

CSIRO

SUSTAINABILITY NETWORK

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Feature thought :

“Usually when my son came home to visit, he would find that the amount of water in the house could only be enough for either cooking only or drinking only; so he had to decide whether he wanted to drink or to eat. Now that the water is near, when he comes home there is enough water to both cook and drink at the same time.”

Comments from a community member at the evaluation of a water project in Southern Sudan. In taking our own water supply for granted, what do we really understand of the value of water in the lives of others? ¹

Dear Networkers:

SUSTAINABILITY NETWORK UPDATE – No 23E

Air transport – Is it time for a re-think? Should we fly just because we can?

Last month I attended a particularly interesting meeting in Perth entitled “Western Australia Beyond Oil”, convened jointly by the Sustainable Transport Coalition (STC)² and the WA Branch of the Australian Institute of Agricultural Science and Technology. A group of excellent speakers discussed the ramifications for urban planning, road and rail transport, and agriculture of the inevitable rollover in oil pricing from the present buyers’ market to a sellers’ market as cheap, easily accessed supplies of oil decline. (A selection of material discussed at that meeting will appear in future Network Updates.)

To attend the meeting, I had to fly from Adelaide to Perth – a matter for twinges of conscience as I imagined all the clouds of CO₂ and pollutants pouring out the back of the plane’s engines. It seemed somehow incongruous to be using so much jet fuel going to a meeting on oil decline. It was also a backward step in my personal campaign for a smaller ecological footprint via diminished Frequent Flyer status. By concentrating on different ways of working (such as electronic networking and teleconferencing), I have been able to drop back through “Gold” status to “Silver”, and hopefully will eventually be able to achieve total insignificance. I imagine myself earning “nega-points” – much more environmentally friendly than the other sort. Of course, all the artificial hierarchical status is very seductive; but I am just not happy any more to have the environment pay for this game of one-upmanship.

¹ Thanks to Simon Buckley of AusAID for the Water Thematic Newsletter that provided this arresting thought.

² See web site at: www.multiline.com.au/~bta/advocacy/sustain.htm

Back to the meeting in Perth. Two areas of oil dependence not specifically examined at this particular event were air and sea transport – even though they are vitally important to WA as a relatively isolated region. Come to think of it, both sectors have been slow to appear on the sustainability radar screen, most notably air transport, which has by far the heavier environmental impact – and often social impacts as well. Somehow, air passenger transport has managed to maintain its glamour image, and air freight its cachet of urgent superiority, while both have avoided much of the environmental regulation applied to other sectors.

How much longer can we afford to keep our collective heads in the sand over air transport? There are some interesting signs this sector is indeed working its way into the sustainability debate. Here, Peter Fisher introduces a set of emerging reflections on planes, and we can expect the debate to expand in the future.³

Here come the planes: the effects of a relentless spiral in air traffic

Dr Peter Fisher, Network member and regular contributor, is an environment industry consultant who also teaches environmental management at Central Queensland University, Gladstone Campus. Peter specialises in water management, energy management, solid waste recycling, air pollution, cleaner products & services, and industrial ecology. Here Peter draws our attention to the fact that growth in traffic is expected to overwhelm improvements in technology and management. As air transport is already a significant contributor to air pollution and global warming, this trend will be unsustainable. A first version of this feature was published by the Australian Financial Review on 8th December 2000. Since that date, however, and despite the perturbations of terrorism, the sustainability issues posed by burgeoning air travel have only become more pressing.

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San Francisco mayor Willie Brown has been ridiculing the turboprop commuter planes that are forcing some awkward decisions on his office – he calls them “flitterbugs”. They account for just a tenth of the flights and one 50th of the passengers passing through San Francisco airport, yet they take up valuable runway space and control-tower time. If only he could get people on to bigger, less frequent planes, either by persuading the carriers to make the shift, or even requiring them to do so by US Federal Aviation Agency order. By such means the mayor could stave off an environmental disaster – expanding the international airport into the bay – and eliminate significant congestion delays.

Until, that is, growth in air traffic volume brings the problem back to the critical point again.



San Francisco's problem is all too familiar to managers of busy airports like Sydney's Kingsford Smith (globally, 34th in annual passenger volume). The statistics are awesome, with a certain mania to them: A record 14.5 million people flew into and out of Australia in the year to the end of May 1999. At the time this was the latest in a string of records for air travel. Airbus expects the world cargo fleet to double. The Southern California Association of Governments sees demand at LAX (Los Angeles International Airport) growing from 60 million passengers per year to 94 million passengers per year between 1997 and 2020 – a jump of 64%. Orange County demand would grow 379%, from 8 million to 29 million, and Ontario demand 243%, from 6 million to 15 million.

³ In this feature we are not considering the environmental impacts of military aircraft. That's one element in a more difficult, politically charged discussion of the triple-bottom-line impacts of war and armed conflict. Is war a smart way to use materials, resources, energy and human capital? Is it cost effective?

Until frequent flyer programs and fare discount wars, the passenger side of the industry tended to be the preserve of jetsetters and business travellers. The past twenty-five years, however, have seen air travel extend well down the income scale, expressed by robust growth in planes, tonnes of freight shifted, airport passenger volumes, and vehicular traffic. Global air traffic has grown 9% per annum since 1960. By 2015 the FAA (US Federal Aviation Authority) believes that a billion passengers will travel by air in the US alone, compared with 615 million in 1998. Europe expects air travel to double from 2000 to 2010. These developments are commonly seen as wondrous – a true harbinger of vitality. Yet compared with that other quintessential 21st-century industry, information technology, aviation is unforgiving in terms of energy, pollution and noise.

Recently, the US Environmental Protection Agency added electricity utilities, coal & metal mining, chemical wholesalers, petroleum bulk plants & terminals, and solvent recovery & hazardous waste facilities to the list of places for which operators must lodge emissions data. Airports have escaped this requirement, but for how long? Apart from their CO₂ emissions, arriving and departing planes generate a witch's brew of nitrogen oxides, hydrocarbons, sulphur dioxide, naphthalene, known carcinogens benzene and formaldehyde, and dust.

In the catalogue of aviation sins, the cargo sector is by far the worst offender – often involving planes pensioned off from passenger work. Some can be up to 40 years old. Toiling in the night skies of Europe and America, these veterans are fitted with “hush kits” made by American companies, which cut their noise to legal limits. But they remain rowdier than contemporary aircraft (whose noise levels are 10 decibels quieter than their 1969 counterparts), and heavier loading sees them on full throttle for longer, straining to gain a respectable altitude. People living near busy airports, especially in Europe, are being driven bonkers in the name of flourishing world trade. Outside Roissy-Charles de Gaulle airport in Paris, residents from surrounding districts have felt driven to block access highways, demanding an overnight pause in planes.

Guidelines for Community Noise, issued by the World Health Organisation in 1999, state that excessive or persistent noise “interferes with communication, induces sleep disturbance effects, cardiovascular and psycho/physiological effects, performance reduction effects, annoyance responses, and [affects] social behaviour”. The Guidelines urge that “night-time aircraft movements should be discouraged where they impact residential communities”. This nocturnal derangement catalysed the “Green Skies” campaign, co-ordinated by the Aviation Environment Federation. Green Skies, which comprises 25 environment and citizen groups from more than 20 countries, launched its Save-Our-Sleep initiative around three years ago, and has been progressing the issue through the European Court in Strasbourg.

Freighters are often dirtier, too. A 1999 report by the Intergovernmental Panel on Climate Change concluded that aircraft were already responsible for 3.5 % of global climate change through CO₂ emissions and this could rise fourfold by 2050, with the cargo sector making a disproportionate contribution. Furthermore, the report had actually factored in big improvements in aircraft design, fuel efficiency and traffic management. The panel developed a reference scenario, which assumed that fuel efficiency would improve by 40-50% by 2050 while progress in aircraft management would reduce fuel burn by another 8-18%. Nonetheless, the sheer growth in air traffic (estimated at about 2-4% per year) is expected to swamp these gains, with CO₂ emissions rising to 4% of the industrial total, ozone concentrations increasing 13%, condensation trail cover to 0.5% and cirrus formation by 400%.

In the meantime, airport planners are trying to meet traffic growth by adding runways and using a range of technologies and management systems – or they're seeking supplementary venues. In the US, in 2000, President Bill Clinton signed into law the Airports Expansion Act, which provided for \$US40 billion to be made available for improvements including extension of runways at 2,000 existing metropolitan airports, and the building of new ones. Minneapolis-St Paul airport, for example, has opted for a new, angled runway, to separate landings from take-offs, adding more capacity.

Closer to home, Minneapolis is being joined by Sydney, and possibly Brisbane. The Precision Radar Monitor system, developed for Kingsford Smith's dual runways, is an integral part of this tweaking of paraphernalia. It allows more planes to be landed because simultaneous parallel approaches in inclement weather are now possible. Another device on its way in is called Automatic Dependent Surveillance-Broadcast which, linked to the satellite-based Global Positioning System (ADS-B/GPS), allows curved glide paths and enables planes to fly closer together and on more direct routes. Under its "free flight" concept, pilots are given more discretion to select paths within predetermined areas, and have a greater ability to maintain minimum separation rather than needing to pad it out. (The US FAA, however, has proposed delaying by 15 years the complete replacement of ground-situated navigation systems by ADS-B/GPS.)

Airports are archetypal LULUs (locally unwanted land uses), along with hazardous waste facilities, nuclear waste repositories, power plants, prisons and road tunnels (aka their ventilation stacks). While there may be a societal need for new airports, no-one wants them in their locality.



Thanks to **Dave Lawrance** of Dave Lawrance Photography, UK, for use of this great photograph of aircraft **vapour trails** over the Yorkshire Moors. You can find this and other landscape shots on Dave's website at: www.first-contact.demon.co.uk

At Mascot, sandwiched between urban development and the sea, aircraft movements and neighbourhood noise exposure are approaching European levels. Flight paths remain a bone of contention while a new airport development at Badgerys Creek is still on hold. CSIRO research has pointed to a need for new regulations to deal with the growing noise epidemic.

Sydney's circumstance contrasts with Europe where the EC requires large towns and cities to develop "noise maps" identifying problem areas, and prepare action plans. But mitigation can be costly: Chicago has spent over \$US78 million on a school-soundproofing program, the world's largest, for 37 schools near O'Hare airport. (A Cornell University study has shown that children exposed to airport noise in classrooms are slower to acquire language skills.)

A number of large airport terminals have been reconfigured to feature a "lifestyle cluster" of shops, hotels, cinemas, and mini-golf courses. This presents an opportunity to defray high development costs. Heathrow is a showcase, with 40 shops anchored by Harrods. Los Angeles is more novel, with a porn movie theatre and mini-golf. So apart from the growing local

surface traffic of travellers and freight, there is an additional growing contribution from sightseer-shoppers.

The aviation industry's greenhouse emissions are growing faster than in any other sector. Other sectors are busying themselves with ways to turnaround their emissions, so why not airlines and airport operators? At least, that's the view of those concerned with climate change, notably the Intergovernmental Panel on Climate Change (IPCC) and public-interest coalitions like the Aviation Environment Federation.

The International Civil Aviation Organisation has been debating a jet fuel tax – an instrument designed to encourage use of more fuel-efficient aircraft. At the moment, however, taxes on aviation fuel are still illegal under the Chicago convention that regulates international civil aviation. Accordingly, with oil still a cheap commodity, there's not a lot of incentive to reduce fuel burn. Britain's Institute for Public Policy Research has suggested that an emissions trading scheme be introduced within the sector with a cap on CO₂ and equal splitting of emissions between departure and arrival countries. However, this still leaves out the issues of water vapour and nitrogen oxides.

In an earlier move to defuse the issue, the British industry proposed a voluntary agreement that offered a lowering of the UK government's air passenger duty (up to 80%) for the use of more fuel-efficient planes. Moreover, it wanted the government to provide enhanced capital allowances for fleet revamps. The British plan also suggested a levy paid for out of the air passenger duty could be used to invest in carbon offsets. Additional savings would come from better management systems at airports, and aerospace manufacturers would look harder at emission reduction.

But there are also more immediate possibilities. The Danish Environmental Organisation has suggested cutting the number of aircraft queuing for take-off. An American study has estimated that taxiing planes on two engines instead of four would cut ground-level hydrocarbon emissions by 80% and carbon monoxide by 70%. It also suggested towing planes to and from terminals.

Australia's main airlines have signed up to the Greenhouse Challenge. As some 97% of energy usage is in aircraft fuel burn, there has been some attempt to reduce this by adjusting take-off angles and routes, but so far most of the effort has centred on terminals and workshops. Before its demise, Ansett, in partnership with Landcare, had moved to offer frequent flyers the chance to buy trees for carbon sequestration, in effect, asking loyal customers to share emission offsets. (With the short-term fate of carbon sequestered by afforestation still controversial, however, would directing such funds to trusts for the purchase of threatened bushland perhaps be a better way to go?)

There is no escaping the fact that the sheer volume of global traffic will in time erode any fuel and emission savings achieved by a jet tax or similar measures. Without new airports under separate airspace at major hubs, physical constraints will encroach on existing airports to a point where fiddling with capacity enhancement will hardly be worth the trouble. Some believe the answer lies in fewer, bigger planes like the Airbus A3XX-100 a 540- to 960-seat double-deck super jumbo that will fit within the 80m per-plane square required by airport infrastructure. But precisely the same thing was said of the original jumbo and look what happened.

The problem is inevitably leading to passenger/aircraft “family planning”. The electricity and especially the water industries have accepted the need for demand management in recent years, so why not the aviation industry? Imagine the equivalent of water conservation ads: “Do you really have to make that extra trip?” “Can you holiday locally this year?” “Take the train instead.”

Sooner or later, the aviation industry will have to commit to bringing ecologically sustainable development into its core business operations – a transition already begun by some of its fuel suppliers, notably BP and Shell. Technical innovation can accomplish a good deal, but it won't carry the day on its own.

Perhaps the passenger side of the aviation business should recast itself as a transportation/communication provider? It could invest in and promote high-speed rail for short-haul travel. Virgin airlines and some overseas terminal operators already have such investments. More profoundly, the industry could team-up with telcos to provide a hybrid product – virtual travel – offering high-quality (even holographic) image links in lieu of travel for commerce or even virtual tourism experiences. It may sound crazy now, but if the skies are eventually overwhelmed, it could look pretty astute!

The Environmental Effects of Civil Aircraft in Flight

www.rcep.org.uk/avreport.html

The Royal Commission on Environmental Pollution (RCEP) is an independent body, appointed by the Queen and funded by the UK government, which publishes in-depth reports on what it identifies as the crucial environmental issues facing the UK and the world. On 29 November 2002, The RCEP presented to Parliament and the public its Special Report on “The Environmental Effects of Civil Aircraft in Flight”, essentially damning the Government’s aviation growth policies while drawing attention to the sector’s major environmental impacts. The web site gives free access to the report in PDF format, either as a single file (48 pp, 665Kb) or in smaller sections. Here’s how the British press received the Report::

Aviation's climate impact soars as RCEP slams airport growth plans

The global warming impact of aircraft using UK airports is set to rise at a staggering rate - and by 2030 could be equivalent to more than 40% of the UK's current CO₂ emissions. The Government has shown little sign that it recognises the scale of the threat to the UK's future greenhouse gas targets, and the Department for Transport (DfT) appears hell-bent on a "predict and provide" approach to airport capacity. The Royal Commission on Environmental Pollution (RCEP) has now waded into the debate, with calls for a Europe-wide emissions charge and a halt to the Government's plans to expand airport capacity.

The Government's efforts to produce a White Paper on aviation are starting to run into serious trouble. Originally promised for 2002, the document has now been put back until autumn 2003 at the earliest. The delay stems from a legal challenge, brought by councils in Kent, opposing a proposed new airport on their patch. The case illustrates how local concerns about noise, habitats and air pollution have dominated the aviation debate - with many bodies relaxed about airport expansion provided it is in someone else's back yard.

Limits to growth?

However, in late November the Government's two leading environmental advisory bodies dropped a bombshell into the debate by challenging the entire case for airport expansion. The Sustainable Development Commission called for a “total rethink” of the Government's "deeply flawed" approach, which was "stuck in the old mindset of 'predict and provide'." It concluded that the DfT's consultation "falls seriously short" on all six fundamental principles of sustainable development. An even more damning assessment was offered by the RCEP, which concluded that "if no limiting action is taken, the rapid growth in air transport will proceed in fundamental contradiction to the Government's stated goal of sustainable development."

Over the years, the RCEP has issued several warnings about the environmental implications of aviation growth. Its latest broadside stems from its first full assessment of the effect of aviation on atmospheric ozone and, particularly, climate change. The RCEP warns that "air travel will become one of the major sources of anthropogenic climate change by 2050". Chairman Sir Tom Blundell said: "The Government shows little sign of having recognised that action to reduce the impacts of air transport is just as important as action in other sectors contributing to climate change."

Firming up on the science

Aircraft emissions play a complex, and still uncertain, role in global warming. Subsonic aircraft, which fly mainly in the troposphere, have a warming effect through emissions of CO₂, water vapour and condensation trails. Emissions of nitrogen oxides lead to both a warming effect, through formation of ozone, and a cooling effect, through reductions in atmospheric concentrations of methane. In 1999, the Intergovernmental Panel on Climate Change (IPCC) concluded that global emissions from aviation are currently responsible for 3.5% of total "radiative forcing". It warned that the forcing effect from aircraft was likely to increase four-fold by 2050. The RCEP reviewed more recent research - some of it conflicting - in concluding that the IPCC's estimates remain broadly valid. It believes that the total warming effect of aviation is probably some three times that due to the CO₂ emissions alone.

However, the effect may be even greater. The RCEP reports "an increasing indication" that cirrus clouds formed as a result of aircraft emissions may be a significant contributor to warming, with a radiative forcing up to twice that of CO₂. One important piece of evidence was the increased difference between day and night temperatures over the USA in the days after 11 September 2001, when all commercial aircraft were grounded.

Two years ago, the RCEP issued a major report on energy which concluded that the international community should aim to stabilise CO₂ concentrations at twice the pre-industrial level by 2050. Under this scenario, it says, aviation is on course to contribute 6-10% of all man-made warming by 2050. The proportion would be much higher if significant fleets of supersonic aircraft - which have ten times the global warming effect of subsonic planes - are developed. Moreover, aviation's emissions will still be rising even though global emissions will need to be on a steep downward trend by that date.

If anything, the RCEP is guilty of understating the importance of aviation emissions for the UK. The DfT's own forecasts suggest that by 2030, aircraft fuelled at UK airports could have a global warming impact equivalent to a staggering 200-230 million tonnes of CO₂. This is equivalent to 40% of current CO₂ emissions from all domestic sources.

There is growing pressure for emissions from international flights to be brought within national targets under the Kyoto Protocol. Bringing them into the UK's inventory would undermine hugely the Government's drive towards a low carbon economy. It would also cast a different light on the DfT's argument that the UK needs to develop airport capacity to avoid losing business to other European airports.

Little hope of a technical fix

The aviation industry has been keen to push technological advances as a potential solution. In early 2002, the Society of British Aerospace Companies and other aviation groups produced a study entitled *Greener by design*. This claimed that changes to aircraft shape and low-NO_x engines could deliver a ten-fold reduction in the greenhouse impact of long-range aircraft. In November, the Advisory Council for Aeronautics Research in Europe, an advisory body sponsored by the European Commission, set out plans for a €100 billion, 20-year research

programme. Its targets included an 80% improvement in fuel efficiency and an 80% reduction in NO_x emissions by 2020. The RCEP, however, is sceptical of the claims made under these initiatives. It notes that the IPCC's projections already assume improvements in fuel efficiency of 30-50% by 2050 - and that this is "if anything optimistic". It found "no evidence suggesting that [further] technological improvements are in prospect." The *Greener by design* project promoted the new blended wing-body, or "flying wing", design; but the RCEP says this remains at the "conceptual stage" and could not enter service "for decades even on the most optimistic prognosis." Moreover, the design would only be suitable for long-haul flights.

Some have advocated a shift to hydrogen as a replacement fuel for kerosene. The RCEP pours cold water on this idea too. Besides the technical challenges, hydrogen-fuelled aircraft would need to fly in the stratosphere where the main emission - water vapour - would probably have a greater global warming impact than emissions from conventional planes.

Overall, the report concludes that the increase in demand will "easily outstrip" the benefits of any technological developments.

Shift to other modes

One important conclusion from the report is that short-haul passenger flights "make a disproportionately large contribution to the global environmental impacts of air transport," with a relatively high level of CO₂ emissions per passenger-kilometre. The RCEP argues that rail travel should be developed as a competitor to short-haul flights. It puts CO₂ emissions from rail travel as "at least an order of magnitude lower" than for the same journey by air.

Some 18% of passengers are carried on domestic flights, while many more head for destinations in western Europe - "precisely the journeys for which efficient rail travel should be available." The RCEP says that "instead of encouraging airport expansion and proliferation... it is essential that the Government should divert resources into encouraging high-speed rail." Instead of developing "feeder" regional airports, the major airports should be developed as "land hubs" served by an efficient rail network. The report highlights Schiphol airport in the Netherlands as an example of such an integrated approach.

Air freight is growing at an even faster rate than passenger travel. The RCEP says that CO₂ emissions are 20-100 times lower for rail freight, and lower still for shipping. It concludes that "air freight is so much more environmentally damaging than other transport modes that it must be reserved for very high value, and usually perishable, goods."

Putting a lid on demand

The RCEP is clear, however, that action must be taken to curb demand. The exemption of aviation fuel from fuel taxation is an "unacceptable" and "large subsidy at the expense of other modes of transport." Environmental groups put the effective subsidy for the UK aviation industry at £7 billion per year. However, the RCEP says that a fuel tax would be impractical as exemption is guaranteed by numerous bilateral agreements under the 1944 Chicago Convention. Instead, it urges the Government to press for a Europe-wide emissions charge, differentiated by aircraft type and distance travelled. Such a measure has been under half-hearted discussion by EU Environment Ministers for several years.

The key question is the level at which a charge should be set. The Government has already accepted that aviation should cover its external costs. But the level of charges it has floated would be swiftly overwhelmed by the steep fall in air fares which underpins the DfT's air traffic forecasts. An initial consultation two years ago put the costs of climate change and noise at £3 per passenger for short-haul flights, rising to £20 for long-haul journeys. The RCEP notes that a

tax at this level "would have a negligible effect on the numbers who would actually travel." Indeed, the aviation industry claims to already meet these costs through air passenger duty.

The DfT's recent consultation suggested a higher tax equivalent to a 10% increase in airline costs. If passed on to passengers, this could reduce demand by up to 10%. However, the DfT admits that the effect would be cancelled out by the unexpectedly rapid decrease in air fares. The RCEP argues that attempts to put a monetary value on the environmental costs of air transport are "not sufficiently robust" to set the level of an emissions charge. A forthcoming report from the Institute of Public Policy Research will propose a tax of £35 on a single ticket. The RCEP endorses this as a suitable "initial rate" for European flights.

Such a charge may provoke a consumer and media backlash. But the RCEP argues that "the availability of cheap air transport... is a very recent phenomenon. It is not a traditional 'right' in any sense." Commission member Roland Clift commented: "We recognise that we have been a privileged generation".

No to airport expansion

The RCEP also urges the Government to restrict airport development. The report argues that constraining capacity "would sharply and progressively increase competition for, and the implicit price of, slots at the major airports" - encouraging airlines to move away from the less profitable, and more damaging, domestic and short-haul flights. The report does not spell out the level of constraint which the RCEP is seeking. But at the launch, Sir Tom Blundell made clear that it is opposed to *any* further increase in airport capacity. The RCEP is sceptical of the Government's claims that constraining air transport would damage economic growth.

The aviation industry is looking to emissions trading as a way of reconciling its ambitions for growth with pressure to cap its emissions. In essence, it argues that flying is so valuable a commodity that society will be prepared to pay for deeper emission reductions elsewhere to support it. However, the International Civil Aviation Organisation has made painfully slow progress in developing a scheme.

The RCEP agrees that trading could replace an emissions charge in the medium term. It wants aviation to be brought fully under the Kyoto Protocol "with urgency". Emissions from international flights - suitably weighted to reflect the full warming impact - should be included in nations' emissions inventories in order to avoid double-counting issues.

However, Commission member Paul Ekins suggested that emissions trading may not get the aviation industry off the hook. "Sometime soon, the sector is going to find itself paying quite a lot for its emissions," Professor Ekins warned. "My fear is that we may invest billions in airport growth and find that in 20 years time climate change is so apparent that it is simply inconceivable to deliver the passenger numbers. We may create stranded assets on a huge scale. There is a danger that having made those investments, you've got to go on using them."

The RCEP's report represents a major challenge to the Government's policies. In particular, it exposes the failure of a weakened Environment Department to ensure that climate change - supposedly one of the Government's main concerns - is taken seriously by a Transport Department which is lurching back to its old "predict and provide" mentality.

The high price of low-cost airlines

From Jonathan Duffy writing in BBC News Online, 15 October 2002, shortly before the release of the RCEP Aviation Report:

Cheap flights could be about to get cheaper still, thanks to Easyjet's bargain deal for 120 new aeroplanes. But not everyone's happy - cut-price air travel is costing the Earth dear. Booking a low-cost flight is seldom as cheap as the headline figure, with taxes, handling fees and surcharges. But there's one fee you won't find on your ticket - the cost to the planet.

Cheap air fares have broadened our travel horizons and spawned a trend for weekend breaks in exotic locations, but for the environment it is proving a nightmare. Burn rate: Air travel produces more carbon dioxide per km travelled for each passenger than car travel. Passengers: Numbers passing through UK airports expected to double to 400m by 2030. Expansion: Plans are afoot to expand Britain's airports and maybe build new ones, but firm decisions have not yet been made. (Source: Aviation and Global Climate Change report)

Air travel is growing globally at about 5% a year and by 2030 the number of Britons flying is expected to more than double. At the forefront of this revolution are the low-cost, no-frills carriers such as Ryanair, Easyjet and Buzz, which are growing at a phenomenal rate. In June, Easyjet passenger numbers were up more than 50% on the same month in the previous year. Ryanair increased by 34% and Go saw an incredible 72% rise.

The lesson learned from these airlines, especially post-11 September, is as clear as it is simple - the cheaper your fares, the more people will fly. The result has been a price war which has sucked in major flag carriers such as British Airways. Now Easyjet is promising further price slashing, following its deal to buy 120 new planes. The company claims to have secured such a good deal, it will pass on cost-savings to passengers. All of which is great news for holidaymakers, who account for almost three-quarters of air passengers.

But if air travel is allowed to grow unchecked in this way, it will spell disaster for the planet, say environmentalists. More flights mean bigger, busier airports, which in turn means more noise and growing problems with air quality for those who live and work close by.

But perhaps the biggest concern is the effect on global warming. Burning aviation fuel releases carbon dioxide (CO₂) into the environment, causing the Earth to heat up. And aircraft burn a lot - one return flight from the United Kingdom to Florida produces, per passenger, as much CO₂ as a year's driving by the average British motorist, according to environmental campaign groups. Flying also releases nitrogen oxides and sulphur oxides, and even the vapour trails - contrails - left by planes are thought to be a hazard. It's been suggested that they add to the insulating effect of cirrus clouds on our climate.

The problem for environmentalists is that while efforts are being made to cut CO₂ emissions from cars and industry, nothing is being done to rein in the airlines. While travellers in the UK do pay an Airport Passenger Tax, there is no tax on aviation fuel, which allows airlines to be wasteful. Also, no VAT is charged on airline tickets.

The situation is unsustainable, says Simon Bishop of the Institute for Public Policy Research, who is about to publish a report on sustainable aviation. Stansted is planning for 10 million more passengers "Lower prices have raised people's expectations - we now all want to fly abroad for a short break, and do so several times a year. But the government is doing nothing to inform people of the environmental impact of flying. The tax advantages mean that, in effect, the aviation industry is being subsidised to the tune of about £6 billion a year in the UK."

In 1992, 3.5% of global warming was attributed to flying, yet by 2050 the UN thinks this will rise to 7%. Optimists, including Easyjet, pin their hopes on technology to make planes more efficient. Easyjet is developing an environmental policy "based on buying new aircraft". "This

will mean our planes are more efficient, quieter and have less environmental impact," said a company spokeswoman.

But progress in efficiency is being outstripped by the growth in passenger demands, says Mr Bishop. The result is that air travel will undo much of the good work done by the Kyoto protocol to curb pollution elsewhere. Easyjet argues rather than expanding the air travel market, it is attracting many passengers who would normally use other airlines. And it rejects the idea of a tax on aviation fuel, saying passengers are already paying through the airport tax.

But if the environmental lobby get their way, in future we could be taking a few more holidays at home. Skegness anyone?

Flying with a conscience

Since release of the British RCEP Report, there have been other signs of growing international disquiet over the environmental impacts of aviation. Only last month (18 February) the New York Times – www.nytimes.com - published an article by Harry Rijnen entitled "Offsetting environmental damage by planes." In it he describes some developing schemes to allow concerned individuals to offset the CO₂ impacts of their air travel. The following excerpts give the flavour. You can find the full article at www.nytimes.com/2003/02/18/business/18FORE.html

Do you feel guilty about global warming every time you get behind the wheel of your car? If you are a frequent flier, start feeling more guilty.

On a round trip from New York to London, according to the calculations of the Edinburgh Center for Carbon Management in Scotland, a Boeing 747 spews out about 440 tons (880,000 pounds) of carbon dioxide, the main greenhouse gas. That's about the same amount that 80 SUV's [4WD vehicles] emit in a full year of hard driving – and about 126 pounds for each mile flown. At an occupancy rate of 78 percent, each of the 317 passengers in that Boeing 747 will be responsible for 2,776 pounds of the pollutant.

There may be cause for more concern in the years ahead. Despite the current lull in air travel relating to fears of terrorism and war, and according to figures provided by the Edinburgh Center, an independent consulting group, worldwide carbon dioxide emissions from civil aviation will double from 1999 to 2015, to 900 million tons a year, despite a 20 percent increase in fuel efficiency by the airline industry over the period. By 2015, airplanes' share of human-generated carbon dioxide emissions will rise to 3% from 2% in 1999.

But short of swimming to London or jogging to Los Angeles, what is the concerned business traveler to do? The airline industry, busy trying to avoid bankruptcy, is not offering tips on how to limit the environmental damage. And chances are your travel agent has not given the matter much thought.

But a few organizations, among them the Better World Club [www.betterworldclub.com] and American Forests [www.americanforests.org] in the United States, and Future Forests in Britain [www.futureforests.com] have stepped into the breach. They have devised ways for the environmentally concerned to mitigate their role in the collective output of carbon dioxide. For a contribution (in the order of US\$12-15 for a short-haul flight), they will plant trees in Siberia or Texas; replace inefficient oil-burning boilers in Portland, Oregon; supply energy-saving light bulbs in Jamaica; or take some other conservation measure aimed at offsetting the harm of an individual's commercial flight.

So far, the number of Americans who pay to undo the damage their flights inflict is negligible. The Better World Club says it handles 1,500 to 2,000 requests a year. American Forests says it receives more than 25,000 donations, though not all are related to air travel. Future Forests says the majority of the 40,000 individuals who have paid for environmentally friendly measures since it was founded in 1997 are Europeans. Should the general public become more uneasy about global warming, though, these figures could explode. In European countries like the Netherlands, Britain and Germany, the practice has become much more common and encompasses road as well as air transport.

But it might take a while for the airlines to come on board. "We are extremely focused on financial survival," said Tim Doke, a spokesman for American Airlines. "CO₂ emissions are not something we have time to think about." And Jonathan Shopley, Future Forests' chief executive, says his appeals to the airline industry have fallen on deaf ears. "They act towards this environmental problem like the chemical industry 20 years ago: 'If we ignore it, maybe it will go away,' " he said. "But it won't."

Big business is not thinking a lot about the issue, either, but here and there the movement has won a corporate convert. For example, Nike; Interface, a carpet maker based in Atlanta; and the American subsidiary of Tetra Pack, the Swedish packaging concern, offset the business air miles traveled by their employees. Interface pays American Forests to plant a tree for every 1,500 passenger miles its employees fly. "It's part of our program to minimize our impact on the environment," said Ray C. Anderson, Interface's chairman. "The cost is minimal, and we create enormous good will."

For me personally, the upshot of all this is that my attitude to cheap air travel is shifting radically from where the airlines would no doubt like it to be. On the day of the "Beyond Oil" meeting in Perth, (21 February) the West Australian newspaper published the following views from Qantas Boss, Geoff Dixon and a "leading travel industry representative" under the headline "War trigger to air fare boon":

"There are going to be some great bargains out there if war breaks out." "And after the war is over, Qantas will want to stimulate the market with specials. There is expected to be a series of frequent flyer specials ..." "Qantas is also set to look at "kids fly free" programs to such destinations as Queensland, and two-for-one offers for full-fare business-class tickets."

Good news for individuals – lousy news for the planet!

The trouble is, these deals are almost irresistible. If we CAN rapidly and cheaply visit distant relatives, attend family events, avoid too-hot or to-cold weather, and travel to exciting new places – well, why wouldn't we? If we can tick a box and have some distant mail-order purchase air-freighted to us overnight – well, why shouldn't we? And in the case of family visits, the fact that we CAN travel cheaply may even function as "emotional blackmail". Try telling your distant, aging parents that, while you could afford financially to visit them, your ecological footprint will not permit it!

I guess the bottom line is that while long-haul aviation is a valuable part of our overall transport mix, underpricing and heedless short-haul overuse are more destructive than we realised. Flying is patently another area where we need to figure out what is reasonable, and at what point enough is enough. Looking quite dispassionately at Peter Fisher's earlier suggestion, it makes good sense to move ideas, intellectual property and electrons around while keeping bodies and materials as locally fixed as possible. Virtual tourism anyone? E.G.H.

Human fertility and population size: An anthropologist looks at the numbers game

Last month, thanks to Network member, John Coulter and Sustainable Population Australia – www.population.org.au, I was able to attend a talk by Professor Virginia Abernethy, Emeritus Professor of Psychiatry (Anthropology) at Vanderbilt University, Tennessee, USA [Right].⁴ Virginia Abernethy is a research anthropologist specializing in population size, environmental constraints, and population politics. Her main recent work has been a detailed examination of the factors surrounding the so-called “demographic transition” – a term commonly taken to mean the fall in fertility rate that occurs when material standards of living are raised.



Because this fall in fertility has often appeared to be associated with increased material standards of living, including the contribution made by educated women joining the workforce, conventional wisdom has it that the way to halt population growth is to provide education, particularly for women, and raise material living standards.

Not so simple, says Virginia Abernethy. Her findings challenge this view. Instead, she proposes that fertility rates fall, even in the absence of modern contraceptive technologies, when perceptions of abundance are replaced by perceptions of material constraint. And she has numerous observations to support this hypothesis:

- Sudden greater-than-trend decline in fertility in Asian countries immediately after the 1997 economic collapse
- Fertility decline related to critically small land-holding size but not to education or other factors in Malawi and Rwanda
- Fertility decline in response to price rises for staple foods in the Indian sub-continent
- Sharp fertility decline in Morocco in response to sudden lower material standards of living but with no change in education levels
- Fertility fluctuating coordinately with material constraints over the last half century in Egypt and Peru
- Increased fertility of the indigenous Malays in Malaysia, and coordinate decline in fertility of the Indian and Chinese sectors, following the political and material gains made by Malays
- Many historical examples of greatly increased family size among first colonists, and among economic migrants to new countries with higher material living standards

In her 2002 paper “Fertility decline; no mystery”⁵, Virginia Abernethy summarises:

“The economic opportunity hypothesis (EO hypothesis) states that perceived shrinkage of opportunity discourages women or couples from embarking on marriage or reproduction. On the contrary, the sense that opportunity is expanding encourages couples to raise their family-size target. The hypothesis assumes that humans are genetically programmed to maximize successful reproduction by having more offspring when environmental/economic conditions

⁴ Illustration of Virginia Abernethy from the March Newsletter of Sustainable Population Australia. If you are interested in population issues, or in joining SPA, check their website at www.population.org.au

⁵ See box on next page for how to access the full paper.

appear favorable, but exercise restraint – delaying marriage and child-bearing, or limiting the total number of offspring – if the latter strategy promises greater long-run success.”

[Interestingly, anecdotal discussion at the meeting revealed the fit of this hypothesis to the family planning decisions of a number of individuals in the audience, with the high cost of housing, raising, and especially educating children figuring prominently.]

While Virginia Abernethy confesses to being out of favour with some traditional demographers, her hypothesis fits readily with what we might expect from evolutionary biology. In other animals, fertility rates decline when the supporting resource base is stressed or degraded. In her view, it is the same for humans, except that the mechanism involves ‘intelligent’ decision making based on subjective perception, rather than direct physiological feedback.

One reason for being out of favour might well be the political and ethical awkwardness associated with the EO hypothesis. The traditional concept produces little in the way of political and ethical dilemmas – i.e., ‘Help people to prosper, give them education, and fertility will fall.’

The implications of the EO hypothesis are more troubling: Providing aid and opportunities for the less well off may be counterproductive in reducing fertility. Does this imply population control will mean providing education and health support to existing children but restricting direct assistance to adults and parents? If humans are programmed to breed until we all perceive no opportunities remaining, and if, as anthropologists observe, inter-group (‘us versus them’) tensions and conflicts increase as resources decline, what does this say of our chances of achieving a just, humane, and ecologically sustainable society?

We are already seeing worrying indicators of stress in our global resource base, and an upswing internationally in religious, ethnic, and economic tensions. Are we actually staring into Nature’s toolbox at the ultimate tools for fertility control? I, for one, would like to hope we could do better – or at least make every rational attempt to do so.

If you are interested in reading more of Virginia Abernethy’s work, I suggest starting with the following:

Abernethy, Virginia D (2000) Population Politics. Transaction Publishers, New Brunswick, NJ. ISBN 0-7658-0603-7

Abernethy, Virginia Deane (2002) Fertility decline; no mystery. Ethics in Science and Environmental Politics (ESEP); online www.esep.de - click on “ESEP Info” at top left, then on “Contents” under ESEP at left of screen; and look under “2002”.

Abernethy, Virginia Deane (2002) Population Dynamics: Poverty, Inequality, and Self-Regulating Fertility Rates. Population and Environment 24:69-96. *[If you have problems accessing this journal, let me know; I may be able to help – Elizabeth.Heij@csiro.au]*

ABS Report shows Australians guilty of neglecting the environment

If you have been reading the Sydney Morning Herald recently, you may have seen its (21/2/03) coverage of the Australian Bureau of Statistics (ABS) ‘environmental report card.’ It is not good news. Australians are growing wealthier but caring less about the environment and using more of the nation’s precious natural resources. Here are a few of the statistics:

- Income per person up to \$27,245 in 2000-01 from \$21,000 in 1990-91
- Consumption of freshwater up to 23,300 gigitalitres (GL) annually in 1996-97 from 14,000 GL in 1983-84
- Energy consumption increased by 23% during the 1990s while population increased by less than 10%
- The nation’s 12.2 million cars account for 56.3% of transport emissions

- One hundred million hectares of forest and woodland cleared since European settlement
- The proportion of Australians expressing concern about environmental problems fell from 75% in 1992 to only 62% in 2001, with the biggest drop amongst people aged 18-24 *[which makes our “Parting Shot” below not quite so much of a joke! Could we be suffering from “environment fatigue” – disillusionment over our power to produce positive outcomes in the face of huge intractable, systemic problems and long lead times for positive change to become visible? NGO’s addressing poverty and famine relief have discussed falling donation levels in similar terms as “donor fatigue”. E.G.H.]*

For me, the one really significant positive is the expectation that the use of wind power is expected to grow by 25% per year up to 2020, compared to the 2.3% growth forecast for total energy consumption.

BUT – we still appear to be losing ground overall. And, if our politicians behave only as followers of public opinion, rather than leaders of vision, integrity and courage, then our falling national concern for the environment is indeed a real concern for the future.

Read more at: www.smh.com.au/articles/2003/02/21/1045638478325.html
and www.smh.com.au/articles/2003/02/21/1045638474513.html

Disposal of waste – Will heresy become gospel?

One of the apparently positive statistics in the ABS environmental report (see previous item) is the fact that Australian households are recycling more than in the 1990s, with 97% of people practicing at least some recycling compared to 85% a decade ago. But is there a chance this gain will become just a wasted feel-good distraction?

The Scandinavian countries tend to be way ahead of us when it comes to implementation of more sustainable policies and practices. So we listen when they flag new sustainability trends. Now, it appears that influential sustainability campaigners from Sweden are dismissing the practice of separating various categories of refuse for recycling as a waste of time and money. Instead they advocate new incineration technologies that have made the process cleaner and linked it to the generation of electricity, cutting dependency on oil and other fossil fuels.

Maybe we still think of incinerating rubbish in terms of a dirty, smelly, smoky fire in a 44-gallon drum in the backyard. The new technologies, however, are a very different story. This will be a discussion to watch.

BUT - For my money, the best contribution any of us can make will always be the reduction of refuse at source. CREATE LESS TRASH!

See the alert as published by THE AGE at:
<http://www.theage.com.au/articles/2003/03/04/1046540183505.html>

Other Information Resources

GREAT TRANSITION: SCENARIOS FOR A SUSTAINABLE FUTURE – Slide Presentation

www.gsg.org

Last year, the Global Scenarios Group (GSG) of the Stockholm Environment Institute and Tellus Institute published their excellent, thought-provoking, free e-Book “Great Transition: The Promise & Lure of the Times Ahead” (accessible via the above webpage, and featured in Sustainability Network Updates 8E, p 12, and 10E, pp 2-3 at www.bml.csiro.au/SNnewsletters.htm). Now the GSG has added an excellent accompanying slide presentation that can be viewed via the GSG webpage – either as a simple slide

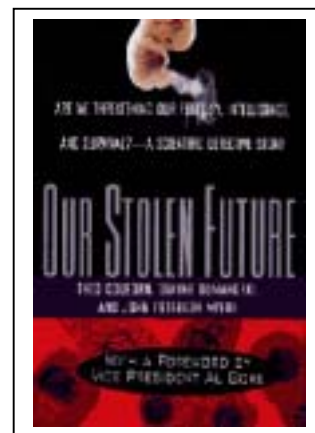
show or with associated explanatory notes. It looks like a good tool for teaching and discussion of the principles of building a sustainable future from today's world. Do check it out. [Thanks to Philip Sutton's GreenLeap network for the alert - Philip.Sutton@green-innovations.asn.au]

ENDOCRINE DISRUPTION – Book and Web Resources

Our Stolen Future

www.ourstolenfuture.org

The book, *Our Stolen Future*, by Dr Theo Colborn, Dianne Dumanoski and Dr John Peterson Myers, is a scientific detective story, originally published in 1997 and viewed as the successor to Rachel Carson's *Silent Spring*. It explores the emerging science of endocrine disruption: how some synthetic chemicals interfere with the ways that hormones work in humans and wildlife. The web site, the web home for the book's authors, provides continuing regular updates about the cutting edge of science related to endocrine disruption, including both sides of the debate. It also posts information on policy discussions, as well as new suggestions about what individuals can do to minimize risks related to hormonally-disruptive contaminants. [Thanks to Network member Bob Sutherst of CSIRO for the alert.]



ENDOCRINE DISRUPTION – Two reports from the International Water Association (IWA)

Endocrine Disruptors in Wastewater and Sludge Treatment Processes

www.iwapublishing.com/template.cfm?name=isbn1843390310

Endocrine Disrupting Chemicals (EDCs) produce changes in the endocrine system of organisms that lead to increases in cancers and abnormalities in reproductive structure and function. Recent research has highlighted the existence of hormonally active compounds in sewage and industrial effluents and their potential for recycling back into the environment - including drinking water supplies- through point sources and non-point sources. The Report presents the latest research on EDCs, covering the sources, fate, and transport of EDCs in sewage and industrial effluents, and sludge treatment and disposal options in light of effects on receiving environments. In addition, the authors review current legislation, future research needs, and potential management strategies for endocrine disrupters in the environment.

Editor(s): J W Birkett , J N Lester; ISBN 1843390310

Evaluating Endocrine Disruption in Receiving Waters: Screening for Biomarkers

www.iwapublishing.com/template.cfm?name=isbn1843396505

In recent years, concerns have been raised that low concentrations of chemicals may alter the normal functions of the endocrine system, resulting in potentially significant adverse effects on growth, reproduction, and/or development. For domestic wastewater discharges to surface water bodies, estrogenic activity of effluents has been suggested by chemical analysis, "biomarkers", and /or in vitro assays. This report presents the results of a two-year project to evaluate the potential for biomarker formation as a result of effluent exposures, and the subsequent relevance of the emerging assays and physiological measurements on potential adverse impacts to individuals or populations of fish in the receiving streams.

Author(s): PV Cline, N Denslow, P Meyer, S Goudey, A Lewellen, I Johnson; ISBN 1843396505

AGRICULTURAL SOIL AMMENDMENTS – Report

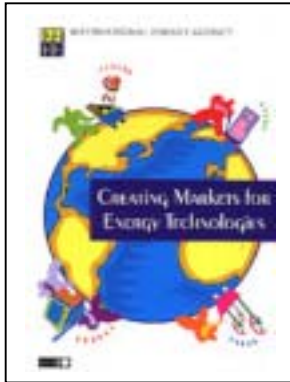
www.iwapublishing.com/template.cfm?name=isbn1843396513

Farmers are faced with an array of products that they can use to improve the fertility of their lands. Organic soil amendments such as biosolids, manures and, to a lesser extent, Municipal Solid Waste (MSW) composts are products that can be used to supplement or replace mineral fertilizers. Many farmers are aware of the benefits that organic products offer, especially in terms of improved crop yields, increased soil fertility, reduced fertilizer costs, and their overall contribution to sustainable agriculture. Concerns have been raised, however, regarding the long-term safety of organic soil amendments. Depending on the type of product, these can include (but are not limited to) the accumulation of phosphorus and metals in soils, plant uptake of land-applied metals, the contamination of groundwater and soil with organic compounds, and potential health impacts from pathogens and viruses.

The Report details results of a comprehensive study of soil amendments, fertilizers and their uses. The study generally found that the relative risk to the environment from amendments and fertilizers varies by parameter and shows that known risks from each of the materials studied can be managed. Moreover, these manageable risks must be carefully weighed against the considerable benefits provided by the land application of amendments and fertilizers.

Author(s): LH Moss, E Epstein, T Logan, SD Frank, K Scott ; ISBN 1843396513

RENEWABLE ENERGY MARKETS – OECD Book Creating Markets for Energy Technologies



Expanding markets for clean and efficient technologies will increase energy security and help to reduce greenhouse gas emissions. But many promising technologies are still too expensive or face other obstacles to commercial deployment. Realising the potential for a cleaner and more secure energy system requires governments to consider deployment policies to create markets for the new technologies. This book explores the design of technology deployment programmes and the sources of their success. Based on 22 case studies from IEA countries, the analysis is framed within three perspectives. The first focuses on market learning processes, the second on an economic analysis of market barriers, and the third on market actors and practical techniques to transform energy markets. These three perspectives together provide a framework for understanding and designing successful technology deployment programmes. [Published Feb-2003. OECD Online bookshop: www.oecd.org Code 612002341P1; ISBN 9264099638]

And a 'raspberry' to

the Federal Government for last month's decision to cap spending on solar energy rebates – just when we need continuing stimulation for an Australian industry based on renewable energy resources.



Read more at http://finance.news.com.au/common/story_page/0,4057,6031420%5E462,00.html
[If the link gives problems, go to www.finance.news.com.au and enter the remainder of the URL by hand.]

Websites of interest

Food for the Future: Opportunities for a Crowded Planet – Conference Proceedings www.crawfordfund.org/events/index.htm

This high-level conference, conducted by the ATSE Crawford Fund at Parliament House, Canberra, on 8 August last year, focused largely on issues around the potential role of GMOs and genetic technologies in feeding an increasing human population, particularly in developing countries. Topics covered by the group of national and international speakers included: overviews of the world food situation and Australia's responses, reviews of the status and record of biotechnology in crop production, consumer, farmer, and government attitudes to GM crops, how to empower third-world farmers and maintain their access to technology, and ethical issues raised by GM foods.

The Proceedings, in PDF format (1.2MB, 92 pp) can be downloaded via the above site or accessed directly at www.crawfordfund.org/events/foodforfuture.pdf

ABC Science Online – The Lab - Sustainable Development Gateway www.abc.net.au/science/sustainable/default.htm

The ABC Science Lab's Sustainable Development Gateway brings together ABC news, transcripts, features and forums relevant to sustainability and sustainable development.

REMINDERS – Check the latest postings on the following two sites:

Sustainable Development Update

www.albaeco.com/sdu/

The latest issue of SDU (Vol 3 No 1 Feb 2003) is now available for downloading in PDF format. As usual, it is focused on the links between ecology, society and the economy. Topics in this issue include:

- The importance of traditional local knowledge to the international science and policy community.
- Traditional flexible cropping strategies to manage through extreme climate events may be smarter than the attempts of western resource management to exert more rigid control.
- The cost of foreign invasive species such as water hyacinth in African wetlands.
- Accounting for virtual water (the water embedded in traded commodities). Will there be sufficient fresh water, part of it traded as virtual water, to meet the demands of population growth?
- Is transgenic cotton a better option for poor farmers?
- A new program from the International Council for Science (ICSU) to promote science for sustainable development, especially in developing countries.

Sustainability Science – Harvard University Forum on S&T for Sustainability

<http://sustsci.harvard.edu/index.html> and <http://sustsci.harvard.edu/keydocs.htm>

The Forum is an activity of the international Initiative on Science and Technology for Sustainability (ISTS). It facilitates information exchange among the growing and diverse group of individuals, institutions, and networks engaged in science and technology for sustainability by providing access to emerging ideas, relevant activities, key documents and web sites.



A Green Power Tick to

CSIRO's Urrbrae site in Adelaide – my own workplace – for its recent commitment to Green Power. The CSIRO Divisions on site have signed on to a 5% green power contract as part of CSIRO's overall commitment to improved environmental management. The annual greenhouse saving from this new contract is estimated at over 74 tonnes of CO₂, equivalent to planting over 280 trees or removing 13 vehicles from the road each year. It will reduce the site's total greenhouse emissions by about 4%. A modest start – but definitely a step in the right direction.

'Green Power means electricity derived from renewable energy sources in accordance with the National Green Power Accreditation Program. This generally means: Solar photovoltaic and solar thermal electric systems, wind turbines and wind farms, hydro-electric power stations, biomass-fired power stations, geothermal power stations, and wave and tidal power stations.

Events of interest

John Elkington returns 'Down Under for a 2003 Conference Series – "Boards, Brands & Business Models: Beyond the Triple Bottom Line"

Auckland – 31 March; Sydney – 1 April; Brisbane – 2 April; Melbourne – 3 April; Perth – 4 April. John Elkington and four international speakers look at issues of corporate governance, reputation, trust, and evolving business models on the path to sustainability. Information: www.edmondsmgt.com.au or murray@edmondsmgt.com.au

ISOS Online Conference – "In Search of Sustainability"

February – November 2003. An innovative and progressive Internet Conference open to Australians from all walks of life. Jointly managed by Australia 21 Ltd, Nature and Society Forum Inc, & Sustainable Population Australia Inc, in association with The Australian Collaboration. Information: www.isosconference.org.au

Water Conferences listed by the International Water Association (IWA):

See: www.iwahq.org.uk/template.cfm?name=events

Ownership Concentration in the Oil & Gas Industry – Australian Energy Forum (AEF) free open forum
 Darwin, **March 14**. Register & receive venue information by phoning AEF on (02) 4921 8745

Third World Water Forum
 Kyoto, Japan, **16-23 March**. Information: <http://www.worldwaterforum.org/eng/index.html>

Sustainable Urban Design Course – Learning how to produce more liveable environments
 Perth (Murdoch Uni), **24-28 March**. Info & flyer from Dr Jeff Kenworthy - kenworth@central.murdoch.edu.au
 at Institute for Sustainability & Technology Policy (ISTP) – <http://www.wistp.murdoch.edu.au>

2nd Regional Government Network Conference for Sustainable Development
 San Sebastian, Spain, **27-31 March**. Organisation established at the WSSD to represent state & regional governments in the UN system and facilitate best practice in sustainability at this level. Information: www.nrg4sd.net (and click on “Events for Reg. Govs.”) or Andrew Higham – ahigham@dpc.wa.gov.au

Efficient 2003 Conference – Efficient use & management of urban water supply
 Tenerife, Canary Islands, Spain, **2-4 April**. Information: www.iwatenerife2003.org

Innovations in Water - Ozwater Convention
 Perth, **6-10 April**. Information: <http://www.enviroaust.net/>

Ensuring Coal Sustainability – Australian Energy Forum (AEF) free open forum
 Newcastle, **April 11**. IDC Bldg, Univ. Newcastle, 9:30-12:30 pm. Register with AEF on (02) 4921 8745

Eco-Innovation & Sustainable Development -- Professional Development short course
 Canberra, **28-30 April**. Information available from convenor, Dr Janis Birkeland: (02) 6201 2693 or Janis.Birkeland@canberra.edu.au

National Landcare Conference - Respecting Values - Working and Learning Together
 Darwin, NT, **28 April – 1 May**. Sponsored by NT Dept Infrastructure Planning & Environment and the Tropical Savannas CRC. Pre-registration at www.landcareconference.nt.gov.au and information from the secretariat at: dcem@desliens.com.au

Inaugural national workshop of the Economics & Environment Network at ANU (ANZSEE Affiliate)
 Canberra, **2-3 May**. Information: Wendy.Proctor@csiro.au, <http://een.anu.edu.au> or http://een.anu.edu.au/eenationalworkshop_callforpapers.pdf

Sustainable Development Indicators in the Mineral Industries (International Conference)
 Aegean Island of Milos, Greece, **21-23 May**. Information: www.heliotopos.net/conf/sdimi2003/

Leading Edge Water & Wastewater Treatment Technologies – IWA Leading Edge Global Conference
 Amsterdam, Netherlands, **26-28 May**. Information: www.iwahq.org.uk/template.cfm?name=technology2003
 or technology2003@iwahq.org.au

Sharing Indigenous Wisdom – An international dialogue on sustainable development
 Wisconsin, USA, **8-12 June**. Information: www.sharingindigenouswisdom.org

International Society for Industrial Ecology – 2nd International Conference
 Ann Arbor, Michigan, USA, **29 June – 2 July**. Information: <http://css.snre.umich.edu/isie2003/>

Ninth International Conference on River Research – sponsored by the CRC for Freshwater Ecology
 Albury, NSW, **6-11 July**. Information: www.conlog.com.au/NISORS/overview.html

Integrative Modelling of Biophysical, Social and Economic Systems for Resource Management Solutions – the MODSIM 2003 International Congress on Modelling and Simulation
 Townsville, Qld, **14-17 July**. Information from: <http://mssanz.cres.anu.edu.au/modsim2003.html> or David.Post@csiro.au

WATER: histories, cultures, ecologies – Interdisciplinary research symposium on the future of water
 Perth (UWA), **14-18 July**. Info: ias@admin.uwa.edu.au or www.ias.uwa.edu.au (under activities & programs)

Environment, Planning & Law in the Coast Zone – Short Course
 Sydney, **21-25 July**. Information: www.fbe.unsw.edu.au/news/enews/ProfDev/registration.pdf

Rangelands in the New Millennium – VII International Rangelands Congress
 Durban, South Africa, **26 July – 1 August**. Information from : delegates@sbconferences.co.za or www.ru.ac.za/rqi/irc2003/IRC2003.htm

Farming Systems in the Future – First National Farming Systems conference 2003
 Toowoomba, Qld., **7-10 September**. Information: www.afsa.asn.au and stewartc@usq.edu.au

GIN2003: Innovating for Sustainability – 11th International Conference – The Greening of Industry Network
 San Francisco, **12-15 October**. Information: www.greeningofindustry.org/gin2003.htm

International Conference on Water-Saving Agriculture & Sustainable Use of Water & Land Resources
 Yangling, Shaanxi, P.R. China, **26-29 October**. Working language, English. Information from local Australian contact: Lu.Zhang@csiro.au

Coal – Contributing to Sustainable World Development – 12th International Conference on Coal Science
 Cairns, **2-6 November**. Hosted by Australian Institute of Energy, the International Energy Agency, and IEA Clean coal Centre. Information from iccs@aie.org.au or www.aie.org.au/iccs

LOOKING FOR COMMENT: Megan Antcliff's feature in the last newsletter (22E) on the use of density as a tool in urban planning stimulated some interesting comments on **urban density, the urban-rural divide, and the optimal distribution of humans in the landscape**. I am compiling these comments as a discussion "spot" for an upcoming newsletter. If you would like to contribute, **send me your BRIEF thoughts on these issues by Friday March 28.**

Parting Shot

Shools have an imprtoant roal to play in susatainbility eduacatsion



And Finally – Notes and Reminders

Check out our web site at www.bml.csiro.au/sustnet.htm

The site is maintained by Lyndon Hirst at CSIRO's Black Mountain Library. Your suggestions are welcome.

- **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 would be 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.

Milestone: Our Sustainability Network now has over 530 members.



That's it for this update.

Sincerely,
Elizabeth G. Heij
Network Facilitator