

More and more people are coming to realise that our planet may ultimately become uninhabitable. Environmental considerations have increasing prominence as more scientists raise their voices about the rapid degradation of planet Earth.

International efforts in the past twenty years have begun to address measures to reduce pollutants & degradation. The most notable of these initiatives was the Kyoto Protocol in 1997 at which Australia received special consideration with a concession to increase emissions over 1990 levels while all other participating nations agreed to reduce emissions to 1990 levels.

Australia's foremost expert on climate change, Dr Graeme Pearman states that even if stabilised at present levels of emissions, the amount of CO₂ in the atmosphere would double by 2050 and global warming will continue to get worse. He warns that the world will need to cut greenhouse gas emissions by 70% - 80% in this century to prevent global warming from increasing even further.

The Chief Scientific Advisor to the United Kingdom government states that there is a lag effect in the atmosphere – the climate change effects we see now are the result of the greenhouse gas emissions of thirty years ago. We know we have increased emissions very substantially over the past thirty years, so this means that even if we reduced emissions today, things would continue to get much worse for at least thirty years. This is why it is so frustrating to environmentalists to hear politicians talking about reducing global warming.

We don't need to look far to see the effects of global climate change. The hottest ten years on record have happened since 1990. Thirty thousand people died in Europe in 2003 because of the northern hemisphere heat wave. Hurricanes can cyclones have been doing more damage. Katrina proved this in 2005. Insurance companies are very concerned about the rising cost of claims from the increasing severity of major climate events. To an insurance company the prospects of hurricanes moving steadily southwards on the east coast of Australia creates a nightmare image.

Of course, global warming doesn't only mean that the weather gets warmer. It means that the weather gets warmer in some places, colder in others, drier in some areas and wetter in others. Australia, being a dry continent anyway, is very susceptible to these changes and scientific modelling shows that the parts of Australia where most of the population is concentrated will suffer more and more droughts and poorer water quality as river flows slow down. As for storms, you can easily do your own research by checking how far south the serious storms and cyclones have moved in the past decades.

Not everyone is satisfied that Global warming exists or is indeed a problem – the Roman Catholic Archbishop of Sydney, Cardinal George Pell, speaking to leading Catholic businessmen in the U.S.A in April 2006 said that "Pagan

emptiness and Western fears of the uncontrollable forces of nature had contributed to hysterical and extreme claims about global warming. In the past, pagans sacrificed animals and even humans in vain attempts to placate capricious and cruel gods – today they demand a reduction in carbon dioxide emissions”

But the scientific evidence is very clear to those prepared to examine it. We have the technology to tell us the global temperatures and the concentrations of carbon dioxide in the atmosphere for the past 400,000 years. The link between carbon dioxide concentration and global average temperature is very obvious, so while it is true to say that there have been cyclic fluctuations over the millennia, it is also true that when carbon dioxide concentrations were high, global average temperatures were high and vice versa.

Carbon dioxide concentrations in the atmosphere are higher than at any time in the past 400,000 years – and by a significant margin!

When we look closely at the data, we can readily see that carbon dioxide concentrations have been rising since the beginning of the industrial revolution, but the rise in the past fifty years is very noticeable – startlingly so.. No-one seriously doubts that human activity and population (world population has tripled in about 55 years) is the cause of the increase even if they dispute the effect.

I used to think that, if there is any chance we are wrong about the greenhouse effect, at least we should be cautious and be careful to prevent avoidable increases in carbon dioxide or the other so-called greenhouse gases – methane and nitrous oxide. Now I've come to realise that it has gone much too far. We are in for a rough ride for at least the next thirty years. More importantly, the action to pull back the increases that are happening every day needs to be started now, seriously and urgently.

Australia, with a population of only 20 million (about one-third of one percent of the world population) can't change the world, so what can we do about it? Why don't we just leave it to the bigger countries or the most populous ones? Unfortunately, the most populous countries are often the poorest ones. That means they're not the countries causing the problem anyway. A simple illustration of this is shown in this comparison: India, with 17% of the world's population uses one-third of a litre of oil per day for each person. In Australia we use 6.3 litres of oil per person every day. The equivalent number for the U.S. is 11.3 litres. Indian people could reasonably aspire to the same lifestyle we have, but if they succeed, using technologies we use today, greenhouse gas emissions will go through the roof, so to speak. In fact they do have ambitions to reach our standard of living and with growth of ten percent per year, it's only a matter of time. The World Bank reports air travel by Indians has increased six-fold since 1996 to more than 50 million passengers last year.

Rich nations such as Australia have a moral responsibility to participate in a constructive plan to stop the increase in greenhouse gas emissions, let alone

reductions. Australia and the USA have not ratified the Kyoto protocol but have started, in a very small way, to stop the increase in emissions. There has not been a groundswell of public opinion to spur stronger action. Until the last year, that is.

When fuel prices started to rise, people responded. Suddenly we were seeing articles about energy almost daily in our newspapers and on our television screens. And as we have come to understand the reason for fuel prices rising, we've also started to think about the whole energy picture. While we're still crying for reduced excise on our fuel so we can fill the tank for less than \$100, it's also dawning on us that we've been living in a fool's paradise for many years.

When oil prices shot up in 1973, and again in the early 1980s there was a flurry of activity to find alternatives to oil, but when the price of oil fell back to previous levels, the search stopped. One exception was South Africa where, because of the embargo on oil shipments to that country, they worked on the technologies for getting oil from coal. Now they're one of the world leaders in that technology. We could have done the same if we'd been farsighted enough to see that oil would at some stage become scarce again. But we didn't.

Now oil prices have risen again, so the airwaves are full of talk of biofuel, ethanol, methanol, hydrogen, atomic power and more. But this time, it isn't just a matter of finding something that will burn as well as oil, or provide energy as conveniently as oil; we now need energy that will not add to the greenhouse burden. And there's a feeling deep down in all of us that it's going to be expensive but we don't like to ask.

Let's face it; there is no simple solution to the global climate change issue. So it may be useful to look at what we can reasonably expect.

Those who understand how serious the problem is will drive governments to join a world-wide treaty to take action. There's no point half of the planet taking action if the other half just goes on mindlessly down the road to economic development at all costs.

In Australia we have a choice of waiting for the overseas powerhouses of technological development – USA, Europe, Japan – to find cleaner ways to generate energy and alternatives to oil, or we can use our own scientific skills to find the mix of solutions that best fits Australian conditions. We do have a different set of conditions from every other country; we have massive reserves of coal and gas but we don't have the hot and wet conditions that Brazil, for example has, so while ethanol could support 80% of Brazil's liquid fuel needs, the proportion in Australia would be much lower.

If we wait for others, we'll pay dearly to licence the technologies. If we concentrate on what is suitable for Australia, we may be able to licence to others.

With massive reserves of brown coal it makes sense to invest heavily to find ways to generate electricity from brown coal without greenhouse emissions. Capture and long term storage of carbon dioxide will be a goal for all nations, so our investment in that area should depend on whether we believe we can develop the technologies faster than others. This isn't only a matter of laboratory research; it involves the big investments in pilot plant and larger scale operations.

Natural gas is an obvious contender for our energy needs, but the reserves are mostly in the north-west corner of the country, a long way from the majority of our population. Burning natural gas produces less greenhouse gas than burning coal, but it's far from 'clean'. If the choice were to be to ship coal to nations who then burned it without capturing the emissions, while we burned natural gas, the result for the planet would be appalling, so clean technologies for coal must be a high priority. Enthusiasts for nuclear power would have to admit that it would take several decades to displace coal as the prime source of electricity in Australia, and a factor I haven't heard mentioned is that if many countries start out on the nuclear path simultaneously, suppliers of the expertise and materiel will be swamped.

Biofuels are much talked about lately. Biofuels may help us reduce our reliance on oil but they won't do much for the environment. Research at CSIRO shows that, taking the entire energy cycle of planting, fertilising, harvesting, processing and distributing as well as using the fuel in vehicles, shows a small saving in greenhouse gas emissions as compared with unleaded petrol (ULP). BP has just announced a co-investment in UK to make biofuel and claims a 34% reduction in greenhouse gases. However, for Australia

Our early research shows that all the arable land in Australia could only support around half of our liquid fuel needs. We see claims that a small area of land could support the fuel needs of one car, but when we scale this up, the energy used in transporting the crops, fertiliser and other materials and then distributing the final product, makes a huge difference to the result.

A factor we tend to overlook is that the engines in today's cars are far more sophisticated than only twenty years ago. Sophisticated engine combustion technology demands very strict quality control of fuels and this trend is sure to continue. So, while a farmer may be able to produce a biofuel suitable for his tractor or farm machinery, the fuel would almost certainly need a lot more processing to be suitable for today's car engines, even when mixed with petroleum diesel

The oil industry forecasts that Australia's oil consumption will be 900,000 barrels per day (that's almost 50 billion litres per year) by 2008. In 2005, the Federal government announce a target of 350 million litres of ethanol per year by 2011. That's less than 3 days' worth of oil, or less than one percent of our oil needs. Ethanol at a 1:10 mix with ULP (known as E10) has been agreed as acceptable in Australia, but even if the government target is met, fewer than ten percent of cars would be running on E10.

Imagine if all the car companies in the world started making hybrid cars or small diesel cars today. It would still take more than ten years to replace the more than 500 million cars in the world. And unfortunately, there's no sign of a rapid shift to smaller or more fuel efficient vehicles.

There are still many improvements that can be made to the car of today . Carmakers know what these are, but they haven't so far built them into their products because it seemed that customers weren't prepared to pay the extra cost. Things may be changing. Sales of so-called sports utility vehicles have dropped very significantly in the USA (by 48% in the case of one manufacturer, one of the leading SUV makers).

One bright note is that energy storage technologies are developing rapidly and within ten years or so will likely be sufficient to store enough electricity for a day's driving. At the same time, higher fuel costs will bring about a change in buying patterns, not only towards more fuel-efficient vehicles, but more fit-for-purpose vehicles. If I tow my trailer once or twice a year, I may be more inclined to drive a small car and hire or borrow a large vehicle for towing. It doesn't make sense to carry around all that extra muscle for the rare occasional use. Well, it may have done so when fuel was very cheap, but it will make less and less sense in the future.

As our cars become more electrified, probably leading to an all-electric car being mass-produced in just a few years, another revolution is likely to come into play. We know our electricity usage is very wasteful and much of the waste is because of sudden rises and falls in demand. The day can't be far away when smart electricity meters will provide the incentive for us to manage our energy consumption more cleverly. Even more likely, we'll turn over the task to a computer. This in turn will open the way to charging our cars at low-demand times such as night time or when the car is parked at a parking station.

If we put enough care into community planning, it is feasible that our cars could be charged without increasing the emissions at the power generating stations.

With my solar panels on my roof and my windmill catching every breeze, I shall be more interested in how I can share my energy with others rather than being a dumb consumer with little incentive to conserve energy.

Not everyone can afford to buy the latest energy-efficient appliances. Not everyone can limit their travel to reduce fuel use. We have to be compassionate to people who in good faith believed advertisements assuring them they could afford to drive a 'family-sized' car. We built our houses mostly with little regard for energy efficiency and with little expectation that a reliable public transport system would be provided. Now, as we begin to understand more about what the future holds, it's up to us to change our society - and influence the rest of the world - to bring our lifestyle to a sustainable level. When we see the effect of the rise in fuel price, we can't help but conclude that the quickest way to bring about these changes is to make it too expensive to do otherwise.

As an energy conscious member of the world community I must encourage my government to join a world body to manage our way out of the looming crisis. Not only must I do all I can to limit the damage I cause to the environment, I shall have to accept increasingly severe regulation limiting my ability to squander energy and prohibiting me from dumping my pollution into the world's sink. My efforts to conserve will be increasingly valued and I trust that eventually my descendents will be glad that we started behaving in a globally responsible way.

David Lamb
June 2006