



EnergyWatch

The Newsletter of the Sustainable Energy Forum

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

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Sustainable Energy Forum Conference 1999

Threshold 2000: Can our cities become sustainable?

24-25 June 1999 Auckland

With a public forum on Wednesday evening 23 June

The Theme

Auckland is experiencing extreme pressures on its infrastructure—transport, water, energy, wastewater and waste management are all under strain. Unless 'business as usual' habits change, further crises are inevitable. However, new technologies and new approaches create opportunities to break this cycle. This year's conference will look at Auckland as an example of a city which needs a new integrated approach to planning and development, to create a livable city for the future.

Wednesday 23 June

7.30 - 9.30 pm Public Forum:

Can Auckland become sustainable?

Functions Room, Students Union. Speakers are:

- Christine Fletcher, Mayor of Auckland
- Morgan Williams, Parliamentary Commissioner for the Environment
- Tim Hazledine, Professor of Economics, Auckland University

Chair: Professor Ralph Sims from Massey University

Thursday 24 June

8.30 - 9.30 am Registration

Conference Centre, University of Auckland

9.30 - 11 am Opening and keynote speakers

Speakers will address the question :

What is the challenge of sustainability in their field of expertise, in relation specifically to Auckland?

- Peter Newman / Mark Bachels, Perth University / Canterbury Regional Council
- Kathy Garden, New Zealand Business Council for Sustainable Development

Chair: Ken Piddington, Convenor of SEF

11 - 11.30 am Tea/coffee break

11.30 - 1 pm Keynote speakers (continued)

- Alastair Bisley, Secretary for Transport
- Martin Gummer, Transfund (tbc)
- Arthur Williamson, Emeritus Professor, Canterbury University
- Richard Maher, CEO, Infrastructure Auckland

Chair, Fiona Weightman, EECA (tbc)

1 - 2 pm Lunch break

2 - 3 pm Sector seminars

The conference breaks into three specific sectors : transport; energy and water/waste management. Seminars will open with a 20 minute presentation, followed by questions and discussion. Each seminar will address issues such as barriers to progress, integration with other sectors, policy changed required, roles of local and national government, business, industry, and the general public.

Transport: Chaired by Mark Bachels (tbc)
Stephen Knight, Environmental Consultant; Ross
Rutherford, Manager Transport Planning,
Auckland City Council.

Energy Chaired by Ian Shearer, Energy
Consultant and Manager of NZ Wind Energy
Association

Brian Leyland, Leyland Consultants; Robbie
Morrison, Energy Management, University of
Otago

Water/waste management

Chaired by Muhammad Afzal,
Manukau City Council

Jim Bradley, Montgomery Watson Ltd; Robert
Vale, Sustainable Development Research Centre,
University of Auckland.

3 - 3.30 pm Tea/coffee break

3.30 - 4.30 pm Workshops

Conference will break into discussion groups to
address the themes emerging from the
presentations and seminars.

4.30 - 5.30 pm Plenary

Four 10 minute presentations followed by
questions. Presentations from Warren Snow, Zero
Waste; Jim Gladwin, Water Pressure Group; Bruce
Aitken, Methanex; Ernst Zollner - Business
Analyst, Wellington City Council.

5.30 - 6 pm Break

6 - 10 pm Dinner, after-dinner speech from
Jeanette Fitzsimons MP on the Energy Efficiency
Bill.

Friday 25 June

9 - 10.30 am Keynote speakers on "Achieving
solutions"

Molly Melhuish, Power for our Future; Mark
Prain, Sustainable Cities, Christchurch; Ken
Piddington, Convenor, SEF

Molly will address issues related to integration of
infrastructure sectors. Mark will look at lessons
learnt from the Sustainable Cities work in
Christchurch, and from other work around the
world. Ken will discuss financial mechanisms
needed to achieve sustainable solutions.

Chaired by Max Harre, Waitakere City Council
(tbc)

10.30 - 11 am Tea/coffee break

11 - 12.30 pm Sector seminars

Focussing on transport, energy and water, these
will identify what solutions exist within these

areas, and how they can be achieved to take
Auckland towards sustainability. Each seminar
will open with a presentation.

Transport Dorothy Wilson, Director of
Pacific Rim Institute of Sustainable Management
(PRISM)

Energy Speaker from a sponsor (tbc)

Water/waste management

Speaker from a sponsor (tbc)

12.30 - 2 pm Lunch

(Reporters from the sector seminars in the morning
will pull together conclusions from the seminars)

2 - 3 pm Poster Promenade

There will be various poster presentations on
display during this hour, in which time conference
delegates can find out more about selected subjects.
Poster presentations will come from the delegates
at the conference.

3 - 4.30 pm Final Plenary

Feedback from reporters followed by discussion on
formation of a conference policy statement. The
plenary will conclude with a brief presentation of
outcomes from the conference, and an outline of the
ways forward from Jack Henderson, Auckland
Regional Council, and Ken Piddington, Convenor,
SEF.

4.30 pm Close of conference

Saturday 26 June

Three field trips will be on offer to delegates.
Each field trip will include visits to several
different sites. (Delegates can select which Field
Trip they want to attend at the conference.)

- (1) Urban sustainability and conservation
- (2) Waste management solutions
- (3) Visit to Waiheke sustainability projects

**It is not too late to register:
send us the enclosed form today!**

An apology

The February issue of EnergyWatch was on
white paper, instead of the usual recycled.
The printer made a mistake. He offered to
reprint but it seemed more environmentally
friendly to accept the mistake...

Global Warming Is Here: The Scientific Evidence

By Patrick Mazza and Rhys Roth

A worldwide wave of extreme weather inflicted at least US\$bn 90 in damage in 1998, more than in the entire 1980s. Last year was also the hottest on record. While no single weather event or year proves humans are warming the planet, a powerful scientific case is building. Some of the most compelling evidence emerged last year.

Greenhouse gases are present in the atmosphere in greater amounts than at any time in at least 220 000 years. Certainly something is heating the globe. The century's 10 warmest years have all occurred since 1983, seven in this decade. A new United States National Science Foundation study based on natural indicators such as tree rings, ice-cores and corals finds the last decade of the millennium has been its hottest. And 1998 was by far the hottest year. Temperatures surged faster than previously documented to break a record set just in 1997.

Middle and lower latitude mountain glaciers are showing the effects. University of Colorado glaciologists at Boulder in 1998 reported that those glaciers have retreated on average at least 20 m since 1961, and the melt rate is increasing. The retreat of mountain ice in tropical and subtropical latitudes provides *"some of the most compelling evidence yet for recent global warming,"* Ohio State University researchers note.

A new study by NASA's Goddard Institute found Greenland glaciers appear to be releasing icebergs into the ocean faster than in the past. The finding was unexpected, and raises fears that global sea levels, already projected to rise 500 mm next century, could increase even faster.

Predictions that global warming will be greatest in the polar regions are now being borne out. Arctic sea ice has been shrinking by 3% each decade since 1970. Several of the years with the smallest sea ice coverage were in the 1990s. Around the Antarctic Peninsula, extensive sea ice formed 4 winters out of every 5 in the mid-century. Since the 1970s that dropped to 1-2 winters out of 5.

Several Peninsula ice shelves, which attach to the continent but stretch into the sea, are in retreat. Some of the most dramatic losses came in 1998, when around 5000 km² calved into icebergs. The loss in one year equalled the average of 10-15

years. The Larsen A ice shelf, after years of slowly melting away, suddenly disintegrated in 1995. Scientists have now mounted a death watch for Larsen B and Wilkens, together three times larger than Delaware.

Since ice shelves already displace water, the loss will not add to rising ocean levels. But melting northern tundra could have a devastating global effect. Carbon in tundra soils, equal to one third that in the atmosphere, could be released. Tundra researcher George W. Kling of the University of Michigan says, *"Our latest data show that the Arctic is no longer a strong sink for carbon. In some years, the tundra is adding as much or more carbon to the atmosphere than it removes."*

A warmer atmosphere is expected to cause more evaporation, making for worse droughts and more deluges. Beginning around 1980, sections of the US, Europe, Africa and Asia did begin to experience more dry spells, while parts of the US and Europe have become much wetter.

The National Climatic Data Centre scrutinised US weather records for extremes expected to increase under global warming. NCDC discovered that wild weather has been surging since the late 1970s. Statistical analysis showed only 1-in-20 odds that was a natural fluctuation. NCDC Chief Scientist Tom Karl commented, *"I would say the climate is responding to greenhouse gases."*

Thick, precipitation-prone clouds significantly increased over Australia, Europe and the United States between 1951 and 1981. Researchers concluded the increase is *"likely to be related"* to human-caused greenhouse gases.

Cloud cover holds in heat after the sun goes down, so night time warming is a significant global warming indicator. Night time temperatures are going up more than twice as fast as daytime temperatures. Extreme summer heatwaves in the U.S increased 88 percent between 1949-95, with the biggest heat increases coming at night.

Warming is having devastating impacts on plants and animals. Coral reefs, the "rainforests of the ocean" where a quarter of all marine species are found, suffered record die-off due to heat-induced bleaching in 1998. *"... it appears that only ... global warming could have induced such extensive bleaching simultaneously throughout the disparate reef regions of the world,"* a State Department scientific report concluded.

A dramatic temperature increase off North America's west coast began around 1977.

Zooplankton, the microscopic plant-eaters that form the base of the marine food chain, dropped 70 percent because warmer waters suppressed colder, nutrient-rich currents. Indicating food chain collapse, ocean sea birds in the California Current have declined 90 percent since 1987.

As the Pacific has warmed, so has Alaska. On the south central coast, cool temperatures normally keep the spruce bark beetle under control. But with the warming the beetles have killed most trees over 1.2 million hectares, one of the largest insect-caused forest deaths in North American history.

Evidence is mounting that global warming is here and humanity is driving it. Remaining scientific uncertainty *"does not justify inaction in the mitigation of human-induced climate change and/or the adaptation to it,"* the American Geophysical Union said in a recent statement.

The emerging scientific consensus leaves us with no excuses. We must rapidly transition from fossil fuels to clean energy. The global climate crisis, perhaps the greatest challenge in the history of civilisation, calls upon us to act decisively and without delay.

(This article is from a detailed paper with the same title, available from
Climate Solutions, 610 E. 4th St.,
Olympia, WA 98501, USA,
info@climate solutions.org)



ERDC Publications

With the closure of the Energy Research and Development Corporation, ERDC publications may be purchased from:

Publication Sales Energy Strategies Pty Ltd
PO Box 4170 Manuka ACT 2603
E-mail: publications@enerstrat.com.au

These publications will soon be available in electronic form from:

EIDN Pty Ltd PO Box 1 Kensington NSW 2033
E-mail: crcwmpc@unsw.edu.au

SEF submission on climate change

In a major policy document released in January the Ministry for the Environment set out the main options for meeting New Zealand's commitment under the Kyoto Protocol. Although this commitment covers all greenhouse gases (GHG), the Ministry's preferred option focusses on CO₂.

In its submission, SEF took the same approach, favouring a strategy which dealt with carbon emissions through a hierarchy of actions:

- **Carbon containment** Actions which reduce emissions by achieving higher efficiency in all energy use, especially when investment decisions are being made.
- **Carbon avoidance** Actions which avoid the use of carbon to produce electricity (or to fuel motor vehicles of the next generation).
- **Carbon absorption** Actions which absorb CO₂ (sinks), such as new forest plantings and possum eradication to protect native bush.

We pointed out that the Ministry's preference for emissions trading, possibly in combination with a carbon tax, emphasised the third of these actions. Renewable energy (carbon avoidance), should in logic receive at least the same incentive as the creation of a carbon sink, and this should be available as a lump sum to offset the initial investment, eg in wind turbines.

SEF also picked up the theme of the 1998 Conference at Massey, stressing the need for consistency across a range of Government actions. The MfE document recognised the linkage in the case of roading reform and land-use policies, but did not (of course) point out that restructuring of the electricity industry had already affected GHG emissions.

With increasing evidence about the real and potential climate change impacts on NZ itself, SEF stressed the need for urgency in reaching some greater measure of scientific consensus. Should we stay with the 'no regrets' principle (which essentially means not spending extra money to offset risks)? Or had the stage been reached where a higher 'insurance premium' was justified because of the social and economic impacts of changes in climate patterns (eg drought in the rural sector)?

We recommended a major conference of stakeholders prior to final decisions on New Zealand's GHG policy. It is pleasing to report that MfE subsequently endorsed an initiative by the NZ Institute of International Affairs to hold a one-day international conference in Wellington on 27 July (see notice below). Cabinet is expected to take decisions on policy instruments in August.

A copy of the full text will be posted on the new SEF web page, or is available from the SEF office.

Climate change: Implementing the Kyoto Protocol

The NZ Institute of International Affairs is presenting a one-day seminar:

**Tuesday 27 July 1999
Parliament House, Wellington**

Speakers include the Hon Simon Upton, who will open the seminar, international experts and representatives of all major political parties. Commentaries on the Minister's speech will be given by Ken Piddington (SEF), Maria Robertson (Comalco) and a representative of the South Pacific Regional Environment Programme.

Sessions will cover the scientific risk assessment, the prospects for widening the international consensus and the broad economic issues. There will also be a report on corporate initiatives to anticipate climate change factors.

For further details and registration of interest contact the NZIIA office:

e-mail nziia@vuw.ac.nz
phone/fax (04) 471 5356

BioEnergy in the UK: The real issues

Damian Culshaw, ETSU, UK
(Based on a seminar given at Massey University)

Commercial project developers are coming to terms with the real issues associated with building biomass fired power stations. In the last round of the UK's premium pricing mechanism for electricity generated from renewable energy (NFFO), around 5 projects were granted licenses to produce electricity from wood residues or energy crops such as willow coppice.

Until recently most British research was focussed on technical issues associated with using wood as fuel. The government funded programme, managed by ETSU, covered such issues as: forest residue harvesting, wood chip storage, transport, planting and harvesting techniques for willow coppice energy crops.

Although this work provided a useful foundation for the industry, other issues are now foremost in the minds of the consortia developing the projects. Satisfying the land use planning authorities is usually the first hurdle to overcome. The planning authorities often demand full environmental impact assessments which cover such issues as local noise and traffic generation, forest nutrient depletion, effluent run-off from wood storage pads and the assessment of the plant's visual impact.

Another major hurdle in the early stages of project development is securing finance. Money usually needs to be borrowed and lending institutions are very suspicious of novel projects such as generating electricity from wood. When borrowing money, perceived risk means high interest rates. Also, lending authorities always need somebody identifiable to sue if the project goes badly wrong and interest payments cannot be met!

Developers in the UK are now beginning to think about wood generation projects in a different way. When seeing a project through the eyes of a banker, the issues which at first seemed important, such as how best to store the fuel over a 6 month period, appear as mere details. More major issues become apparent such as the companies supplying equipment or fuel, need to guarantee their projects and they need to have enough collateral to be able to stand by them. This inevitably means that large companies need to be involved in the project. Legally binding contracts need to be drawn up to define the responsibilities of all those involved, which is expensive. Fuel quality control and payment becomes a major consideration when contracts are being negotiated. In fact, securing a reliable fuel supply, when seen in its entirety, is usually quite a problem. When a developer starts to contemplate consuming hundreds of thousands of tonnes per year, rather than a few trees from an individual forest trial, perceptions change. Managing the logistics of the whole operation becomes of paramount concern.

Perceptions are changing in the bioenergy industry in the UK as it reaches full commercialisation. Only once developers plan to actually build biomass power stations, do the real issues start to emerge.

Better Transport, Better Roads?

This is a summary of the Forum's submission to the Ministry of Transport (MoT) on the consultation document *Better Transport Better Roads* (BTBR). More detail is given in our submission: copies are available from the Forum's office or on the web. The emphasis of our comments is on energy saving and environmental effects.

The greatest danger is not that the reforms will fail, although they *will* fail in environmental terms: it is that they will work well enough for the road lobby to claim a success. This will lock New Zealand in to years of development based on simplistic notions that transport and land use are somehow independent, and that the sustainable transport modes—walking, public transport, cycling and car sharing—are unimportant.

Separately optimising each part of a complex system is unlikely to optimise the whole. This is a fundamental problem in BTBR, and many opportunities for optimisation have been ignored. There is no appreciation of the varied and often conflicting demands of road users, or the scale and importance of effects which are difficult to monetarise. BTBR is an exercise in navel gazing, with little or no reference to economic theory; research; alternatives; or overseas practice. Ingenious solutions to the difficulties of a market model abound, but are useless if the model itself is wrong.

In contrast, this is what Buchanan (1963) said about community interests, in a very influential UK report: widely studied in Europe but largely ignored in Britain—and New Zealand:

Streets... give access to buildings, they provide an outlook from buildings, they give light and air, they are the setting for architecture, and they are the backbone of the everyday surroundings for many people. It is impossible to maintain that these functions are subordinate to the passage of vehicles.

- An astonishing omission from BTBR is deferring, or cancelling, the National Land Transport Strategy. This is throwing away the map at the start of the journey, which is unwise if the journey has not been done before.
- Transport and land use policies are inextricably linked. To pursue transport efficiency in isolation is a nonsense. The key to success is understanding the interaction, but to assume that commercial pressures will bring best results

is to ignore the link entirely.

- Transit NZ is to be retained in virtually its present form. The intention is to provide competition for the road companies, but there are two problems:
 - Transit will have a near-monopoly of high capacity and limited-access highways and so will appear to be much more efficient than the road companies.
 - In Auckland the Transit- and ACC-controlled roads are already optimised separately to give a sub-optimal system. Such problems will get worse with formal competition.

Planning of long distance routes is best done regionally, not nationally. Even a cursory look at traffic at—for example—Wellington's Ngauranga Gorge and Levin, confirms that most main highway traffic is local or regional.

- Climate change issues are ignored in BTBR, on the assumption that they should be *addressed as part of the broad economy-wide response*. This is simply not good enough. For example:

New Zealand faces some real challenges to the sustainability of urban ecosystems. These issues... cannot be properly addressed by generic environmental management approaches and the management of effects via the Resource Management Act. There is a compelling need to focus on improving the efficiency of resource use and integrated management of the urban environment, with people and communities being recognised as core elements of the environment. (PCE 1998)

- The BTBR approach to amenity is unbelievable. It is effectively reduced to objects which are neither road improvements nor utilities. The contrast with Buchanan is complete: roads are solely for motor vehicles. Another example of this attitude is that MoT are to quantify the direct net benefit *accruing to motorists* from subsidising passenger transport. Restricting the benefits in this way, rather than considering both direct and indirect net benefits to the community as a whole, effectively guarantees a sub-optimal outcome.
- Reducing congestion must mean encouraging some road users to travel by other modes, or at other times. This usually means public transport, so

good quality public transport must be available as the effects of reform are felt. Taking no action until the demand is there leads to overcrowded services and lost patronage. But how are public transport operators to anticipate demand, when they have no way of knowing when it will increase; or by how much; or what facilities, such as bus lanes, will be available to them? All these factors are at least partially controlled by a road company trying to maximise profit—and a good way of doing this is to discourage transfers to public transport.

- The BTBR authors claim that public transport will not need subsidies once the road reforms are in place. This makes sense in elementary economic theory, but the economics of transport are rarely simple, and the assertion is not supported by either transport economics or overseas experience. The authors seem to share our doubts here: why the need to cap public transport subsidies if they will no longer be needed?

- A BTBR paper asks ministers to

...note that the common law rights to pass and repass on public highways and the unique characteristics of the roading corridor limit the ability to develop normal commercial relationships between users and providers of roads.

These difficulties have not been overcome. Methods and rates for purchasing services are not discussed: they are to be a contract between Transfund and the roading company, no doubt confidential. And that is all: a commercial contract is to be the black box that sorts everything out.

- A proposed alternative system is for large users to by-pass both Parliament and Transfund and negotiate directly with road companies. These road users will display an 'opt-out' licence sticker. If the police find an irregularity with such a licence they will not prosecute, but instead notify the road company, who will not prosecute either: they can only sue—and the penalty charges will be lower than at present. Evasion costs about \$M 65 / year at present but we expect an increase.
- One of the few cost control measures we have seen is:
A road price should not exceed the costs that a road user... could be expected to pay if the road user were the only road user.

In other words, a road user may be expected to pay up to the cost of buying the road and using it as a private drive: hardly a major restriction on the road company.

- A BTBR paper says that environmental externalities are *not sufficiently determined to be capable of being priced*. This is nonsense. Oil company accounting has always been far more accurate than the best flow meters, but the industry has managed to price the stuff somehow. For environmental externalities the accuracy is even lower but the principle is the same: accept the best measure available. The social costs of environmental externalities are a best estimate total of over \$bn 1.0 / year: to ignore this is a huge subsidy.
- BTBR offers real hope for better road safety, but with no certainty:
 - Operating information requirements in the Roads (Information Disclosure) Regulations relate very largely to permitting higher traffic speeds, such as target design speeds and the geometric efficiency of curves. There are no measures to enhance the safety of non-motorised users.
 - A BTBR paper states that *Measures contained in (safety) rules must be justified by cost-benefit analysis.*

The second point will ensure that cycle safety is ignored: it cannot be justified on benefit–cost grounds unless cycle numbers increase, but little increase can be expected until a critical mass of roads have been made safer for cyclists. A compounding problem is that a poor quality cycle facility may be more dangerous than none. Cyclists are protected in theory, but benefit–cost will win the day.

- In environmental terms the key safety question is *who benefits?* but it is not answered. Widening a road makes it safer for drivers but more dangerous for pedestrians, because crossing the road takes longer and motor vehicles travel faster. The 'who' question should also be applied to children: New Zealand has one of the highest rates of child pedestrian fatalities in the OECD.



Climate Change: Domestic policy needs public support for successful implementation

Ralph E H Sims, Director, Centre for Energy Research, Massey University

The Ministry for the Environment recently sought submissions on the domestic policy options for New Zealand to meet its climate change obligations. Public understanding and support is crucial for successful implementation and several of the relevant issues are summarised below.

- A clear message is needed to provide an awareness for both industry and the general public of New Zealand that climate change is a real issue. If a 'low level carbon charge' is eventually implemented, it must be clearly identified as such and substantial enough not to be ignored. Only then will this have the desired result of reducing fossil fuel use. Simply adding say 2 cents to a litre of petrol will have no effect. Whatever the level imposed, it should be termed a 'climate change levy' and appear labelled as such on appropriate invoices and accounts as does GST now.
- The sooner the method of allocation of emission outputs is developed and an indication of the implications for various sectors is publicised, then the sooner will New Zealand society take the issue of climate change seriously. At present there are many unknowns that industry need to understand before making decisions:

- On what basis will allocations be made?
- How will 1990 emissions be measured retrospectively, given that many firms will have no records of their energy use from that period?
- What if a current company was not in business in 1990, or has since been amalgamated with others?
- How will credit be given for energy saving measures undertaken since 1990?
- Will sheep and beef farmers be restricted from increasing their stock numbers again when the wool/meat prices rise as they inevitably will at some stage in the future?
- Who will receive ownership rights to forest sink credits and will they be a single payment or

annual payments which will vary as the trees mature?

Obviously many of these questions cannot yet be answered. However before implementation of any of the options can be achieved equitably and efficiently, much additional work and consultation will be needed. Whether Government is sufficiently committed to its Kyoto obligations to put more resources into further detailed studies to answer such questions as these in the near term remains to be seen.

- Close involvement in climate change mitigation activities by industry, small businesses and the public in general will be necessary if efforts to combat the problem are to succeed. Changes in public attitudes will be essential if significant emission reductions are to be achieved, particularly from transport and energy use. This in turn will require a major campaign of awareness raising and education planned with intelligence and sensitivity. Some ideas are given to illustrate what approaches, examples and methods could be used as part of a campaign to simplify the new concept of carbon trading for many people (Figure 1).

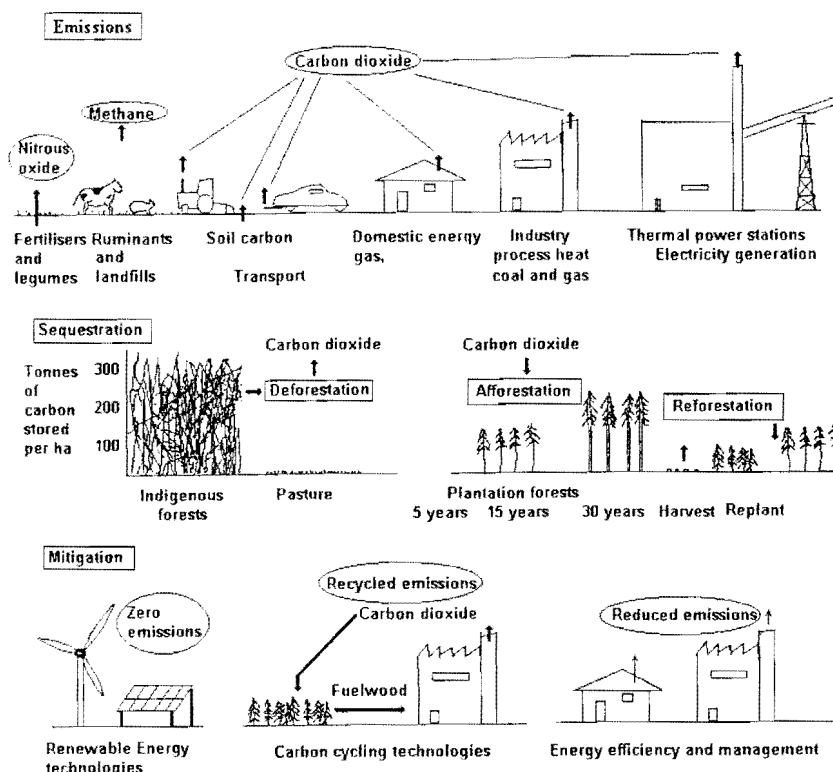


Figure 1 Approaches to emissions reduction

- It must be realised that terminology accepted as normal language by those closely involved with the climate change process may be very confusing for others. As a simple example most people can visualise a 'tonne of coal' but 'tonnes of carbon dioxide' may be beyond comprehension—how can anyone weigh an invisible gas? Some definitions of terminology are illustrated in Figure 2

- It should be made clearer from the outset that the economic instrument option finally chosen, together with any complementary measures, will be at best only a preliminary initiative in an attempt to encourage reductions of

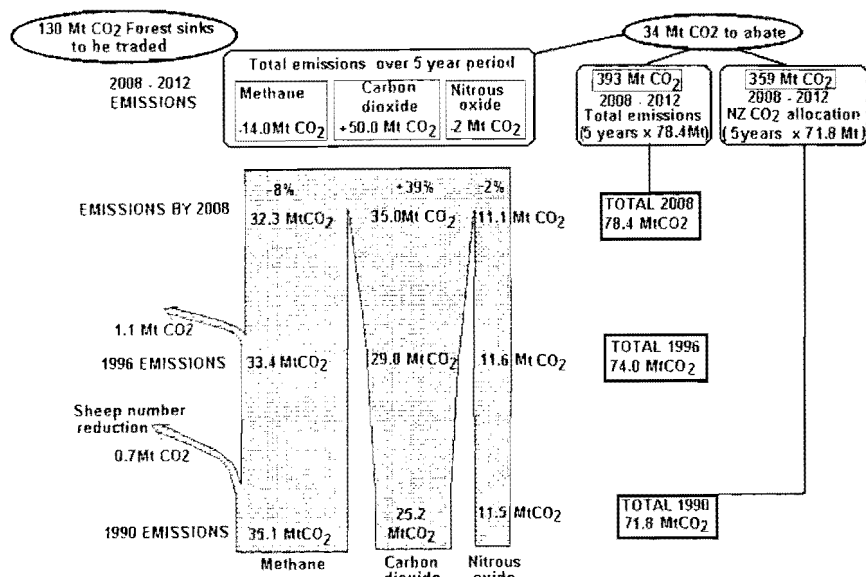


Figure 2: NZ greenhouse emissions 1990 - 2008

enough to achieve, whereas a 50% reduction may prove to be necessary in the longer term.

New Zealand society has first to be convinced that the climate change problem exists and that it is not a fabrication by some powerful group for some gainful reason.

- Currently the general public is largely unconcerned by the climate change issue and little has been done to inform and convince. It is not 'newsworthy', except perhaps when tornadoes strike or flooding occurs. Even such extreme weather events are becoming common and will soon be relegated to low category news items (as have car fatalities which are so frequent nowadays that they have sadly become the norm).

- Societal change has been successful in recent times in New Zealand with the anti-smoking and anti-nuclear examples to the fore. Why was this? What made the general public support such issues? If this could be analysed and replicated for climate change, then perhaps a

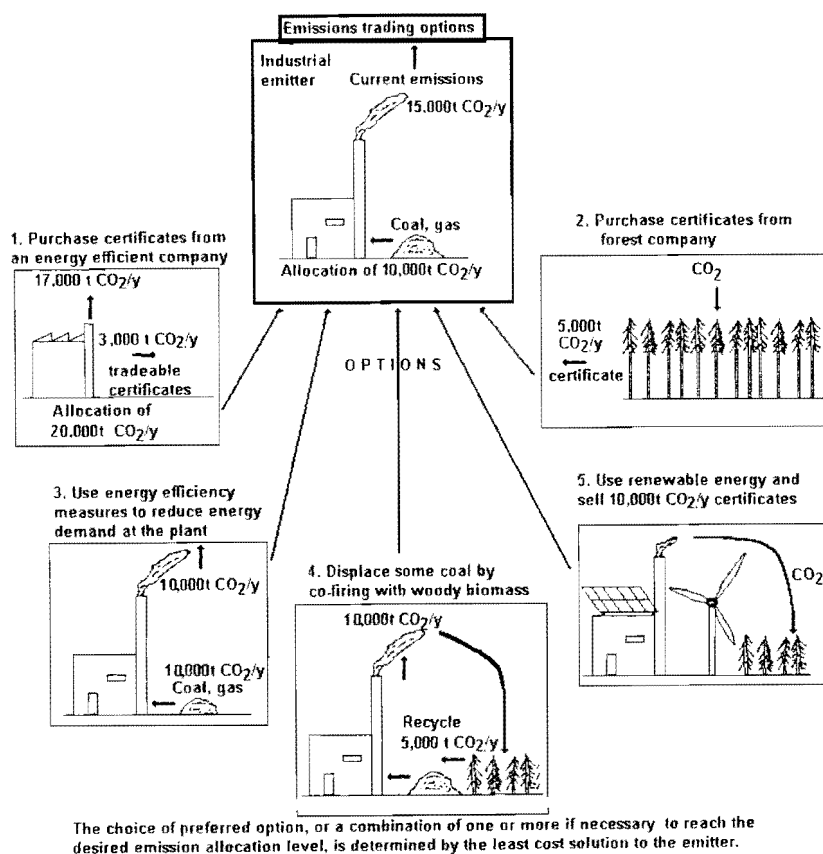


Figure 3: Emission reduction options

greenhouse gas emissions. To reach stabilisation of atmospheric levels in the longer term will require significantly greater efforts internationally. Seeking a 5% reduction below 1990 levels internationally now is difficult

greenhouse gas mitigation campaign would also be successful. The question could then be asked of an individual, *What actions have you taken to reduce your share of greenhouse gas emissions by 5%?*

Such a campaign would be measured to be successful if climate change became a key political issue by 2004 or thereabouts.

- If some form of economic instrument (levy, auction etc) is eventually implemented which results in revenue generation for Government, it is absolutely imperative that the revenue be used to support the development and uptake of new technologies to reduce greenhouse gas emissions and to support relevant education programmes. Public support for the whole concept of climate change will be enhanced if it is clear that any additional costs that people will experience are to be used for worthwhile related activities. This would then be seen and accepted as some form of "compulsory green pricing". In this regard an independent Sustainable Energy Trust should be established to administer the resulting additional revenue for the public good in terms of climate change mitigation.
- During 2008-2012 the total increase in carbon stocks is projected to add more than 130 Mt of CO₂ equivalent to New Zealand's assigned amount. This will be a significant contribution which could theoretically be used to offset the total emissions and hence easily solve the problem for New Zealand at least in the short term. (Figure 3). The fact that Government has decided to enable these sink credits to be traded internationally rather than be used as an offset will need further analysis and more detailed promotion of the concept. Ownership of the rights to the sink credits logically resides with the owners of the forests. It is important that this be determined soon and announced so that emitters can better plan their strategies as to how they might offset or trade their emission allocation.
- For how long the rate of change of land use from pasture to plantation forests can be sustained as a carbon sink is not clear. There is obviously a limit to land availability for tree planting and public resistance to planting yet more pine trees could become evident well before this constraint is reached. The longer term solution is to recycle the stored carbon through the bioenergy route which will provide both a carbon sink and energy source to displace fossil fuels. This opportunity needs to be included in any deliberations relating to forest sinks. Meanwhile, a wise investor wishing to maximise carbon credits might well be encouraged to purchase a pasture based livestock farm; sell off the methane producing stock and gain the credits; plant it in carbon

sequestering pine or eucalyptus to gain more credits; and then market the biomass product as an energy source to displace fossil fuels!

Green Transport Fuel in Canada

A group of Canadian companies are to spend \$C 25 million to construct a demonstration plant to spur the commercialisation of ethanol from cellulose, for use as a transportation fuel. Iogen's technology ferments sugars from grass and feedstocks to produce cellulosic ethanol which, according to the US DoE, reduces greenhouse gas emissions by more than 90% over gasoline and can be pumped directly into existing vehicles. The demo plant will allow Petro-Canada and Iogen to construct the world's first commercial plant within two years, with the goal of reducing CO₂ emissions by more than 10 MT. Last year, Ford and Chrysler introduced vehicles that can run on 85% ethanol.

Another organisation, DynaMotive Technologies, has started producing a fossil fuel substitute, 'BioOil,' at a plant in Vancouver. The source is forest waste and agricultural by-products but the process is not stated. A key target market is Europe, where high fossil fuel taxes allow a niche.



Bird strike and wind turbines

Birds seem to be able to live with wind turbines, according to an article in Wind Directions (4/99). The major artificial risks are shooting and sports (16 / 100 000 birds), power cables (11 / 100 000) and motor vehicles (21 / 100 000). Wind turbines account for only 0.2 / 100 000. The presence of turbines does not seem to drive birds away: the article lists 6 species observed to nest within 40 m of a turbine, with one nest—an oystercatcher's—within 0.7 m. Monitoring of 35 nests found that only one clutch was lost: it was crushed by agricultural machinery.



Manukau's State of The Environment Report

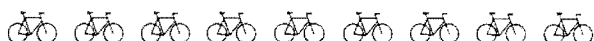
Manukau's first State of The Environment Report was officially launched on 8 April 1999. The report has received the Nancy Northcroft Planning Practice Award from the New Zealand Planning Institute.

The report is the result of a major effort by the Council with valuable assistance of many agencies. It presents a frank and comprehensive picture of Manukau's environment, covering a wide range of social, economic and natural resource issues.

The State of The Environment report is a 1999 snapshot of the Manukau environment and focuses on aspects of the City's environment: the people and the place; the built environment; water; air; the acoustic environment; land; biodiversity; waste and energy.

The document identifies a number of environmental issues of concern to the City. A strategy would soon be developed to monitor the significant aspects of the environment to help develop policy responses.

Mohammad Afzal
Manukau City Council



Fuel Cells

Electric Power Research Institute Journal

Originally developed for on-board power in spacecraft, electrochemical fuel cell generators are entering commercial use in terrestrial applications, thanks to government subsidies. As ongoing R&D and improved design bring down fuel cell costs, the technology's many advantages should lead to its widespread deployment in the years ahead, in both grid-connected and off-grid applications.

Fuel cells offer compact, modular packaging, high efficiency, fuel and siting flexibility, and pollution-free operation. They could become widely used as distributed premium-power sources at industrial sites and in manufacturing

plants, office buildings, institutional settings, and perhaps eventually homes. Electric power companies may deploy them at their own or customer sites to provide combined heat and power services. And there are efforts to develop practical vehicles with fuel cells instead of batteries for powering electric and hybrid motor drives. In many areas, fuel cells are expected to provide strong competition to commercial and industrial electricity rates at the point of end use.

As part of an integrated ecological design, for example, a major new skyscraper under construction at Times Square in New York City will include fuel cells for powering external lighting and serving some of the building's heating requirements. Advanced fuel cell technologies also are expected to find many off-grid applications as lightweight, compact, remote portable power generators.

Several electric power companies are already positioned in joint ventures with fuel cell developers to market the systems to customers that have special power quality and reliability requirements. Other energy service providers are planning to market fuel cells as part of premium-power offerings.

Because of their high efficiency in converting natural gas, methanol, hydrogen, and even gasoline into electricity, fuel cells offer the lowest carbon dioxide emissions of any fossil power system. Moreover, the hot exhaust of solid oxide fuel cells makes them ideally suited for combination with small gas turbines in a modular power plant package that could reach efficiencies of over 70%--the highest of any thermal power cycle.



Biomass on the Internet

The Internet provides a valuable source of information on biomass and allied topics. Addresses are being consolidated on the (Australian) Biomass Taskforce's web page: <http://www.users.bigpond.com/Steve.Schuck/ABT>

Energy tidbits

- Korea will privatise its power generation sector by 2002, putting 56 hydro and thermal power plants under affiliated companies.
- The government of India will conduct a life cycle analysis to identify where technology can optimise coal production.
- The 27.5 MW Miravalles III geothermal project is being built in Costa Rica to provide renewable electricity to the national utility. The \$70 million plant is the first geothermal site in Latin America to begin construction under a tax program. Commercial production should start in 2000, and a second 27.5 MW unit may be awarded to the same Oxbow/Marubeni consortium.
- Spain's electricity utility is reported to be about to build a \$18 million generating plant in Ciudad Real in southern Spain that will be fuelled by the mashed waste left-overs from olive oil manufacture.

100 000 PV roofs in Germany

Germany has begun a programme to promote the installation of photovoltaic equipment on 100 000 roofs throughout the country. The intention is to install a gross capacity of 300 MW within six years. It is thought to be the largest ever PV introduction scheme.

The scheme will provide the PV industry with a secure, long-term base for investment, substantially accelerating the industrialisation of PV; creating economies of scale; and acting as a substantial incentive to wider use. It also changes the emphasis from a subsidy based approach to a self-financing scheme tailored to customer's needs. Other renewable energy proposition schemes are expected to follow.

Renewable Energy World

Spanish renewable energy to be purchased by utilities

Spanish electricity companies are now obliged to buy all renewable electrical energy from sources within the country. Payment is to be at the average cost of production (0.036 Euro, NZ 7.1 c), plus a photovoltaic premium of 0.36 Euro for capacities of less than 5 kW capacity, and

0.18 Euro for capacities of up to 30 kW. In effect, this is an extension of existing law, covering wind, hydro and biomass energy production, to all sources. The law defines contractual conditions. The intention is to meet at least 12% of Spanish electrical demand from renewables by 2010.

Renewable Energy World

Reinventing the wheel

There are vast numbers of old water-wheel sites around the world, with many thousands in the UK alone. They are very acceptable aesthetically and ecologically, and have capacities generally in the 3 – 100 kW range. Traditional water wheels cannot use a head greater than the wheel diameter and frequently have a head of only 1.5 - 2.0 m, but head can often be increased without too much disruption, by either raising the inlet or lowering the outlet. Engineer Richard Hodkin installed a turbine at a site in the Cotswolds, using a crossflow turbine to generate 4 kW from a 1.5 m head. Over 10 years the system produced domestic power at about a fifth of the cost of a mains connection, but then Hodkin replaced the turbine with two Francis units generating up to 6 kW. With a water-water heat pump it is enough to give the equivalent of 7 kW of heat, plus 2 kW of electrical energy.

Renewable Energy World

Japanese businesses support a carbon tax

Reuters

Japanese firms favouring a tax on fossil fuels to curb environmentally damaging carbon dioxide emissions outnumber opponents of the idea for the first time.

'The poll indicates there is a growing perception among Japanese firms that voluntary corporate efforts alone cannot curb carbon dioxide emissions,' an agency official said. According to the survey, 42.7 % of listed firms said they either support or tend to favour the tax. A total of 31.8% of listed firms said they disapproved of the levy.

Among unlisted firms, 35.4% said they approved of the tax, while 34% said they disapproved. This year marks the first time both listed and unlisted firms have backed the tax since the agency began conducting the annual poll in 1991.

US disappointed at EU emission proposals

The United States expressed disappointment in a decision by the European Union to seek limits on carbon emissions trading under the Kyoto global climate treaty, saying the EU was rewriting prior agreements.

"Market mechanisms, such as emissions trading, are essential to dealing with the global problem of climate change in the most cost-effective and environmentally effective manner," said James Foley, deputy State Department spokesman.

Diplomats from the 15 EU states have finalised a proposal to limit so-called 'flexible mechanisms,' such as emissions trading, to ensure that countries meet most of their Kyoto commitments by cutting their own domestic emissions.

The EU action precedes a planned June round of climate change talks in Bonn. Foley said Washington would oppose the EU proposal, adding it was clearly stated that US participation in the Kyoto program depends on the flexibility of emissions trading, and other measures to lower the cost of meeting targeted cuts.

'The United States is taking vigorous domestic action to reduce greenhouse gas emissions and will continue to do so. But restricting trading simply limits one of the most effective tools in the world's arsenal for combating global warming,' Foley said.

Even though the United States has signed the treaty, the actual implementation of the plan must still be negotiated. Republican leaders have led a group of anti-Kyoto lawmakers in the Senate, blocking any White House hopes for gaining the deal's ratification in the near future.

Opponents say the Kyoto accord would harm the US economy, and let developing countries, like China and India, avoid making cuts. The White House believes that scientific data prove the earth is warming, and says something must be done to prevent a potential public health and environmental disaster. They also think emissions trading and other incentives must be in place to reduce costs to the economy and present new opportunities. Reuters

Canada has (nearly) stabilised greenhouse emissions

Canada's greenhouse gas emissions rose 1.5% in 1997, but the increase would have been close to zero were it not for past problems at Ontario Hydro's nuclear power stations. New data from the federal government shows a slowdown in emissions growth in 1997. 'It certainly is a kind of watershed. You have to stop going up before you can start going down,' said Natural Resources Minister Ralph Goodale.

'Were it not for the difficulty with Ontario Hydro and their lack of nuclear capacity that hit them in 1997, the line would have been flat.' Federal officials confirmed a 10 Mt increase in Canada's emissions in 1997, with 80% of the uptake tied to the Ontario situation.

Calgary Herald

The weather isn't changing, is it?

At least five people have been killed and thousands evacuated after heavy rain caused widespread flooding in southern Germany, Austria and Switzerland. Villages, farmland, roads and rail tracks throughout Bavaria and Baden-Wuerttemberg are under water and rescue workers have been erecting sandbagged embankments in an attempt to contain the rising Danube River. Several cities have been placed under alert. At Ingolstadt, the Danube has reached its highest level since 1845. BBC

Mexico's reservoirs and rivers are drying up, crops are wilting and cattle are dying by the thousands. Along the Texas border, some farmers have even resorted to watering their crops with raw sewage to keep them alive. Meteorologists say it could be the worst drought in Mexico's history. It is the second consecutive dry year across northern Mexico—and for some states the fifth consecutive drought. CNN

Heavy rains have caused rivers in Peru's Amazon jungle to flood, leaving four people dead and forcing thousands from their homes. About 7000 homes in the region were damaged by the waters and their residents have fled to higher ground. The Amazon was at its highest level in 17 years. CNN

Forest fires are raging in the Russian far east as temperatures rose to record levels at the start of the hottest dry season in years. Pine forests

covering more than 3000 ha are said to be being destroyed in four Siberian regions from Irkutsk to the shores of lake Baikal and further east to Khabarovsk near the Pacific coast. BBC

The Arctic Ocean has warmed 0.5° C in a decade. The loss of ice cover is only 5% but the ice has thinned by 20%. Ice cap loss increases warming because the sea reflects less light. ABC

BioFacts

- Bioenergy rules of thumb:
 - Energy content of typical biomass 18 MJ/kg
 - Gasification of 1 kg of biomass makes 3 m³ of gas
 - The energy of 1 kg of biomass can generate 5 kWh thermal or 1 kWh electric power (at 20 percent thermal efficiency).
- Biomass often has low bulk densities, providing an incentive for increasing the density by pelletising, briquetting or charcoaling. An indication of typical dry bulk densities is:

Hardwood sawdust and bark	227 kg/m ³
Mixed pine-hardwood sawdust	219 kg/m ³
Clean hardwood pulp chips	210 kg/m ³
Hardwood whole tree chips	211 kg/m ³
Pine whole tree chips	181 kg/m ³
Hardwood hogged trims	221 kg/m ³
Hardwood shavings	157 kg/m ³

- The Netherlands Energy Research Foundation (ECN) maintains a database containing most (bio)chemical and physical properties of many different biomass and waste streams. The database contains over 1100 records. ECN may be able to help biomass energy planners with information from the database. Contact Bram van der Drift on e-mail vanderdrift@ecn.nl or try biomass@ecn.nl.
- The Institute for Chemical Engineering, Fuel and Environmental Technology, University of Technology Vienna also maintain a database (called BIOBIB) which contains calorific values, and other information. The address of the database is:

<http://edv1.vt.tuwien.ac.at/biobib/>

Vital Signs 1999

Trends jumping off the charts

Worldwatch Institute

"This past year was an off-the-chart year. In 1998, the Earth's average temperature literally went off the top of the chart we have been using for years in Vital Signs," said Worldwatch President Lester Brown, co-author of Vital Signs 1999: The Environmental Trends That Are Shaping Our Future.

This record-high temperature, leading to more evaporation and rainfall and powering more destructive storms, may have helped push other indicators off the chart as well. For example, weather-related damage worldwide totalled US\$bn 92 in 1998, up 53% from the previous record of US\$bn 60 in 1996.

Record storms and floods drove at least 300 million people from their homes in 1998. Many lived in China's Yangtze River valley, in Bangladesh, and in eastern India. Smaller numbers, in the Caribbean and Central America, were affected by two of the most powerful hurricanes ever to have come out of the Atlantic: George and Mitch.

Was this a glimpse of the future? Are rising atmospheric levels of carbon dioxide from fossil fuel burning causing climate change to spiral out of control? Or was 1998 an aberration, something that may never be repeated? We cannot know for sure, but climate simulation models suggest that the events of 1998 could be a window on the future, a consequence of failing to rein in carbon emissions soon enough.

While the rise in 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 in seven years. Closely associated with the economic turmoil was a 4% drop in international trade in 1998, the first decline in 15 years.

Driven partly by concerns about climate change and partly by depletion of fossil fuel resources, the world energy economy is undergoing massive reconstruction, shifting from historically heavy reliance on oil and coal to renewable energy sources, such as wind turbines and solar cells. While wind use was expanding at 22% / yr from 1990 to 1998, and solar at 16% / yr, oil use was growing at less than 2%, and coal use was steady.

Glimpses of the new emerging energy economy can be seen in the solar cells rooftops of Japan and Germany and in the wind farms of Denmark, India, Spain, and the USA.

The foundation is being laid for the emergence of wind and solar cells as cornerstones of the new energy economy. The growth in world wind generating capacity from 7.6 TW (Terawatts: 1000 MW) in 1997 to 9.6 TW in 1998 was concentrated in a handful of countries. Germany led the way, adding 790 MW of capacity followed by Spain with 380 MW, Denmark with 308 MW, and the United States with 326 MW. Within the developing world, India is the unquestioned leader with more than 900 MW of capacity in operation.

In 1998, sales of solar cells jumped 21%. Growth is being fuelled by a new photovoltaic roofing material that generates electricity. In Japan nearly 7000 rooftop solar systems were installed in 1998. The new coalition government in Germany announced the goal of 100,000 solar roofs. In response Royal Dutch Shell and Pilkington Solar International are together building the world's largest solar cell manufacturing facility in Germany. Italy joined in with a goal of 10,000 solar rooftops.

On the food front, world grain prices in late 1998 were the lowest level in two decades, partly because of the economic downturn in several East Asian countries, but more fundamentally because of extensive over-pumping for irrigation in both China and India, with 1.25 and 1 billion people, respectively. In effect, both countries are expanding food production in the short run by depleting their aquifers, which means they will face sharp cutbacks in irrigation water supplies once the aquifers are depleted.

World beef production has stabilised in the 1990s, while the oceanic fish catch has been growing by scarcely 1% /yr. Most growth is now in the more grain-efficient sources of animal protein, namely poultry and the farmed fish. World poultry production is growing at over 5% / yr and has now overtaken beef, making it second only to pork.

Aqua cultural output, growing at nearly 12% / yr during the nineties, is emerging as a major new source of animal protein in the world food economy. Increasing from 7 million tons in 1984 to an estimated 27 million tons in 1998, it is the world's fastest growing source of animal protein. The 1998 production is just over half of world beef production, and could easily overtake beef production before 2015.

Over the last year, the numbers of phones and Internet connections increased dramatically, integrating more and more people into the global electronic network. Cellular phone sales were 60 million, higher than traditional phones for the first time. This growing linkage was facilitated by the launching of 140 satellites in 1998, most of them commercial communication satellites. Satellite launches, once dominated by government military satellites, have now been eclipsed by the launching of private communication satellites.

The number of lines linking host computers to the Internet increased to 43 million in 1998, up from 30 million the year before. This growth of 43% means that 147 million people worldwide now have access to the Internet. The United States accounted for half the world total. Japan was a distant second with 10 million users, followed by the United Kingdom and Germany with 8 million and 7 million, respectively. Some of the most explosive growth is coming in China, where the number of users doubled in 1998, reaching 1.6 million. One projection shows the number of Internet users in China exceeding the number of automobile owners by 2002. This raises the question of which contributes more to mobility: access to the Internet or ownership of an automobile? For someone interested in visiting the great museums of the world, the Internet obviously provides more mobility. And for someone wanting to shop, the Internet offers a wider range of goods than any shopping centre, however large, can possibly provide.

Cigarette production per person fell 2% in 1998, continuing a decade-long trend. The changing fortunes of the tobacco industry is evident in its landmark agreement in the United States to pay the state governments a total of US\$bn 251 over the next 25 years to compensate for the Medicare costs of treating smoking-related illnesses, or nearly US\$ 1000 per person.

Progress in reducing cigarette smoking, the source of an estimated 3 million deaths per year, was more than offset by the rise in HIV infections. New infections in 1998 totalled nearly 6 million and deaths from the virus totalled 2.5 million. The highest infection rates are in several countries in Africa where 18-25% of the adult population is HIV-positive. Without a dramatic advance in developing a low-cost treatment for the disease, countries like Botswana, Namibia, Swaziland, Zambia, and Zimbabwe will lose one fifth to one fourth of their adult populations within the next decade.

In 1998, world population increased by 78 million, roughly the equivalent of another Germany. In late 1998 UN demographers reduced the projected population for 2050 by some 500 million. Roughly two thirds of this decline was due to falling fertility, but unfortunately one third was due to rising mortality, largely the result of the HIV epidemic, especially in sub-Saharan Africa.

Another sign of deteriorating human health is a fall in sperm counts. Among men in the United States, average sperm counts have dropped from 120 million in 1940 to just under 50 million in 1998. Counts in the European countries indicate a similar decline. The principal explanation for this is the so-called endocrine disruption hypothesis, namely that chemicals in the environment act as 'environmental estrogens.' These imitators of this basic female hormone-found in plastics, pesticides, and industrial pollutants-may adversely affect male reproductive functioning, among other things.

Worldwatch is pleased to announce the publication of *Vital Signs 1999: The Environmental Trends That Are Shaping Our Future*, by Lester R. Brown, Michael Renner, and Brian Halweil. This book is the eighth volume in the series from the Worldwatch Institute that shows in graphic form the key trends that often escape the attention of the news media and world leaders, and that are often ignored by economic experts as they plan for the future.



Stalled on global warming

Charles O Moore
Journal of Commerce, USA

Although scientific evidence keeps accumulating that human activity is slowly heating the planet, a political solution to the problem lately seems to be taking its lumps in the United States from the left, right and middle.

Environmentalists have traded charges with the Clinton-Gore administration, while in the Senate opponents of the 1997 Kyoto treaty have backed legislation ostensibly created to attack the problem but actually aimed more at lining the pockets of a few fortunate businesses. Even some of those who express genuine concern about the issue seem to be damning the problem with faint remedial proposals.

Recently, in an extraordinary public admonishment, CEOs of several leading environmental organisations issued a public letter to Vice President Al Gore, sharply criticising him for breaking repeated promises to stem the pollution that causes global warming. In an equally unheard-of move, indicative of administration sensitivities, President Clinton stepped in on behalf of candidate Gore, personally authoring a defence of the vice president's record on the global warming issue.

But the White House remains unwilling to spend the political capital necessary to meaningfully address the big problem -- greenhouse gas emissions from automobiles, industry and electric utilities.

(The original article was long on US politics and has been heavily edited for EnergyWatch)



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