

31 March 2007

Members
CSIRO Sustainability Network**Feature thought:**

"The environmental system of the Earth would collapse if the attempt were made to supply all human beings alive today with a European style of living. To suggest that such an increase in living standards is possible for a world population twice the present size by the early part of the next century is preposterous."

Paul & Anne Ehrlich ca. 1980

Dear Networkers:

SUSTAINABILITY NETWORK UPDATE – No. 65E

The two main features in the last Update, by Walter Jehne on the biology of global warming and Chris Tipler on the need for a “war footing” to address climate change – seem to have struck a chord with many of our readers, including some high-profile activists in the sustainability field. While it is not our usual style to put feedback up front in the newsletter, this month’s feedback warrants an exception. Accordingly, we hear first from John Leake and Tim Flannery (2007 Australian of the year) [\[p 1\]](#), and then from acclaimed author, Dr Mary E. White, endorsing the views expressed in last month’s feature and stressing the critical importance of tropical forests in addressing global warming [\[p 4\]](#). These views are followed by two further short features on rampant deforestation in tropical Africa [\[p 6\]](#), and how the need for baseload power generation is really a myth [\[p 8\]](#).

In this issue, we also touch on further evidence of the grass-roots ‘getting the message’ [\[p10\]](#); the importance of ‘low-hanging fruit’ in dealing with global warming [\[p 11\]](#) – and some examples of such ‘fruit’ [\[p 12\]](#); a deeper ‘inconvenient truth’ that acts counter to our best efforts to harness collective will on climate change [\[p 13\]](#); how to create an unsustainable society [\[p 13\]](#); cutting emissions by ‘taking the pledge’ [\[p 14\]](#); a re-think needed for fire management [\[p 15\]](#); and further feedback on intermittency problems with renewable energy sources [\[p 16\]](#), and the biology of global warming [\[p 18\]](#).

Feedback: Support for a “war footing” approach to combating global warming

John Leake has spent over 30 years in Asia, Africa and Australia engaged in planning and managing rural development. This has evolved into an interest in experiential learning and in the social and biophysical processes leading to improved resource use and recycling in a world expecting to sustain 9 billion people. He has been instrumental in setting up several businesses in the agricultural sector, and has worked in some 39 countries for a wide range of national and multinational clients and the private sector. John’s international interests are now focused through the Institute for International Development (IID) – www.iid.org – an international NGO which operates in many areas of Asia with a development fund focused on education and improving communication through collaborative research and publishing.

His national interests are focused through Land Repair Australia – www.landrepairaustralia.com.au – which operates as an entrepreneur in land and water rehabilitation

Dr Tim Flannery, Australian of the year and one of Australia's most eminent writers and thinkers, needs little introduction. Two of his books in particular, *The Weather Makers*¹ and *The Future Eaters*², have been seminal in moving the thinking of a broad audience towards greater recognition of the problems of climate change and human patterns of unsustainable resource consumption. You can find a recent biography and summary of Tim's achievements and publications at: <http://www.theweathermakers.com/about/>.



In a nutshell: There is a possible 'war footing' response to global warming and related problems – as outlined by both Walter Jehne and Christopher Tipler in the last Sustainability Network newsletter (No. 64).³ Such a program would redirect and augment the development capital flows that are now being applied, not always successfully, towards single issues such as poverty alleviation, reforestation and biodiversity conservation, towards a more systemic change in the incentive mix faced by the people who live in degraded areas of the tropics to enable them to combat climate change. In principle, the potential exists for the industrial world to sequester a lot of the additional carbon it has accumulated in the atmosphere since 1800 into tropical soils and vegetation over a 50 year period, while also addressing poverty and the need for improved biodiversity conservation. As the reality of a world where carbon is priced appropriately sinks in, the organic technologies necessary for such a change in land use and agricultural practices will become the most financially attractive option for these people.

The two lead features in the last Sustainability Network newsletter (No 64) by Walter Jehne (*The biology of global warming and its profitable mitigation*) and Christopher Tipler (*The only 'just' war: What we must do to head off the ecological crisis*) struck a number of cords with us as we have just completed a paper⁴ on the potential to address many of the issues mentioned in these articles. Firstly, to comment on the articles: Walter Jehne makes the observation that it is already too late to mitigate global warming by reducing CO₂; he links this to his interesting discussion about the possible primary role of the hydrological and associated bio-chemical cycles in global warming. This conclusion can, however, be reached from many directions, and it was view of one of us (Tim Flannery) that only bio-sequestration in the tropics has the potential to strip enough CO₂ out of the atmosphere in time to avoid catastrophic climate change. This prompted the two of us to undertake an assessment of the potential for this to occur within a useful period. We found this bio-sequestration to be linked to cooling effects in two ways, by reducing atmospheric greenhouse gases it reduces warming, and through increased evapotranspiration from an increased leaf area it increases cooling; indeed according to a research paper by Gibbard *et al.*⁵ it is essential that this bio-sequestration be undertaken in the tropics if cooling is to be the outcome of increased forest growth. This is because the impact of increased forest growth in temperate areas will, in contrast, be short-term heating due to changed albedo effects from reduced snow cover.

¹ *The Weather Makers* (2005) Text Publishing, ISBN 1920885846.

² *The Future Eaters* (1994) Reed New Holland, ISBN 0802139434.

³ See Update 64 at www.bml.csiro.au/SNnewsletters.htm

⁴ *Rehabilitation of Tropical and Subtropical regions as a Means of Bio sequestration of Carbon*, Leake John E & Flannery, Tim © Leake J. E & Meganesian Enterprises February 2007.

⁵ *Climate Effects of Global Land Cover Change*, Gibbard et-al Geophysical Research Letters, Vol. 32 L23705, doi:10.29/2005GL024550,2005.

We agree with Walter Jehne that we need to re-establish the bio systems that sequester carbon in the soils and vegetation of the tropics and subtropics to give us time to change our energy generation systems; and we agree with Christopher Tippler that this needs to be addressed on a 'war footing' for timely success. There is another observation of Walter Jehne's with which we strongly agree, and that is the necessity to address these needs from a systems perspective. For example, a review of forestry projects quoted in our paper indicates that poor uptake of projects designed to conserve biodiversity has been caused by failure to sufficiently consider people in the system – specifically their needs to grow food and to enjoy secure rights to use the resources they are expected to invest in. One of the case studies we have quoted shows that ensuring community members see the activities as improving their livelihoods in these ways, including permitting sustainable logging, improved uptake from 17% to 71% while sequestering 85 mt of carbon over 30 years in a 228,000 ha forested river basin.

In the same vein we also concur with Christopher Tippler that it is highly desirable to address both species decline and bio-sequestration together. For example, mono-cropping of trees in the tropics will set up damaging trends in other directions, such as reducing biodiversity where monocultures replace forests, even degraded ones, and will increase social divisions as land is alienated from the local people to plantation investors.

Our work on the potential for bio-sequestration in the tropics has focussed on the potential to reverse the negative succession processes inherent in human cultivation and harvesting over the last 10,000 years or so, but instead of replacing lost nutrients with inorganic fertiliser (which leads to carbon depletion), to replace it with organic fertiliser, sustainable-harvest forests, and the inclusion of deep-rooted plant species in degraded tropical grasslands. The mostly subsistence farmers who live in these degraded tropical regions have shown themselves capable and willing to change their land use practices where logistics and markets enable the nutrients to be replaced in these ways. The difference in our model is that pre-payments for the carbon sequestered, along with other non-cash incentives, such as secure land-use rights, will induce these farmers to use organic, rather than inorganic nutrient supplements leading, as a significant number of case studies across tropical regions have already shown, to gradual increments in soil carbon of around 20-85 tonnes per ha over 12-30 years, and significantly more where some simple irrigation is possible. This task is not as hard as it would be in the west as most subsistence farmers still use organic fertilisation in their food gardens, particularly where they live away from roads, so the technology is still known and furthermore the cost may be lower than anywhere else as the incomes of these people will still be lower for some time to come and they are already in residence.

We believe that as the new carbon 'value chain' permeates natural resource use, the changed land-use practices necessary to efficiently sequester carbon in soils and land used by humans – essentially relying on more organic rather than inorganic nutrient replacement – will become more financially attractive. This is because the cost of inorganic fertiliser will rise to offset the carbon emission cost, while the sale of carbon sequestered by soil storage of organic fertiliser by-products below the root zone will eventually become possible as cost-effective methodologies to monitor this usage are developed. People interested in the potential for this change should look into Terra Preta soils and Bio Char via their friendly Google doorway to the Internet. Indeed such a change in Australia's old soils, where rainfall is mostly an 'accident', will have the additional benefit of greatly improving moisture holding and cation exchange capacity between these increasingly variable weather accidents.

We have pointed in our paper to the potential to redirect the significant international development funds that are now focussed, often separately on, e.g., poverty alleviation, agricultural development, power generation, and biodiversity conservation, towards a more systemic program, including addressing the institutional and other barriers to such programs. In

a 'war footing' approach to climate change, these separate objectives would be seen together, enabling more focus on public private partnerships, particularly at local levels, to allow activities to evolve to suit the human actors – as Christopher Tipler also suggests.

Our paper assesses the potential for a 'one shot' gain in carbon sequestration (and evapotranspiration improvements) over a 30-50 year 'war-footing' program of changing land use practices in; tropical degraded forests (74 Gigatonnes (gt) over 65% of 1.3 billion ha), mixed crop lands in forest areas (1.3 gt over 5% of the same area), subtropical grasslands, (77 gt over 70% of 2 billion ha), fire climax grasslands, (77 gt over 75% of 0.2 billion ha) and smaller contributions from other degraded systems such as mangroves, corals and salty and other low-quality degraded lands. The executive summary of our paper follows:

Bio-sequestration in the tropics is considered the best option to reduce atmospheric carbon dioxide (CO₂) in time to address major climate change due to fast growth cycles and large areas of degraded forest lands. Experience in temperate regions in Europe and the US between 1930 and 1960 shows that significant increases in carbon bio-sequestration can occur over relatively short periods through reforestation and natural regeneration. Bio-sequestration in the tropics is suggested to be a better option than temperate areas as the photosynthetic potential is much greater and recent climate modelling suggests that additional benefit will occur because of the greater cooling impact of tropical forests and grasslands due to higher evapotranspiration.

The estimates in the paper, based on up-scaling case studies reported in public domain literature, suggest that a net gain of 197 Gigatonnes (Gt) of carbon (729 Gt of CO₂) or an average of 3.94 Gt (14.58 Gt CO₂) per annum is possible in the tropics over a 50 year period as a "one shot" contribution to combating climate change. This compares favourably with the present net emission rate from all forests of about 1.1 Gt of carbon (4.07 Gt of CO₂) per annum. It approaches the additional carbon that has been released into the atmosphere by the action of humans since 1800; about 204 Gt.

It is suggested in the paper that this can be achieved by a 'war footing' approach to facilitating farmers reversing the processes of degradation that now result in emissions from many tropical ecosystems and that this would also improve livelihoods and produce other socioeconomic benefits sufficient to justify much of the cost.

It is also suggested that prepaying for part of the value of the carbon sequestered in the process with other non cash benefits such as more secure land use rights will be a sufficient 'catalyst' for the process of land use change required if farmers see the process as enhancing their livelihoods and are involved in planning and land selection in their areas. Based on the case studies quoted, the cost of this carbon has been less than \$2.00 per tonne in some degraded tropical forest areas. It is noted that much of this projected carbon bio-sequestration is not admitted under current Kyoto rules but other market systems exist, such as the Chicago Climate Exchange, that would admit it once the carbon is quantified. Modern satellite surveillance, backed by targeted ground-truthing, has the capacity to provide cost-effective accountability and security of the carbon investment. The provision of solar power and computers at village level is, however, required for this to be accepted by markets and suppliers alike. The potential requires more detailed study and the emergence of a middleman between these people and industry seeking to purchase climate stability.

Feedback: The Biology of Global Warming

Dr Mary E. White is a paleobotanist, a specialist in prehistoric plants and their environment. Since 1984, she has been a full-time writer and lecturer, presenting her interests in the prehistoric world and the evolution of the Australian continent and its biota for the enjoyment of everyone interested. She is best known for a series of meticulously researched and

compellingly illustrated books that include **The Greening of Gondwana** – the story of Australia’s plant heritage from the time of the super-continent Gondwana; **After the Greening** – an account of how Australia became the driest vegetated continent (winner of a Eureka Prize); companion volumes **Listen ... Our Land is Crying** and **Running Down: Water in a Changing Land** – on the Australian environment and how the geological history of the continent pre-determined many of the problems that European-style land and water use have caused. Her latest book, **Earth Alive! From Microbes to a Living Planet** looks at the Biosphere; bacterial origins for Life; symbiosis; the microbiology of soils; the significance of microscopic organisms in maintaining a living Earth and how Australian ecosystems function. Mary has collected many public awards for her books, but it is her more recent private conservation activities that distinguish her from other best-selling authors. In 2003 she moved from Sydney to Falls Forest Retreat at Johns River on the mid-north coast, a large property with wonderful forests, rainforest gullies, river cascades and an eco-business comprising townhouses and a conference centre. The forests on the Retreat have been covenanted and protected for all time and the property and business will have an increasingly educational role – enabling Mary to fulfill a lifetime’s ambition to conserve biodiversity and, at the same time, inspire others with an interest in, and love of, the natural world. You can contact Mary, read about her books, and find out more about Falls Forest Retreat at: www.fallsretreat.com.au and www.fallsretreat.com.au/Books.html.



In a nutshell: Walter Jehne’s article puts back into context the vital biological elements that have been missing so far from much of the scientific and public debate on global warming. This positive step towards an expanded “big-picture” understanding of the phenomenon, gives hope that we may indeed have a chance to mitigate the looming crisis before it is too late.

The article by Walter Jehne in the last Sustainability Network newsletter (No. 64)⁶ has lifted my spirits and given me hope. For so long I have been advocating a “big picture” approach to Australia’s environmental problems by having a geological-time perspective that enables one to see that the parameters for sustainability have been set by the continent itself. Now I see that the “biggest big picture” – that understands that the Biosphere is kept life-friendly by the interactions of all its components, animate and inanimate, microscopic and macroscopic – has been forgotten up to now in seeking to understand the complexities of climate-change.

My book *Earth Alive! From Microbes to a Living Planet*⁷ is all about the role of life in making and keeping Earth life-friendly. I found the concepts that opened up while I was researching the book were mind-blowing, and I marvelled at the journey and the product of 3.5 billion years of life’s continuum that had made the wonderful world that I live in. The work of the Sustainability Science Team (SST) – to show that damage to the feedback systems maintaining balance in global water cycles is resulting in global warming – has been the missing bit in everyone’s thinking. Life and water are inseparable and Earth is the one and lonely blue planet because it has water – so there is no more fundamental threat to its wellbeing than disruption of water cycles.

Now suddenly it seems so obvious that the ability of Mankind to function outside the laws of nature controlling other species has enabled such profound environmental change in “man time”, as opposed to geological time, that delicate dynamic balances have been upset. It

⁶ See Update 64 pp 1-8 at www.bml.csiro.au/SNnewsletters.htm

⁷ *Earth Alive! From Microbes to a Living Planet* by Mary White, Rosenberg Publishing, April 2003, ISBN 9781877058059

should come as no surprise that simply clearing natural forests – and also, surely, any deep-rooted vegetation – in the development of settled agricultural lifestyles (long before the industrial revolution) has had a profound effect on the delicate balances in Earth’s water cycles. (Interglacials are times of precarious balance and rapid reversals, and this one that we are living in has been benign when compared with what preceded it.) Considering the additional impacts of the Industrial Revolution, the present technological revolution, the escalating destruction of natural forests (particularly tropical forests) and natural vegetation on a vast global scale, and the population explosion that has occurred in this short time, it is no surprise that we now face catastrophic changes.

Analogies of the human population explosion and its environmental impact acting like a ‘virus’ in the living biosphere, and of natural forests and vegetation being the ‘lungs’ of the Living Planet are apt. Gaia is now a seriously fevered patient, sweating and dehydrated, with viral damage to all her organs. There is a limited window of opportunity for us to restore health before the damage is irreversible. What can we do? And here is the good news – plenty, and all beneficial. The response has to be global, so spreading the word and getting all the best communicators worldwide on side is vital.

In Australia: IMMEDIATELY:

- Stop the clearing of forests, old-growth and re-growth, and all remaining natural vegetation. Begin massive replanting of trees wherever possible; of deep-rooted vegetation in damaged and bare areas. (Much good work has already started with restoring trees to landscapes, and with saltbush, lucerne, etc.)
- Outlaw the use of fire. Stop the burning. Replace “control burning” with firebreaks. Introduce huge fines or gaol those who start bushfires or clear remnant vegetation. Stop “backburning” and fire bombing except as a last resort. Stop the “vandalism” that the Forestry Department (in my region and possibly others) calls “forest management” – wasteful, destructive and accompanied by unnecessary burning.
- Reduce our human population (as part of global population reduction) and reduce individual environmental footprints – control CO2 emissions, save water, etc.
- Everyone is empowered by knowing that it will be the sum of individual contributions that determine the outcome.

As things are going now, we are killing the planet. A virus that kills its only host will not survive for long. It is in our own interest to use our intelligence and change from parasite to symbiont.

Tropical deforestation – global catastrophe in motion

In the last Update, Walter Jehne, gave us the message that filling the atmosphere with CO2 while also cutting down forests is like turning up the heater in summer and at the same time wrecking the air conditioner. In this context, I was interested to come across a feature on the observed weakening of the African monsoon in the European research magazine RTD Info (No.



51, December 2006). Sub-Saharan drought may well be another frightening manifestation of this CO2-deforestation double whammy. Here’s an extract from the article entitled “Extreme Climatic Tensions”

In a nutshell: As the zone with the highest levels of solar radiation, the tropics constitute the thermal “motor” for the Earth’s climate.

Africa, which has the largest tropical continental zone, influences the entire atmospheric flow of the planet in this region. Now it appears the West African monsoon is weakening in parallel

with global warming, making climate change in this region literally a matter of life and death. Over the last century, the tropical rainforests of Africa have been decimated as growing populations of impoverished residents have cut forest to provide fuel and food – up to 95% of tropical forest cover has been removed in some regions. If deforestation is indeed removing a major planetary cooling mechanism, we had better heed this warning!

Starting on the largest scale, scientists wonder about the past and future influence of global climatic changes on the African monsoon. The shortage of rainfall in West Africa dates back to the 1970s, almost perfectly in tune with the recent marked increase in global temperatures.

The effects of demography

On a more local scale, one of the most important issues relates to the extent of human responsibility. Over a few decades, the impact of the rapidly expanding human population has clearly disrupted Africa (its vegetation, hydrology and atmosphere) to a point that is difficult to perceive unless we go into the remotest areas. “In the 1930s, West Africa must have had 8 million inhabitants,” estimates the hydrologist Thierry Lebel. “Today, there are at least 200 million.”

Invisible to the tourist, the revolution to which Africa is subject becomes tangible when scientists point out the effects. Traveling by car through kilometers of orchards, interspersed with banana and other fruit plantations, Christophe Peugeot, Operations Manager of AMMA⁸ in Benin, points to a small group of trees overlooking an expanse of arable land around 40 metres long like a fortress of vegetation. “We are talking about the remnants of a primary forest, no doubt preserved because it is sacred. This primary forest, just 20 years ago, occupied the whole of this area. There were just a few clearings exploited by man”

A thousand kilometers further north, in the heart of the Niger Sahel, the changes – just as radical – take completely different forms. Jean-Louis Rajot, Director of research at CNRS and a specialist in aerosols, comments on a landscape that has turned orange, arid and burning, where the few bushes are short of leaves. A Fulani family, a group of nomadic farmers, have put up some temporary huts. Further away, on the horizon, around twenty solid houses can barely be distinguished from the soil that provided the clay for the buildings. Nevertheless, we



can easily pick out the village in the mini oasis of large trees which, visible from afar, cover it in shade. They are the only trees for several dozen kilometers in every direction not to have been cut down.

Some distance away, surprisingly, a dense green grove stands out against the arid backdrop (above left). “This is a zone that the scientists placed under protection twelve years ago and to which neither man nor animal has access,” explains the researcher. “This abundance in a quasi-desert tells us a lot about the extent of the human impact.”



As far as rapidly growing populations in these regions are concerned, they are almost completely deprived of financial revenue. Wood is the sole source of energy, and is used for cooking and most craftsmen’s activities. Along the roads and tracks, piles of branches are for sale (right). Niger, one

⁸ The African Monsoon Multidisciplinary Analyses international programme – www.amma-eu.org

of the countries with the highest demographic growth in the world, currently has 95% cultivated or fallow land (periods of growing and leaving fallow alternate so that the soil can be restored), against just 5% at the start of the 20th Century.

The canker of deforestation

These disruptions can impact the climate, especially precipitation, in many ways. The destruction of forests, for example, even when they are replaced by cultivation, increases the soil albedo, in other words its capacity to reflect light rather than absorb it. As a result, a larger share of solar energy is sent back towards the atmosphere, and may then cause faults in usual meteorological processes such as the triggering of storms.

Deforestation reduces, moreover, the capacity of the soil to store water. Trees slow down the flow of water, both mechanically (water descending into soil along the roots) and chemically (the humus traps water). On land that has been stripped bare, water reaches the rivers more quickly, and is effectively lost to the vegetation. At the same time, deforestation also reduces the quantity of water retained by the soil after rain. The trees effectively operate as pumps. Their roots search for the precious liquid in the depths, bring it back to the surface through their vessels, before it evaporates into the atmosphere via the leaves. Cultivated land is clearly less capable of playing this role – its leafy surface is weaker and the surface roots capture much less water. Water vapour restored by vegetation can trigger rain by saturating air.

The need for ‘base-load’ power generation is a myth

The March / April issue of EcoGeneration, the magazine of the Australian Business Council for Sustainable Energy – www.ecogeneration.com.au - contains a useful plain-language opinion piece on “Dispelling the ‘baseload’ myth. The information is offered in the spirit of support for those who find themselves at a loss in the face of support for coal or nuclear power and dismissal of renewables “because the wind doesn’t blow all the time and the sun doesn’t shine at night”. The extract below is offered in the same spirit to help equalise this politically unequal debate.



Let’s get creative: Here’s one example.

Sydney’s ‘Solar Sailor’ flexibly harnesses two intermittent energy sources – solar and wind power – depending on weather conditions and time of day.

In a nutshell: The sun may not shine all the time and the wind may not blow all the time, but most of us don’t need electricity all the time either! ‘Baseload’ means big, inflexible coal-fired power that wastes a lot of electricity.

Even the word ‘baseload’ evokes something fundamental, basic, obvious and strong. Trouble is, the baseload argument is about as solid as a piece of Swiss cheese melting at a sun-fried barbecue. The argument that Australia needs ‘clean coal’ or nuclear for baseload electricity is incorrect on two fronts:

- Baseload power is an artificial engineering construct that is irrelevant in the context of the operation of Australia’s power grid (particularly the National Electricity Market).
- There are a number of clean energy technologies that can provide power in the middle of the night on a consistent and controllable basis.

Baseload power is an artificial engineering construct

Baseload means inflexible, large coal-fired power stations that deliver power 24 hours a day whether we need it or not, whether it is midday or three in the morning.

Australia has gone to considerable effort to induce power consumption overnight to take advantage of this inflexible coal generation. Such efforts include subsidising off-peak electric water heating (how bizarre: we heat water in the Hunter and La Trobe Valleys to create steam to make electricity – only to heat water again in people’s homes). Also, large energy-intensive smelters have been subsidised through long-term low-price power contracts.

The National Electricity Market (NEM) in eastern Australia stretches from Far North Queensland to the Eyre Peninsula in South Australia. The grid operates as a battery, where generation is injected and load taken across its length and breadth. A number of renewable generation facilities – hydro stations in the Snowy region and in Tasmania – have extensive water storages and operate when power is needed most during summer, driven by air-conditioning load.

For example, renewable power is injected into the grid in Far North Queensland from sugar cogeneration projects, and at the other end on Eyre Peninsula a number of wind farms inject power. These renewable projects offset the need to transfer coal-fired electricity vast distances to meet customers’ power needs.

The NEM treats all power equally and does not differentiate baseload from peak or intermediate load. Baseload is an artificial construct that has more to do the nature of the load rather than the generation. What customers need is electricity when they need it. Not many customers need lots of power in the middle of the night (although some do).

To effectively manage the grid will require a certain amount of dispatchable or controllable generation. This is the real issue. Electricity systems can accommodate a significant amount of variable generation (such as wind). South Australia will have 15 percent of its power coming from wind by the end of 2007 and the network and system operator expects 20 percent can easily be accommodated without much difficulty.

In the case of wind, wind is a freely available resource with no greenhouse emission and we have been harnessing it for years. The Western Australian Regional towns of Denham and Hopetoun have been using wind to provide up to 70 percent of the towns’ power needs, with the balance supplied by diesel generation.

There is no technical problem in harnessing the power of the wind when it is available, and then designing our fossil fuelled generation to pick up the balance. To date in the operation of the NEM we have operated the system the other way round – we have gone to great lengths to build a system to accommodate inflexible coal-fired generation – and then aim to fit cleaner variable technologies such as wind around them.

We do not need to keep doing this. We should be developing, building and operating our electricity networks to maximise the potential of clean renewable technologies.

Clean energy technologies can provide flexible, controlled power

Hydro and natural gas currently provide 7 percent and 14 percent respectively of Australia’s power needs on a controllable basis. These generators come on line when customer demand is at its highest, typically in the middle of the day. Solar produces power in the middle of the day – when we need it the most.

Hydro, gas, bioenergy and geothermal technologies can provide power on a 24-hour a day basis, although they do not need to because this is not the typical pattern of customer demand.

Wind can produce large amounts of power, as can fast-response gas and hydro, to deliver a reliable stream of cleaner electricity. Also, the wind is always blowing somewhere across the national electricity market – including at night.

Baseload means big, clunky, inflexible power that wastes a lot of electricity during the low-demand periods of the 24-hour cycle. This is not the generation we need. We need source of electricity that can be switched on at the peak times when demand is at its highest.

Nuclear or coal for baseload is a false choice. Australia has an abundance of clean energy technologies that can provide power when customers need it.

“Little Morsels” – Food for Thought

More evidence of the grass-roots getting the message

Greg Nichols, Seattle Mayor and founder of the US Mayors' Climate Protection Agreement, was ashamed of the way his nation was dragging its feet on greenhouse gas emissions and decided to do something about it. You can read his story in the BBC News “Green Room” series at <http://news.bbc.co.uk/2/hi/science/nature/6366349.stm>. Here are a few quotes to whet your appetite:

“I remember very well the day the Kyoto Protocol took effect in 141 countries around the world, but not mine. In Seattle that winter, the warnings about the distant threat of climate change became all too real. The mountain snowfall that we rely on for clean drinking water and hydroelectric power literally didn't fall. We faced an uncertain year of water supply. I was concerned for my city, and I was worried about the future. And I was mad that my nation's government was sitting on its hands.

In the United States, we view ourselves as a great nation; a principled people with a history of rising to the challenge of the most serious international threats. Yet there we were, responsible for 25% of the greenhouse gas emissions causing a global meltdown, but somehow incapable of doing anything about it. I was determined to show the world that intelligent life had not been snuffed out in America. So I asked nine fellow mayors to join with me in pledging to cut greenhouse gas emissions in our cities and meet the goals of the Kyoto Protocol. We also agreed to challenge other mayors from around the country to do the same; we called it the US Mayors' Climate Protection Agreement.

Our initial goal was to get a symbolic 141 cities to join. Today, I am proud to say that more than 400 mayors have signed our climate commitment. They represent 58 million people in cities from every state in the nation. They are Republicans, Democrats and Independents. They are leaders of some of our biggest cities and some of our smallest towns. And they are united in the knowledge that cities are the frontlines of the war on climate change, where the risks are most keenly felt and where the opportunities springing from the clean energy revolution will be seized.”

“The good news is that cities have long been the great incubators of ideas. That remains true today. In Seattle, we are already seeing a growing green economy create jobs and economic opportunities in fields such as energy, construction and transportation. Across the country, cities are trying new approaches to reducing emissions. They have focused on cleaner electricity production, reducing energy consumption in buildings and encouraging clean-burning cars and transportation. If an idea works well, it can be quickly adopted by other cities. If it fails, others can avoid the mistake.

We have had success in Seattle” ... [but] ... “if Seattle were doing this work alone, it would be a symbolic gesture. But the fact that 400 other cities are working together to reduce emissions means that we are making a real difference for the future of our planet. Last month, more than 100 mayors joined me in Washington DC to make our voices heard on the need for federal action. We asked Congress to take meaningful steps to protect the climate, and they have responded with a series of strong proposals.

Australia seems addicted to following America's lead – sometimes much against the will of the majority of citizens – but this is one time when it would not hurt one bit! To those of you working in local government, how about getting this concept into your mayoral office!

A timely reminder about low-hanging fruit

*This week I was lucky enough to take part in a panel discussion, a public “Stirring the Possum” forum⁹ with David Engwicht, author of the book *Mental Speed Bumps: The smarter way to tame traffic*, and cofounder of ‘Creative Communities International’. Not only is David an entertaining speaker, but he also brings to the sustainability discussion about twenty years experience in working with cities worldwide to develop alternative approaches to traffic problems through social change. David is passionate about creating child-friendly cities in which children walk to school. His pioneering work on programs, such as the Walking School Bus and Red Sneaker Week, have inspired many of today's leaders in the active-transportation field. His discovery that the speed of traffic on residential streets is largely governed by the degree to which residents have psychologically retreated from their street, led to successful experiments in neighbourhoods all over the world that showed how rebuilding the social life of the street dramatically reduces traffic speeds. During his panel presentation, David gave a timely reminder about the importance of “low-hanging fruit” when it comes to social and behavioural change to combat global warming. Here's my paraphrase:*



Look at all the possible actions as if they were fruits hanging on a large tree. If we go first for the fruit at the top of the tree, we easily become paralysed by the difficulty of the task. For example: Look at the way we have changed our behaviour on smoking. Could we have banned smoking in all public enclosures straight out? Of course not - imagine the outcry! So we didn't do it that way. First we banned it on domestic flights, then we tackled taxis, then we gradually we tackled the various stages in turn.

In the smoking scenario, domestic airline flights and taxis were the low-hanging fruits. That's where we have to start with global warming. If we agonise over how to get America and China to reduce their CO2 emissions, we are hung up looking at a fruit on top of the tree. Ignore it for now and get on with the changes we, as citizens, CAN make. If we change our behaviour, it will give our politicians the confidence they need to make the necessary tough decisions without fear of getting tossed out of office.

[But, in this context, also read and ponder the ‘morsel’ on page 13 on a “Deeper Inconvenient Truth”. It really is food for thought. E.G.H.]

At the same forum, David Engwicht also made an impression on Network member, Ryan Farquharson of CSIRO – Ryan.Farquharson@csiro.au – who transmitted the same message to the Waite Campus Bicycle Users Group (BUG - <http://www.waitebug.blogspot.com/>):

Last night I went to a “Stirring the Possum” session on how to create action on climate change. For me the most poignant messages came from David Engwicht, the guy who started the ‘reclaim the streets’ movement:

- To do the big things, you need to look at the little things
- Focus on the ‘low hanging fruit’ – i.e. the easy things that do make a difference



Climate change is a big problem, and it's easy to get caught up in the big picture and be stifled into doing nothing. To me there are many big problems - like lifestyle diseases, environmental quality,

⁹ “Stirring the Possum” is a series of lively public discussions on contemporary issues run by the South Australian Department for Environment and Heritage – www.environment.sa.gov.au.

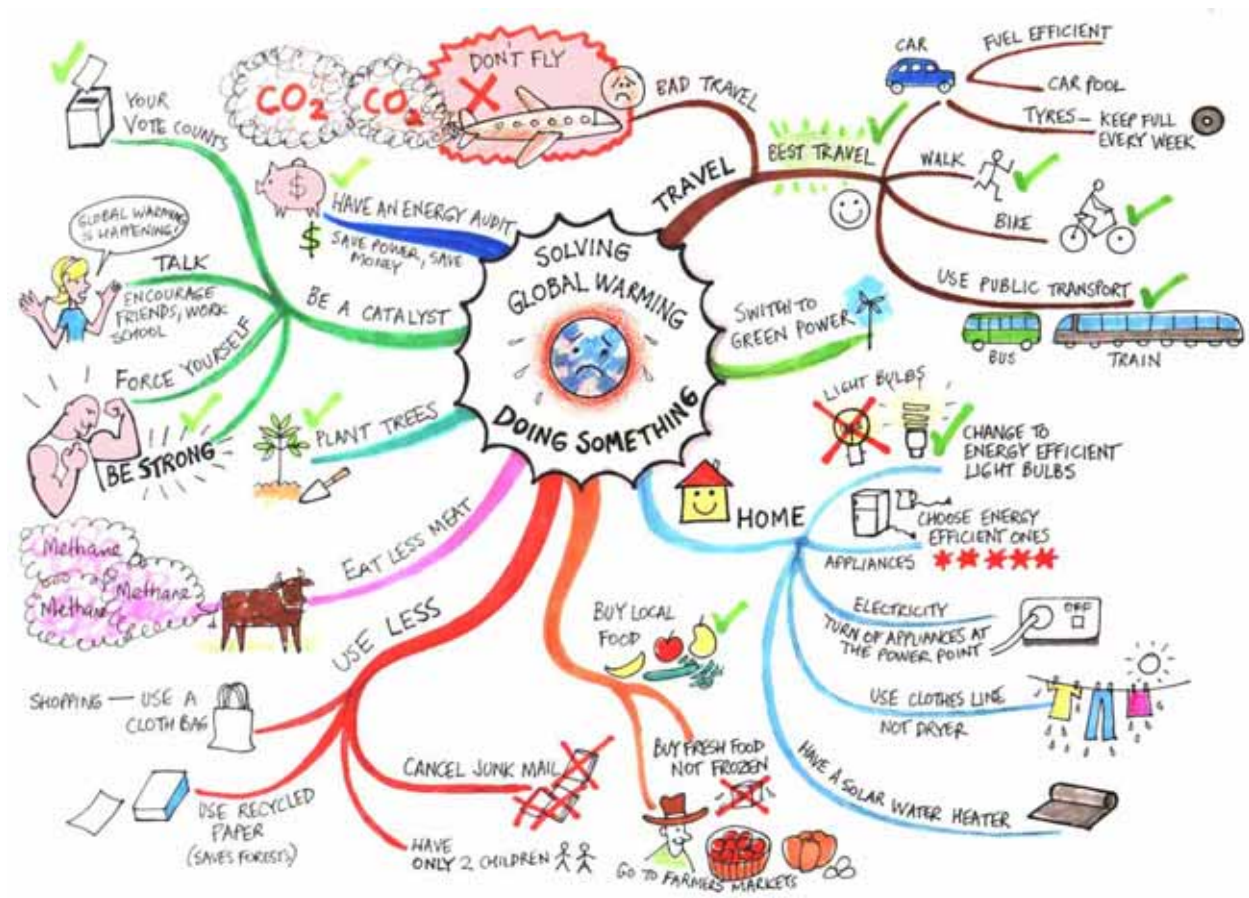
fragmentation of communities, peak oil, traffic congestion, and of course climate change. And all of these problems have a common factor – the motor vehicle.

I really do believe that riding a bike instead of driving a car is not only a low-hanging fruit, it is also the juiciest and sweetest fruit of all. I can't think of a single choice that offers so many benefits to the individual in terms of saving money and keeping you fit, engaging in your community and getting you where you need to go, when you need to go (I got from Waite Campus to the National Wine Centre in under 15 minutes while two guys who sat down behind me were exasperated about getting stuck in traffic) without negatively impacting on the environment and those around us.

So next time you are on your bike, remember to enjoy that fruit, because that's what will make others come to the party, and that's how the little things soon make a difference to the big things. Happy cycling!

So don't just stand there – there are lots of things you can do!

Waiting for action on global warming by politicians who are unsure of their voter base, or by industry leaders who are thoroughly invested in the status quo, is not going to generate solutions in time. It is up to us as individual citizens, to change our behaviour and then push, push, push policy makers into doing the right thing. So what can we do ourselves? Plenty – and teachers are just the people to get the ball rolling with a broad raising of awareness in the classrooms of the nation. There are many useful educational tools emerging for this purpose. Here's one from Network Member Sharon Genovese and www.learningfundamentals.com.au. If you have trouble accessing it, contact Sharon at: sharongenovese@yahoo.com.au.



A deeper “inconvenient” truth – and the opportunity it brings

Global philosopher Tom Atlee of the Co-Intelligence Institute – www.co-intelligence.org – is a believer in the generation of collective wisdom to address major social change. His mission is to find ways to facilitate human society “weaving more of ourselves, each other and life into our collective visions and solutions so we can evolve consciously together into a wiser civilisation.” Here he offers us clues to a deeper level of understanding and action that can potentially empower us to harness our collective people-power.

We have evolved to create problems that are much bigger than we can readily solve. Our next evolutionary leap will change that. The only way we will remain in the great drama of life is to make that leap.

In short, this is our predicament: We can co-create global warming much easier than we can co-create a stable climate. Not only that, we can co-create population explosions, chemical pollution, weapons of mass destruction, species extinction, and poverty just by living our ordinary lives – whereas solving these problems is a major challenge. Our social systems are so designed that when we each act intelligently on our own self-interest, we collectively move towards global destruction.

Once I realized that, I knew that solving each of these problems would not solve our propensity to create more problems. The Bigger Problem is deeper: To overcome our biological limitations as individuals, we have co-evolved collective systems and capacities – cultural, social, economic, political, scientific, media, educational, public relations, etc. But the flaw in all that is that we have designed them primarily for comfort, profit, power, control, and entertainment rather than for collective intelligence, sanity, and wisdom.

That is what needs to change. And that is what is missing from powerful wake-up calls like Al Gore's remarkable film AN INCONVENIENT TRUTH. They tell us that the change needed to deal with global warming is the political will generated by millions of individuals, a great "rising to the occasion".

But the change that is actually needed is in the collective systems that prevented us, as a society, from seeing clearly and responding to global warming in the first place. They are the same systems that prevent us from seeing clearly and responding to every other great problem, threat, and opportunity we face.

And there's more: It isn't just a matter of solving these problems or increasing our capacities. The changes that are demanded will transform us as a civilization, as a species. If we pass the test we have created for ourselves in the 21st Century, we will BE different, individually and collectively. We will have made the evolutionary leap required of us.

That evolutionary leap will be different in kind from every other evolutionary leap in the 13.7 billion year history of our universe: It will involve the ability of life to evolve CONSCIOUSLY – to intentionally and wisely redesign itself to serve not only its own survival but the well-being of the whole of life.

And that will be something new under the sun, something of ineffable beauty and grace, a collective dream worthy of our best efforts today, when we have the resources we need to take that remarkable step together, to make that unprecedented difference in ourselves and our world...

You can find more of Tom Atlee's thoughts and writings at: www.evolvingcollectiveintelligence.org, www.democracyinnovations.org, and www.taofdemocracy.com.

How to create an un-sustainable society

Professor Ian Lowe AO, President of the Australian Conservation Foundation, is one of Australia's most persuasive speakers on sustainability. This month I was lucky enough to hear him give a public lecture – “A Roadmap to Sustainability?” sponsored by Sustainable Population Australia (SPA) in

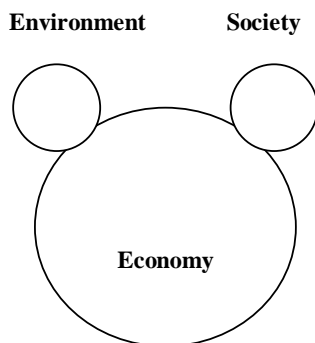


Adelaide. He began, confrontingly as usual, with a roadmap to un-sustainability – here paraphrased from my notes:

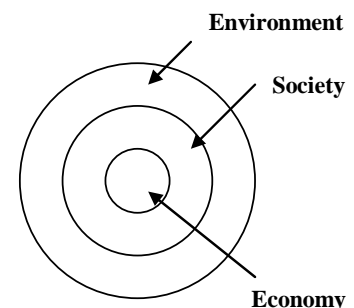
How to create an unsustainable future:

- Encourage exponential population growth – including baby bonuses and exhortations to have “one more for Australia”.
- Encourage growing consumption per person – with a big industry engaged in creating new perceptions of “need”.
- Once these two mechanisms are in place, celebrate them publicly at every turn with glowing statistical reports about “economic growth” in all available media.
- Deplete significant resources – e.g., oil and minerals – preferably avoiding public entanglements over environmental damage.
- Create a highly specific transport infrastructure totally dependent on a non-renewable resource that is running out.
- Over-use and over-allocate fisheries, forests, water, etc.
- Export any available raw materials and, having done that, publicly celebrate the resulting “global quarry” status – preferably while continuing to import manufactured goods without question.
- Widen inequality by embracing globalization to put corporate salaries up while pushing workers’ wages down.
- Run down public services and move from public to private provision so the rich have more choices.
- Embrace materialism as the modern “spirituality”.
- Disrupt the global climate system.

But, isn't this just what we would be seen to be doing by an inter-galactic visitor to Australia?



It's high time we gave up the “pig-headed” model (left) for a more realistic view of our place in the world (right). After all, markets only give us (some of) the things we want, whereas natural systems give us the things we really need. For any chance of sustainability we need to move from domination of Nature to ecological sensitivity; from consumerism to quality-of-life; and from individualism to human solidarity and shared humanity.



Cut your emissions by “taking the pledge”

First came greenhouse gas offsets – the commercial schemes that allow you to off-set your air travel, automobile or household emissions by contributing funds to plant trees to soak up your CO2. Do they work? To a very limited extent, yes, since they draw attention to the problem of emissions and symbolize our thinking about it. They are, however, a license to pollute – another version of “polluter pays” – and they are doing relatively little to discourage polluting behaviour. In effect, people fly anyway and buy off-sets if they are rich and green. Now a new concept has entered the arena that provides a way to help push change in the polluting behaviour itself – a formal personal pledge to limit the number of flights you make each year.

The single most effective decision you can take to reduce your impact on the climate is not to fly. In the absence of any leadership from government, we offer you the chance to pledge to limit the number of flights you take each year.

There are two pledges – gold and silver. If you sign the gold pledge, you promise to take no flights in the coming year, except in a personal or family emergency. If you sign the silver pledge, you promise not to take more than two return short-haul flights, or one return long-haul flight, in the coming year – again, except for an emergency.

You can check out this concept and “take the pledge” at the website of Flight Pledge Union, UK – www.flightpledge.org.uk. While the scheme is still voluntary, it just might help strengthen the resolve of individuals who intend to travel less but find themselves giving in (a) to the “emotional blackmail” of well meaning friends and family, or (b) to the temptation of going to distant professional conferences that might look good in their CV but for which the knowledge is actually available by other means.

Fire management needs a re-think!

Australia is a country in which increasingly large amounts of capital and resources are knowingly wasted by wilfully throwing them into fires at significant risk to human life and ecosystem integrity.

It sounds ludicrous, doesn't it – but this, in essence, is the situation we have today. As a community, we are well aware of the results of allowing residential and urban development to disperse further and further into peri-urban bushland. The question is what are we, as a community, going to do about it? This ‘morsel’ comes from the background materials to a CSIRO discussion held several years ago, around the time of the devastating Canberra bushfires, to determine what inputs science might be able to make to mitigating the impacts of bushfires. As far as I am aware the deep-seated policy and urban-planning issues flagged here have not yet been publicly recognized or addressed.

The Australian community needs to answer some tough questions, including:

- Is it acceptable for the whole community to be forced to pay (via raised insurance premiums and taxes) for losses incurred by individuals through their personal choice to live in patently fire-prone situations? Should some areas be declared “uninsurable” and “non-compensatable”?
- What limitations are we prepared to impose on public access and land-use (industrial as well as residential) in the interests of better fire control? Should some land uses be prevented in particular zones and circumstances? Should we continue to permit extensive urban-rural dispersion zones around cities and towns?
- Should we live in:
 - compact urban settlements with hard boundaries and managed buffer zones;
 - compact urban settlements with outlying compact “villages”, all with hard boundaries and managed buffer zones;
 - cities with dispersed boundaries, as at present, but with compulsory new building codes, retrospective compulsory vegetation management, and compulsory retro-fitting for existing, non-compliant dwellings in fire-prone situations?
- Should we accept fire as natural for our bushland environment and, if we choose to live in this environment, should we learn to live with its fires – e.g., in semi- or fully underground dwellings with naturally vegetated earth roofs and effective fire shutters so that fire can simply move across the landscape with a natural frequency and pattern?

Fire is an agent of biophysical and socioeconomic change. It changes the natural and managed environment, the spectrum of biodiversity, and the hydrological properties, soil characteristics, and related aspects of the ecological system. In socioeconomic terms, bushfire catastrophically affects the life, property, and economic activity of individuals, but all losses ultimately impact the wider community. Occurrence of catastrophic fire causes at least temporary modification of the dispersion of human settlement into the natural ecosystem, and can dramatically change the value of property as a result of ecosystem damage and heightened perception of risk.

Since much our Australian biodiversity is adapted to periodic fire – triggered naturally by lightning strikes and then more recently by “fire-stick farming” – attempting to prevent fire altogether may not be the best long-term strategy for the health and integrity of some Australian ecosystems. (While we cannot now remove humans from the Australian ecosystem, it would be interesting indeed to know what our vegetation would look like under a regime of lightning-strike fires alone!)

Outer suburban dispersion, a trend linked to our love affair with car-based personal mobility, has led to a more extensive urban-rural interface and associated biophysical and socioeconomic risks. Those who live in these dispersion zones would generally like to prevent fires from occurring altogether, but this is impossibly difficult as human habitation is associated with a variety of combustion-based activities (with attendant fire risk) and a proportion of resident individuals who find the lighting of fires psychologically irresistible. These risks are in addition to the continuing and ever-present risk of lightning strike.

Thus, if we continue to allow settlement to spread into seasonally dry bushland areas, then we must adapt better to the inevitable occurrence of fire and stop feeding the flames with our hard-won resources! Presently, we appear only to be working harder and harder for diminishing returns to improve fire-fighting skills and approaches. Furthermore, now that the restoration of deep-rooted vegetation is a recognized need in Australian landscapes, it makes little sense to clear more and more land around creeping suburban encroachments in the interests of fire protection.

Science has much to offer in improving knowledge of fire behaviour and weather patterns, designing effective fire buffer zones in a range of micro-environmental situations, and developing new building designs and materials. The first inputs, however, must come from public policy debate – to decide at the macro level whether we will attempt to separate our settlements from bushfire or learn to live with it more sensibly.

Purely for fun!

Everywhere we turn we are hearing about the seriousness of global warming and climate change. What that means is that we have to find answers – fast. What it doesn't mean is that we have to give up laughing altogether!

Thanks to one of our Network Members who retains a sense of mischief.



More Feedback

Wind power variability: A note

Energy, with its links to economy and society, never fails to produce robust discussion. Here Ted Trainer of the University of NSW – F.Trainer@unsw.edu.au - points out that intermittency of wind and solar power sources are indeed an issue – IF we insist on business as usual in our profligate energy consuming lifestyles. Read more at – www.arts.unsw.edu.au/tsw/

In Update 63,¹⁰ Mark Diesendorf made a number of points about wind power which I think are important and valid. However the impression given re the potential of wind to contribute to the solution to our energy and greenhouse problems was misleading.

¹⁰ See Update 63, pp 15-16, at: www.bml.csiro.au/SNnewsletters.htm

Most of Mark's comments referred to situations where wind contributes up to 20% of electricity demand. As he noted it might be able to contribute more than this to Australian demand, (although conclusions should not be based on places such as Denham WA which have unusually good winds.) The important question however is can wind and the other renewables meet virtually 100% of demand, and how big a problem would wind variability be if wind was to make a big contribution to this situation? (See also Diesendorf & Martin 1980¹¹)

Safe CO2 emission levels cannot be achieved without in effect almost totally eliminating carbon use. The often quoted 60% reduction is associated with a doubling of CO2 in the atmosphere, to 550 ppm, whereas a sensible target might be 400 - 450 ppm. Even then serious problems are likely. Such a level would require global emissions to go down to around 1 billion tonnes per year and if this was shared among all the people the world will soon have, it would provide each person with something like 3% of present Australian fossil fuel consumption. So our goal should be to get right off fossil fuels, and this makes the variability of renewables very problematic.

Mark gave the impression that the variability problem is essentially to do with meeting peak demand. "To maintain reliability...some additional peak-load plant...has to be installed. But ... this is rarely used..." In his article with Brian Martin¹¹ the variability problem is taken to be the limit wind can contribute without having to dump excess power. However, neither of these is the focal variability problem. The most important question confronting wind is how often might supply fall far below demand.

Davey and Coppin¹² carried out a valuable study of what the situation would be if an integrated wind system aggregated output from mills across 1,500 km of south east Australia. Coppin points out that this region has better wind resources than Europe in general. Linking mills in all parts of the region into one system would reduce variability of electricity supply considerably, but it would remain large. Calms would affect the whole area for days at a time. My interpretation of their Figure 3 is that the aggregated system would be generating at under 26% of capacity about 30% of the time, and for 20% of the time it would be under 20% of capacity. Clearly a very large wind system would have to be backed up by some other large and highly reliable supply system, and that system would be called on to do a lot.

Coppin emphasises that south east Australia is a much better wind power region than much of Europe. According to the reports of the E. On Netz wind generator providing almost half Germany's wind power, their system output never rises above 80% of system capacity. It actually averages around 5% for several months of the year. Thus the amounts of time for which their system's output would have fallen below various percentages of demand would have been considerably greater than those derived from Davey and Coppin's Australian study.

Clearly therefore supply in a system in which wind provided a large fraction of the electricity would have to fall back on some other source quite a lot. In my "Renewable Energy Cannot Sustain Consumer Society" (to be published later this year), I argue that, in a society with anything like our level of energy consumption, there is no possibility of renewable sources filling such gaps, and that the amount of coal that would have to be used would far exceed safe greenhouse targets.

It is therefore misleading for Mark to say that back up for wind capacity "...is rarely used." It is probably true for the situation he is discussing, i.e., where wind contributes c 20% of demand. Where the contribution of wind to an electricity supply system is low there might be no need to build additional coal or nuclear power plants to cover times when the winds are down, because the existing excess of coal generating capacity might be sufficient. But if wind is to make a big contribution, and especially if renewables are to provide almost all power, it will be necessary to build a lot of coal or nuclear capacity. E. On Netz stresses this. Even though wind provides only about 5% of Germany's power they say that to significantly increase the contribution could require also building coal or nuclear back up capacity equal to 80% of the new wind capacity. They also stress the need for expensive grid reinforcement to cope with the increased wind dependence.

¹¹ Diesendorf, M., and B., Martin, (1980), "Integration of wind power into Australian electricity grids without storage; A computer simulation," *Wind Engineering*, 4.4., 211 – 226

¹² Davy, R. and Coppin, P., (2003), *South East Australian Wind Power Study*, Wind Energy Research Unit, CSIRO, Canberra, Australia.

Hence the major problem with renewables: at low penetration they can fit into existing supply systems without difficulty, but as penetration increases we move towards the situation where we will have large PV, solar thermal and wind systems which are alternative, not additive. This means that there will be times when the wind system is doing little and the load will have to be taken by the others, there will be times when the solar systems are down, and there will be times when both wind and solar are down. So it might be necessary to have maybe four systems each of which is capable of meeting demand when the others are down, but three of them sit idle much of the time. Coal use would be reduced, but obviously system plant capital costs would be extremely high.

In other words the variability of renewable sources is indeed a huge problem, for the task ahead of us, which is moving entirely onto them. It has been my argument that we could and must do this, but it can't be done without dramatic reduction in the amount of producing and consuming going on and therefore it can't be done in a capitalist-consumer society. The magnitude of the unsustainability of this society is far too great to be remedied by changes within it. For instance, the Australian per-capita footprint is 10 times that which all people will be able to average. Sustainability is impossible unless we achieve huge and radical change to NEW SYSTEMS – away from an economy driven by market forces, profit and growth, and away from a cultural system that is about competition, individualism and greed.

I do not think we have the wit or the will to even face up to this situation, let alone make the necessary changes. Our chances of doing so are diminished by the tech-fix optimists, abundant in the renewable energy field, who reinforce the belief that, if we change from coal to renewables, and do a few non-threatening things like recycle, we can all go on living affluently in growth economies. It is of the utmost importance that we consider the possibility that this comforting assumption is a mistaken. My "Renewable Energy" argues that it is a delusion, yet it has been impossible to get governments, environmental agencies like the ACF, or the public in general to even think about it.

Feedback on albedo and the biology of global warming

As I said in the introduction, Walter Jehne's lead feature in the last Update struck a chord with many networkers. Here's another comment, this time from Network Member and retired chemical engineer Les Gore – lesgore@swiftdsl.com.au – who, in effect, also provides further support for the necessity of a "war-footing" approach if we are to implement a solution in time.

The leading article in Update 64 makes fascinating reading - it seems plausible. It hit a note with me, in that my Chemical Engineering professor lectured us 35 years ago about the much greater importance of water and cloud albedo than CO2 in global heat balances. His view was that the rising temperatures would lead to greater evaporation and albedo, i.e. a negative feedback mechanism. I think we know now that the global warming issue seems to be serious, if not potentially catastrophic, and that there are too many positive feedbacks at work.

While I do not know anything about the SST and their work, it would be interesting to elicit a response from the climate science princes, or Tim Flannery. After some massive previous failures of consensus (e.g., on plate tectonics and phlogiston, some people are suspicious of consensus, or at least on the causes of warming and the responses we should make.

If Walter Jerne is right, the mind boggles at the extent and speed with which we would need to plant more trees. Even stopping the destruction of the world's forests would be a monumental political and economic challenge. The root cause of our climate, energy and resource problems is population growth, and maybe global warming is about to fix that for us!

More feedback on the biology of global warming

There is just room for this extra little piece of feedback on Walter Jehne's feature in the last Update – this time from Network member Martin Drerup – mdrerup@bigpond.net.au:

A very impressive and relevant article in my view – I could not help but think about the "Easter Island syndrome"!

Other Information Resources and Links of Interest

ECOS, Australia's most authoritative magazine on sustainability in the environment, industry and community is published bi-monthly by CSIRO – in print and online. See: www.publish.csiro.au/ecos.

AGRICULTURE

Food, Water and Phosphate

www.atse.org.au/index.php?sectionid=948

I thoroughly recommend this well-written summary of how our modern waste treatment systems are depleting food production systems of phosphate and what we can do about it. Author John M Swan AO is a Fellow of the Academy of Technological Sciences and Engineering and an emeritus professor of Monash University with special interests in chemistry, biology, water, the marine sciences and a wide range of environmental issues. In this article he shows why the flow of phosphate from farm to city to waste disposal is not good news. After explaining how the insidious positive feedback pattern arose, he makes a good case for returning all suitably treated sewage materials to farmland, even at the considerable cost of ensuring biological safety. In addition, he discusses the need to move to waterless and local nutrient recycling in systems such as composting toilets and urban agriculture – a move that could potentially return 100% of dry nutrients to the land and make massive quantities of water available for other purposes. For those interested in this link between human food production and the environment, he recommends as further reading: A. Duncan Brown (2003) *Feed or Feedback: Agriculture, Population Dynamics and the State of the Planet*. 432 pp. International Books, Utrecht, The Netherlands; ISBN 905727048X [If you can't access John Swan's article via the web, I can mail a hardcopy (photocopy) if you send me a postal address: Elizabeth.Heij@csiro.au.]

BUSINESS EDUCATION

Teaching Business Sustainability Vol. 2 – Cases, simulations & experiential approaches

www.greenleaf-publishing.com/productdetail.kmod?productid=2483

Business sustainability depends on interdisciplinary thinking, non-traditional approaches, and working with different stakeholders – hence the need for new teaching approaches. Deep learning for sustainability needs ultimately to be experiential: that is, learning while doing rather than a passive absorption of facts and figures. While much of the underlying theory of sustainability may be taught using more traditional lecture and reading approaches, the implementation of true business sustainability requires students to experiment — to win and lose — while grappling with the myriad challenges and frustrations posed by sustainability. This book, **edited by Chris Galea**, provides a guide to this new training environment. [Published March 2007 by Greenleaf Publishing; ISBN 9781874719731]

ELECTRICITY GENERATION

Energy Supply Association of Australia: Energy and Emissions Study Stage 2 Report

www.esaa.com.au/images/stories//eestudy2introduction.pdf (11 pp; 79 kb)

The energy and emissions study was commissioned by the member businesses in the electricity supply sector to provide a balance of information from their perspective in the debate over emissions from energy supply and the economics of reducing them. Stage 1, completed in 2005, examined the likely electricity load growth to 2030 and the potential to meet this load with a existing and new generation facilities. Stage 2, completed in 2006, models what may constitute the least cost electricity generation fleet to meet projected load at 2030 for three potential greenhouse gas emission targets and three technology 'slates': (1) all contemporary and likely future technologies including Generation 3+ nuclear reactors and advanced fossil-fuel generators with carbon capture and storage; (2) as for 1 but without nuclear reactors; and (3) as for 1 but without nuclear and advanced fossil fuel generators with carbon capture and storage.

Coal Fired Power Stations: Thirst for water an equal argument for alternative generation 20 litres of water per day, per household, just to turn on the lights

www.climatechangecoalition.com.au/ (Click on the “News” tab at the top of the page and then on “Water” in the menu at top left.)

The link between dirty electricity generation and profligate use of water, is not commonly understood. These two articles make the link in the context of pushing for action on climate change. Large coal-fired power stations demand and get water in huge quantities no matter how dire the water-shortage situation in the catchments compelled to slake their insatiable thirst. The semi-humorous suggestion is made that light switches should be wired for sound – the sound of toilets flushing – to remind us of the huge quantities of water used in generating electricity.

Wave farms show energy potential

<http://news.bbc.co.uk/2/hi/technology/6410839.stm>

Wave energy has been slow to take off, but that's changing. Scottish engineers will soon deploy an offshore "wave farm" in Portugal, and have also signed a deal to build an even larger farm in Scottish waters. The system currently being deployed is known as the Pelamis system (the name of a type of sea snake). It consists of end-to-end linked massive steel tubes like rounded train cars. Wave working of the hinges between them is captured as hydraulic power and ultimately electricity. The article includes a diagram of how the system works.

ENVIRONMENT

State of the Environment (SoE) 2006 Report, Summary, and Future Directions

www.environment.gov.au/soe/2006

State of the Environment 2006 (SoE 2006) is the third independent national stocktake of the Australian environment. It covers the five-year period 2001 to 2006, and reports on all aspects of the environment. Of particular importance are the recommendations for future directions. Under “SoE 2006 report and summary” on the above page, click on “Australia State of the Environment 2006 AT A GLANCE”, then on “Suggestions for Future Directions”.

FUNDING FOR SUSTAINABILITY PROJECTS

The Australian Green Grants Guide 2007

www.molinostewart.com.au/

Molino Stewart publishes this resource to assist the community and industry in getting more environmental projects off the ground. With listings of hundreds of environmental and heritage grants from government and non-government sources, it is relevant to community groups, local councils, individuals and businesses. Projects that lower greenhouse gas emissions, conserve places of environmental and heritage value, or use water wisely are examples of those that have received funding.

GLOBAL WARMING & CLIMATE CHANGE

Participate: An Inconvenient Truth – Citizens campaign to end global warming

www.participate.net/aninconvenienttruth

Participate.net is a networking and blogging site based around films promoted by Participant Productions, a film company with a mission to make the world a better place. “We believe in the power of media to create social change, but the movie is just the beginning. Our goal is to deliver compelling entertainment that will raise awareness about important social issues, educate audiences and inspire them to take action – here at Participate.net. We are dedicated to creating a whole new kind of action flick, where positive social change is the true measure of success. Here at Participate, each film has its own social action campaign.” Al Gore’s film is just one of several films promoted for generation of discussion and community action. The site provides great classroom resources for teachers (registration necessary) and good opportunities for students to participate in discussion. It also offers access to a new DVD of An Inconvenient Truth encompassing additional information.

The Discovery of Rapid Climate Change

www.aip.org/pt/vol-56/iss-8/p30.html

Only within the past decade have researchers warmed to the possibility of abrupt shifts in Earth's historical climate. Traditionally, it had been assumed that climate change occurred only over tens of thousands of years. In the 1950s, a few scientists found evidence that some of the great climate shifts in the past had taken only a few thousand years. During the 1960s and 1970s, other lines of research made it plausible that the global climate could shift radically within a few hundred years. In the 1980s and

1990s, further studies reduced the scale to the span of a single century. Today, there is evidence that severe change can take less than a decade. In this readable journal article in *Physics Today* (August 2003), author Spencer Weart reviews the scientific history of this "paradigm shift."

Don't let truth stand in the way of a red-hot debunking of climate change

www.guardian.co.uk/commentisfree/story/0,,2032575,00.html [My browser seems unable to deal with double commas under some circumstances – so if you have trouble with this link, also try entering the URL by hand.]

In this Guardian article George Monbiot debunks the climate change debunkers as only Monbiot can! The criticism is levelled at a recent television documentary (Channel 4 UK) entitled "The Great Global Warming Swindle", and plentifully backed with references that can only embarrass the debunkers!

ECONOMIC GROWTH

China: The challenges of economic growth and environmental sustainability

www.greenleaf-publishing.com/productdetail.kmod?productid=2521

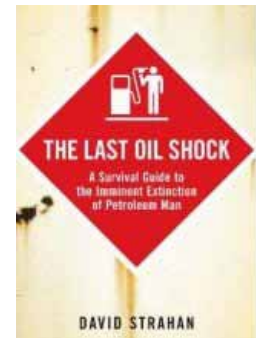
The People's Republic of China is in the process of growing from a staggering 1.3 billion to 2 billion inhabitants while its economy, estimated at \$1.9 trillion in 2004, continues to grow at 9-10% a year, as it has for the last 25 years. With a series of papers from international experts, this special issue (No. 50) of the journal *Greener Management International* (ISSN: 0966-9671) provides an overview of the interplay between China's enormous economic growth and its need for environmental sustainability.

OIL DECLINE

The Last Oil Shock: A survival guide to the imminent extinction of Petroleum Man

<http://books.global-investor.com/books/73427.htm?qinPtrCode=00000&identifier>

"If you think that running out of oil might be good for global warming," says author **David Strahan**, "think again!" It is mathematically impossible that peak oil will solve climate change. Although oil is the biggest single source of energy-related greenhouse gases, coal and gas combined are bigger still, and the expected growth in their emissions would overwhelm any reduction from oil. Many environmentalists seem to dismiss or ignore peak oil because they simply cannot see it as significant when compared to climate change. But this is to miss the point. Oil depletion is deadly serious in its own right, but it also has the capacity both to worsen emissions and destroy the wealth needed to fight global warming. For this reason - among others - it too has the power to destroy our civilisation. For an extended summary of the theme of this book, read the author's BBC News Green Room article at: <http://news.bbc.co.uk/2/hi/science/nature/6505127.stm>. [Published 2007 by John Murray; ISBN: 0719564239]



RECYCLING

Recycling Myths: Sorting the facts from the fiction

www.planetark.com.au/nrw/media/NRW_RecyclingMythsReport.pdf (1.4 MB)

The recycling industry of today is relatively mature, consolidated and experienced. The trial and error of early years, however, coupled with lack of education and various degrees of reluctance from households, government, and corporate Australia, has seen the misconceptions of recycling grow to mythic proportions. This report has been prepared to dispel widely held key myths about waste and recycling - misunderstandings that undermine the public's confidence in Australia's recycling systems, confuse those trying to do the right thing and slow our progress on the path towards sustainable resource use.

TRANSPORT

Fuel-less transportation

www.solarvehicles.org/

Fuel-less, solar-powered personal mobility vehicles are not going to replace the family car any time soon. They are, however, already capable of providing short-distance transport for one or two people for shopping and other local purposes. Exciting developments in this field will be stimulated by the invention of light-weight, flexible, transparent, dye-sensitised solar films, allowing the solar cells themselves to be used as both wind-screen and roof. Click on "pictures and videos" in the menu and watch the video of the "DSFC VEE (Dye Sensitised Film Cell Vehicle)". The sound track may be annoying but there is no doubt this little baby can move – for free – and is within the reach of many ordinary 'blokes' who have a

shed and a love of DIY tinkering. The Mark II and Mark III versions look even better in design terms. Definitely an idea to watch!

WATER

Water Efficiency Guide: Office and Public Buildings

www.environment.gov.au/settlements/publications/government/pubs/water-efficiency-guide.pdf

The first section of this publication gives an introduction to the technical and behavioural opportunities that exist in office and public buildings for reducing water consumption and increasing re-use. The second section presents National water intensity benchmarks for office buildings and public buildings as star ratings (1 to 5 stars) in terms of kL/m²/year for State capital cities and Canberra. Benchmarks were developed using an extensive national sample of such buildings. [ISBN 0642552878; 59 pp; 5.5 MB]

Aquifer recharge blueprint for groundwater zones

This case study of the Upper Namoi Valley in NSW, by Network member Ken Crawford of KLC Environmental – kencrawford@klcenviro.com.au, deals with the establishment of guidelines assessing the recharge rate of aquifers and establishing best practice for sustainable groundwater use. It summarises a presentation to a 2006 Murray Darling Basin groundwater workshop and was recently published in *Irrigation Australia*. If you would like an electronic copy, contact Ken, or you can contact me: Elizabeth.Heij@csiro.au

Water Recycling in Australia – information manual

www.lwa.gov.au/downloads/publications_pdf/PX061130.pdf (888 kb, 20 pp)

This handbook is a useful resource for those seeking more detailed information on recycled water use in Australia, particularly for agricultural and amenity purposes. Is the water safe for humans and crops? Does it contain the right nutrients? The aim is to address critical emerging environmental management issues, while generating long-term economic and social benefits that ensure irrigation has a viable future. *[If you have any problems with the download, ask me for an email copy: Elizabeth.Heij@csiro.au]*

Water Reform – National policy and information resources

www.dpmc.gov.au/water_reform/index.cfm

Access portal for Water Reform in the Department of the Prime Minister and Cabinet

River Murray System – Drought Update (No. 6) February 2007

www.mdbc.gov.au/ (Click on “Drought Update February 2007 [PDF 252 Kb]” at bottom of list on left.)

Gives recent rainfall and inflow data, summarises the current situation as of last month, and gives some forward outlook information plus preliminary contingency approaches.

Calls for information, input and participation

Climate scientists needed for public education task

Dear Networkers - You will by now be aware that the Intergovernmental Panel on Climate Change has released its latest report. The Zero carbon Network is looking for people with the expertise to place the implications of the report in context for policy here in Australia. We intend to run a series of newsletters on each of the 12 chapters. If you have the expertise to critically evaluate the science and place that science in the context of what is happening in Australia, then the network would welcome your participation in this exercise. If we get more than one taker for a chapter then we propose to develop a collegiate response. If you are able to participate, or would simply like more information about the Zero Carbon Network before deciding, then please contact Network Coordinator John Töns at: zerocarbonfuture@gmail.com.

Thank You – John Töns

The Next Great Transformation: Sustainable Enterprise – a conversation about the future Call for Ideas, Stories, Innovations and Papers

Please send ideas, stories, innovations and papers on sustainable enterprise for a conversation taking place at the Eden Project in Cornwall, England from 24-26 October 2007 organised by the Applied Research Centre in Human Security, the UN Global Compact, Boston College, and The Eden Project. Enterprise, innovation and creativity, like conversation, caring and sharing, are part of what it means to be human; and we now need to reward these human characteristics more than ever before if we are to make

the transition to a sustainable future on Earth. Two pressing issues need reconciling: the need for resourceful, innovative and creative communities that reward enterprise; and the imperative for all enterprise to be environmentally light-footed and socially responsible. A sustainable enterprise economy includes private, public, civil society and social enterprise. It is based on the benefits of collectivism and wealth creation, whether organised publicly or privately; and, in a sustainable enterprise economy, individuals, communities and investors must all gain from the fruits of their labours. Bringing together the principles of sustainable development, which include eco-efficiency and social justice, with the principle of allowing enterprise and innovation to blossom provides the best possible milieu for a wholly new model of capitalism to be born out of the current wasteful and inequitable model of wealth creation. We want to hear from sustainable enterprise pioneers, from interesting thinkers, from business, from government, from agencies, from NGOs, and from academics. This is an event where we hope to explore new models, new systems, new policies and new strategies for this century.

Please send Ideas, innovations, stories and abstracts for papers to malcolm.mcintosh@coventry.ac.uk with the subject heading: 'Conversation Idea'. Accepted ideas, innovations, stories and papers will be notified by the end of May 2007. If you would just like to pre-register to attend in person please send your details to pam.shoker@coventry.ac.uk with the subject heading: 'Conference October 2007'. Registration will open in July 2007. Proceedings will be webcast and published after the conference. The conference website will be launched soon.

The 2007 Banksia Environmental Awards

www.banksiafdn.com/index.php?page=131

Entries in all award categories close on at 5pm on 8th May 2007.

The 2007 Australian Museum Eureka Prizes

www.australianmuseum.net.au/eureka/

Many of the categories are directed at the environment and sustainability. Entries close on 4th May 2007.

Bouquet



Hearty congratulations to all the winners of the Victorian **savewater!** Awards. Read about some stunning water-saving achievements by industries, government, individuals, researchers, and educators at www.savewater.com.au or www.savewater.com.au/index.php?sectionid=675.

Reminders

Sustainable Development Update (SDU) – Issue 1, 2007, now online

www.albaeco.com/sdu

Contents include: Editorial – A new era for the environment; Why a coastal people in Madagascar starve rather than fish; Why quick fixes tend to be dirty; Return of water hyacinth plagues Lake Victoria, and Invasive species.

Courses in Sustainable Development

See our website at www.bml.csiro.au/sustnet.htm under “Useful Links & Resources”

Conferences, Workshops & Events

See our website at www.bml.csiro.au/sustnet.htm under “Useful Links & Resources”

And Finally – Notes and Reminders

Our web site at www.bml.csiro.au/sustnet.htm has CSIRO's “P@NOPTIC” search facility installed – and also features short content summaries for archived newsletters.

The *SustNet* website is maintained by Trudi Prideaux at CSIRO's Black Mountain Library – Comments and suggestions welcome. Contact Trudi at Trudi.Prideaux@csiro.au.

- To **SUBSCRIBE** to the Sustainability Network, visit www.bml.csiro.au/SNabout.htm or send me an email request: Elizabeth.Heij@csiro.au
- To find back issues of Sustainability Network newsletters directly, go to our web archive at: www.bml.csiro.au/SNnewsletters.htm
- **Pass it on!** The Sustainability Network is intended to be inclusive rather than exclusive. If you know someone who might be interested in this newsletter, by all means forward it to them or give them our web address.
- **Want to make contact with scientists?** If you can see an application for the science featured in these newsletters and need to contact the scientists involved, let me know by email.
- **Want to see a particular area of sustainability science featured?** If there is a particular area of sustainability-related science that you would like to see featured as a “spot” in a future newsletter, send me an email or call me by phone to discuss it.
- **Give me your feedback.** I am interested in your comments as to whether these newsletters are interesting, useful, and pitched at the right level for your particular purposes. Do you have suggestions? Thanks to all those who have already sent in comments and alerts.



Sincerely,

Elizabeth Heij

Network Facilitator

Network Milestone:
Our Sustainability Network
has over 13 hundred members.

Parting Shot

Using any more than our fair share of the Earth's resources is a crime against humanity.

IT IS STEALING FROM OUR CHILDREN!

