



# Energy Watch

The Newsletter of the Sustainable Energy Forum

Facilitating the use of energy for economic, environmental and social sustainability

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## Under New Management...

There is absolutely no doubt that in the energy area things are going to change. Ian Shearer's analysis of the policy statements of the centre-left parties prior to the election (next page) shows that the government led by Helen Clark will be moving in a number of areas of direct interest to Forum members. Your Wellington caucus already senses a shift in attitude around town and a greater receptiveness to the ideas which SEF has been promoting.

We have written to congratulate the new Minister of Energy, Pete Hodgson—himself a frequent contributor to Forum conferences—as well as his colleagues Marion Hobbs (whose portfolio covers the commitment to review greenhouse gas policy) and Judith Tizard (who may be in a position to use some of the ideas generated by participants in the Auckland Conference last July).

We hope to be active contributors to the policy process as the Coalition partners get down to business. When they finalise their working arrangements with the Greens we will see more clearly where the main opportunities are going to open up. The future of Jeanette Fitzsimons's Energy Efficiency Bill (and the timing of its passage into law) will be a good indicator of the progress that SEF members can hope to see.

This newsletter has deliberately included a wider coverage of issues coming to SEF's attention. In a dynamic period of policy development, we owe it to our members to keep information flowing and we shall also resume the practice of inviting guest contributions from those who hold a range of views. SEF's contribution can be richer if we retain the idea of a 'broad church' and avoid

conformist rigour. After all, we can see what that did to the previous Minister!

We already have a web page which we intend to develop, hopefully including electronic feedback from members. The address is:

[www.converge.org.nz/sefi/](http://www.converge.org.nz/sefi/)

This is a phase when I would like to see the membership hit a growth curve and when I would hope all our readers would see value in renewing their subscriptions. The climate is also right for an increase in corporate membership, so please let us know if you see companies or institutions which we should be targeting.

As a practical first step we are planning to use the occasion of our AGM, scheduled for 21 February in Wellington, to hold a roundtable discussion on the policy directions of the new administration. We want to create an early opportunity for the new Ministers to hear the views of those who have lobbied for sustainability as the key plank in energy and other policies.

With many regrets, I have decided that the February AGM is the right time for me to step aside from the role of Convener. After five years I firmly believe it is the moment to follow the theme of change and renewal, for SEF to have an injection of new ideas and new energies, and for me to get on with projects which have been on the back burner for too long. Naturally, I still hope to help SEF obtain the results it has been pursuing for so long.

On behalf of the whole Management Committee, let me close by wishing you all a happy and optimistic celebration of the festive season and the new millennium.

Kia ora ra!

Ken Piddington

## Sustainability a focus of the new Government

A major change in the way we use energy is indicated in the election results. We seem to be looking at the start of a trend to sustainable energy activity in New Zealand. This much is clear from a review of the election policies of the new Government and their supporters The Greens.

SEF accepts a definition of 'sustainable' activity as one that you believe you can continue indefinitely into the future, or at least for seven generations (roughly 200 years). (Quote from John Cairns, Jr, *Defining Goals and Conditions for a Sustainable World*)

Energy is fundamental to life and the economy. Our world is bathed in energy radiated from the Sun, which provides many renewable energy resources, but we also have stocks of fossil fuels in which energy is locked up. Economic development has taken the world away from using sun, wind and water energy to technologies dependent on the dwindling supplies of fossil fuels.

Fossil fuels represent natural capital. Industrialism has been committing the fundamental economic error of using capital as income. As E F Schumacher pointed out, the wealth generated from the use of capital energy resources must be directed towards making ourselves independent of that type of resource.

So what is the evidence of a change in direction? Election policies of the Labour and Green Parties, reported briefly below, seem to highlight that this new era of sustainability is about to start. Unfortunately the Alliance policies on these subjects are very limited on their web site, although the Deputy PM made a forceful commitment to sustainable development when the coalition agreement was announced. SEF therefore congratulates the new Government and offers support to facilitate the rapid implementation of this new vision for a sustainable energy future.

### Renewable energy research

Labour will: Increase research funding for renewable energy and energy efficiency, and facilitate the development of relevant technologies such as wind power and solar power.

Alliance will: Emphasise the development of ecologically sustainable technology and investments which improve the state of the ecosystem; establish technology transfer links

with energy research bodies elsewhere.

Greens will: Support a shift of research priorities to sustainable systems of production and patterns of consumption.

### Energy Efficiency Improvements

Labour will: Widen the role of EECA and require it to develop energy efficiency strategies.

Alliance will: Establish a goal to design waste and pollution out of energy production and manufacturing processes so that negative environmental impacts are eliminated; ensure the Building Act is amended to enable higher standards of solar design and energy efficiency in buildings.

Greens will: Push for the Energy Efficiency Bill to be strengthened and then passed into law. It strengthens the role of EECA and would establish national strategies for implementation of energy efficiency and new renewable energy schemes.

### Climate Change Reduction Measures

Labour will: Set up an inquiry into the impact of climate change and ozone depletion; ratify the Kyoto Convention and promote targets for further greenhouse gas reductions.

Greens will: Introduce a carbon tax on the carbon content of non-renewable fuels (oil, coal, gas) would be a concrete step towards the polluter pays principle. This eco-tax would be used to support programmes such as energy efficiency and solar heating, and could reduce income taxes on low incomes. A range of measures to increase energy efficiency, encourage alternatives to private car use and develop renewable energy technologies in addition to the carbon tax.

### Public Transport System Improvements

Labour will: Invest in and promote public transport; develop appropriate benefit/cost analyses to quantify the true economic and environmental benefit of public transport.

Greens will: Support a \$100 million yearly investment in upgrading public transport systems and infrastructure such as light rail, bus only lanes, integrated ticketing systems, park and ride and other ways of making public transport more convenient and attractive;

ensure that the true costs of transport—including environmental costs—are taken into account in government funding decisions.

### Electricity Sector Reforms

**Labour will:** Set up an inquiry to establish whether there is a need to regulate distribution and transmission companies and determine an appropriate structure for any regulatory response; support the progressive upgrading of electricity generation efficiency; consider re-amalgamating the three 'baby ECNZs' and making that new company responsible for maintaining security of generation; not sell any of the new baby ECNZs or Transpower.

**Alliance will:** Support the principle of progressive pricing; abolish fixed line rentals; prevent monopoly pricing.

**Greens will:** Support progressive electricity pricing which will make the first block of power available for a low price, but for those who use more and waste energy it will not be cheap; support removal of the fixed line charges to make it more economically attractive to conserve energy.

Ian Shearer

## Future rural community power supplies in New Zealand

### Background

Most rural communities in New Zealand have been connected to the mains power supply—as a result of government policy—over the last 50 years. However recent privatisation of the electricity industry has threatened the future security of supply to hundreds of these communities, especially those located towards the end of the power distribution lines.

Following the Electricity Act 1992 and subsequent amendments, the newly established lines companies are legally obliged to maintain supplies to existing customers until 2013. However there is no control of fixed supply charges, which are already rising rapidly for communities more distant from the power supply centre. These communities will have several options to consider

for the future. They can:

- Continue to pay higher and higher supply charges.
- Hope the government at the time changes the current legislation.
- Establish a legal co-operative or trust and purchase and maintain the poles, transformers and wires back to the node from which the lines company will be willing to supply.
- Set up individual power supply systems using biogas, wood-fired steam boilers or gasifiers, solar systems, small wind turbines, or micro-hydro installations. In the longer term perhaps micro-turbines such as the Capstone or fuel cells running on methane or biomass sourced methanol, will become feasible.
- Develop a community owned independent power supply system using one or more of the above technologies to match the local resources.

Distributed power sources could be integrated with the grid or stand-alone. Development and use of these local resources, often in modular form at a small scale, can be achieved by local communities as a co-operative or trust, or by utilities or even third party developers. Such developments could benefit the overall electricity supply system by improving power quality at the end of the lines if connection remains in place. These benefits should be considered when planning to expand a supply network or when the environmental impact of traditional energy systems might damage local, regional or even global ecosystems.

### Environmental issues

New Zealand has good environmental legislation in place under the Resource Management Act 1991. As a result, the renewable energy resource evaluation of a potential site for power generation would need to consider the following possible environmental impacts under an Environmental Impact Assessment report in order to obtain planning resource consent:

- Resource consent application for use of water for small hydro systems and the effects on fish and stream ecology.
- Seasonal variations in stream flow levels.
- Growing short rotation energy forests as a

monoculture. Would it be sustainable and visually acceptable? Already additional planting of *Pinus radiata* forests is becoming unacceptable to some people in certain areas of New Zealand.

- Air emissions resulting from combustion or gasification of the woody biomass resource.
- Carbon sinks (when first planting energy forests into pasture), carbon cycling and carbon offsets to mitigate for greenhouse gas emissions.
- Diffuse and direct solar radiation inputs in the locality.
- Visual and noise impacts from wind turbines and effects on bird life.
- Integration of waste treatment with energy utilisation, including anaerobic digestion to produce biogas, land treatment of effluent or sludge on to energy plantations, or co-firing of solid waste with woody biomass.
- Sustainable production of energy crops without depletion of soil nutrient levels or excessive uptake of available moisture.

#### **Current research programme at Massey**

Massey University staff have surveyed members of several rural communities to ascertain their views on future power supplies and developing independent generation and distribution systems. For members of some communities it appeared that what might occur by the year 2013 is too far away to contemplate at this stage so there was little concern and no local champion of the cause. Conversely, other communities would be keen to become independent of the national grid tomorrow if that was even remotely feasible.

Two communities are being evaluated in detail. D'Urville Island is in the Marlborough Sounds, at the northern tip of the South Island. Mains power is delivered for 80 km alongside a gravel road before it crosses French Pass, with its notorious tide rips, to the island and is then distributed over 60 km of lines to the 12 permanent dwellings, 4 holiday homes and a small hotel. By contrast Kumeroa is a group of four sheep and beef farms situated in the Tararua ranges only 15 km from the town of Woodville but also at the end of a branch line of the power distribution network. Both case studies are being evaluated and wind, hydro, solar and biomass resources monitored to ascertain their optimum renewable energy mix.

The difficult part is obtaining an accurate representation of their power demand, which varies daily and seasonally. In association with Industrial Research Ltd, over 30 line and appliance meters have been installed on each site to provide detailed data collection of their daily and seasonal demand and major uses.

This data will be analysed and used to evaluate a computer model presently under development which will be useful as a decision making tool for other similar communities. At this early stage of the research programme ideas are still being formulated. Your comments are welcomed.

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#### **The Energy-Wise 2000 Renewable Energy Award**

The aim of the Energy-Wise New and Emerging Renewable Energy Award is to highlight and foster improvements in the New Zealand new and emerging renewable energy industry by:

- Raising the profile of new and emerging renewable energy projects and products
- Providing recognition of achievements in these renewable energy areas
- Assisting the dissemination of information on such new and emerging renewable energy areas
- Encouraging the sustainable use of natural resources

The Energy-Wise New and Emerging Renewable Energy Award is for a product or project which fosters improvements in the New Zealand new and emerging renewable energy industry, for example efficiency, economic or uptake improvements. If the entry is a project it must have been undertaken in New Zealand and have been implemented in 1997-1999. If a product it must have first been made commercially available and demonstrated within the same period.

More information on: [www.eeca.govt.nz](http://www.eeca.govt.nz).

## More on global warming

On the next pages we present articles looking at global warming and its effects. Together they present a chilling picture of the possible risks we face, and of possible new risks which we may create by ignoring problems or seeking inappropriate solutions.

None of this is certain—for or against—but the scientific consensus is that we are well into the danger zone (one article estimates only a 0.1% probability that ice thinning is natural) and should have our preparations well advanced.

- *More on GEO 2000* summarises the UN report Global Economic Outlook 2000, drawing attention to both new and increased threats. (at right)
- *Climate change warning* summarises a draft IPCC report on thresholds, and the possibility of rapid and unpredictable changes when a threshold is exceeded. (page 6)
- *The military evidence* presents evidence of widespread thinning of the arctic ice sheet, with unknown effects on northern hemisphere air and water circulation. (page 7)
- *A new European ice age?* presents modelling studies showing that arctic melting could lead to a dramatic cooling of north western Europe. (page 7)
- *Fossil fuel revolution?* Focuses on a human response to resource depletion, describing a Japanese research project in mining methane hydrates. (page 7)
- *Fossil global warming* draws attention to an earlier phase of global warming, which may have been triggered by a natural event similar to a botched attempt to mine methane hydrates. (page 9)
- *Indifference to a planet in pain* summaries the lack of appropriate human response to global warming. (page 10)
- Finally, *And now to get rid of the stuff* summarises a (possibly fatuous?) attempt to sequester CO<sub>2</sub> by pumping liquid CO<sub>2</sub> into old oil fields or onto the sea bed. (page 11)

## More on GEO 2000

As promised in the last issue we give more information on *The UN report Global Environmental Outlook 2000*.

It is now too late to halt global warming and time is fast running out to prevent other environmental catastrophes, the UN's environment agency says in a major report. *Global Environment Outlook 2000* paints a devastating picture of the Earth's health on the eve of the new millennium, and points to new threats, such as increased levels of nitrogen in the water supply, which the world has not yet started to tackle.

"The gains made by better management and technology are still being outpaced by the environmental impacts of population and economic growth. We are on an unsustainable course," Klaus Toepfer, head of the United Nations Environment Programme said at the African launch of the report in Nairobi.

The report says emissions of greenhouse gases that cause global warming have quadrupled since the 1950s, and 'binding' targets to reduce emissions agreed by governments at last year's Kyoto summit may not be met. The rate at which humans are destroying the environment is accelerating, often the result of excessive consumption by the rich and to the detriment of the poor.

About 20% of the world's population already lacks access to safe drinking water, and half have no access to a sanitation system. This situation will get worse as the world's population—now six billion—increases by another 2 billion in the next 50 years.

Disasters such as hurricanes and forest fires are increasing in frequency and severity and have killed some three million people in the last three decades. Armed conflicts and unprecedented refugee flows are causing greater damage to the environment than ever before.

There is also mounting evidence that humans are seriously destabilising the global nitrogen balance. Huge amounts of nitrogen are being deposited on land and in water through intensive agriculture and the burning of fossil fuels. Eventually, this could make freshwater supplies

unfit for human consumption. "The full extent of the damage is only now becoming apparent as we begin to piece together a comprehensive overview of the extremely complex, interconnected web that is our life support system," said Toepfer.

Much of the damage is irreparable, but through a huge mobilisation of resources and political will, much can still be done to prevent further destruction.

A long-term target of a 90% reduction in the consumption of raw materials in industrialised countries may seem far-fetched, but without it hundreds of millions in future generations will be condemned to a life of suffering, the report concludes.

"We can no longer be complacent and assume that the environment can look after itself," Toepfer said. "We have a huge task ahead to ensure a more sustainable future for the planet and human society."

Reuters

## Climate change warning

A draft report on the probable impacts of climate change, written by the world's leading climate scientists, carries a stark warning—that the world may be in for some nasty shocks. The report, was prepared by IPCC Working Group 2, the authoritative group of the world's most respected climatologists. The report, entitled *Climate change: Impacts, adaptation and vulnerability*, is undergoing expert review and is unlikely to be published for some months.

In its most disturbing section, the IPCC report deals with the subject of thresholds. These are levels of environmental disruption or pollution below which no observable effect occurs. However, exceeding the threshold can trigger major climatic changes in short periods of time.

Acknowledging the incorporation of such thresholds in some climate models, the authors write: "In climate change, thresholds have been proposed which are much more worrying than this. Below the threshold there may be some impacts, but they will be smoothly varying with the change in the climate. Above the threshold something really nasty may happen. Examples include the instability of the thermohaline circulation that transports warmer water to the

North Atlantic and the collapse of the west Antarctic ice sheet." If the warm waters of the Gulf Stream ceased to flow, the British Isles would be plunged into severe winters.

The authors say other surprises could include the release of methane—a potent greenhouse gas—from frozen gas hydrates trapped in permafrost.

The IPCC go out of their way to warn that unpredictable impacts of climate change could have unforeseeable consequences. "Surprises can make even the most careful calculation of impacts way off the mark." And they say the speed at which the climate heats up at is crucial.

"Non-linear systems, when rapidly forced, are particularly subject to unexpected behaviour. A fast rate of change is likely to generate more 'surprises' which inhibit the effective adaptation of both natural and managed systems."

The report includes a number of more detailed impact assessments for particular sectors:

- A probable decrease of crop yields in the tropics and subtropics, "raising enormous problems because of the serious potential for exacerbated deprivation."
- Drought and floods, "are projected to become a larger problem in many temperate and humid regions."
- Soil degradation could be worsened by increased erosion caused by higher rainfall, while elsewhere more land could become desert.
- Existing stresses on fish stocks could be worsened as water temperature, salinity and entire ecosystems change. Insect species may expand their ranges towards the poles, increasing the risk of crop loss. In Africa there could be significant changes in tsetse fly distribution.

The report also says that the composition of the world's forests is likely to change because some tree species will not be able to move polewards (or to higher altitudes) to escape the encroaching warmth.

Forest types could vanish. "Entire forest types may disappear," and there is likely to be, "a net decrease in global biodiversity." Nor will humans escape unscathed. The report says land lost to rising sea levels is likely to affect about

70 million Chinese and the same number of Bangladeshis.

The IPCC still faces criticism from those who do not accept that climate change is inevitable, or that it matters, or that it is cause to some degree by human activity. But this sober and detailed report—even while it remains in draft form—will command wide respect as an all too credible warning of what awaits the world.

BBC

## The military evidence

New evidence of global warming was presented to the 1999 conference of the British Association. Climatologists agree that the polar regions will play a key role in determining how the oceans and atmosphere respond to man-made global warming. According to computer models, they will heat up more quickly than the temperate and tropical regions and the resultant melting of ice sheets and sea ice might not only raise sea level but also transform circulation patterns in the oceans.

"Recent evidence from ship-based studies, coupled to the release of a vast military archive of information from US and Russian submarines, shows unprecedented, extreme and system-wide changes taking place in the Arctic Ocean and surrounding seas during the 1990s," said Andrew Kerr of Edinburgh University. "The recent evidence of fundamental changes in the climate system of the Arctic is likely to have a profound impact on European climate," he said. "But I don't want to play the doomsday card."

The circulation of the North Atlantic, which brings warm water to the shores of north-west Europe, is driven by the freezing of sea water around the Arctic Ocean. According to one alarming scenario, global warming could stop or even reverse the ocean currents, leading to strong regional cooling in Europe—even tipping the world into another ice age. At the opposite pole, the main cause for concern is the West Antarctic ice sheet. It is far less stable than the East Antarctic sheet, which contains the world's oldest ice, laid down 12 million years ago. "If the whole West Antarctic ice sheet slipped into the ocean, that would raise sea level by about five metres," said David Vaughan of the British Antarctic Survey. "But we don't need a complete collapse to have a serious impact." Even a loss of 10% of the ice would mean an overall rise of one

metre in sea level, imperiling many low-lying parts of the world.

Financial Times

## A new European ice age?

Modelling work at the Potsdam Institute for Climate Impact Research has shown that a possible consequence of global warming is for the North Atlantic Drift to turn off. If this happened, the ocean currents that warm north west Europe would slow or even reverse and London would be as cold as Newfoundland. The ocean currents are driven by 'pumps' caused by dense (cold and saline) water sinking to the sea bed, and too much ice melting would 'block the pump' by introducing too much less dense fresh water.

Now New Scientist (27/11/99) reports evidence that this is happening. The density of the ocean water around the Faroes is falling, when before the 1950s it was so constant that it could be used to calibrate instruments. Bottom water flow, from the Greenland Sea into the Norwegian Sea, has reversed. Stefan Rahmstorf, of the Potsdam Institute, describes these observations as very important and consistent with global warming, but possibly with natural causes.

## Fossil fuel revolution?

*An article in EnergyWatch 9 (2/1999) asked what will happen when oil scarcities develop, and touched on the possibility of energy from methane hydrates. Now a trial hydrate mining programme is under way.*

*Reading this article is easier if you understand that methane hydrates exist only as a solid, so 'melting' and 'boiling' are combined as the stuff separates from a slushy solid to water and gas. This may happen because of increasing temperature or falling pressure.*

The first step in a new era of global energy production is being taken, with a Japanese attempt to recover vast reserves of frozen methane gas from under the ocean floor. The drilling project is the first commercial offshore attempt but it is fraught with danger. Accidental releases of vast volumes of the buried gas have in the past led to the destruction of oil platforms in

the Caspian Sea. These releases are also a possible explanation for the mysterious disappearances of ships.

Professor Richard Selley, a gas hydrate expert at the Royal School of Mines, Imperial College, London, says "It's horrifically dangerous. If they drill in with a conventional drill ship and they hit the stuff and destabilise it, all the gas comes bubbling up and the ship will sink." "The Japanese are the brave souls who are drilling this first commercial test offshore. It may be very easy to avoid the risk of a catastrophic blowout but this is the first to test it."

Tatsuya Sameshima, the project's director at the Japan National Oil Company, says that commercial production is likely to be ten years away, but Professor Selley believes the results of this well will set a likely timescale for the methane coming on stream: "If the technology works, then they could be producing it commercially very quickly, within 18 months or two years."

The methane is the product of ancient sea-floor bacteria, which fed on plant and animal remains. As the sediments subsided, the pressure increased and the methane and water solidified to gas hydrates.

The cause of the danger is that much of the gas hydrate in the world is close to melting and even a small disturbance can release huge volumes of the gas. When the hydrate melts it belches out 160 times its volume in gas. "The trouble is that you can't run," said Professor Selley, noting that one underwater landslide can set off "huge destabilisation events".

The drilling attempt is being made from a semi-submersible oil rig, stationed 60 km off Japan's Omae Zaki peninsula. The water depth in the area is 950 m but the engineers are aiming to reach a total depth of 2850 m. The gas hydrates are believed to begin 350 m below the sea floor, based on the analysis of the reflections of sound waves. The whole research programme which culminates in this well is believed to have cost more than US\$ 60 million.

The reason that oil companies are so interested in gas hydrates is the colossal global reserves which are estimated to be 80 000 times greater than those for conventional natural gas. These figures imply the, "end of the energy crisis as we know it", said Professor Selley. "This year or next year, depending on who you believe, we are at maximum production of conventional petroleum—

we are no longer finding oil and gas at the rate at which it is being used up," he said. The US reserves alone are estimated at 5.7 trillion m<sup>3</sup> of methane—enough to meet that energy-hungry country's needs for 2000 years at current rates of use. Japan has led the way because it has very little oil and gas resources of its own.

But the prospect of a huge, and cheap, source of fossil fuels will alarm those who advocate cutting carbon dioxide emissions to the atmosphere. "If you believe that global warming is happening and that it is due to burning fossil fuels, then you would be concerned at gas hydrates being burned as an energy source, because they will continue that effect," said Professor Selley.

"But if you have to burn fossil fuels, then methane is the cleanest—you don't get the particulates, sulphur compounds or nasty metals that you get with oil." As well as Japan, a number of other countries have research programmes in gas hydrates, including the US, Canada, India, Korea and Norway.

The key to successful exploitation of gas hydrates, which would change the entire structure of the global energy industry, is the technology. Syntroleum, a US company based in Oklahoma, has just received a patent for a gas hydrate recovery system. It envisages drilling from a ship which 'hovers' over the drill site, carefully uncorks the reservoir and then pipes the gas aboard. Here, water is siphoned off and the gas is then compacted into a liquid for easier storage. Included in the hydrate collection device at the bottom of the well are heating elements and electrodes to melt the hydrates, and an agitator to stir them. one safer approach which has been suggested is to drill into the gas hydrate from the side. It is now possible to drill horizontally for several kilometres, meaning that the ship or rig is not directly over the danger zone.

BBC



## Fossil global warming

What happens when a lot of greenhouse gases are injected into the atmosphere in a relatively short span of earth history, as is happening today as a result of the burning of coal, oil and natural gas? One way to help answer this urgent climatic question is to examine what has happened in similar situations in the remote past. American and Australian scientists are reporting evidence that the biggest global warming event in the last 100 million years may have been touched off by a sudden blowout of greenhouse gases from the ocean floor. The scientists say that for a relatively brief period around 55 million years ago, after the extinction of the dinosaurs but long before the onset of today's pattern of periodic ice ages, the temperature of the earth's surface in northern latitudes, and of the deep ocean, soared by some 5 or 6 degrees Celsius.

This is substantially more than the 3 to 5 degrees the world has warmed since the depths of the last ice age 18 000 to 20 000 years ago. So great was the effect of the warming, experts say, that it wiped out many species of marine life and created climatic conditions that led to an explosive expansion in the number and variety of mammal species. It was at this time that the primates first appeared.

The analogy with today's conditions is far from perfect, and many questions remain to be answered, but those who have investigated the ancient warming spike say it reinforces a belief that has lately been growing among climate scientists: that a gradual warming of the climate can abruptly soar to new heights once a certain threshold is reached.

That is what scientists believe happened in the case of the warming 55 million years ago—and perhaps what could happen again.

The chief greenhouse gas was and is CO<sub>2</sub>, and since the start of the Industrial Revolution its atmospheric concentration has increased by nearly 30%. The average global surface temperature has risen by about 0.5° in the last century.

Mainstream scientists believe, based on computerized simulations of the climate's workings, that the temperature will rise by about another 2° by the year 2100 if greenhouse gas emissions continue at the present rate. A gradual warming of unknown cause preceded the sharp upward spike in temperature 55 million years ago, said Miriam Katz, a paleo-oceanographer at

Rutgers University, who is the leading author of a report on the ancient phenomenon in the journal *Science*.

But at some point, the warming crossed a threshold that abruptly kicked the temperature up to a new level, said another author of the *Science* paper, Dr. Gerald R. Dickens of James Cook University in Australia. He compared it to the stretching of a rubber band: "You gradually pull at both ends and, at some instant, the rubber band suddenly breaks." What caused the climate to snap and send the temperature soaring, according to a hypothesis formulated by Dr. Dickens, was a sudden release of methane locked in the ocean floor, touched off by the previous, more gradual warming.

Methane (CH<sub>4</sub>) is a greenhouse gas in its own right, and when released from ocean sediments it also combines with oxygen to form CO<sub>2</sub> that eventually percolates to the atmosphere.

Dr. Dorothy Pak of the University of California at Santa Barbara and Dr. Kenneth Miller of Rutgers are the other authors of the report, which describes chemical and geological evidence of the ancient rush of greenhouse gases and the way it happened. The evidence was contained in corings and ultrasound readings of sediments on a subsea promontory called the Blake Nose, northeast of Cape Canaveral, Florida. The researchers believe that the original, gradual warming, beginning about 60 million years ago, caused a change in ocean circulation currents that pushed warm surface waters down into the deep sea.

This deep-sea warming converted ice-like solid methane locked in crystalline structures in the sea-floor sediments into gaseous form. This gas then blasted upward through the sediment, starting mud slides that freed the methane and allowed it to escape into the water and eventually to the atmosphere. On the way, it reacted with oxygen to produce globe-warming CO<sub>2</sub>.

According to Katz, one effect of the warming spike was to transform the environment of the deep ocean, as evidenced by the extinction of more than half of all species of microscopic bottom-dwelling animals. The warming is also believed to have enabled that era's relatively small array of mammals to spread out into formerly frozen regions to colonize other continents, where they proliferated in many evolutionary directions.

Among these were the ancestors of horses, apes and humans. Dickens has calculated that the sudden influx of carbon associated with the sharp spike of global warming 55 million years ago amounted to at least  $10^{18}$  tonnes. At present rates of CO<sub>2</sub> emission from global sources, about two-thirds of that amount would be added to the atmosphere by 2100. Some scientists say it is possible that before then, some threshold could again be surpassed, resulting in an abrupt but unknown change in climate.

Many questions remain. The cause of the gradual warming that preceded the spike 55 million years ago is unknown. Nor do scientists know the magnitude of the atmospheric concentrations before the gradual warming trend and the spike, frustrating comparisons with today. Moreover, it is not clear how much of the ancient warming resulted from the influx of greenhouse gas and how much from accompanying changes in ocean circulation, although Dickens believes both were involved.

According to Dickens, a further complication is that the influx of greenhouse gases was spewed initially into the ocean 55 million years ago, but is going directly into the atmosphere today. That difference could affect the rate of the consequent warming, since the ocean's inertia might slow the migration of CO<sub>2</sub> into the air, making the ancient warming spike less abrupt than otherwise. The evidence drawn from ocean sediments in the new study was not fine-grained enough to determine just how sharp the ancient warming was, though it took place within a few thousand years at most.

Other large, abrupt climatic changes of the more recent past—during the transition out of the last ice age, for example—have taken place within a human lifetime or less and sometimes within a decade, according to recent evidence.

All of these complications muddy the possible comparison between what happened 55 million years ago and what is happening today. Nevertheless, says Dickens, the ancient transformation provides a new and continuing opportunity to explore the possible effects of growing concentrations of greenhouse gases without resorting to computer-assisted simulations of the climate. It teaches that, "the earth can, for natural reasons, suddenly change dramatically."

New York Times

## Indifference to a planet in pain

Ten years ago, global warming was a strong hypothesis. Now, after a decade of intensive research, scientists around the world have formed an ironclad consensus that we are heating the planet. Almost daily some new piece of evidence appears; the weekly editions of the journals *Science* and *Nature* make *The Blair Witch Project* look like *The Baby-Sitters Club*. Forget the piddling drought and heat wave that withered lawns and fields across the Northeastern USA this summer. Consider the real news: Spring comes a week earlier across the Northern Hemisphere than it did just 30 years ago. Severe rainstorms have grown by almost 20%, precisely what you'd expect on a planet where warmer air can carry more water vapor. A Navy sonar survey conducted this summer shows that the Arctic ice sheet is in many places a metre thinner than its normal 3 m. Warmer waters have bleached coral reefs around the globe. Glaciers are melting. Sea levels are rising.

The question is not what we should do. Though it's far too late to prevent global warming, it takes no special insight to deduce the policies that would slow it down. Stiff increases in the price of fossil fuels would quickly bring a new generation of renewable energy technologies to the fore. Raising fuel-economy standards for cars and trucks would end the trend to ever-bigger sport utility vehicles. And focused diplomacy and foreign aid could keep developing nations from sliding into our bad habits.

No, the question is why we've done so little. In 1992, President George Bush promised the world that the United States would emit no more carbon dioxide in 2000 than it had in 1990. The Clinton Administration instead watched with little apparent concern as our emissions increased by more than 10%. Congress refuses even to consider the baby step represented by the 1997 Kyoto accords, which would return us to 1990 levels by 2010. The issue barely even crops up in the Presidential campaigns.

The reason, I think, is that we don't yet feel viscerally the wrongness of what we're doing—not just the very rational fears about what it will be like to live in a superheated world but, even more, the simple shock that we've grown so large we can dominate everything. Earthquakes and volcanoes are the only 'natural disasters' left. Everything that happens above the surface comes at least in part from us, from our appetites and our economies.

I used to wonder why my parents' generation had been so blind to the wrongness of segregation; they were people of good conscience, so why had inertia ruled for so long? Now I think I understand better. It took the emotional shock of seeing police dogs rip the flesh of protesters for white people to really understand the day-to-day corrosiveness of Jim Crow.

We need that same gut understanding of our environmental situation if we are to take the giant steps we must take soon. Go outside: try to understand that the sun beating down, the rain pouring down, the wind blowing by are all now human artifacts. We don't live on the planet we were born on. We live on a new, poorer, simpler planet, and we continue to impoverish it with every ounce of oil and pound of coal that we burn.

In retrospect it will be clear. A hundred years from now, people may well remember the 1990s not as the decade of the Internet's spread or the Dow's ascension but as the years when global temperatures began spiking upward—as the years when rain and wind and ice and sea water began irrefutably to reflect the power and heedlessness of our species. But how bad it will get depends on how deeply and how quickly we can feel.

It depends on whether we're still capable of shock.

Bill McKibben, *New York Times*

## And now to get rid of the stuff

Federal energy officials have joined scientists worldwide in studying the disposal of CO<sub>2</sub> as a way of slowing down the greenhouse effect. The US Department of Energy has funded two carbon sequestration programs—one on land and one in the deep ocean—offering US\$ 27 million in research grants.

Other countries have already begun pilot projects. A state-owned Norwegian petroleum company, for example, has been pumping a million tons of liquefied CO<sub>2</sub> each year into depleted natural gas aquifers below the North Sea since 1996. Japan is conducting research into deep-ocean disposal, and others have suggested funneling liquefied carbon dioxide into abandoned coal or salt mines, or perhaps bubbling it through CO<sub>2</sub>-scrubbing algae ponds.

The world's largest deep-ocean sequestration project is scheduled to begin next year off the coast of Hawaii. The \$5 million, four-year experiment will pump liquefied CO<sub>2</sub> from a laboratory in Kona, Hawaii, through a flexible pipe, down to nearly 900 m. Funded mainly by Japan with assistance from the US, Canada, and Australia, the project still faces environmental reviews from local officials.

Despite these international efforts, the US government has balked at this new field of research because of political concerns, according to federal officials. Some members of Congress believe that carbon sequestration will lead to a de facto passage of the Kyoto Protocols, and some environmentalists oppose sequestration because they believe it will allow industry to continue burning fuels that cause the problem in the first place. Scientists themselves also question whether injecting CO<sub>2</sub> into the ocean could be dangerous to sea creatures, or just be too expensive.

Researchers will also look into another option: seeding the upper ocean with iron (it acts as a fertilizer) in order to produce a massive plankton bloom, the so-called "Geritol solution."

Scientists at Moss Landing Marine Laboratory tried this method in 1995 in the Pacific Ocean 1000 km west of the Galapagos Islands. The project worked, and the plankton bloom took in an estimated 560 tons of carbon from the atmosphere. The plankton bloom also attracted tiny predators that grazed on the plants like sea-going cows munching on grass.

*Christian Science Monitor*



Now that you are thoroughly worried, what about going to a conference?

See the next page for details.

## Renewable Energy Conferences & Events

Renewable energy conferences are booming around the world. Now is the time to plan that world trip to prepare for the future business opportunities that are available.

If you would like more details on any of these events, please use the web or email address link provided. If a link is not listed or you want a phone/fax number please call Energy Information Services

Care is taken on adding events to this list but we accept no responsibility for incorrect information which is provided in good faith. E-mail requests for additions to your event to this list, which can be copied freely by not-for-profit organisations. Please acknowledge Energy Information Services as the source.

Energy Information Services  
P O Box 576, Wellington, New Zealand  
Phone 0800-65-46-36 or 04-586 2003  
Fax 04-586 2004  
E-mail [shearer@express.co.nz](mailto:shearer@express.co.nz)

### Abbreviations:

EECA Energy Efficiency & Conservation Authority (NZ)  
EWEA European Wind Energy Association  
ISES International Solar Energy Society

February 9-11, 2000. Chennai, Tamil Nadu, India  
Millennium International Conference on Renewable Energy Technologies. Indian Institute of Technology Madras.  
([pen@vsnl.com](mailto:pen@vsnl.com) or [pen@md3.vsnl.net.in](mailto:pen@md3.vsnl.net.in))

February 15-16, 2000. Regional Conference on Energy and Environment RECEE 2000.  
Universiti Tenaga Nasional, Kuala Lumpur, Malaysia.  
See <http://www.uniten.edu.my/go/event>

February, 2000. Throughout New Zealand  
Load Management Seminar (EECA)  
([www.eeca.govt.nz](http://www.eeca.govt.nz))

April 13-14, 2000. Siracusa, Sicily, Italy  
Offshore Wind Energy in Mediterranean & other European Seas.  
([colletta@casaccia.enea.it](mailto:colletta@casaccia.enea.it))

May 1-5, 2000. Glasgow, UK  
16th European PV Solar Energy Conference & Exhibition. ([www.wip.tnet.de](http://www.wip.tnet.de))

May 28 – 10 June 2000. Kyushu-Tohoku, Japan  
World Geothermal Congress 2000  
([www.wgc.or.jp](http://www.wgc.or.jp))

June 5-9, 2000. Sevilla, Spain  
Biomass for Energy & Industry - 1st World Conference & Technology Exhibition.  
([www.etaflorence.it](http://www.etaflorence.it))

June 19-22, 2000. Copenhagen, Denmark  
Eurosun 2000 – 3rd ISES-Europe Solar Congress  
([info@danvak.dk](mailto:info@danvak.dk))

July 2-4, 2000. Brighton, UK  
Renewable Energy 2000, Congress & Exhibition ([rob.schulp@reedexpo.co.uk](mailto:rob.schulp@reedexpo.co.uk))

July 23-28, 2000. Las Vegas, USA  
ENERGEX 2000: A global energy forum on greenhouse gases and climate change.

August 8-11, 2000. Kansas City, USA  
HydroVision 2000  
([www.hydrovision2000.com](http://www.hydrovision2000.com))

September 17-22, 2000. Anchorage, Alaska, USA  
28th IEEE PV Specialist Conference, ([johnbenner@nrel.gov](mailto:johnbenner@nrel.gov))

September 17-22, 2000. Mexico City, Mexico  
ISES, Millennium Solar Forum 2000.  
([ises2000@maxatl.cie.unam.mx](mailto:ises2000@maxatl.cie.unam.mx))

September 25-27, 2000. Kassel, Germany  
EWEA 2000 Conference & High Wind Power Penetration in Electrical Networks.  
([www.ewea.org](http://www.ewea.org)) or ([fgw-hh@t-online.de](mailto:fgw-hh@t-online.de))



On yer bike!



# Spinning out of Control

When BP-Amoco announced at the end of last month that the 6.5 billion tons of fossil fuel the world burnt last year was 0.5% less than the year before, the Worldwatch Institute in Washington greeted the statement as uniquely good news.

For the first time in history, the institute said, greenhouse gas emissions had fallen while the world economy, which grew 2.5% in 1998, continued to expand. This suggested that economic expansion was being 'de-linked' from carbon emissions, undercutting arguments that reducing emissions would damage the economy. In the past two years, Worldwatch explained, the global economy had grown by 6.8%, while carbon emissions had held steady. This had led to, "an impressive 6.4% decrease in the amount of carbon emissions required to produce \$ 1000 of income."

The British media gave the Worldwatch press release generous and uncritical coverage. The BBC even produced a graph, which is now on its website, showing that almost 250 tons of carbon had had to be burnt in 1950 to produce \$1.0 millions-worth of 'wealth', but that it now took only 150 tons to do the same thing.

The only thing which can be welcomed wholeheartedly is the fact that CO<sub>2</sub> emissions in 1998 were less than the previous year. All the rest is spin applied by Worldwatch to convince US politicians that the consequences of ratifying the Kyoto Protocol might not be too bitter a pill to swallow.

What the statement overlooks, however, is that emissions of greenhouse gases from fossil fuel burning, which are principally CO<sub>2</sub>, accumulate in the atmosphere. It is this increasing concentration of gases which is causing the world's temperature to rise and the climate to become less stable. To stabilise these rising concentrations, emissions have to fall not by half a per cent or even 10%. They must be cut by 60-80% as soon as possible. The longer the delay, the hotter the planet will become. At the Global Commons Institute we decided to calculate what would happen to levels of CO<sub>2</sub> in the atmosphere if the rate of improvement in energy efficiency detected by Worldwatch continued for the next 200 years while at the same time the world economy continued to grow at 3%, the sort of rate that the World Bank and other authorities would be pleased to see.

The results are staggering. Global income would be 369 times above the present level in 2200 and the efficiency with which fossil fuel was being used would have increased sixtyfold. Unfortunately, the level of carbon dioxide in the atmosphere would be rising beyond 3000 ppm, ten times the pre-industrial concentration, with incalculable effects on the world's climate. Indeed, 45 billion tons of carbon would be emitted annually, compared with 7 billion tons at present. In other words, the rate of efficiency improvement hailed by Worldwatch is nothing like fast enough. So we did another calculation to determine what the rate of efficiency gain had to be to keep atmospheric concentrations of CO<sub>2</sub> below 450 ppm if growth continued at 3%. The 450 ppm figure is a current international target for CO<sub>2</sub> levels, despite the fact that it is 70% above the pre-industrial level and takes the world's climate into totally unknown territory since it would be the highest CO<sub>2</sub> concentration for 220 000 years.

Our results showed that world energy efficiency has to be improved by between 4-5% a year every year for 100 years until the 450 ppm level is reached, and then by 3% a year to maintain that level for as long as the 3% rate of economic growth continues. In total, we would have to increase our efficiency of carbon energy use by 173 000%, which is clearly absurd. The question to be asked, therefore, is whether growth can continue. Certainly, it would be much easier to reduce our CO<sub>2</sub> emissions by the required amount if growth stopped. According to Professor Malcolm Slessor, of the Resource Use Institute in Edinburgh, around 55% of all the fossil energy we use is required to make the growth process happen. It is used to build the new factories, roads, shopping centres and all the other things that economic expansion entails.

Moreover, it doesn't make sense to continue trying to grow economically if, by doing so, we cause more damage to our planet than the growth we achieve brings in benefits. This could be happening already because, while the fossil fuel we burn produces just this year's income, the gases that get released from that fuel stay in the atmosphere and will cause damage every year for, perhaps, 100 years.

It is more than 10 years since Worldwatch pointed out that protecting ourselves against

rising sea levels and the other consequences of climate change would take more resources than the burning of the fossil fuels had created in the first place.

And what is the quality of the growth that is currently being generated? Is it doing us, or anyone else, much good? It's certainly not curing global poverty. Year after year, the United Nations Development Project produces figures to show that the gap between rich and poor is widening, both within countries and between them. Growth as we know it is making the world's divisions more extreme.

Thanks to its spin, the Worldwatch statement gave the impression that a real turning point had been reached on the road to solving the climate crisis and that hard decisions need not be taken.

In other words, it suggested that radical change could be avoided and that economic growth could go on. Whatever its political motives, it could not have been more wrong.

The Guardian  
(no author given on the copy we received)

## Carbon sink doubts

Hopes that planting trees could absorb significant amounts of carbon dioxide look set to be dashed. The UN's Intergovernmental Panel on Climate Change (IPCC) say tree-planting will simply buy the world a little time. Their research effectively scuppers the hopes of countries like the US, the biggest emitter of greenhouse gases, (*and NZ: EnergyWatch*) that they can plant their way out of trouble by creating new forests to soak up their CO<sub>2</sub>. The IPCC says these planned carbon sinks will soon become saturated with carbon and start returning most of it to the atmosphere.

'This will have the effect of temporarily accelerating global warming, not slowing it down. Peter Cox, of the UK's Hadley Centre for Climate Prediction and Research, says the IPCC's conclusions are correct, and we are on a 'saturation curve'. "This is not something that may or may not happen as the world warms. It is more or less inevitable." Will Steffen, of Sweden's Royal Academy of Sciences, says the problem of sink saturation was barely known even a couple of years ago, when the forests were assigned an

important role under the Kyoto Protocol, the international agreement on tackling climate change.

Annual CO<sub>2</sub> emissions from human activity add just over six billion tonnes of carbon to the atmosphere, of which about a third is absorbed by the world's forests. Governments thought this meant that more trees would simply mean more carbon absorption, leaving them more leeway to carry on polluting.

But it now seems the carbon sinks are a recent and temporary phenomenon. The problem is that although trees absorb CO<sub>2</sub> during photosynthesis, they also release it back into the air when plant matter breaks down the sugars they have made. This process is called respiration. Crucially, respiration increases in response to temperature rises, which are triggered by the rising levels of CO<sub>2</sub>. Many scientists believe that respiration may be about to accelerate, turning the forests from sinks to sources of carbon. They failed to recognise that this could happen because, although CO<sub>2</sub> take-up is instantaneous, the warming that triggers respiration has a built-in delay of about 50 years, mainly because of the oceans' thermal inertia. So planting more trees could soon prove a quick way of speeding up climate change, not of moderating it. Bob Scholes, of the South African Government's research agency, CSIR, says it could be a costly mistake. "The carbon cycle has a very long equilibrium time. The consequences of actions taken now will persist for many centuries." The new research is published in *New Scientist* magazine.

BBC

This article looks important for NZ policy so EnergyWatch asked Ralph Sims to comment. His reply:

*The argument is new to me but seems to be of some scientific standing; perhaps readers should read the original article to make their own judgment. But I do have some doubts about the article :*

- *The IPCC does not do research—just pulls together all the latest science.*
- *The article is correct to say in effect sinks only buy time and that once a forest is mature it takes up no more carbon: it just recirculates it.*
- *Respiration is just part of the carbon cycle. If this increases more carbon would be absorbed to replace that lost—or else the forests or trees would effectively become smaller!*

## Energy Policy and The Greens

The Green Party will push to implement greenhouse gas emission constraints that the Government has backed away from—for the third time in five years.

Co-Leader Jeanette Fitzsimons said New Zealand's greenhouse gases had risen by 30% since 1990, despite pledges to drop them by 5%. It was one of the world's highest greenhouse gas increases. She said, "My Energy Efficiency Bill was stalled by the Government in the last Parliament and I will make sure it is passed as part of a comprehensive response to climate change in the next Parliament."

Transport accounts for nearly 40% of New Zealand's CO<sub>2</sub> emissions. Fitzsimons said Transport Minister Maurice Williamson's claim that building more roads would solve Auckland's transport problems was just a recipe for more congestion and more CO<sub>2</sub>. "The Minister ought to be embarrassed, he knows better than this. Auckland's transport problems need investment in public transport and a serious effort to help people use their cars less."

She said the Minister's roading follies would just increase Auckland's problems by encouraging more traffic. "Just one more road'—it's the cry of an addict!"

Fitzsimons said Green transport policies, its commitment to energy efficiency and a carbon tax—part of switching taxes from income to pollution—offered a balanced response to our global responsibilities. "A stable climate is crucial to much of our economy - agriculture, tourism, forestry. So, it is essential we get the climate back on a stable footing."



## After the storm

In September, Hurricanes Dennis and Floyd dropped some 900 mm of rain on the eastern third of North Carolina, turning the region into a putrescent hell of polluted flood waters, decomposing chickens and hogs, rotting farm fields and ruined neighborhoods. Now scientists fear the flood has also created an ecological time bomb that could bring disaster of a different sort, and they fear for the biologically rich waters that separate the famous Outer Banks from the Carolina mainland.

This complex of sounds, bays and inlets comprises the second largest estuary in the country, after the Chesapeake Bay, and is one of the nation's most important incubators of marine life.

Rarely have ecologists confronted such a striking example of what can happen when a first-order natural disturbance is combined with a first-order disturbance of the natural world by humans. "I guarantee you there have been floods like this in the past," said Dr Robert Young, a geologist at Western Carolina University, "but I can also say with the same amount of assurance that there has never been a flood like this with the potential for this much ecological impact. Never."

The main problem is that the September flood picked up huge amounts of organic matter in the form of decomposing vegetation, topsoil, farm and lawn fertilizer, raw sewage, hog waste from containment ponds maintained by the state's corporate farms, even grass clippings. This richly fertilized water surged directly into the estuary, turning its water the color of weak coffee. The contaminated runoff is still coming at more than the ordinary rate. Once in the sounds, the organic matter is mostly trapped because the barrier islands of the Banks convert the sounds into a single, nearly closed lagoon. The material sinks to the bottom of this shallow water, and that is the root of scientists' fears. When the water warms up again next spring and summer, they say, two things are likely to happen:

- The organic waste will provide nutrients for the production of vastly larger amounts of algae called phytoplankton. When they die, they will fall to the bottom and join the carpet of organic matter washed there by the floods.
- Multiplying aquatic bacteria will feed on both the dead algae and the matter washed off the land. In the process they will use up tremendous amounts of oxygen from the water. If

weather and water conditions are right—or wrong—great expanses of the estuary could rapidly be drained of oxygen, killing multitudes of fish and other creatures and drastically limiting habitat for surviving aquatic life.

The sheer amount of fresh water may already have killed many immobile marine creatures that bigger fish eat, like small worms, crustaceans and crabs. Some bottom-dwelling creatures may also have simply been buried and suffocated by the sediments. Besides croaker, spot and menhaden, the estuary is also a nursery for flounder, weakfish, shrimp and crabs, all valuable commercial species. So far, there are mixed reports from fishermen: some say the estuary is ruined, while others say it is fine. These mixed reports might be explained by disruptions in fish movements caused by the flood; some fish may have fled some parts of the estuary for others, and some that usually move from the estuary to the ocean in the fall may have moved earlier.

Whatever happens next year might not be the end, because it could take several years for the situation to play out and for nutrient levels to fall back to within some kind of boundary. But at this stage, said Dr Feldman of NASA, "we don't really know what's going to happen."

New York Times

## Your chance to predict global change

A UK scientist is appealing for anyone with a home computer to help forecast how the Earth might be affected by global warming in the next century. Dr Myles Allen from the Rutherford Appleton Laboratory, England, says that if enough people join forces worldwide to analyse data, it might be possible to get an accurate prediction of what the planet's climate might be like in 50 years' time. More than a million volunteers are currently involved in a similar scheme which uses screen-saver software to scan radio telescope data for signs of extraterrestrial intelligence. Scientists currently use the world's fastest supercomputers in an attempt to forecast what the climate might be like on planet Earth well into the next century. But even these machines struggle with the number of calculations that are required to build up what might be regarded as a realistic picture of events.

The Casino-21 Climate Simulation project will effectively allow the number of these measurements to be increased and tested. This, hopefully, will improve the accuracy of the simulations and help humankind formulate a practical response to the problems that may stem from an increase in CO<sub>2</sub> and other greenhouse gases. Computer users can register to take part in the project at a special Website set up by the Rutherford Lab at:

[www.climate-dynamics.rl.ac.uk/](http://www.climate-dynamics.rl.ac.uk/)

The screen-saver software can be downloaded over the Net or requested on a CD.

## US Action on Kyoto

A group of influential bankers, financiers and corporate executives are not waiting for the US Senate to ratify the Kyoto Protocol limiting the greenhouse gas emissions blamed for global warming. They are moving ahead to create market based solutions for climate change, by forming a Global Warming Early Action Coalition.

In September, the Dow Jones company created an index of sustainable companies that measures and quantifies sustainability based on Dow Jones principles. This index of 500 companies has outperformed the Standard and Poor's Index by 25%. The sustainable companies were chosen from respondents to a questionnaire. They are ranked according to their adherence to sustainable principles, according to David Moran, chairman of the Dow Jones Sustainable Group Index company. Information used to rank the companies comes from the companies themselves, and also from their critics and from independent observations of their performance.

ENS

## The Energy Reforms are Working

The state-owned company, Meridian Energy, has announced a large power price increase for Whangarei: 6% for businesses and 13% for households. Meridian said it could not make a commercial profit under the pricing structure it inherited from former Whangarei supplier, Northpower.

## Firms scramble to look greener

In major corners of corporate America, it's suddenly becoming cool to fight global warming. Facing significant shifts in the politics and science of global warming, some of the nation's biggest companies are starting to count greenhouse gases and change business practices to achieve real cuts in emissions. Many of them are finding the exercise is green in more ways than one: Reducing global warming can lead to energy cost savings.

The changes, though gradual, are coming as more and larger companies are accepting the hotly debated scientific theory that man-made carbon dioxide emissions are warming the earth. And even when they question the science, companies like General Motors say there is enough cause for concern to warrant actions now.

"More and more companies have realized that they can't sit on their hands and have no strategy to respond to what may be the biggest environmental issue of the next century," says Joseph Romm, a former US Energy Department official and author of *Cool Companies*, a book about corporate efforts to cut emissions. Romm estimates half of the nation's 50 largest companies are in some phase of assessing or reducing their greenhouse gases.

One reason for the change is US multinationals trying to keep pace with Europe's faster approach. They don't want to be on the extreme end of the political spectrum, especially if they want a seat at the table where regulations are being crafted. Some hope to forestall or dilute legislation by reducing emissions voluntarily.

The weather has something to do with it, too. Last year beat 1997 as the hottest on record, according to the National Climatic Data Center, and the agony of this summer's heat waves and droughts is still a fresh memory in the nation's boardrooms.

Some large companies—notably Exxon and others whose businesses depend upon fossil fuels—continue to publicly question the science and insist on a go-slow approach. But for many other companies, the global warming debate now centers on how much emissions cutting is enough and how to regulate the process. Dirk Forrister, a former White House official now working for the Environmental Defense Fund, sees in the shift, "a stunning disconnect," between business executives and politicians. Since the Kyoto Protocol, the

global treaty to reduce greenhouse gases negotiated in 1997, "the business community has been coming to the middle and the Congress has been swinging way to the right."

Solutions can be as simple as new lighting fixtures or as complicated as BP Amoco's internal system of trading emissions among business units. The oil giant is considered to be at the forefront among multinationals in reducing global warming, both in the US and abroad. One natural-gas pipeline manager grumbled that he shouldn't be responsible for cutting greenhouse gases because he didn't believe his operations produced any. Pressing his lieutenants, however, the manager found that pipeline valves leaked methane gas, a major global warming contributor. Installing new valves will cost \$2 million, but the investment will reap a 60% return in the form of increased methane available for sale to customers. In addition, the valves will stop losses of 450 000 tons of carbon emissions, far beyond the manager's 1% goal.

Wall Street Journal



## Arctic ice melting

A team led by Konstantin Vinnikov of the University of Maryland has been comparing computer models of arctic ice melting with the observed reality. They conclude that there is only a 2% chance that melting over the last 19 years is a result of natural climate changes, with only a 0.1% chance that the melting over the last 46 years is natural. The team modeled the probable normal changes in the Earth's atmosphere over long periods and human-induced global warming, and compared the models with observed sea ice decreases. The result, the team reports, "strongly suggests that the observed decrease in northern hemisphere sea ice extent is related to (human caused) global warming."

New York Times

## Worldwatch urges phase-out of coal

Environmental and economic trends have made a global phase-out of coal both necessary and feasible, the Worldwatch Institute says in the latest issue of its World Watch magazine.

"Although coal was dubbed 'The Bridge to the Future' as recently as the 1980s, its use has actually declined during the 1990s, experiencing a 2.1% drop in 1998," said WorldWatch.

Hastening coal's decline is imperative if climate change is to be slowed in the next century. Coal is the most carbon-intensive fossil fuel, releasing 25% more carbon per unit of energy than oil, and 80% percent more than natural gas. It accounts for 43% of annual global carbon emissions. It is also the most abundant of the fossil fuels, with an estimated 1000 year reserve.

Two main ingredients of coal smoke are particulate and sulphur dioxide pollution, which cause 500 000 premature deaths and millions of new respiratory illnesses each year in urban areas worldwide. Several cities, including Beijing and Delhi, are near the pollution levels that London experienced during its famous 'smog' that took 4000 lives in 1952.

Piecemeal attempts to deal with coal's health and environmental effects have created new, more chronic problems. Higher smokestacks, built to lessen coal's local air pollution, have led to widespread acid rain and deposition. One key to the 'de-coalozation' process is reducing the large subsidies that encourage its use in some countries. China has more than halved its coal subsidy rates since 1984, a move which contributed to a 5.2% drop in Chinese coal consumption in 1998. Belgium, France, Japan, Spain, and the United Kingdom have collectively halved coal use since slashing or ending coal supports over the last fifteen years.

Opportunities exist for further reductions: remaining coal subsidies total some US\$ 63 billion annually: \$30 billion in industrial nations, \$27 billion in the former Eastern bloc, and \$6 billion in China and India. In Germany, the total is \$21 billion, including direct supports averaging more than US\$ 70 000 per miner.

Worldwatch Institute  
E-mail <worldwatch@worldwatch.org,  
Web <<http://www.worldwatch.org>.

## Rich 'owe' poor billions

Far from being in debt to rich countries, the world's poorest nations are owed hundreds of billions of dollars by them for the disproportionate amount of environmental damage they inflict on the planet, says a report published by one of Britain's leading charities. Christian Aid says the developed world's bill on its CO<sub>2</sub> account is three times as large as its financial debt from the developing world, or US\$ 612 billion compared with US\$ 200 billion. The report says rich countries' demands for debt repayments are morally illegitimate and undermine the ability of poor countries to achieve internationally agreed poverty reduction targets. Andrew Simms, a policy adviser at Christian Aid, said, "We constantly think of the world's poorest countries as being in debt to us, and force them to adopt draconian economic austerity measures as a result. But these debts are dwarfed by the huge and rising carbon debt owed by the rich countries to the global community, and for which, yet again, the poorest are paying."

To calculate carbon debt, Simms has taken the world population in 1990 and divided it by the CO<sub>2</sub> emissions which scientists at that year's inter-governmental panel on climate change said would be permitted to hit the target of a minimum 60% reduction in production of global warming gasses. That gives everyone an allocation of 0.4 tonnes a year, with each tonne priced at US\$ 3000 according to the contribution it is estimated to make to global GDP.

On that basis, heavily indebted poor countries are in credit on their climate account because of their under-use or efficient use of fossil fuels, while the developed world is deeply in the red.

The Guardian

## Renewable energy research seminar

A successful seminar organised jointly by EECA, forest research and Massey University was held at Massey in November to enable researchers funded by the Foundation Research Science and Technology to present their latest findings on bioenergy, wind, solar, geothermal heat, fuel cells and distributed power supplies. More important was the opportunity to attract industry and government users of the research and to

discuss the need for increased future funding and priorities.

Phil Harrington, Executive Manager of the Sustainable Energy Group, Australia Greenhouse Office gave an excellent keynote address describing all the initiatives and huge investments (more than \$Aus 400 million) underway in Australia to meet Prime Minister John Howard's 2% new renewables target and to substantially bring down their greenhouse gas emissions. By comparison New Zealand is solar light years behind: the annual investment in renewables R&D is only around \$1.5 M. This is only 25% of the PGSF energy research budget, most of which still goes to fossil fuel exploration!

Of the 96 attendees at the seminar, those representing energy users from industry were encouraged to provide input as to the direction and relevance of future research in this area.

Members of the discussion panel, ably chaired by Ken Piddington, and representing users of the research outputs including FRST, Ministry for the Environment, power generators, project developers, rural users and communities, and industry, were unanimous in the need for more research going into renewables. This includes small and large scale projects and for alternative transport fuels as well as heat and power. It was generally agreed that funding should not only come from the public good science fund but also from the industry users. At present industry support for R&D is one of the lowest in the OECD

Insufficient research funding is causing New Zealand to lose top research teams, the latest being Prof Nigel Sammes and his crew from Waikato University who are off to the USA to further develop their leading edge research on solid oxide fuel cells. This was one of the 'bright stars' of NZ renewables research. Who will be the next to go? Or will the new government and the successful passage of Jeanette Fitzsimons' Energy Efficiency Bill ensure that appropriate recognition of Renewable Energy eventuates before the rest of the world leaves us behind?

Copies of the Seminar Proceedings are available from Ralph Sims, Massey University for a small charge (Tel: 06 3505288; Fax 06 3505604; e mail R.E.Sims@massey.ac.nz).

## More die from car pollution than road accidents

Road traffic is the fastest growing source of pollution in Europe and in some countries more people are dying as a result of this air pollution than are being killed in crashes. A report prepared by the World Health Organisation (WHO) for the Third Ministerial Conference on Environment and Health shows that long-term air pollution from cars in Austria, France and Switzerland triggered 21 000 premature deaths per year from respiratory or heart diseases, more than the total number of annual traffic deaths in the three countries.

Dr Carlos Dora, of the WHO centre for health and environment in Rome, told the conference, "Air pollution from traffic at the levels we have today does cause a major health impact."

Air pollution from cars caused 300 000 extra cases of bronchitis in children, 15 000 hospital admissions for heart disease and 162 000 asthma attacks in children in the three countries. "The growing evidence that air pollution is causing a major health burden adds to the effects of road traffic through noise, accidents and barriers to cycling and walking, and we need to address this head on," Dora added.

## Mini-Whats

### Solar works better in energy management

Greater use of renewable energy technologies would save millions of dollars in losses during natural disasters. The US DoE's National Renewable Energy Laboratory says solar-based technologies could help avoid disasters, increase the survival odds for buildings, and allow faster restoration of electricity after a disaster. All these factors would add value to both insurance companies and their clients. Solar PV systems can restore electricity supply to businesses and homes more quickly after hurricanes, floods or other disaster, reducing business interruption losses and claims for living expenses. PV power can also allow the insurance industry to accelerate its response time by providing power to mobile offices at disaster sites. Other applications include emergency communication, water purification, lighting and operation of laptop computers and cellular telephones.

## **Pumped storage**

China is completing a pumped storage hydro-electric power plant at Guangzhou, near Hong Kong that will be the world's largest facility when it is completed next year. It will have a total generating capacity of 2400 MW, equivalent in size to the facility at Niagara Falls. Guangdong's strong economic growth has increased demand on generation facilities, and pumped-storage generators can be in full operation within three minutes. The quick backup avoids major power outages in the region. The pumped storage facility is part of Guangdong's Daya Bay Nuclear Power Plant. A Hong Kong power company owns half the unit's output.

## **Tasmania a carbon sink?**

Tasmania plans to become Australia's only greenhouse gas sink—and profit from it. Tasmania removes more CO<sub>2</sub> from the air than it produces: a net gain of 8.3 tons per capita per year. Though details of emissions trading for greenhouse gases are yet to be finalized, programmes would allow industries to buy net carbon sink capacity rather than reducing emissions by other means. Tasmania would also like to increase its sink capacity by developing cleared land into plantations and building more renewable power, such as wind energy, to sell to the mainland.

Australian Greenhouse Office  
<http://www.greenhouse.gov.au/>

