform, including the removal of subsidies on fossil fuels and open competition, can also be an important factor. Whether managed, as in the UK, or spontaneous, as in Indonesia, reform has helped drive technological advance and has encouraged the efficient use of technology.



Climate Change in Multimedia

The IEA GHG Programme is about to release a multimedia simulation of climate change and mitigation options, on CD-ROM. The user friendly model called Merlin, gives users a feel for factors influencing climate change. Users are first presented with a series of questions to establish a scenario. Based on this scenario, predictions are then made for their impacts on the climate. Users can then experiment with different mitigation options to see what impacts they might have.

The simulation is based on results from the IEA GHG full

fuel cycle study, to make some of the results more accessible to non-specialists. The CD also contains many of the IEA GHG public summary reports as well as other information about climate change and energy statistics from BP Amoco and IEA.

Copies of the CD ROM can be obtained from IEA GHG Programme, Stoke Orchard, Cheltenham, Glos. GL52 4RZ, United Kingdom, Tel. +44 (0) 1242 680 753; Fax. +44 (0) 1242 680 758. For more details please visit web site at WWW.ieagreen.org.uk/

Regional Impacts of Climate Change

Tropical Asia

The sixteen countries of Tropical Asia range in size from about 61,000 ha (Singapore) to 300 million ha (India). The region is physiographically diverse and ecologically rich in natural and crop-related biodiversity. In 1997 population added up to 1.6 billion and is projected to 2.4 billion in 2025. Although the population is principally rural, in 1995 the region included 6 of the 25 largest cities in the world. Exploitation of natural resources associated to rapid urbanization, industrialization and economic development has led to increasing pollution, land degradation and other environmental problems. Climate change represents an added stress.

Climate in Tropical Asia is characterized by seasonal weather patterns associated with the two monsoons and the occurrence of tropical cyclones in the two core areas of cyclogenesis (the northern Indian Ocean and the northwestern Pacific Ocean).

Ecological Systems. Substantial elevational shifts of ecosystems in the mountains and uplands of Tropical Asia are projected. At high elevations, weedy species can be expected to displace tree species although the rates of vegetation change could be slow and constrained by increased erosion in the Greater Himalayas. Changes in the distribution and health of rainforest and drier monsoon forest will be complex. Projected increases in evapotranspiration and rainfall variability are likely to have a negative impact on the viability of freshwater wetlands, resulting in shrinkage and dissipation. Sea level rise and increase in sea-surface temperatures are the most probable major climate change related stresses on coastal ecosystems. Landward migration of mangroves and tidal wetlands is expected to be considered by human infrastructure and human activities.

Hydrology and Water Resources. The Himalayas play a critical role in the provision of water to continental monsoon. Increased temperature and increased seasonal variability in precipitation are expected to result in accelerated recession of glaciers and increasing danger from glacier lake outburst floods. A reduction in flow of snow-fed rivers, accompanied by increases in peak-flows and sediment yields would have major impacts on hydropower generation, urban water supply and agriculture. Runoff from rainfed rivers may change in future, although a reduction in snowmelt water would result in a decrease in dry-season flow of these rivers. Larger populations and increasing demands in the agricultural, industrial and hydropower sectors will put additional stress on water resources. Pressure will be most acute on drier river basins and those subject to low seasonal flows. Hydrological changes in inland and coastal drainage basins are expected to be small, apart from those associated with sea level rise.

Agriculture. The sensitivity of major cereal and tree crops to changes in temperature, moisture and CO₂ concentration of the magnitudes projected for the region has been demonstrated in many studies. For instance, projected

any increases in production associated with CO₂ fertilization will more than offset by reduction in yields resulting from temperature and / or moisture changes. Although climate change impacts could result in significant changes in crop yields, production, storage and distribution, the net effect of these regionwide is uncertain because of varietal differences and local differences in growing season, crop management and so forth; non-inclusion of possible diseases, pests and micro-organisms in crop model simulations, and the vulnerability of agriculture areas to episodic environmental hazards, including floods, droughts, and cyclones. Low income rural populations that depend on traditional agricultural systems or marginal lands are particularly vulnerable.

Coastal Zones. Sea level rise is the most obvious climate-related impact in coastal areas. Densely settled and intensively used low-lying coastal plains, islands and deltas are specially vulnerable to coastal erosion and land loss, inundation and sea flooding, upstream movement of saline/freshwater front and sea water intrusion into freshwater lenses. Socioeconomic impacts could be felt in major cities, ports and tourist resorts; artisanal and commercial fisheries; coastal agriculture and infrastructure development. International studies have projected the displacement of several million people from the region's coastal zone in the event of 1 m rise in sea level. The costs of response measures to reduce the impact of SLR in the region could be immense.

Human Health. The incidence and extent of some vector-borne diseases are expected to increase with global warming. Malaria, schistosomiasis and dengue – which are significant causes of mortality and morbidity in Tropical Asia – are very sensitive to climate and are likely to spread into new regions on the margins of presently endemic areas, as a consequence of climate change. Water-borne and water related infections, which already account for the majority of epidemic emergencies in the region, also are expected to increase when higher temperatures and higher humidity are superimposed on existing conditions and projected increases in population, urbanization rates, water supply declines and other factors.

Small Island States

With the exception of Malta and Cyprus, all the other Small Island States are located within the tropics. About one third of the states comprise a single main island; the other are made of several or many islands. Low lying island states and atolls are especially vulnerable to SLR because in many cases (e.g., The Bahamas, Kiribati, Maldives, Marshall Islands) much of the land area is only 3-4 meter above the present mean sea level. Islands at higher elevations also are vulnerable – particularly in coastal zones, where settlements, economic infrastructure and vital services tend to be concentrated.

Regional characteristics. The ocean exert a strong influence on small islands. Climate is moderated by the maritime influence – which gives the islands' main tropical location – result in uniformly high temperatures (2°C or

e: A Assessment of Vulnerabilities

more) throughout the year. However, other climate variables often exhibit distinct seasonal patterns – particularly rainfall distribution, which result in wet and dry seasons. Small Island States are subject to tropical cyclones (i.e., hurricanes or typhoons); those that are outside the main storm tracks also are affected by high seas and swells associated with such events. In the Pacific large interannual rainfall variations resulting from the ENSO phenomenon are an important climatic characteristics.

Economic activities in Small Island States frequently are dominated by agriculture (i.e., sugar and bananas for export; subsistence farming for local consumption) and by tourism, both of which are sensitive to external forces and are influenced by climatic factors. Fisheries, although largely artisanal, also support an important economic activity. Although the total population numbers are low, settlements are commonly concentrated in the capital city or on the capital island, where population densities are very high. Human demands for coastal and marine resources are continuing to increase, the potential impacts of climate change, added to these pressures almost certainly will result in the degradation or loss of some natural ecosystems that are important to the economy of these states.

Marine Ecosystems. The impact of a climate change-related increase in air temperature on small island states has not been investigated in any detail. A rise in temperature of the magnitude projected is not anticipated to have widespread adverse consequences, though some critical ecosystems (e.g., coral reefs) are highly sensitive to temperature changes. Although reefs have the potential to keep up or catch up with the projected rate of sea level rise, in many parts of the tropic (e.g., the Caribbean Sea, the Pacific Ocean) some species of corals live near the limits of tolerance to temperature (about 25 – 29°C). Thus relatively small projected increases in sea surface temperature could have an adverse impact. An increase in the incidence of bleaching – associated with the elevation of water temperatures above seasonal maxima – similarly would pose a threat to coral reef ecosystems.

The natural capacity of mangroves to adapt and migrate landward in response to projected SLR is expected to be reduced by associated land loss, land use practices and the pressure of infrastructure in the coastal zone. Survival of mangroves appears likely where the rate of sedimentation approximate the local rise in sea level, but landward migration commonly inhibited by topography and infrastructure, which will constrict the mangrove belt.

Some ecosystems are already seriously affected by anthropogenic stresses. Where this situation exists, the natural capacity of ecosystems to adapt to the effects of climate change will be substantially reduced.

Coastal Systems. Many islands are likely to experience increased coastal erosion and land loss as a consequence of SLR. Beaches are expected to be affected by the reduced supply of sediment from adjacent reefs. On high islands, however, increased sediment yields from stream catchments,

in addition, increased sea flooding and inundation (as has been projected for the Marshall Islands and Kiribati) are expected in most low-lying islands and atolls.

Human Settlements and Infrastructure. In many Small Island States the largest settlements, much critical infrastructure and major economic activities and services are located close to present sea level and therefore, will be at risk from SLR. Vulnerability assessment studies have shown that the costs of shoreline and other infrastructure protection could be burdensome for some islands.

Tourism. Tourism is the dominant economic sector in many Small Island States in the Caribbean and the Pacific and the Indian Oceans. This sector is the single largest contributor to gross national product (GNP) in many countries. The tourism sector also earns considerable foreign exchange for them, many of which depend heavily on imported food, fuel and a range of other goods and services. Climate change and sea level rise would affect tourism directly and indirectly. The loss of beaches to erosion and inundation, increasing stress on coastal systems, damage of infrastructure and an overall loss of amenities would jeopardize the viability of the tourism industry in Small Island States

Events

The *fifth meeting of the Conference of the Parties (COP5)* of the UNFCCC will be held in Bonn, Germany during 25 October to 5 November, 1999. Parallel to the main governmental negotiations, there will be separate activities for the international/regional NGOs engaged in negotiating and help implementing the Kyoto Protocol. For more details visit the web site: www.unfccc.de

An international Workshop on *Estuarine Systems of South Asia* will be held in India during January 25 – 28, 2000. The Workshop will be jointly organized by Land Ocean Interaction in the Coastal Zones (LOICZ) and the United Nations Environment Programme (UNEP). For further details please contact Mr. Stephen Smith, e-mail <svsmith@soest.hawaii.edu>.

An international Workshop on *Global Change and Malaria* will be organized between February 22 and 24, 2000 in New Delhi, India. The emerging issue of effect of global warming on increasing incidences of malarial diseases, especially in the tropical countries will be discussed in the workshop. For further details please contact Mr. VP Sharma, mail <vps@icmr.mrc.ren.nic.in>

The *sixth Congress of World Renewable Energy* with the subtitle “Renewables – The Energy for the 21st Century” will be held during 01 to 07 July 2000 in Brighton, UK. There will be five thematic topics: low-energy architecture, PV technology, solar-thermal applications, wind energy generation, and biomass conversion. Related topics cover energy and sustainability, politic and projects, and transportation and urban pollution. For further details: Ali Sayigh, director General of WREN, 147 Hilmanton, Lower Earley, Reading RG6 4HN, UK. Web: www.wrenuk.co.uk/

PUBLICATIONS

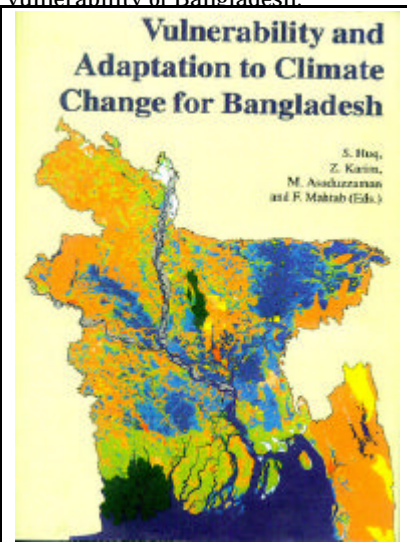
Vulnerability and Adaptation to Climate Change for Bangladesh

Edited by: S. Huq, Z. Karim, M. Asaduzzaman and F. Mahtab

Published by: Kluwer Academic Publishers

First Published: December 1998

The anthology is a scientific account of vulnerability to climate change likely to be faced by Bangladesh. It begins with an overview of overall vulnerability of Bangladesh to climate change. The succeeding chapters of the anthology, each representing stand-alone article, describe climate change induced vulnerability with respect to general climatic variabilities, water resources, crop agriculture, salinity, coastal recession, forest ecosystems, and fishery resources. The last chapter identifies the types of adaptation towards reducing the vulnerability of Bangladesh.



On the Compatibility of Flexible Instruments

Edited by: CJ Jepma and W van der Gaast

Published by: Kluwer Academic Publishers

First Published: 1999

The anthology presents an analytical account of the flexible policy instruments towards mitigating global warming through implementing the Kyoto Protocol. Authors have presented insights of different policy regimes on clean development mechanism, international emissions trading and compatibility of such flexible policy measures including JI, CDM and IET. This has been an outcome of an international workshop on 'Dealing with Carbon Credits after Kyoto', held in Callantsoog, the Netherlands during 28-29 May 1998.

Promoting Development while Limiting Greenhouse Gas Emissions: Trends and Baselines

Edited by: J. Goldenberg and W. Reid

Published by: UNDP and WRI

First Published: 1999

This anthology is essentially an account of what the developing countries have done towards slowing down the effects of climate change. Experts from both the developed and developing world jointly examined how the developing countries, non-binding to CO2 limiting targets under the Kyoto Protocol, have tried to curb their respective emissions and upheld their "common but differentiated" commitments and responsibilities under the UNFCCC. The report is the result of a collaboration between the UNDP and the World Resources Institute.

Editorial Board: A. Atiq Rahman (BCAS), Saleemul Huq (BCAS), Ahsan Uddin Ahmed (BUP), F.H. Abed (BRAC), K.F. Ahmed (Proshika MUK), Ashok Khosla (Development Alternatives, India), R.K. Pachauri (TERI, India), Anil Agarwal (CSE, India), Jyoti K. Parihk (IGIDR, India), Amulya Reddy (IEI, India), Asif Karim (WWF, Pakistan), Tariq Banuri (SDPI, Pakistan), Ravi Algama (EFE, Sri Lanka), K anak Dixit (Himal, Nepal), Dipak Gyawali (Nepal), Abdullahi Majeed (Maldives), Kunzang Yonten (Bhutan).