The Real State *of the* World

BJØRN LOMBORG

THE SIR RONALD TROTTER LECTURE

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NEW ZEALAND BUSINESS ROUNDTABLE

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The Sir Ronald Trotter Lecture

SIR RONALD TROTTER was the first chairman of the New Zealand Business Roundtable in its present form, a position he held from 1985 to 1990.

Among his many other roles he has been chief executive and chairman of Fletcher Challenge Limited, chairman of the Steering Committee of the 1984 Economic Summit, a director of the Reserve Bank of New Zealand, chairman of the State-owned Enterprises Advisory Committee, chairman of Telecom Corporation, chairman of the National Interim Provider Board, a chairman or director of several major New Zealand and Australian companies, and chairman of the board of the Museum of New Zealand Te Papa Tongarewa.

He was knighted in 1985 for services to business.

This lecture was instituted in 1995 by the New Zealand Business Roundtable to mark Sir Ronald Trotter's many contributions to public affairs in New Zealand. It is given annually by a distinguished international speaker on a major topic of public policy.

The ninth Sir Ronald Trotter lecture was given by professor Bjørn Lomborg at the Museum of New Zealand, Te Papa Tongarewa, in Wellington on 8 October 2003.

Bjørn Lomborg

BJØRN LOMBORG is an associate professor of statistics in the Department of Political Science at the University of Aarhus and director of Denmark's national Environmental Assessment Institute. He holds an MA in political science (1991) and a PhD from the University of Copenhagen (1994).

In 1998 he published four lengthy articles about the state of the environment in a leading Danish newspaper. The articles led to the publication of *The Skeptical Environmentalist* in 2001, which has now been published in Danish, Swedish, Icelandic, German, and Portuguese, and is coming out in Spanish, Italian, French, Korean and Japanese.

Professor Lomborg is a frequent participant in debates on environmental issues, with commentaries in such places as the *New York Times*, *The Globe and Mail*, *Daily Telegraph* and *The Economist*. He has also appeared on television programmes such as Politically Incorrect, ABC 60 minutes, CNN, BBC, CNBC and PBS.

In November 2001, Bjørn Lomborg was selected *Global Leader for Tomorrow* by the World Economic Forum and in June 2002 he was named one of the '50 stars of Europe' in *Business Week* (June 17).

His professional areas of interest include simulation of strategies in collective action dilemmas; simulation of party behaviour in proportional voting systems; use of surveys in public administration; and use of statistics in the environmental arena.

Introduction by
Roger Kerr
executive director
New Zealand Business Roundtable

IT IS MY VERY PLEASANT DUTY to introduce our guest speaker, professor Bjørn Lomborg.

This is the ninth annual Sir Ronald Trotter Lecture. The series was inaugurated in 1995 to recognise Sir Ron's role as the Business Roundtable's founding chairman and his many contributions to business and public affairs in New Zealand. We are delighted that Sir Ron and Lady Margaret Trotter are with us this evening. We nearly managed to stage it on Sir Ron's birthday, which is tomorrow, but couldn't quite pull that off.

The purpose of the Trotter lecture is to feature an outstanding international speaker on a major topic of public policy. Our speaker and his theme this evening amply meet those criteria.

Professor Bjørn Lomborg is the executive director of the Environmental Assessment Institute, a leading environmental agency in Denmark. But he is better known around the world as the author of the book *The Skeptical Environmentalist*, which he published in 2001 after four years' solid research.

There is a nice irony that connects professor Lomborg's book and this lecture.

As he explains in the preface to his book, the motivation to write it came from his exposure to some of the writing of the American

economist Julian Simon. In many books and articles, Simon had argued that doomsday conceptions of the environment were wrong. Professor Lomborg quotes this prophecy by Simon:

> The material conditions of life will continue to get better for most people, in most countries, most of the time, indefinitely. Within a century or two, all nations and most of humanity will be at or above today's Western living standards.
>
> I also speculate, however, that many people will continue to *think and say* that the conditions of life are getting *worse*.
>
> *Julian Simon (1932–98) Professor of Economics, University of Maryland (Regis 1997:98), quoted in* The Skeptical Environmentalist *(2001) p vii*

Professor Lomborg set out, with the help of his students, to examine Simon's work, expecting it to be (I quote) "simple, American right-wing propaganda". Instead, he ended up agreeing with most of what Simon – and for that matter many other writers – had concluded.

The irony is this. In 1994, I invited Julian Simon to visit New Zealand to give this lecture. He was a fine scholar and a wonderful man. I have his reply here: "It was fun seeing you in Cannes. I will keep your invitation under my pillow." Sadly, Julian died in 1997 before he was able to take up the invitation.

But, as events have turned out, professor Lomborg has given more publicity to Julian Simon's life and work than Julian could ever have hoped for. Without doubt, a reason for that is his impeccable credentials. As he says in the preface to *The Skeptical Environmentalist*, "I'm an old left-wing Greenpeace member". When his heretical book came out, the Green movement erupted in outrage. Websites around the world melted down. *The Economist* featured a three-page article and reviewers said things like "this is probably the most important book on the environment ever written".

It kept on getting better. At one of those bastions of academic freedom, Oxford University, Bjørn had a pie thrown in his face. The most Orwellian response was from the so-called Danish Committees on Scientific Dishonesty, which condemned him without pointing to a

single instance of inaccuracy or distortion in the book. 'Green inquisition burns first heretic' was the title of an article in the *New Zealand Herald* on this episode by Denis Dutton earlier this year.

What we are seeing here sometimes looks like science meets superstition, or religion. But it is vitally important for the prosperity of our societies and the quality of our environment that all these controversial topics – resource depletion, species loss, climate change, genetic modification and so forth – are examined on the basis of science and calm analysis. We need to worry about the real environmental problems, not the imagined ones.

What's more, prosperity and the environment are linked. Good economic policy and good environmental policy more often than not go hand in hand. Richer is cleaner. Property rights, prices and markets do more for many environmental problems than regulation and bureaucracy. In many of our national debates – over fertiliser subsidies, Think Big, producer boards, water use, road pricing and so on – the environmentalists were often not there when we needed them.

It is in the interests of promoting informed and reasoned discussion, not necessarily to endorse any particular findings, that the Business Roundtable and the Resource Management Law Association have brought professor Lomborg to New Zealand to share his insights with us.

He joins us after a week in Australia where he was a guest of the Australian government and met with members of the Australian Cabinet.

It is my very great pleasure to invite professor Lomborg to give the 2003 Sir Ronald Trotter Lecture.

The Real State of the World

ECONOMICS HAS BEEN CALLED THE DISMAL SCIENCE. But, in modern times at least, it has tended to be environmentalists rather than economists who have put forward a dismal view of the world.

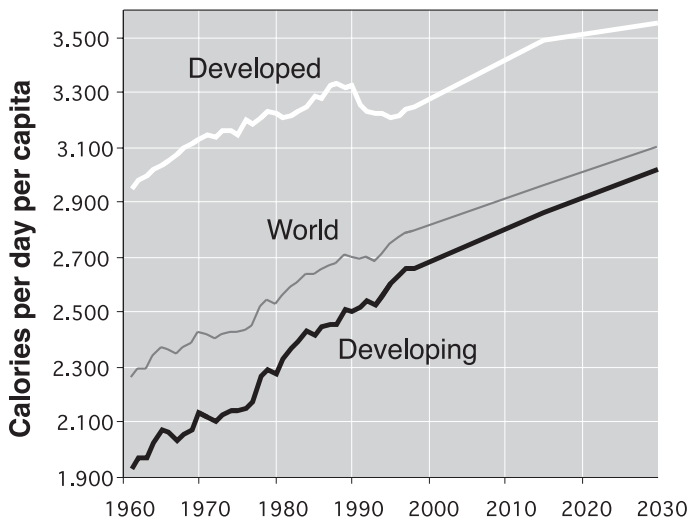
Beginning with a sceptical view of his work, I discovered that the late American economist Julian Simon was right. As the first chapter of my book says, things are getting better. Simon emphasised what became a crucial message of *The Skeptical Environmentalist*: myth-making prevents us from using our judgment wisely. We will panic and fail to prioritise if we believe that the world is falling apart. If people worry too much about the small problems, they will not worry enough about the big ones.

There is only one pot of money, and it must be spent wisely. We need to concentrate on the facts. The myths about the environment have convinced many people that we are headed in the wrong direction. I believed them before I wrote *The Skeptical Environmentalist*. Then I realised that these myths were like holding a gun to our heads, stopping us from being able to prioritise. The analogy is with a street criminal pointing a gun at you and demanding your money. You would not pause and wonder whether you would prefer to buy a new toaster; you would simply hand over the money.

Economic improvement

If we take away the gun, we can look calmly at the statistics. These show that, on almost any measure of human welfare, we are better off today than ever before. Things are improving in many different ways. Today, we have more leisure time, greater security, fewer accidents, better education, more amenities, higher incomes, less starvation and more food. We are healthier and we lead longer lives. This is true for the industrialised world, but it is also true for the developing world.

Figure 1: Calories for developed and developing countries, 1961–2030



Source: Food and Agricultural Organisation, 2001.

Figure 1 uses data from the Food and Agricultural Organisation of the United Nations. The graph outlines the average intake of calories per person per day, over the past 40 years, and projects what is likely to happen over the next 30 years.

People in the developed world today consume, on average, more than 3,000 calories per person per day. If we have any problem, it is possibly that we are getting a little too fat.

But, more interesting is the trend in the developing world. In 1961, people in the developing world consumed, on average, about 1,932 calories per person per day. That is a little more than the basic requirement to sustain life. Today, that figure has risen to round 2,650 calories.

In discussions on these issues, I have found that one of the hardest messages to convey is that a particular situation is improving. This is often confused with another message: that everything is fine. However, it is possible to state that something is improving *and* we want it to be better yet; we can say both things. It is important to point out that things are getting better, so that we can take the gun away from our heads and start thinking sensibly about priorities.

In 2030, people in the developing world will be consuming about 3,000 calories per person per day. That is much better than today, but the developing world will still only be as well off in 2030 as the developed world was in 1961. Things are moving in the right direction but there are still problems.

I often hear it said that "there are lies, damned lies, and statistics". I agree that it is possible to cheat with figures, but I believe that they provide the only real way to understand the world. Figure 1 uses averages. It has been suggested that the graph could be depicting just the middle classes in the developing world eating better. However, other statistics show that is unlikely. For over 30 years the United Nations has estimated the number of starving people in the world. In 1970, 35 percent of all people in the developing world were starving – more than one in three. Today, that figure is down to 17 percent.

In 2030, about 6 percent of the world's population will lack food. A world with 6 percent of its population starving is undoubtedly better than a world where one-in-three people is starving – but that does not mean there is no problem. In 2030, there will still be 400 million people starving unnecessarily. They will not be starving because we cannot produce enough food, but because they do not have enough money to buy food.

Although there are still economic challenges, we know that things are getting better in a material sense. What about the world's environmental problems?

Improvements in environmental indicators

Contrary to popular opinion, both air quality and water quality are generally improving. This may come as a surprise. We hear a lot of bad news about the environment, and we tend to have a more pessimistic view than the statistics actually support.

Surveys show that people generally believe air and water quality in their own area is acceptable. The intriguing paradox is that they generally believe that other regions have major problems. As an example, researchers asked Americans what they thought of water quality. About 20 percent of people were worried about their local area. But when the researchers asked about water quality on a national level, 90 percent of respondents were concerned. Surveys from around the world have found similar results.

Obviously, many people believe that the grass is browner on the other side of the fence. However, that cannot actually be true for all of us. There is a vast difference between what we experience ourselves and what we perceive.

We hear a lot of bad news for three main reasons. The first is that research has a built-in bias. A researcher who finds no problem is not very likely to gain funding to continue studying in their field. The researcher's chances are much higher if they find that we could all die within five years if something isn't done.

This approach to research makes sense because it means that we deal with problems that can and do arise. However, it also means that we tend to hear only about possible, future problems.

Our attitudes to different interest groups is the second reason we hear so much bad news.

If a business organisation argues that implementing the Kyoto Protocol is not a good idea, the citizenry is naturally sceptical, because

that group clearly has an interest. However, the public does not treat organisations like Greenpeace in a similar fashion. Surveys show that most people do not trust business groups, but overwhelmingly trust Greenpeace and organisations like it – far more than they trust independent scientists, university researchers or environmental ministries.

As members of the public, we fail to recognise that, like any business group, Greenpeace has its own interest: it wants us to worry more about the environment than about any of the other problems in the world. We should certainly be happy that Greenpeace exists. But we need to understand that interest groups come in all shapes and sizes, and we should hesitate before accepting any interest group as the sole arbiter of truth.

The third reason we hear bad news is simply because we love it and the media loves to deliver it to us. Many studies show that if you offer people a pile of bad news and a pile of good news, they will overwhelmingly choose to read the bad news.

These three points are not intended as a criticism of scientists, of organisations like Greenpeace, or of the media. We do hear a lot of bad news, but we should realise that this is not necessarily an accurate reflection of the world.

Resource depletion

In the 1970s and 1980s, the world was very worried. The fear was that we would run out of resources. This 'limits to growth' argument continues to underpin many people's present-day understanding of the environment.

As an energy-based civilisation, it is understandable that people have worried about our energy supply for a long time. To borrow a phrase from a Princeton professor who happens to be much older than I am: "We have been running out of oil ever since I was a kid!".

Calculating the amount of oil left in the world has always been a rather simple business. In 1920, we knew how much oil the world used

on an annual basis. We also knew how much oil we thought was left over. We divided those two numbers and discovered that there was only enough oil for 10 more years. So it is understandable that in the 1920s the American Bureau of Mines warned that there was just one decade of oil remaining. However, 10 years later, when the same calculation was done, it was found that there was still a decade of oil left – even after consuming 10 years of oil and at a higher level of consumption.

That, perhaps, was a little surprising. Not so surprising was that the American Bureau of Mines declared in the 1930s that there was just one decade of oil left.

In 1940, one could be forgiven for thinking that the world would most certainly have run out of oil. After all, we had now used 20 years' worth of oil. There was more oil being used in 1940 than in 1930 or in 1920. Yet, in 1940, there was still eight years of oil left at this higher level of consumption.

Now this is all getting very odd: the more oil we have used, the more we seem to have remaining. It reveals that there is something fundamentally flawed with the concept that there is only a certain amount of oil left over, and that we are done for once that amount has gone. It is like someone coming to my house, looking in my refrigerator and saying, "Wow, you have only got food for three days, so you will die in four". The reason I won't starve in four days is because I will go shopping – and that is exactly what has happened with oil.

We have become better at finding oil and better at using it. Eventually, people will stop using fossil fuels. But there is enough of this resource left for 40 or 50 years at the current rate of consumption. If we include the undiscovered resources – another strange concept – we probably have 100–150 years supply. The shale oil that will become economically viable within the next 25 years will probably last another century. If we take all the available shale oil in the world, there is enough to cover current energy consumption levels for 5,000 years.

Worrying about running out of oil in 40–50 years is very different from worrying about running out of oil in 5,000 years. We must remember, though, that the world will not continue to use this resource the way that we do today. Renewables have been coming down in price dramatically – about 50 percent per decade over the last 30 years. Even if the price fell in future at a much slower rate, it is likely that renewables will become a serious competitor to fossil fuels by mid-century.

Sheik Yamani, founder of the Organisation of Petroleum Exporting Countries (OPEC), has often pointed out that the oil age will come to an end but not for a lack of oil, just as the Stone Age came to an end but not for a lack of stones. Humans search constantly for better alternatives.

The situation is the same for gas and coal and minerals. Of the latter group, the most important are aluminium, iron, copper, zinc and cement – although I have yet to meet anybody who is worried about running out of cement.

When we use a resource, we start with the easily accessible, richest deposits. Iron ore is an example. Future generations will have to dig deeper and use lower-quality iron ore. However, we are leaving them with better technology that more than makes up for the problem.

The price of raw materials has come down dramatically – about 80 percent over the past 150 years. In economists' terms, raw materials have become more abundant, not scarcer.

These myths must be exposed. Humans are replacing the decreasing availability of easily accessible resources with improved technology. Our generation is leaving our children and grandchildren with the better ability to get ever-cheaper raw materials.

This set of facts raises questions about recycling, which is often based on concerns about things running out. Recycling may be a good idea sometimes but not always. Such questions will only be investigated coolly if we drop the gun and look at the facts.

Pollution

Many environmentalists will agree that future generations are likely to be richer. They will then ask how that will help if pollution undermines people's welfare. Will money really assist us if we cough all the way to the bank? That is, in fact, a sensible concern.

The most important environmental problem by far is air pollution – especially particulate air pollution. The US Environmental Protection Agency estimates that anywhere from 86 to 96 percent of all social benefits from all environmental regulation stem from regulating just one environmental pollutant – namely, particulate emissions.

One could make a credible argument that the entire environmental debate should be about air pollution.

Most of us assume that air pollution is a fairly recent phenomenon, and that it is getting worse. That is not true. The best data that we have is from London. Between 1585 and about 1890, air pollution in London worsened. Since then, it has declined so dramatically that, today, the air in London has not been cleaner since medieval times.

In many cities air pollution has been cut a lot, but it is a good investment to cut it even further. For example, putting particulate filters in diesel cars is expensive, but it is also a worthwhile investment.

Clearly, air pollution is not a recent phenomenon, and, clearly, it is not getting worse in much of the advanced world. It is, however, important to acknowledge that this is not the case for cities like Bombay or Bangkok. Things there *are* getting worse. But that is not surprising, either. These are places that are becoming industrialised.

If a population lacks industry, it will also lack pollution – and money. As a poor country becomes industrialised, pollution will rise. Citizens trade this off against their increased incomes. Only when a population becomes sufficiently rich – some research suggests this figure in purchasing power parity terms is about US$3,000 per person per year – will the citizens start to 'buy' more environmental protection. That

is what the developed world has done, and it is what is happening in many parts of the developing world today.

In two of the richer countries in the developing world, Mexico and Chile, air pollution has begun to decline in the past five to 10 years. These nations have bought more protection. To achieve sustainable development, it is important that the developing world becomes sufficiently rich.

In short, some of the most central environmental problems have been getting better in the developed world, and it is likely that they will get better in the developing world as wealth grows. This means we do not have a gun to our heads, but, of course, it also means that we have to start thinking about smart ways to deal with the problems that remain – such as global warming.

Global warming – the science

In many ways, the debate about global warming is the major environmental discussion going on right now.

We should start by acknowledging that global warming is occurring, and that it is important. Some people claim it is not happening or that there is no proof, but such claims seem unsupportable. It is certainly not the only change taking place, and there is debate about the magnitude of the change. However, the global temperature record over the past 140 years shows a significant increase in temperature. There has been a short period of cooling that is not yet well understood, but the temperature increase over the past 25 years is consistent with global warming.

In the period 1940–1975, when there was a slight cooling of the world's temperature, most of the world actually worried about global cooling. Today's climate models are much better, so I am not poking fun at yesterday's scientists but simply pointing out the dangers of the precautionary principle. Back then, some people seriously suggested

putting soot on the ice to warm up the world. Thankfully they did not do that – but it would have been an application of the precautionary principle. It shows that what people advocate often depends very much on their preliminary understanding of the problem.

Our best information today, I would argue, comes from the United Nations Intergovernmental Panel on Climate Change (IPCC). The IPCC is by no means a perfect group. It is an effort to bring together climate scientists from around the world to form a collective view. One flaw is that it neglects some of the crucial economic questions. Specifically, the IPCC does not ask what is potentially the most crucial economic question: should we do anything at all?

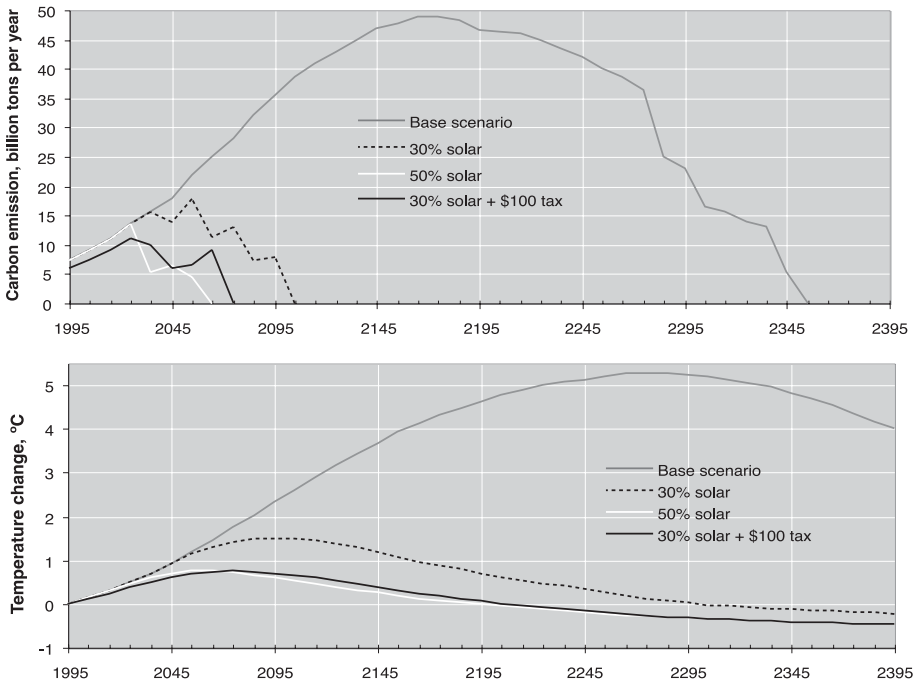
Global warming – the economics

Estimates put the total annual cost of global warming at between 480 and 640 billion dollars. Half a trillion dollars is not a trivial sum of money. It equals about 1.5–2 percent of total global gross domestic product (GDP). But the important questions to ask are: how important is global warming, what will be the future trend of carbon emissions, and most of all, should we try to curb any warming trend?

In some ways, global warming is a limited problem because eventually the world will stop using fossil fuels – this is Sheik Yamani's point about the Stone Age. The question is not whether we will have a transition to a low-carbon or no-carbon world but rather, when.

Figure 2 shows some of the possible scenarios. At one extreme, it shows what would happen if we did not have any other energy options – if we continued to use fossil fuels and if other forms of energy remained at their current price levels. Clearly, we would continue to use large amounts of fossil fuels until all the easily accessible resources were exhausted. Eventually, there would have to be a shift to renewables. In this scenario, there would be a massive amount of carbon emissions that would last into the twenty-second century, giving rise to dramatic temperature increases – in this model, the rise would be greater than 5°Celsius.

Figure 2: Reasonable scenarios: renewable energy substitution



Source: Chakravorty *et al,* 1997; Ahmed, 1994.

But, of course, that is not going to happen. I mentioned that renewables have dropped in price by about 50 percent per decade over the past 30 years. Even if they continue to drop at a much slower rate, say, 30 percent, they are still likely to displace hydrocarbons to a substantial degree within 50 years.

Looking ahead, we will continue to use fossil fuel up to the point where solar power becomes competitive. Then we will use less. Even on very moderate assumptions, we will stop using fossil fuels by the end of the century. There will be a period of transition with its associated costs, but eventually there will be a shift. It is not likely that there will be any problems supplying the world with the new resource. If we just used solar energy, we could meet the entire world's energy needs by putting solar panels on the equivalent of 2.6 percent of the area of the Sahara.

Solar power may not end up being the future choice. We cannot reasonably predict what will happen 100 years ahead, but it provides at least one backstop technology. What this means is that a much lower global temperature increase is in prospect.

The IPCC suggests that temperatures are going to increase somewhere between 1.4 and 5.8 degrees centigrade. Some people assume that the predictions are normally distributed between those two limits. In fact, most of the major scenarios are biased toward the low end. The high end is only possible if massive amounts of fossil fuels were used right into the twenty-second century. That is unlikely to happen.

We are much more likely to be confronted by one of the median outcomes, which is between two and three degrees of warming. This is far more realistic, but it is by no means inconsequential.

It is instructive to examine the effect of global warming on agricultural production.

Figure 3: Consequences: Agriculture (production change in percent)

Scenario, +2.5 to 5.2°C	World	Industrialised countries	Developing countries
Temperature increase only	–1 to –20	–4 to –24	–14 to –16
+ CO_2 effect	–1 to –8	–4 to +11	–9 to –11
+ light adaptation	0 to –5	+2 to +11	–9 to –13
+ moderate adaptation	–2 to +1	+4 to +14	–6 to –7

Source: Intergovernmental Panel on Climate Change, 1996.

Figure 3 shows that with just a moderate temperature increase, agricultural production would decrease by between 11 and 20 percent by 2080. However, without global warming, by 2080 there would probably be an increase of about 100 percent from today's production levels, largely as a result of improved technology. The real effect of global warming would therefore be that, instead of seeing a 100 percent increase in agricultural production, we would only see an 80–89 percent increase by 2080.

We should also take into account the fact that people adapt. Limited adaptation to global warming would mean that farmers would, for example, plant earlier in response to warmer weather. Moderate adaptation would mean that farmers would change crops. It seems fair to assume both adaptations would take place over the next 80 years. So, what we are most likely to see – and this is the IPCC's own judgment – is no change in overall agricultural production.

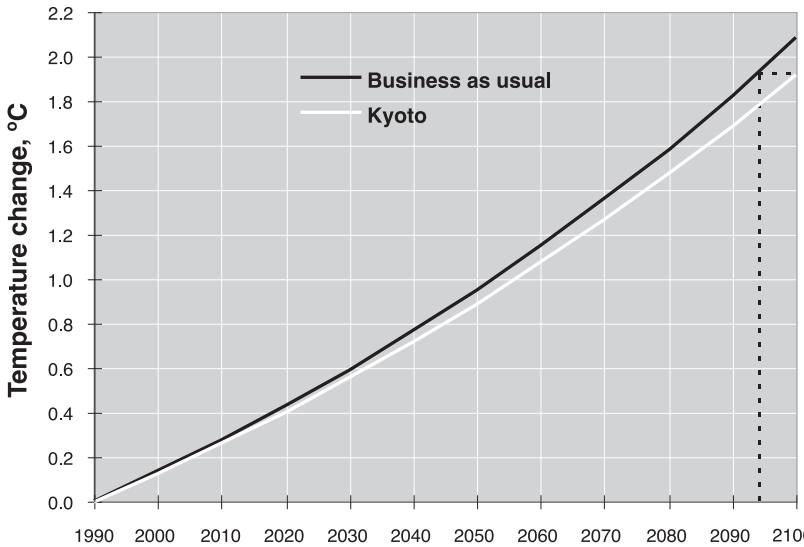
However, an important point to note is that, in this scenario, the industrialised world would be the winner and the developing world the loser. Generally, developed countries will experience both gains and losses from global warming, but it will certainly harm developing nations. In simple terms, the developing world is already pretty warm. More importantly, most developing nations have very poor infrastructural capacities, so dealing with the problems of global warming would be much harder.

The Kyoto Protocol

This leads to the question: are our solutions sensible? Let us assume for a moment that the Kyoto Protocol on climate change will do everything that is envisaged, that the United States will participate, and that there is no carbon leakage (whereby companies move to countries outside of the Kyoto agreement). Figure 4 shows a model produced by one of the leading authors from the 1996 United Nations climate panel, but nearly all models show a similar outcome.

The model suggests that if we do absolutely nothing, there will be a temperature increase of 2.1 degrees centigrade up to 2100. But the Kyoto agreement will not stop that. If every signatory implemented the agreement and stuck to it for the remainder of the century, the temperature would increase by 1.9 degrees rather than 2.1 degrees. So, we would postpone the temperature that would otherwise be reached in 2094 until 2100. The Bangladeshi family that will have to move in 2100 because their house is flooded as a result of sea-level rise can now wait until 2106. That is a benefit, but not a large one.

Figure 4: Consequences: Kyoto



Source: Wigley, 1998.

If there were unlimited resources in the world, we should clearly implement the Kyoto agreement. Given that there aren't, we must ask if that is the best thing to do. Using an average estimate from all of the economic models of the cost of implementing the Kyoto agreement, we find that, if every industrialised country signs up, the cost will be between US$150 and US$350 billion a year depending on trading rules, starting in 2010.

That is no small amount of money. Right now, the entire world gives about US$50 billion in development aid each year. We are talking about spending between three and seven times the annual level of global development aid in order to deliver a minimal benefit to the developing world in 100 years' time.

It is possible to do much better than that. We could solve the single biggest problem in the world once and for all, for the cost of one years' implementation of the Kyoto Protocol: we could give clean drinking

water and sanitation to every single person on this planet. That would save two million lives each year, and save half a billion people from getting seriously ill. The resources required would just be the cost of implementing the Kyoto agreement in 2010. In 2011, we could then go on to solve the second biggest problem in the world and in 2012 we could solve the third biggest.

The point here is to ask: is implementing the Kyoto agreement really a good use of the world's scarce resources? The odd thing is that no-one involved with the Kyoto process asked that question. We had a gun to our heads.

If we act more wisely today, we can do more to help the developing world handle the problems of tomorrow.

We also need to encourage a phasing-out of fossil fuels. It would make sense to increase research into and development of renewables. Right now the United States spends about US$200 million annually in this area of research and development. Increase that tenfold and it would still be just 1 percent of the total bill for the United States for implementing the Kyoto agreement. Yet, it would probably do much more good, in the sense that it would bring forward, by a least a few years, the switch to renewables.

All of the major cost-benefit models tell us that doing very much about global warming is simply not a good deal.

A professor of economics at Yale University, William Nordhaus, has done a lot of work examining the cost-benefit models. He shows that continuing business as usual would cost about US$5 trillion, which is not a trivial sum of money. Global stabilisation of CO_2 emissions on the other hand is far more costly – about US$8.5 trillion. The cost of limiting the temperature increase to 1.5° Celsius is an almost unimaginable US$38 trillion. This is simply a bad deal. Even politicians who support the Kyoto agreement admit that implementing it will not do very much good. They say it is a symbolic act. Do we want to spend US$150 billion a year on a symbolic act? Other supporters of the

Kyoto agreement, who admit that it will not do very much good, say that all that shows is that we need to do much more. Logic would dictate that if the first step is a bad step, we probably should not take any more steps in the same direction. The cost-benefit analysis shows that the Kyoto agreement is a bad deal, and that doing more would be an even worse deal.

Getting our priorities right

We need to get back to understanding what the real problems are. The IPCC estimates of what could happen in the twenty-first century show that the way the world will evolve depends on two things: whether we worry mainly about economic or environmental outcomes, and whether we focus on global or regional solutions. The IPCC tends to believe that worrying about economic outcomes in a globalised world is the most likely outcome.

What would be the net worth of the twenty-first century? Only an economist can ask that question. On plausible assumptions the answer is about US$900 trillion. That is the wealth that may be created in the hundred-year period. What happens if we worry more about environmental outcomes than economic outcomes? Clearly, the world will be less rich. The average person in the developing world in 2100 could be 75 percent less well off than they might have been. Is that a good way to address the world's problems?

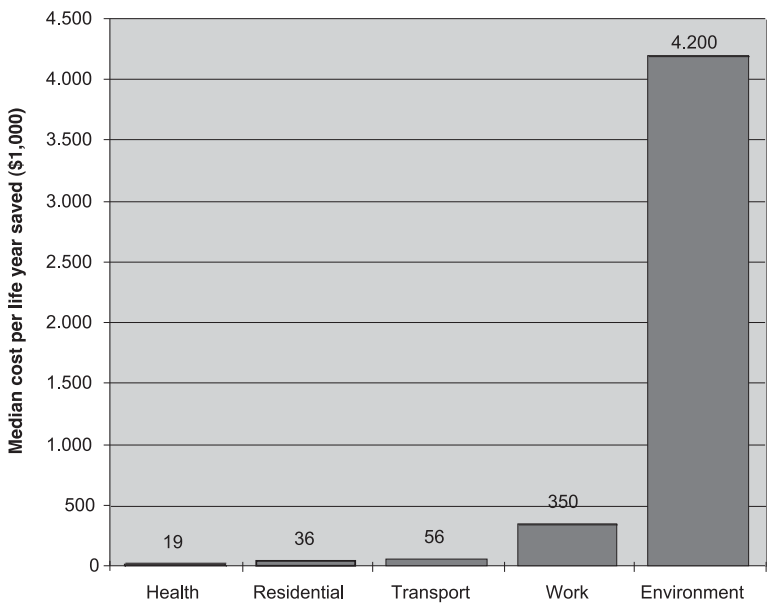
We need to make sure that we deal with problems in a global rather than a regional setting, and that we keep our focus on economic policies that will enable people in developing countries to become wealthy enough to afford to care about their environment. We will only get our priorities right if we understand that things are actually not moving in the wrong direction.

Thirteen researchers from the Harvard Centre for Risk Analysis (associated with Harvard University) spent three years examining every piece of US legislation that had as its stated primary focus to save human lives – about 600 Acts. Their work allows us to compare the efficacy

of environmental legislation that aims to save human lives with other legislation having the same purpose. Notice that much environmental legislation does not have as its primary purpose to save human life, but legislation that does can be compared in efficiency with other legislation with the same aim. As Figure 5 indicates, the researchers found that in the health sector the median cost of saving one human life for one year was about US$19,000. In residential housing, the typical cost of saving one human life for one year was US$36,000. In the transportation area it was US$56,000. In the work-related area it was US$350,000. In the environmental area, when saving human lives was the primary motive, the cost to save one life was US$4.2 million. Spot the bad investment.

This does not mean that some of these environmental policies are not worth pursuing. As I have already mentioned, for example, providing particulate filters for diesel cars is an excellent environmental

Figure 5: Cost of saving one human life one year



Source: Tengs *et al,* 1995.

investment. But a typical investment in the environmental area tends to be a very bad one. We really have to ask some hard questions. Why do we choose to save one human life for US$4.2 million when we could have saved 200 lives for the same cost by directing that money elsewhere? If our primary motive was to save human lives, why did we neglect 199 people? The Harvard Centre for Risk Analysis estimated that, in terms of these pieces of legislation, the United States spent about US$21 billion saving about 60,000 lives a year. Had the money been spent optimally, 120,000 lives could have been saved.

Prioritising poorly is not cost-free. In this example, it meant 60,000 lives were not saved. When I debate with environmentalists, they say "sure, we spent a billion dollars but we did some good". That is true – but I challenge anybody to spend a billion dollars and not make at least somebody happy.

The question should not be whether we did some good with a billion dollars. It should be whether that was the best that we could possibly do. That is why I believe it is important to know the real state of the world and rid ourselves of the myths.

We need to understand that things are generally moving in the right direction. We need to understand that they are likely to continue to do so. That does not mean we can stop worrying: it means we can start worrying about the right things. We can make sure we get our priorities right. We can remove the gun that is being held to our heads. We can refuse to act in panic. We can look calmly at the evidence and ask how best to spend our billion dollars. The result will be that not only will we leave this world a better place – something that is likely to happen anyway – but we will ensure that our children, and their children, will get the best world possible.

Questions

Last year the New Zealand government ratified the Kyoto agreement on climate change. They also nationalised the New Zealand forestry industry's carbon credits. What, in your view, is the best approach to carbon trading, assuming that Russia does ratify at some stage? Is it better to have a centralised government approach to the trading of carbon credits, or would we do better to allow the forestry industry – those who actually own the credits – to trade in them themselves?

Typically, the approach I use is a welfare economics approach – therefore, asking, what is best for the nation? The appropriation of trading rights is basically an issue of distribution – who will have the money? I understand why the forestry sector might be angry about the situation you describe but from a welfare economics point of view it is simply a transfer. So in that sense, it doesn't matter. What matters is that you get efficient trading and good verification.

We conducted a study in Denmark to find out the cost of international trading versus the cost of fulfilling our obligations under the Kyoto agreement internally. The answer was something like NZ$500 million with an international market versus NZ$1.5 billion if it were done internally. So the obvious starting point is that we should trade and use quotas in the best possible way. But this issue is subsidiary to the issue of whether Denmark should have ratified the Kyoto agreement.

Something like Kyoto is going to happen. Certainly, the European Union will stand by many of its Kyoto commitments even if the Protocol is not ratified by Russia. The European Union has basically

said that if the United States won't save the world, it will just have to go it alone. I find that absurd, given that even if everyone joined in, that would not stop global warming. It is a symbolic gesture.

You mentioned that in the foreseeable future it is likely that alternatives to fossil fuels will become cheaper. What technologies or alternative sources of power do you think are practical and realistic and likely to come on stream in the next 20–30 years and beyond?

In the next 20–30 years I don't think we will see a changeover to non-fossil fuel sources. We will see wind power in some countries, like Denmark, where we have a lot of wind and where it makes sense. We are producing almost 20 percent of our electricity with windmills. I think windmills are beautiful – in limited numbers – but people don't want to see them everywhere. Many will probably be moved out to sea parks where they can't be seen. It would cost a little more but probably be cost-efficient within the next 10–15 years.

In the long run, solar power is the main option. We could only supply about half of the world's current energy consumption by wind power alone, so we are likely to see solar power combined with hydrogen production and fuel cells. Of course, we are talking about off-grid production first of all. This is already happening in the developing world and it has huge benefits, including environmental ones.

One of the fairly common concerns is the effect on the environment if everybody in the developing world gets, say, a car and a refrigerator. If that happened today we would be in dire trouble. However, it is just not going to happen. When many people in the developing world get cars they will be running on fuel cells. We have a problem if we foresee everything happening with today's technology, but we are certain to develop better technology. Within the next 50 years it seems likely that alternative energy will become cost-efficient. By 2070, we would expect the last forms of substitution to be occurring – probably in the transport sector.

It's two or three years now since you published your book. Are there any areas in which your thinking has developed or has anything occurred since you wrote your book that has led you to change your mind?

I would very much like to be able to say that something has led me to change my mind or that I've got wiser, because that would sound so much more credible. But, the fact is that I think most of what I wrote actually stands. If you can say one thing about the book, it is that it has been read critically by a lot of people, so I think it's fair to say that most of the likely critical responses are out.

The upshot is that a number of small mistakes in the book have been identified. I have put a list of corrections on my website, but they're minor and detailed in nature. So the basic thrust of the arguments seems to stand, much as I would love it to be otherwise.

You showed us how much it would cost to implement the Kyoto agreement on climate change. Can you estimate how much it would cost us not to implement the agreement, and what kind of parameters you would base your estimate on.

The cost-benefit analysis tries to take into account the cost and the benefits, whereas the cost of Kyoto is just that – a cost. Nordhaus's estimate of the business-as-usual scenario is about US$5 trillion.

This sort of analysis is obviously not an exact science. We cannot predict with great precision. But it is unlikely that our intuition would be a better guide than the best estimates of experts.

If some cost-benefit analyses showed that implementing Kyoto did pay off, and others showed that it did not, then we should be left with a dilemma. However, we are systematically seeing that it is a bad investment. The very good reason for this is that all the discounted costs will fall now or in the near term whereas the smaller benefits will happen in 100 years' time.

If, instead of investing in Kyoto, we invested in malaria protection, that would increase the GDP per capita of many African countries by

perhaps 1–2 percent per year. Those nations would then be many times richer in 2100. Similar benefits would come from investing in clean drinking water and sanitation.

Would you rather be the fairly poor Bangladeshi in 2100 with six more years remaining before you had to leave your house, or would you rather be in the same circumstances but very rich? Yes, you would have to deal with flooding six years earlier, but you would have a lot more money to deal with it. Unless you make major, unrealistic changes to the parameters in the models you cannot get the Kyoto programme to pay off.

We must realise that we can only do so much. Rather than doing something that feels nice and looks good on television, we should undertake things that actually do real good for people in the future.

Vote of Thanks
Denis Dutton,
University of Canterbury

DURING THE ANSWER TO THE LAST QUESTION, I did a little calculation. I was in the American Peace Corps in India, and I was trained as a health inspector, working in dysentery and cholera prevention. In developing nations, since we started tonight, 799 people died because of the problems that come from a lack of clean water and sanitation. That is sobering and it puts the Kyoto agreement costs in perspective. For the cost of implementing Kyoto for one year we could completely eliminate that problem. But there is no will to do that. Instead, there is a will to fly climatologists around the world, first class, from conference to conference, building up a Kyoto 'industry' of gigantic proportions.

Professor Lomborg's good news about the environment is bad news for the green ideologues. They are hurting very badly because his book has changed radically and irreversibly how we analyse these issues. In a review of *The Skeptical Environmentalist* for the *Washington Post*, I said the book was the most significant work on the environment since the appearance of its polar opposite, Rachel Carson's *Silent Spring*, in 1962. The environmental debate will never be the same again.

My native state, California, tonight got Arnold Schwarzenegger. We got Bjørn Lomborg, and we owe him a great debt of gratitude for sharing his insights with us.

Notes

Ahmed, K (1994) *Renewable Energy Technologies: A Review of the Status and Costs of Selected Technologies*, World Bank Technical Paper 240, Washington, DC.

Chakravorty, U, J Roumasset and K Tse (1997) "Endogenus substitution among energy resources and global warming", *Journal of Political Economy* 105(6): 1, 201–34.

Food and Agricultural Organisation of the United Nations (2001) *Agriculture: Towards 2015/30*, Technical Interim Report, FAO, Rome.

Intergovernmental Panel on Climate Change (1996) *Climate Change 1995 – Scientific-Technical Analyses of Impacts, Adaptations and Mitigations of Climate Change*, Report of the IPCC Working Group II, Cambridge University Press, Cambridge, UK.

Lomborg, B (2001) *The Skeptical Environmentalist: Measuring the Real State of the World*, Cambridge University Press, Cambridge, UK.

Tengs, T, M Adams, J Pliskin, D Safran, J Siegal, M Weinstein and J Graham (1995) "Five-hundred life-saving interventions and their cost-effectiveness", *Risk Analysis* 15(3): 369–90.

Wigley, T (1998) "The Kyoto Protocol: CO_2, CH_4 and climate implications", *Geophysical Research Letters* 25(13): 2, 285–8.