

# **Positive Environmentalism**

A Convenient Truth

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Globalisation Institute

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## Executive summary

Policymakers need to adopt “positive environmentalism”, recognising the importance of dealing with environmental problems but rejecting the doom and gloom approach so commonly encountered.

International agreements are not the answer: the Kyoto agreement has not worked, and a successor treaty is not on the cards. India and China, who are set to be the greatest greenhouse gas emitters of the twenty-first century, will not sign up to any agreement that would limit their economic growth and condemn their most vulnerable citizens to continued poverty.

While green taxes have a theoretical appeal, each has serious drawbacks in practice. Most green taxes do little to encourage greener behaviour, and fall disproportionately on the poor.

Emissions trading, already in action in the EU, has proved problematic. There are improvements that can be made but emissions trading in Europe will not reduce global emissions.

Taxing food miles would not be good for the environment because agriculture in the UK is usually energy-inefficient. It would also hurt the ability of developing countries to trade their way out of poverty and put the UK/EU in violation of existing international agreements.

There is a convenient truth about growth and the environment: becoming wealthier and more prosperous in the coming century is not the enemy of environmental progress: it is its very heart and soul.

Within decades, technological progress, funded by growth, will break the relationship between GDP and carbon emissions.

Our approach to India and China, and other emerging economies, must be more savvy than trying to beat them into an international agreement that is not in their interests.

Government should create prize funds to support the development of new green technologies and tariffs on green technologies should be scrapped.

## Introduction

By Alex Singleton

Too often in discussions about the environment, a very negative, pessimistic approach is adopted. This negative environmentalism, full of doom and gloom, is a school of thought which thinks that improving the environment has to be done through restricting foreign holidays, limiting trade, only buying locally, or curbing GDP. It regards the rise of India and China with dread. Economic growth is seen as finite: the West, in this view, has become rich at the expense of the planet, and there simply are not enough resources to sustain economic prosperity in the emerging economies. The consequence of this worldview is that many people support policies that would restrict economic growth.

This publication offers a different approach: positive environmentalism. We recognise the importance of dealing with environmental issues. But we recognise that it isn't all doom and gloom. We see the positive trends over the past century. People no longer worry about the Ozone Layer or acid rain or the cleanliness of Britain's rivers. Londoners don't complain about smog; indeed, air quality in London is the cleanest since records began in 1581. These have been achieved not by curbing living standards but hand in hand with rising affluence. All the evidence shows that after the early stages of development, environmental trends improve because people are wealthy enough to pay for the improvements.

Instead of a fear of economic growth, policymakers should see it as a force for good. Within decades, technological progress, funded by growth, will break the relationship between GDP and carbon emissions. This point is explored in the second chapter of the report which examines the future of energy production.

Moreover, an approach to climate change that emphasises technological progress hand in hand with growth offers the best way to tackle the issue of the developing economies. Our approach to India and China, and other emerging economies, must be more savvy than trying to beat them into an international agreement that is not in their interests. The British public has made clear, through initiatives such as Make Poverty History, that the needs of the world's poorest must be taken into account. The development of cleaner technologies that can be shared with the developing world offers an opportunity to both tackle climate change and see the continuation

of the fast economic growth that countries like India and China are enjoying. Conversely, an approach that tries to limit developing country trade or growth would be unhelpful.

A recent publication from the think tank Policy Exchange, *Science vs. Superstition – The case for a new scientific enlightenment*<sup>1</sup>, says that it is time to make the case for a more positive attitude towards science and its promise of a better future. This is a sentiment with which we wholeheartedly agree.

### **The science of climate change**

This is not a paper about the science of climate change. However, it is worth explaining that when we think about the subject we take the view that one should not seize upon the most dramatic research findings, but look dispassionately at the whole range of scientific opinion.

In a chapter on climate change, Policy Exchange research director Dr Oliver Marc Hartwich criticises how the debate on the science of climate change is being portrayed. He says that the Enlightenment brought in an intellectual approach involving:

scepticism towards received doctrines and wisdom; a belief in science and empirical methods of investigating the world; the employment of human reason and the ever-present possibility – perhaps necessity – of doubt...

Dr Hartwich continues:

Science is not a discipline in which we should expect to find final truths. On the contrary, the principles upon which science is built are doubt and constant inquiry. In the 20th century, this view of science was most clearly expressed by the philosopher Sir Karl Popper, who once put the issue thus: “Whenever a theory appears to you as the only possible one, take this as a sign that you have neither understood the theory nor the problem which it was intended to solve”. To Popper science was an ever evolving process of discovery and refinement.

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<sup>1</sup> <http://www.policyexchange.org.uk/images/libimages/219.pdf>

We can only wonder what Popper would make of the current debate about climate change.

Sadly, we are in the position where climate change has become sensationalised by newspaper headlines too often reporting on the latest, most extreme research findings, rather than reporting new findings in the context of other research that takes a less extreme view. The consensus on climate change is a narrower, more basic one, than is often promoted. As the Policy Exchange report says:

In reality... there are very few things on which the majority of climate scientists would readily agree.

Dealing with those issues on which there is agreement is very simple, for they are few. First, the average global temperature has risen by approximately 0.7 degrees centigrade since 1860. Second, an ever increasing world population has an influence on the climate through increased energy and land use. Everything else in the climate change debate is highly controversial. Has the climate of the past millennium always been colder than today or not? How much of an effect on the climate does atmospheric carbon dioxide have? Do rising carbon dioxide concentrations lead us to a point of no return? Or are there self-regulating mechanisms which will slow, halt, or even reverse the process? For each question one finds much disagreement among climatologists. Such disagreement should be welcomed, for it is what science is all about. Far from any clear-cut consensus then, there is a debate amongst experts about the various aspects of climate change.

Puzzling, then, that most of what we hear in the public domain gives the impression that the case is quite the opposite.

Too often, the demagogues of the climate change debate, buttressed by apocalyptic newspaper headlines, have been able to popularise policy proposals regardless of their effectiveness, practicality or cost. As we shall see in later chapters, many of the policy proposals currently supported in the policy debate simply would not achieve their intended aims. We believe that a more considered examination of policies is needed. Outcomes, not aims, are what should count. After all, the road to hell is paved with good intentions.

# 1. Environmentalism for the 21st Century

By Simon Maynard

When the Kyoto Protocol came into force in 2005 Greenpeace, echoing the sentiments of many in the Green Lobby, described it as a ‘historic’ moment. Stephanie Tunmore of Greenpeace International lauded Kyoto as the ‘signal that governments and industry have been waiting for. There is now a price on climate pollution and penalties for polluters. The switch to a low carbon economy begins here.’<sup>2</sup>

Almost two years later, however, projections show that the European Union, the self-styled global champion in the battle against climate change, is falling woefully short of its targets for cutting greenhouse gas emissions. Under the Kyoto Protocol the EU’s original 15 members are committed to an eight per cent cut on 1990 levels by 2012. The European commission has announced that, based on current measures and policies, by 2010 the emissions of the EU-15 will be just 0.6% below 1990 levels and 0.3% higher than they were in 2004.

These figures, based on national projections compiled by the staff of Stavros Dimas, the EU environment commissioner, are designed to spur European leaders into pressing for tougher targets in the second, post-2012 round of Kyoto. The 25 governments have set targets of up to 30% cuts by 2020 and 80% by 2050, but have not made them binding. Mr. Dimas said that, on unchanged policies, seven countries – Austria, Belgium, Denmark, Ireland, Italy, Portugal and Spain – would exceed their individual emission limits, which are binding under EU law. Even with extra measures, Spain is projected to exceed its 1990 emissions by 51.3% in 2010, compared with an allowed increase under Kyoto of 15%. Ireland is projected to reach 30% above 1990 levels by 2010, against an allowance of 13%, and Portugal 42.7% higher, with an allowance of 27%.<sup>3</sup> In fact, according to the Institute for Public Policy Research (IPPR) the UK is almost alone in Europe in honouring Kyoto pledges to cut greenhouse gases, accompanied only by Sweden. Indeed, the UK’s apparent success has little, if anything, to do with government policy. We have only been able to meet our targets due to the replacement of coal-fired power stations by cleaner gas ones. This shift was a natural and market-led one – the energy industry did it simply to cut costs.

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<sup>2</sup> <[http://www.politics.co.uk/issueoftheday/greenpeace-kyoto-must-mark-start-real-urgency-\\$7815563.html](http://www.politics.co.uk/issueoftheday/greenpeace-kyoto-must-mark-start-real-urgency-$7815563.html)> [Last accessed 15/11/06].

<sup>3</sup> <[http://ff.org/centers/csspp/library/co2weekly/20061031/20061031\\_12.html](http://ff.org/centers/csspp/library/co2weekly/20061031/20061031_12.html)> [Last accessed 23/11/06].

Of course, failure to live up to Kyoto commitments is hardly a European phenomenon. Canada also signed up to the Kyoto Agreement, and it looks like they will also fail to comply. They were meant to cut emissions to 6% below 1990 levels by 2012, but the latest figures suggest they are running 23% above 1990 levels. According to their environment minister, Rona Ambrose, “it is impossible, impossible for Canada to meet its Kyoto targets.” Japan made the same commitment as Canada, and emissions there are running 24% above 1990 levels.<sup>4</sup>

It has been argued that the Kyoto commitments have been undermined because the United States – the world’s biggest emitter of greenhouse gases – has refused to ratify the treaty. In an article published on 12 December 2005, shortly after Kyoto was ratified, Greenpeace referred to ‘Bush’s wrecking tactics’.<sup>5</sup> The US has maintained its position, declared in the Senate’s Byrd-Hagel Resolution of July 1997, that it will not be a signatory to any protocol that does not include binding targets and timetables for developing as well as industrialized nations or that ‘would result in serious harm to the economy of the United States.’<sup>6</sup>

It is difficult to see how America’s position accounts for the EU’s failure to meet its emissions targets. Furthermore, America does not stand alone in its opposition to Kyoto – although press coverage might lead one to believe otherwise. Australian Prime Minister John Howard has refused to ratify the Agreement, arguing that the protocol would cost Australians jobs due to countries with booming economies and massive populations such as China and India not having any reduction obligations. By way of example, if Australia were to shut down all of its coal fired power stations, within 12 months China would have produced so much extra pollution because of its industrial growth that it would have negated the shutting down of those Australian power stations. In addition, the government takes the view that Australia is already doing enough to cut emissions; the Australian government has recently pledged \$300 million over the next three years to reduce the country’s output of Greenhouse gases.

In the cases of India and China, both of whom have ratified the protocol, neither are required to reduce carbon emissions under the present agreement because they are classified as non-annex 1

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<sup>4</sup> Selling Hot Air, *The Economist*, Sep. 7th 2006

<[http://www.economist.com/surveys/displaystory.cfm?story\\_id=E1\\_SRVPDNN](http://www.economist.com/surveys/displaystory.cfm?story_id=E1_SRVPDNN)>

<sup>5</sup>

<<http://www.greenpeace.org.uk/contentlookup.cfm?CFID=6263881&CFTOKEN=78823873&ucidparam=20051212090405>> [Last accessed 23/11/06].

<sup>6</sup> <<http://www.nationalcenter.org/KyotoSenate.html>> [Last accessed 23/11/06].

(developing) countries. China, India, and other developing countries were exempt from the requirements of the Kyoto Protocol as they were judged not to have been the main contributors to the greenhouse gas emissions during the industrialization period that is believed to be causing today's climate change. However, China and India will soon be the top contributors to greenhouse gases. Also, there is evidence that without Kyoto restrictions on these countries, industries in developed countries will be driven towards their non-restricted economies, resulting in no net reduction in carbon emissions.

Whilst an international agreement on Climate Change may be an admirable aim, it will be impossible for it to work without the inclusion of these huge developing economies. Yet how can the international community hope to convince these countries to commit to agreements that will radically retard their economic growth? Indeed, would it even be morally right for developed countries to ask this of China or India, when the resultant decline in economic growth would condemn millions of their population to further years of ongoing poverty and deprivation? As we have seen, without commitment from major developing economies, a number of countries will refuse to commit: the idea of a workable international agreement on climate change has reached an irresolvable impasse and time spent planning a Kyoto mark II is simply time that could be better spent developing alternative solutions.

This certainly appears to be the opinion of the Prime Minister. At a conference on facing up to 'global challenges' in New York in September 2005, Mr Blair admitted that 'no country is going to cut its growth or consumption' despite environmental fears and that rows over the implementation of Kyoto will 'never be resolved'. Blair further conceded that there would probably never be a successor treaty to Kyoto, which expires in 2012, arguing instead that the 'answer' was to try to introduce 'incentives' for business and large-scale energy users to make cut-backs. Speaking at the conference hosted by Bill Clinton, he further commented: 'To be honest, I don't think people are going, at least in the short term, to start negotiating another major treaty like Kyoto.' Specifically addressing the problem of large developing economies the Prime Minister said that: 'China and India... will grow. They are not going to find it satisfactory for us in the developed world to turn around and say, "Look, we have had our growth. You have now got yours so we want you to do it sustainably even if we haven't".'

But how much difference would an agreement really make anyway? On the face of it Kyoto can be painted as a success. As of October 2006, a total of 166 countries and other governmental

entities have ratified the agreement, representing over 61.6% of emissions from Annex I countries.<sup>7</sup> Yet as we have seen, most of these countries do not stand to meet their targets. Moreover, even if Kyoto were successful, its environmental benefits would be marginal. The objective of the protocol is the ‘stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.’<sup>8</sup> The Intergovernmental Panel on Climate Change (IPCC) has predicted an average global rise in temperature of 1.4°C (2.5°F) to 5.8 °C (10.4°F) between 1990 and 2100, yet current estimates indicate that even if successfully and completely implemented, the Kyoto Protocol will only reduce that increase by somewhere between 0.02 °C and 0.28 °C by the year 2050.<sup>9</sup> The science surrounding climate change remains uncertain, and such forecasts are difficult to make with any degree of accuracy. Nevertheless, it is clear that international agreements are not the solution we seek. They are both unworkable and, realistically, inadequate. A new approach must be found.

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<sup>7</sup> <Kyoto Protocol: Status of Ratification, 10 July 2006 (PDF)> United Nations Framework Convention on Climate Change (UNFCCC), [Last accessed 23/11/06].

<sup>8</sup> <[http://unfccc.int/essential\\_background/convention/background/items/1353.php](http://unfccc.int/essential_background/convention/background/items/1353.php)> Article 2, UNFCCC, [Last accessed 23/11/06].

<sup>9</sup> Nature, October 2003

## 2. Technology and growth

By Aeon McNulty

If an effective international agreement is not practical, where do we go from here? Future events are impossible to predict with any great degree of accuracy. We know that we will face new challenges, difficult and subtle problems that defy easy answers. But this has always been our condition.

Historically, innovation has been our saviour but today there is a widespread notion, felt rather than understood, that technological solutions can only ever lead to greater problems. This is an unfortunate misunderstanding. Technology, in essence, is simply applied problem solving and such pessimistic objections must, in all fairness, apply equally to political, social and economic solutions as well.

Although counterintuitive, at least to most people, our immediate environment has actually been getting progressively better. If you are fortunate enough to live in a Western country you will very likely enjoy cleaner, healthier and safer surroundings than your predecessors decades earlier. And generally those incremental - but by no means unimportant - improvements have not come from tighter regulations or proscriptive changes in the way we behave, they came from new technology.

Technology is the practical application of scientific knowledge. Its value depends on the nature of the problem to be solved and the accuracy of the knowledge employed. If it is successful it has the major benefit, besides solving the actual problem, of creating a valuable product that can be sold to others. The process frequently enriches the economy rather than being a drain upon it. Moreover, far from creating more problems, the new technology often leads to more innovation, setting off a cascade of positive wealth creation.

The conflict between economic growth and environmental damage is false. The poorest countries, with the least access to modern technology, are the ones currently wrecking their environment. There are many exciting technological breakthroughs happening today that promise to make the world a cleaner, healthier and safer place for everybody. They are also noteworthy for their potential to aid the economy and reduce global poverty. I will highlight some of these technologies, focussing on energy production, in the following pages.

## Wind

Generally, the pursuit of wind farms as a reliable power source remains Quixotic. Winds are capricious in strength and direction. Unless you huddle in a site where prevailing winds bend trees into lop-sided Bonsai, we can file wind power as an adjunct. Remarkable progress in wind turbine designs and generator efficiency, especially during the last decade, have improved yields dramatically but the fact remains that almost all windmills have to tilt uneasily between gales and zephyrs. Then they have to reconcile synchronising haphazard gusts with peak electricity demands. Buffering or storage of such energy presents its own challenges (see Storage below).

At least three versions of kite-borne generators are aloft, experimentally. Breezes flow more reliably high above the frictional ground. Unfortunately, the down side for these schemes remains - down. One of the systems, developed by Canadian company Magenn Power, employs balloons so that, when the wind drops, the generator plant won't. These schemes will probably float as curiosities or temporary emergency applications.

Rather more promising is the technology referred to as a "wind chimney" or "solar tower". In 1982 Professor Jorg Schlaigh and Rudolf Bergermann, two German engineers, built a prototype power plant in Manzares, Spain that successfully generated electricity for eight years. The principle relies on solar heating to produce less dense air that then exits at the top whilst gravity pushes colder air in at the base; a turbine captures some of the air movement thus producing electricity. An Australian company, EnviroMission, is planning to construct a much taller wind chimney (up to 1 Km). The taller the tower, and the greater the temperature differences, the more compensating air movement. They intend to complete their first fully operational power station by 2008. However, building such enormous structures is expensive. Another scheme, the brainchild of Professor Christos D. Papageorgiou, uses a "floating chimney" - a plastic fabric tube supported by balloons. Construction costs would be a fraction of a concrete tower.

Even more audacious is the Atmospheric Vortex Engine (AVE). The idea has evolved and a Canadian engineer, Louis Michaud, refined the details over thirty years. Here a vortex - a mini-tornado - produces its own "virtual chimney" literally made from spinning air. The compensating airflow promises to produce enormous quantities of electricity for very little running cost. Curiously, converting conventional generator cooling towers to AVE, by capturing

those warm water cloud plumes, could potentially yield a 40 percent increase in overall electrical power output. The AVE could be employed wherever warm water is currently ejected as well as using surface sea or lake water. The process produces fresh rainwater as a by-product, so a desert region could be blessed by cheap electricity and irrigation.

Researchers at General Electric and Texas Tech University employ more conventional wind turbines to power desalination plants. The problem, as ever, is maintaining the steady supply of electricity necessary to drive the reverse-osmosis process they're using. There are plans to use other forms of renewable energy - such as wave and solar - to act as additional sources.

### **Wave**

The oceans hold dazzling quantities of energy. Professor Annette von Jouanne, electrical engineering professor and the director of Oregon State University's Motor Systems Resource Facility, tells us that, "It is estimated that if 0.2 percent of the ocean's untapped energy could be harnessed, it could provide power sufficient for the entire world." This is one of many estimates (which vary from 0.2 to 0.01 percent) but together the indications seem conclusive; there's more energy waiting in the oceans than we can ever imagine consuming.

Although conventional tidal barrier power may be limited to favourable "funnel" sites - estuary channels and so on - more tidal opportunities exist. The largest and longest-lived tidal electricity generator is the La Rance Tidal Barrage, developed by Electricite de France. Other bay and estuary schemes around the globe are under way.

A newer approach, currently being tested by a British company called Marine Current Turbines, looks to harness the tidal currents on the seabed - without erecting barrage dams. Picture a very slowly rotating "windmill" on the sea floor. Water is roughly a thousand times denser than air, so the slow but inexorable push from a tidal current carries a vast amount of potential energy.

### **Solar**

When most people talk about solar energy they usually mean photovoltaics, converting light into electricity. Solar cells seem seductively promising, but they still have a long way to go. Recent

attention-grabbing headlines claiming huge increases in efficiency are misleading. Improvements have inched along incrementally and will, in all likelihood, continue.

Some of the most interesting increases in efficiency have come from fairly straightforward methods of concentrating light by focussing the sun's rays, such as the work by Japanese electronics giant Sharp employing the properties of fresnel lenses. SolFocus, a startup based in California, utilises tiny mirrors to perform a similar job.

It's certainly possible that someone may find a new way to make materials resonate more readily to yield more electrons (there's some remarkable research being done on holographic concentrators and transparent, and multi-layered, cells), but despite the inflated PR releases, no major breakthrough has yet appeared. Besides, concentrating on the efficiency of solar cells misses the most important point. What matters is how cheaply they can produce electricity.

So far it is still too expensive but there are encouraging signs of progress here too. There are a number of Californian companies who are now attempting to employ the same mass-production techniques used in the computer industry to drive down the cost of solar cell manufacturing.

Solar radiation capture for heating - and other purposes - has shown more promise of late. One technique, the saline pond, relies on gravity's influence on progressively denser salt solutions. Layers of saline tend to inhibit convection currents, so captured heat lies at the bottom. With some clever valves and pumps, salt water heated on a black surface nearby can join that energy reservoir. When needed for heating it can be pumped out again. Over sixty of these systems have been constructed around the world and research on advanced equipment is currently under way in Australia and Israel. Used in conjunction with heat pumps, saline storage ponds can also act as a dump for excess heat in buildings (air conditioning) and provide hot water for washing. Solar saline ponds can even power electrical turbine generators via an intermediate working fluid.

Full spectrum light is known to be better for our health, and can combat Seasonal Affective Disorder. Sunlight Direct, an American company, uses a "Solar Collection" platform to concentrate and then transport, via fibre optic cables, sunlight into offices. It is designed as a "hybrid" system to lower energy use. A secondary lens filters out infrared heat.

Perhaps the most intriguing solar energy concentrators are Professor Roland Winston's "non imaging optics" which completely overturn conventional ray-tracing optics and succeed in producing focussed spots hotter than anywhere else on Earth; in fact, on his University of Chicago rooftop, he's reached an intensity only equalled at the surface of the Sun.

Understandably, the Israelis - with lots of sunlight and not much fuel - are pursuing this line with white-hot enthusiasm. Professor Jeffrey Gordon and his team at the Jacob Blaustein Institute for Desert Research of Ben-Gurion University are striving for mass production techniques to make solar powered "scalpels". Heat so intensely concentrated can act as a furnace, destroy toxic waste or cut through most materials.

### **Storage**

Having gone to all the trouble of capturing, concentrating and converting energy, we have a devil of a job in storing it. Batteries are improving, especially in the last few years, but they don't measure up to the potential of two other promising techniques.

Ultra-capacitors that hold large charges for reasonable periods of time have two much needed improvements coming to them, courtesy of research by Massachusetts Institute of Technology's Laboratory for Electromagnetic and Electronic Systems. One is better electronic control, so that they don't discharge all in one flash, the other is innovative nanotechnology that gives the capacitor plates a huge surface area and allows them to come much closer to each other. Ultra-capacitors don't rely on chemicals, don't wear out - and they could be amazingly cheap.

Flywheel technology has moved on - again thanks to better control systems and materials science. Now super composite flywheels, such as those built by American companies Active Power, Beacon Power and AFS Trinity Power, can hold vast quantities of energy by spinning at incredible speeds. Magnetically levitating bearings and low-pressure casings minimise friction. Finally, super-magnet motor generator couplings allow electrical input and output to reach new levels.

### **Hydrogen**

Hydrogen does excite the imagination. Weight for weight it has almost three times the energy of natural gas and, when used, it emits pure water. Unlike oil and gas, however, hydrogen is not a

fuel. It is a way of transporting energy. It has to be manufactured. This can be done in two ways; extracting it from fossil fuels, via a process known as steam reforming, or using electrolysis, the electrical separation of water into hydrogen and oxygen.

Enthusiasm tends to fade with the engineer's saying "Watts to put together, Kilowatts to rend asunder". Hydrogen and oxygen love to couple up and they shed energy in that union. But separating them takes too much energy. There are some tricks, nanotechnology, molecular sieves and some clever methods for using "spare" low-grade energy. Beyond that, hydrogen proves slippery stuff to transport and store effectively. This is because the density of hydrogen gas is so low. Techniques exist but they add extra levels of complexity.

There is, however, some cause for optimism on the horizon. Professor Michael Gratzel, and his colleagues at the Ecole Polytechnique Federale de Lausanne, in Switzerland are researching a more efficient way of generating hydrogen. The process utilises nanotechnology and solar power to induce a photochemical process. It remains to be seen if the research will prove practical but their experimental results look promising.

Many American car manufacturers are currently building models that burn hydrogen gas in addition to a variety of other, more conventional, fuels. As innovative as these "hybrid" hydrogen models are, the long-term future probably belongs to electric cars powered by fuel cells, possibly in conjunction with rechargeable batteries or ultra-capacitors.

## **Fuel Cells**

The fuel cell was first invented in 1839 by German scientist Christian Friedrich Schonbein. Most fuel cells work by combining hydrogen and oxygen to generate electricity without any moving parts. Several types exist but the proton-exchange membrane fuel cell is really the only one light enough to be practical for use in vehicles. They are tremendously efficient but, unfortunately, still very expensive to manufacture.

However the cost is coming gradually down as the technology improves. Researchers at the University of North Carolina have developed a new material which they claim can "dramatically outperform" the material currently used to make proton-exchange membranes. It also has the advantage of being easier to work with, and therefore cheaper to manufacture.

## **Nuclear**

Within perhaps less than a generation traditional nuclear reactors could be replaced by cheaper, smaller and much safer “pebble-bed reactors”. Tsinghua University’s Institute of Nuclear and New Energy Technology, in Beijing, has already built a working prototype called the HTR-10. It plans, with the help of Huaneng Power International, to complete construction of a full-scale reactor by the end of this decade.

The pebbles - spheres around the size of a billiard ball - are used instead of the normal fuel rods. They comprise impermeable wrappings of silicon carbide and pyrolytic carbon encasing flecks of fissile uranium oxide. Fresh spheres feed in from the top to join thousands more in the reactor space whilst spent pebbles roll out from the base; imagine a giant bubble gum dispenser. Helium gas runs between the pebbles and extracts the heat. Because helium is non-reactive it doesn’t carry any radiation but simply transfers the heat to turbines - either directly or by heating water to high-pressure vapour. From there, the choices are conventional; direct heat, electricity, hydrogen production (via thermochemical water splitting), or desalination.

The design is “inherently melt-down proof” and, because it can be constructed using mass-produced parts, can be made much more cheaply. The pebbles also appear almost impossible to pervert into weapons.

Despite the fact that the design was first developed in Germany, and notwithstanding continuing research in America, and attempts in South Africa to start construction, it seems that China may be racing ahead with this technology while Western committees vacillate.

## **Clean Coal**

New coal-fired power stations are currently being constructed in the United Kingdom and Germany that hold out the promise of near-zero carbon dioxide emissions. To achieve this they use a process known as gasification, where pulverised coal is mixed with oxygen under extremely high pressure.

In conventional coal-fired plants capturing the carbon dioxide takes a lot of energy to separate it from the air, which is mostly made up of nitrogen. Because pure oxygen is used, the resultant gases are mainly CO<sub>2</sub>, hydrogen and water, making exhausts much easier to collect.

What to do with the captured carbon dioxide? The most common carbon sequestration method involves piping it directly into underground geological formations, often under the ocean floor.

However, in America the Dakota Gasification Company is making a lot of money piping carbon dioxide gas into aging oil feeds. The CO<sub>2</sub> lowers the oil's viscosity by a factor of four and helps it flow to the surface, greatly improving production. Once in the ground, the CO<sub>2</sub> takes the oil's place and is safely trapped.

Similar efforts are under way in the North Sea's rapidly-maturing offshore oil reservoirs, where a consortium of oil giants are so desperate for carbon dioxide that they are constructing new power plants to produce it. Meanwhile a Norwegian startup plans to sell CO<sub>2</sub> to offshore drilling sites.

An extraordinary study, a joint venture between the Max Planck Institute in Germany, the Louis Pasteur University in France and the University of Patras in Greece, coordinated by researchers from the University of Messina in Italy, has recently discovered a way to turn carbon dioxide back into fuel.

The technique uses solar energy, nanotechnology and special catalysts to break down chemical bonds and create long-chain carbon molecules, which can be converted into fuels. What is truly staggering about this new research is the fact that it is currently efficient enough to build molecules of eight or nine long hydrocarbon chains at one percent efficiency, and this at room temperature. That is better than any other industrial process.

Lead researcher Professor Gabriele Centi, of the University of Messina, claims that viable production of hydrocarbon chains from carbon dioxide could be attained "within a decade".

## The Future

Having briefly covered some of the energy production technologies that currently exist or are being developed, how can we encourage more of this kind of innovation: the ideas and applications necessary to make the future a safer, more pleasant place?

The answer is not an easy one. The history of invention is one of visionary iconoclasts, mavericks and misfits - of unexpected applications coming from unpredictable directions.

In 1958, British economist John Jewkes drew up a representative list of sixty major inventions from the previous half century, ranging from acrylic fibre and the long-playing record to television and the zipper. More than half, he found, had come from individuals working on their own. One reason, he wrote, was that “men with great powers of originality are in many ways a race apart.” They tend not to play well with others, Jewkes decided, “because their great gifts arise from the habit of calling everything, even the simplest assumptions, into question.”

Five-year plans, government road maps and the like are not conducive to genuine innovation. It has its own timetable and chooses its own route, one that is often difficult or impossible to predict.

It is important not to prescribe specific technological solutions, however attractive they may seem. Attempts to incentivise progress in these areas often lead to unintended consequences and can bury other valuable innovations before they ever surface. The undistorted cost of the energy produced must be our ultimate guide to the value of the technology. Obfuscation can only lead to failure.

The incentives to innovate are usually pretty clear. All that is usually needed to start the process is the unambiguous identification of a problem. It is not an idea the average politician is likely to welcome, but it takes wisdom and humility to realise that sometimes the best thing one can do is get out of the way.

### 3. Environmental policy and the government

Tom Clougherty

In the first chapter we saw that the Kyoto approach to environmentalism – the pursuit of grand international treaties – was essentially futile. Despite the fanfare that greeted the original Kyoto agreement little progress has been made and few signatories are on course to meet their commitments. There remains a sense of idealism about international agreements, but there is little point devoting our efforts to solutions that will not work. It is clear that China and India will not sign up to Kyoto-style cuts in energy use which would threaten their economic growth – and since they are set to be the major polluters of the 21st century any agreement they are not part of will be worthless. Consider this: the UK could reduce its carbon emissions to zero, and China would make up the shortfall within two years. Clearly, a different approach is called for.

Chapter two argued that there was no need for pessimism or doomsday predictions. Effective solutions to the environmental problems we face are well within our reach. Scientific and technological advance is the key to a cleaner environment and there are very encouraging innovations occurring all over the world. New technology has the power to make the apparent conflict between economic growth and the environment a thing of the past. It is also the key to a global solution – rich countries should develop cleaner and more efficient technologies and then export them to the developing world. China will not sign up to agreements that will damage their economy, but they will gladly invest in more advanced technologies if it is in their interests to do so.

Of course the question many people have is whether technological advance will come fast enough to make a real difference. Will the market take care of everything or is government intervention required to promote a green future? Many free-marketeers argue that the market will provide solutions without the need for government action. From this perspective, the free market represents a continuous referendum in which people vote with their money. They pay for the things they want, assuming the price is right. In this way markets reflect peoples' preferences. This is as true for the environment as it is for everything else. If people are really committed to environmental goals then government intervention will be unnecessary.

Another argument against central government adopting “command and control” policies on the environment is that they do not have access to the information required to make economically

rational decisions. The government has no effective way of measuring the effect of a particular amount of carbon dioxide on the global climate. As a result it is impossible to measure the economic benefits of reducing carbon dioxide emissions. Nor do they know the economic cost of reducing greenhouse gas emissions. When both the costs and the benefits of a particular action are so uncertain it is not possible to make economically rational decisions. Therefore the government would be better off devoting their resources to things they know will be beneficial.

The perfect example of this sort of thinking in practice is the environmentalist Bjorn Lomborg's "Copenhagen Consensus".<sup>10</sup> Starting from the premise that we all want to make the world a better place but, given finite resources, we should try to find the most cost-effective way of doing so, Lomborg persuaded a group of economists (which included three Nobel laureates) to draw up a list of priorities. The results of the survey were striking. Efforts to fight disease and malnutrition could save many lives at modest expense, while fighting climate change would be hugely expensive and yield only the most uncertain and distant benefits. So - the Copenhagen Consensus was that government resources directed to the environment would be better used elsewhere.

There is a further point that should be made. We have already seen that the key to addressing our environmental problems is developing cleaner, more efficient technologies and then exporting them around the world. However, the development and spread of green technology is dependent upon economic growth. Wealth is vital not only to adapt to climate change if that becomes necessary, but also to reduce greenhouse gas emissions in the first place. The wealthier a country is the more money they can devote to investment in new technology and the more chance they have of making a meaningful difference in the long-term. Historical statistics display a clear trend – both energy use per dollar of output (energy intensity) and greenhouse gas emissions per dollar of output (emissions intensity) are much higher in developing countries than in developed ones.<sup>11</sup> The wealthier a country is, the more efficiently and cleanly they produce things – due largely to the technological advance wealth brings. It follows from this that any government intervention that limits economic growth also limits the growth of technological solutions to climate change and may, therefore, do more harm than good.

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<sup>10</sup> [www.copenhagenconsensus.com](http://www.copenhagenconsensus.com)

<sup>11</sup> Roger Bate and David Montgomery, *Towards a Liberal Utopia?* ed. Philip Booth (London: Institute of Economic Affairs, 2005), 166.

So there is a serious argument against top-down action to protect the environment. However, regardless of whether it is economically rational, it has clearly become politically sensible to promise these sort of measures to cut carbon emissions and prevent global warming. There are votes in environmentalism and green policy is going to be a major issue at the next general election and beyond. Environmental state intervention is a political reality, and is here to stay.

The question is what kind of green policy will we have? What we need is a public policy framework that encourages the use and development of new technologies. These policies must be market-based and must have as little impact on our economic growth as possible. Legislative measures should be positive, they should incentivise good environmental behaviour rather than simply being punitive. Environmentalism must not be looked on as a method of raising revenue. The goal of environmental policies should be to change behaviour and provide a framework in which technology and science can flourish. The two policies most commonly advocated are green taxation and emissions trading. I will look at each in turn.

### **Green taxes**

The thinking behind green taxes is simple. In a market economy people make choices on the basis of price signals, which tell them how to allocate their resources. The goal of a green tax is to manipulate these price signals in order to change behaviour. The government can impose taxes which raise the cost of environmentally insensitive behaviour, giving people an incentive to act differently. A high tax on fuel, for example, would encourage people to use as little of it as possible.

Often green taxes are justified on the grounds that they internalise the negative externalities of behaving in a particular way. Producing carbon dioxide emissions has a cost to society (a recent DEFRA report<sup>12</sup> estimated that emitting one tonne of carbon dioxide had an external cost of £70) and that cost is typically not borne by the person producing the emissions. The point of the green tax is to internalise that cost, so that polluters factor it into their decision-making. The principle is that the polluter pays.

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<sup>12</sup> Richard Clarkson and Kathryn Deyes, *Estimating the Social Cost of Carbon Emissions* (2002)

It sounds fine in the abstract and there are many economists who favour such an approach. But, as always, there is quite a difference between theory and practice. Let's look at some of the existing and proposed green taxes.

### Cars

The first and most common target for green taxes is motorists, their cars, and the fuel they use. This is not surprising: road transport accounts for 21.3% of carbon dioxide emissions in the UK. In his pre-budget report of December 2006 the Chancellor of the Exchequer, Gordon Brown, announced that he would raise fuel duty by 1.25%. That means an extra 1.47p in tax for each litre of petrol (including VAT). But according to research by David Newbery, a professor of economics at Cambridge University, the cost to society imposed by car engines works out to approximately 42p per litre of petrol burned.<sup>13</sup> Even before the Chancellor's fuel tax rise motorists were paying more than 47p tax on each litre of petrol. Proponents of green taxes often invoke the negative externalities argument and the government's recent Stern Review talked a lot about Pigouvian green taxes – i.e. taxes which internalise the actual cost of the activity. Nevertheless, motorists seem to be paying more than their fair share of tax.

Of course, fuel tax is not the only government imposed cost that motorists face. Car-owners also pay vehicle excise duty, and on August 7th 2006 the Environmental Audit Committee called for a steep rise in the excise duty on the most polluting cars from £210 to £1800 per year. The Liberal Democrats would go further still, forcing drivers of new cars emitting more than 225g of carbon per kilometre to shell out £2000 annually. When the negative externality of burning fuel is built into the cost of petrol, why should motorists pay road taxes every year as well?

Moreover, Sir Rod Eddington's recently published report on British transport called for the introduction of nationwide road pricing. Road pricing is an excellent idea – it is proven to reduce congestion by encouraging people to avoid driving on busy roads at peak times. It is also much fairer than simply charging people road tax – with road pricing you pay for what you use. Frequent and urban drivers would pay more; infrequent and rural drivers would pay less. From an economic perspective road pricing is entirely sensible. However, the Eddington report suggested that the prices people pay be determined not only by demand for the road, but also by the amount of carbon the motorist's car emitted. Not only does this unnecessarily complicate the

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<sup>13</sup> "Moving target" *The Economist*, 17 August 2006.

pricing system, it also seems rather unfair. Motorists already pay for their carbon emissions in fuel duty (in fact, they already pay too much) – why should they be forced to pay again under a road-pricing system?

If you examine the green approach to motorists in any detail you will be forced to admit that it is not really about the environment. The taxes may be justified on ecological grounds but they are really about raising revenue. The Government appears to see motorists as inexhaustible cash cows – they can tax them as much as they want because motorists will have to carry on driving. For a great many people, including many for whom money is already tight, there is no real alternative.

### Aeroplanes

After motorists, green tax advocates turn their attention to aviation. Given the hysteria of many environmental activists when it comes to air travel, it should be pointed out that aviation causes only 6% of the UK's annual greenhouse gas emissions. That is not to say that the environmental impact of air travel should not be addressed – it is simply to suggest that a reasonable and proportionate approach be adopted.

In a leaked letter<sup>14</sup> to the Chancellor of the Exchequer David Miliband, the Environment Secretary, recommended an increase in air passenger duty and the imposition of VAT on flights, as well as a new tax on jet fuel. In the pre-budget report the Chancellor pledged to double the air passenger duty from February 1st 2007, meaning the duty would rise to £10 for a short haul flight and to between £40 and £80 for a long haul flight. Apart from lining the Treasury's pockets, it is hard to know what this move will accomplish.

Since it is a tax on passengers it does nothing to encourage the airline to invest in cleaner and more efficient technologies or to behave in a more environmentally friendly manner. The usual argument, that the passenger duty needs to be raised because air travel is taxed more lightly than other forms of travel does not hold water. As anyone who has travelled with Ryanair or easyJet will attest, the tax frequently exceeds the cost of the ticket. The tax would also be regressive, falling most heavily on lower and middle income travellers. A 2004 Civil Aviation Authority

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<sup>14</sup><[http://www.dailymail.co.uk/pages/live/articles/news/news.html?in\\_article\\_id=413224&in\\_page\\_id=1770](http://www.dailymail.co.uk/pages/live/articles/news/news.html?in_article_id=413224&in_page_id=1770)>

survey showed that 25% of travellers at Britain's major airports were "lower income", with most of the remainder middle-income.

The same arguments apply to imposing VAT on plane tickets – it would unfairly hit the budget traveller while doing nothing to promote more environmentally friendly practices by the airlines. The argument that jet fuel should be taxed is a stronger one. It is certainly anomalous that jet fuel is entirely untaxed while motorists bear such a heavy burden. However, legislators must proceed with caution – such a tax could well have unintended consequences.

Firstly, assuming the jet fuel tax was implemented throughout the EU – and that appeared to be the Environment Secretary's intention – flights within the EU would become more expensive, in theory suppressing demand. But flights to non-EU countries like Morocco and Tunisia, both desirable holiday destinations within a few hours of London, would become comparatively cheaper since those countries would not tax jet fuel. Increased demand for such destinations could easily offset the emissions reductions on EU flights. Secondly, a tax on jet fuel would impose an added cost on European businesses which, out of commercial necessity, make frequent use of air travel. The jet fuel tax would do little to stop businessmen taking flights, but would be an added drain on the EU economy – the last thing European business needs in an ever more competitive global economy. Thirdly, an EU jet fuel tax, if set at too high a level, could encourage airlines to use "fuelling hubs" outside the EU where fuel would be cheaper. It is thus conceivable that a jet fuel tax could lead to more airmiles and more emissions – precisely the opposite of what is intended.

#### Other measures

Mr Miliband's leaked letter also contained proposals for making the landfill tax escalator more punitive. He claimed that "greenhouse gas emissions from landfill are now estimated to be twice as large as previously thought" and suggested the tax reach £75 per tonne of landfill by 2013. He ignores the fact that the landfill tax already appears to have resulted in a significant increase in illegal dumping – hardly wonderful news for the environment. He also proposes that energy-inefficient consumer goods be taxed more heavily – yet another measure that would fall most heavily on the poorest in society, who spend a much greater percentage of their income on the basic consumer goods Mr Miliband wants to tax. In fact, manufacturers are already competing

on energy-efficiency: white goods, for example, are subject to mandatory energy efficiency ratings. An additional tax seems unnecessary.

However, while many of the Environment Secretary's proposals are misdirected and unlikely to succeed in their stated aims, his letter does contain an example of the way government would be better advised to promote a greener, cleaner future through the tax system. This is the proposal that new carbon-neutral homes be made free of stamp duty to encourage developers to aim for the highest standards of energy efficiency. The Chancellor announced he would be adopting this policy in his pre-budget report in December 2006, and also announced another encouraging measure. This was to significantly reduce the tax on biofuels and biogas, both of which have impressive environmental credentials.

Overall, it should be clear that despite the theoretical attraction of green taxes they rarely, in practice, live up to their billing. We would encourage the further use of market instruments to incentivise greener behaviour – exempting carbon neutral houses from stamp-duty, for example, is an excellent idea. Carrots tend to work much better than sticks.

Unfortunately the majority of green taxes would not encourage technological advance and would fall disproportionately on the poor. Although green tax advocates like to talk about internalising negative externalities, green tax is usually used merely as an excuse to make money. In the light of these concerns, it would not be to the country's benefit for the Government to push ahead with a programme of large-scale green taxation.

### **Emissions Trading**

The EU's emissions trading scheme (ETS), to which Britain belongs, is the most extensive emissions trading scheme in the world and was one of the few substantial developments to come from the Kyoto Agreement. It was established in 2005, with governments setting national targets for carbon dioxide emissions and giving carbon dioxide allowances to 13,000 factories and power plants in Europe's five most polluting industries. If a company wanted to emit more than its allowance, it would have to buy extra permits from other companies or purchase credits from developing-country companies. This is known as the CDM (clean development mechanism) – companies in the developing world that clean up their operations (emitting less greenhouse

gases) can apply for UN approval and then sell their credits to companies in Europe. The point of the ETS was to reduce the allowances over time, driving up the price of emitting carbon.

The basic idea behind emissions trading is that by putting a limit on carbon dioxide emissions and penalising those who emit too much, you create a market demand for emissions reduction. As the limits get more restrictive the demand will become greater and the price will increase, thus producing an ever-greater market incentive for companies to reduce their emissions and become more environmentally sensitive. In theory this should lead to investment in newer, cleaner, and more efficient technologies that reduce the environmental impact of industry.

However, there are serious problems with the European scheme, which has in practice been almost entirely unsuccessful. As was shown in chapter one, many EU countries will not even come close to meeting their emissions targets. The most serious problems with the ETS relate to the allocation of emissions permits. First of all, governments handed out the emissions permits free of charge to existing polluters (a process known as “grandfathering”). While this had the virtue of making the ETS easier for industry to swallow, it was akin to giving them wads of cash. The polluters pocketed them and passed the extra production costs onto consumers. Once emissions trading took off the value of the allowances rose to €30 per tonne of carbon dioxide, while CDM permits were available from the developing world for roughly half that price. Polluters cashed in their allowances, bought cheap CDM permits, and kept the difference. According to a report for the British government by IPA Energy Consulting<sup>15</sup>, Britain’s power-generation sector has profited to the tune of £800 million a year since the ETS was introduced. Rather than punishing polluters, the ETS has rewarded them.

Consumers, of course, have not been so lucky – power prices have risen sharply thanks to the ETS. According to a report by Jos Sijm<sup>16</sup>, of the Netherlands’ Energy Research Centre, European power generators have passed on up to 95% of the carbon price on to consumers. In Germany, for instance, off-peak electricity prices doubled to more than €40 per MWh. Such rises hit the poorest in society hardest, since they already spend a large proportion of their incomes on basic living expenses like electricity. Rocketing energy costs have hardly been good news for European businesses either, contributing to slowing economic growth and reduced international competitiveness.

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<sup>15</sup> *Implications of the EU Emissions Trading Scheme for the UK Power Generation Sector*, <<http://www.ipaenergy.co.uk/downloads&publications/FINAL%20Report%201867%2011-11-05.pdf>>

<sup>16</sup> “Selling hot air” *The Economist*, 7 September 2006.

The second problem was that when the ETS began there was little information about how much carbon dioxide industry was actually emitting. Allowances were distributed on the basis of guesswork and consultation with industry. Unsurprisingly they turned out to be overly generous. When it transpired that a number of European countries had handed out more permits than there were emissions, the market price of carbon collapsed, falling from more than €30 per tonne to less than €10. In 2005 Germany, responding to some very effective lobbying, handed their industries 21 million tonnes more carbon permits than they needed. Clearly this gave German companies a competitive advantage over their British counterparts, causing UK business to suffer. Open Europe estimates that UK companies were left £470 million worse off as a consequence of this botched attempt at central planning<sup>17</sup>.

An investigation by Open Europe also found that the ETS had taken valuable resources away from Britain's not-for-profit public sector. Many will be surprised to discover that almost 150 schools, universities, military bases and prisons were forced to sign up to the ETS because they had generators or boilers with a capacity of 20MW or more. Most struggled to meet their allocation targets, meaning that huge amounts of the taxpayers' money was spent buying credits from the private sector. Open Europe believes this situation will cost the national health service around £1.3 million a year between 2005 and 2008.

Another problem with the ETS is that it tends to favour older and less efficient companies, restricting market entry and reducing competition – with predictably negative consequences for consumers. Carbon allowances are calculated on the basis of emissions in a given reference period. This means that established companies get more generous allowances than their younger competitors, who may have been much smaller during the reference period. It also means that inefficient companies will receive higher allowances than their more efficient counterparts. Those inefficient companies will profit because of the scheme (it is easy to cut emissions from a high starting point), giving them a commercial advantage.

There are also worries about the clean development mechanism, the purchase of emissions credits from developing countries. The Chinese government, for example, placed a 65% tax on emissions-reduction credits – which means that European companies are actually paying far in excess of the genuine cost of reducing emissions. Their money pours into the coffers of the

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<sup>17</sup> “Carbon trading leaves a nasty smell” *The Daily Telegraph*, 2 July 2006.

Chinese government, and European consumers have to pick up the tab in the form of price rises.

Finally, the time horizons of the ETS are far too short for the scheme to have the desired effect of inducing companies to invest in cleaner technologies and reduce carbon dioxide emissions. The first phase, 2005-2007, covers only three years. The second phase will run from 2008-2012. Beyond that no one has any idea how many permits will be issued, and what the price of carbon will therefore be. Investments to reduce carbon emissions do not pay for themselves – it takes at least five years for them to start paying back.<sup>18</sup> The result of all this uncertainty is that companies cannot effectively factor the scheme into their business plans, which does neither them nor the environment any good.

Clearly, the EU's emissions trading scheme is seriously flawed. There are reforms that could prove beneficial. For example, if the scheme is to continue it would be better to auction the emissions permits than simply to give them away. The most economically efficient method of auctioning the permits would be the so-called "ascending-clock auction". Essentially a price would be set and companies would indicate the number of permits they would like to buy at that price. At first the number of bids is likely to exceed the number of permits, so the price would be raised and bids taken again. This process would continue until demand for the permits met the supply. The money raised could be used to finance a cut in corporation tax rates, so that companies would feel less inclined to flee Europe for countries without an emissions trading scheme. Auctioning permits in the UK could raise £4 billion a year, enough to finance a cut of up to 3% in corporation tax rates without any loss of government revenue.

Unfortunately the EU only permits a maximum 10% of the total number of permits to be auctioned. Moreover, it is highly questionable whether a system like the ETS, which requires effective central planning and coordination between participating countries, can ever be made to function effectively. Government attempts to rig the market invariably fail to meet their objectives, and tend to have negative side effects. All the evidence suggests that emissions trading will not be any different.

Unilaterally capping emissions in Britain, indeed in Europe, will almost certainly restrict our economic growth and adversely affect our international competitiveness. This means less wealth

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<sup>18</sup> "Cleaning up" *The Economist*, 4 May 2006.

creation and, as a result, less technological advance. If we are less wealthy than we would otherwise have been, we will be less able to adapt to climate change should that become necessary. Furthermore, emissions trading in Europe will not reduce global emissions; it will simply encourage companies to relocate to those emerging economies where environmental standards are much lower. China and India, the great polluters of the future, will not sign up to emissions trading agreements because they are not willing to accept an arbitrary limit on their economic growth. Meanwhile, developed countries like the US and Australia are extremely unlikely to join any agreement that does not include the world's emerging economies.

With the benefits of reducing emissions being so uncertain, it seems foolish to impose such undisputed costs on the European economy. In an increasingly competitive and globalised world, being a martyr to the cause will not do anyone any good.

## 4. The food miles folly

By Wilfredo Contreras

The reduction of food miles, the distance food travels from the farm to the table, has been recently promoted as a way of moving towards a healthier and environmentally-friendly lifestyle in the UK. The basic argument is that globalisation and increased trade has led to food being imported from increasingly far-flung places all year round. Proponents, for the most part farmers and environmentalists, contend that the increased distance the food travels leads both to “more carbon dioxide (CO<sub>2</sub>) emissions” and “[reduced] freshness” that decrease the nutritional value of the food that reaches our table.<sup>19</sup> Furthermore, importing food from abroad reduces support for the UK farming industry.

One of the main proposals to address these concerns is placing a tax on food miles, that is, taxing food products differentially depending on the distance between the source and the UK. Ideally, this tax would internalise the environmental costs of transporting food, reflecting the total cost to society, and ultimately reducing the impact on the environment. Careful consideration of the arguments, however, reveals three main flaws: firstly, the proposed tax is inadequate and will fail to achieve the intended goals of reducing the impact on the environment and helping local farmers; secondly, it would contravene current trade agreements; thirdly, the arguments do not take into account the negative consequences of these measures, both in the UK and abroad. The most important impact of these taxes in the UK would be the increase in the cost of living, especially for the lower income groups, who would have to use a larger share of their income to purchase basic food; the most important impact abroad would be the detriment to developing nations, especially in Africa, to whom the UK market represents a vital opportunity to rise out of poverty.

### **Alleged benefits of reducing food miles**

The campaign to reduce food miles is often associated with campaigns for local, “greener,” or organic foods. In the best scenarios, these campaigns translate into promotion of local food to support small farmers; at their worst, they translate into tax proposals and tariff-like measures. The latter are unsound and fall short of providing any real benefit. Reducing food miles is not

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<sup>19</sup> Farmer's Weekly, *Food Miles Facts*, <http://www.fwi.co.uk/gr/foodmiles/facts.html>

synonymous with local, “greener” or organic foods. While the argument that local food is greener because airfreighting food creates additional pollution may be appealing, it is ultimately too simplistic. Firstly, aeroplane emissions constitute around 11% of CO<sub>2</sub> emissions related to food transport in the UK, the smallest share in total food-related emissions.<sup>20</sup> Eliminating these emissions entirely would reduce total UK CO<sub>2</sub> emissions by less than 0.2%. Furthermore, aeroplanes are responsible for less than 0.5% of the social costs, defined as the aggregate cost estimate of CO<sub>2</sub> emissions, loss of air quality, noise pollution, congestion, accidents and infrastructure. Most of the emissions come from Heavy Goods Vehicles (HGVs) transporting food within the UK and most of the social costs, around 40%, come from people driving their cars to buy groceries. Surely any solution that aims to reduce the impact of food transport on the environment should look at more important causes of pollution and external costs?

Moreover, the argument that reducing food miles means consumers get fresher food, produced under more controllable standards, is biased in favour of the well-off: freshness and higher quality food are luxuries that consumers can pay for if they wish, and those who can pay more for better food already do. Consumers who cannot afford fresher, more expensive food, are better off having cheaper alternatives. One study confirms that “a high proportion of organic consumers are drawn from the higher income groups”,<sup>21</sup> effectively placing the fresher or higher quality food beyond the reach of the lower income groups. A study by the IGD (2002), quoted in the 2005 DEFRA report, asked consumers how their shopping experience could be improved: their first request was “prices should not increase,” followed by “more special promotions” and finally “availability of locally produced food.” In other words, the first two requests pertained affordability of food, whereas only the third was concerned with it being locally sourced. A later study conducted by the IGD<sup>22</sup> asked 1,000 Britons to indicate the five most important factors influencing their decisions when buying food. The study found that 72% of the respondents considered price among the five most important factors when purchasing food, followed by taste (55%) and “Sell by date” (52%). Only 11% considered the country of origin among the five most important factors. The report further notes that individuals who actively support locally produced food, defined as those that “always try to buy British food... even if it's more expensive,” are more likely to be wealthy and living in rural areas. Therefore, any measure that

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<sup>20</sup> AEA Technology report for DEFRA, 2005. *The Validity of Food Miles as an Indicator of Sustainable Development*, <http://statistics.defra.gov.uk/esg/reports/foodmiles/final.pdf>

<sup>21</sup> Food Chain Centre (IGD), 2006. *Better Business - Improving Organic and Conventional Lamb Production*, <http://www.igd.com/downloads/25%20Organic%20Lamb.pdf>

<sup>22</sup> IGD, 2005. *Connecting Consumers with Farm Produce (Curry Report)*, <http://www.igd.com/downloads/Curry%20Report.pdf>

gives priority to local foods at the expense of consumer choice and affordability is not in the best interest of most consumers, and would significantly affect those whose incomes prevent them from paying the premiums for local food.

Finally, the claim that long-distance transportation of food produced abroad is not as environmentally friendly as production in the UK is inaccurate. Agriculture in the UK is usually energy-intensive, requiring fuel-heated greenhouses to extend the growth seasons of many fruits and vegetables. In warmer countries, the climatological conditions for many crops occur naturally and, therefore, farmers in these countries can do without the fuel-heated greenhouses. Two recent case studies compare the sustainability of producing food abroad and transporting it to the UK vs. producing it locally. The first case study<sup>23</sup> addresses the question “Does it take more energy and produce more emissions to grow tomatoes in the UK than to import them from Spain?” The basic consideration is that tomatoes in the UK are grown in heated glasshouses fuelled by natural gas, whereas climate in Spain supports growing tomatoes outdoors. The study found that, given the CO<sub>2</sub> emissions due to the heated greenhouses, even when transport emissions are taken into account, total CO<sub>2</sub> emissions of tomatoes grown in the UK are almost 4 times as high as the total CO<sub>2</sub> emissions of tomatoes grown in Spain. The study concludes, therefore, “there are certainly cases where it is better in energy terms to import non-indigenous produce or out of season produce than to grow it in the UK”.

The second study<sup>24</sup> compared the emission performance of New Zealand's agricultural sector with the UK's, focusing on four representative industries: dairy, apples, onions and lamb. With the exception of the onion sector, New Zealand's industries are far more efficient than their UK counterparts in terms of kilogram of CO<sub>2</sub> emitted per tonne of output, including the emissions for overseas transport. The largest difference is found in the dairy and lamb sectors: the UK produces twice as much CO<sub>2</sub> per tonne of Milk Solids (MS) and four times as much CO<sub>2</sub> per tonne of carcass.

The following table summarises the emission rates for the four industries in both countries:

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<sup>23</sup> AEA Technology report for DEFRA, 2005. *The Validity of Food Miles as an Indicator of Sustainable Development*, <http://statistics.defra.gov.uk/esg/reports/foodmiles/final.pdf>

<sup>24</sup> Caroline Saunders, Andrew Barber, Greg Taylor, 2006. *Food Miles - Comparative Energy/Emissions Performance of New Zealand's Agriculture Industry*, [http://www.lincoln.ac.nz/story\\_images/2328\\_RR285\\_s6508.pdf](http://www.lincoln.ac.nz/story_images/2328_RR285_s6508.pdf)

	<b>Kg of CO<sub>2</sub> per tonne of output</b>	
<b>Industry</b>	<b>NZ</b>	<b>UK</b>
Dairy	1,422.50	2,920.70
Apples	185	271.8
Onions	184	170
Lamb	688	2,849.10

*Source: Saunders, Barber, Taylor, 2006*

The results of both case studies raise the question of the effectiveness of using food miles to quantify environmental impact. Given that the measurement of food miles fails to include total energy use, which, as the studies show, can be a significant source of pollution, it is unreliable as a means of gauging the environmental effect of trade.

### **Unforeseen negative consequences**

In addition to the inadequacies of the proposed measures, be it taxes or quotas, proponents often overlook potential consequences. The two main consequences are: the increase in the price of basic food products and the impact on the lower income groups, the contravention of trade agreements and the impact on developing nations.

Given that many food imports, even with the added cost of transportation, are often cheaper than local foods, reduction of food miles would “reduce consumer choice or increase food prices”.<sup>25</sup> How much prices would increase is hard to determine, because it would depend on the exact policy implemented. However, it will undoubtedly penalise most the individuals in lower income groups, who would be forced to pay more money for the same, or smaller, amount of food. With 10.2 million people in the UK living below the poverty line, we should be sceptical of any measure that would make their lives even harder.

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<sup>25</sup> AEA Technology report for DEFRA, 2005. *The Validity of Food Miles as an Indicator of Sustainable Development*, <http://statistics.defra.gov.uk/esg/reports/foodmiles/final.pdf>

### Detriment to developing nations

Proposals for taxing food miles also are anticompetitive, as they disproportionately increase the price of imports with respect to local products, violating multiple trade agreements and conventions. The first violation would be of the Cotonou Agreement between the EU and the African Caribbean and Pacific (ACP) countries, which aims to “eradicate poverty,” “liberalise trade and payments” and “foster participation of Least Developed Countries (LDC) ACP states in the establishment of regional markets”.<sup>26</sup> The second violation would be of the 2001 “Everything But Arms (EBA) Regulation,” where the EU set out to help the 49 Least Developed Countries (LDC) by granting duty-free access to all of their imports, except arms and ammunition.<sup>27</sup> The final violation, though not legally binding, would be of the Millennium Development Goals, specifically Goals 1 and 8: the first goal is to help eradicate poverty and hunger, the eighth is to “[d]evelop... an open trading and financial system...” that “addresses the [special needs of the least developed countries]”.<sup>28</sup> A tax on food miles would be counter-productive to the aims of these agreements, since it would deprive farmers of their UK exports' income, prevent the move towards a liberalised trading system and derail the efforts to increase LDC participation in regional and world markets.

In addition to the legal aspect of violating these agreements, there are also trade and developmental dimensions. As mentioned earlier, the tax on food miles would hurt farmers whose livelihoods depend on access to the UK market. For example, nineteen ACP countries, four of which are LDC, derive a significant proportion of their export revenues from exports to the UK. This proportion ranges from 4% to 32%, with a group average of 13%.<sup>29</sup> Further, there are 33.5 million people involved in agriculture across these 19 countries, and while not all of them export their crops to the UK, these are the people that stand to benefit from fair, open access to the UK market. As President Denis Sassou N'Gusso, Chairman of the African Union, so poignantly put it, referring to the suspended Doha rounds, “it is on Africa that the continuing international trade distortions are taking the heaviest toll.”

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<sup>26</sup> EUROPA, *The Cotonou Agreement*, [http://ec.europa.eu/development/body/cotonou/index\\_en.htm](http://ec.europa.eu/development/body/cotonou/index_en.htm)

<sup>27</sup> European Commission, *GSP: Everything But Arms initiative*, [http://ec.europa.eu/trade/issues/global/gsp/eba/index\\_en.htm](http://ec.europa.eu/trade/issues/global/gsp/eba/index_en.htm)

<sup>28</sup> UN, *Millennium Development Goals (MDG)*, <http://www.un.org/millenniumgoals/>

<sup>29</sup> CIA World Handbook 2006.

### Alternative approaches

Given that taxing food miles does very little, if anything, to address the social and environmental impact of food transport, it is worth considering other solutions. There are two strategies that address both the sustainability of farming, in terms of making it reasonably profitable, and the environmental concerns: firstly, the reform and eventual phase out of the Common Agricultural Policy (CAP), and secondly, the promotion of home delivery services. Dismantling the CAP would create an incentive for efficient, innovative farming, increasing profitability and using fewer resources per unit of output. Further, the incentive to overproduce disappears, doing away with the unnecessary strain on the environment. The widespread adoption of home delivery services, on the other hand, would reduce congestion costs and household CO<sub>2</sub> emissions considerably.

The reform and phasing out of the CAP is covered in detail in the report “Farming & Food: a sustainable future”.<sup>30</sup> The Commission states that when addressing the challenges of the farming industry, “production subsidies paid under the CAP have become part of the problem rather than the solution... [undermining] incentives to grow and adapt.” Furthermore, the removal of the subsidies “is essential to the long-term competitiveness of the industry.” To increase competitiveness and profitability, the report outlines a multi-pronged strategy that boils down to three basic approaches: reduction of costs and increased efficiency, increase value-added to farm products and diversification into new markets, such as tourism and non-food crops. The latter may be of particular relevance.

Diversifying into non-food crops can prove both a profitable and environmentally-friendly strategy. The study found that “growing crops for energy use is the most viable option at present,” and it is worth noting that though still in an infant stage in the UK, ethanol distilleries have already been successfully established in the US. One TIME magazine “Person of the Year 2006”<sup>31</sup> is an Iowan farmer who expanded into the energy market, distilling ethanol from the corn he already grows. The distillery not only created additional jobs, 85% of which are filled by locals, but also provides these farmers and employees with additional income. In addition to the

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<sup>30</sup> Policy Commission on the Future of Farming and Food, *Farming & Food: a sustainable future* (2002), <http://archive.cabinetoffice.gov.uk/farming/pdf/PC%20Report2.pdf>.

<sup>31</sup> TIME Magazine, 2006. *Time Person of The Year 2006: People Who Mattered – The Grain Farmer*, <http://www.time.com/time/personoftheyear/2006/people/9.html>

sought-for independence of ever-decreasing food prices, ethanol would supply the increasing demand for cleaner fuel alternatives.

Regarding the environmental impact of farming, the report recognises that, without substantial change, the farming industry is on an “[environmentally] unsustainable course.” As stated earlier, CAP subsidies and price floors “[raise] commodity prices above those provided by world markets... the result has been overproduction and [a disregard] of the environmental damage this causes.” The recent attempts to remove the incentive to overproduce by partially decoupling payments from production have failed: payments are now linked to farm size, therefore indirectly still linked to production levels, and benefit large farmers over small ones. Therefore, given that in more than 40 years the CAP has failed to create a sustainable and profitable farming industry, as well as exacerbating the environmental impact of farming, a gradual reform and phasing out would be the first logical step to addressing these concerns.

Together with the CAP reform, the adoption of home delivery services is perceived as the best way to reduce the costs associated with car food transport between retailer and household. One study shows that “a direct substitution of car trips by [delivery] van trips could reduce vehicle-km by 70% or more”.<sup>32</sup> As mentioned earlier, cars account for 40% of the social costs of food-related transport, as well as 50% of the congestion costs and 13% of the CO<sub>2</sub> emissions.<sup>33</sup> Therefore, the use of such service would reduce the total food miles and the ensuing externalities.

## Conclusion

Food miles do not provide a complete picture of the environmental impact of food production and transport. Therefore, the campaign to reduce them with the aim of reducing the strain on the environment is wishful thinking at best. More importantly, a tax, or any measure to limit the entrance of imported food will not reduce food miles or CO<sub>2</sub> emissions considerably, given that a large percentage of food miles are accrued by transport within the UK and that airplanes produce less than 0.2% of the UK’s CO<sub>2</sub> emissions. As the case of Spanish tomatoes and New

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<sup>32</sup> Cairns, Sally, 2005. *Delivering supermarket shopping: more or less traffic?*  
<http://eprints.ucl.ac.uk/archive/00001391/>

<sup>33</sup> AEA Technology report for DEFRA, 2005. *The Validity of Food Miles as an Indicator of Sustainable Development*,  
<http://statistics.defra.gov.uk/esg/reports/foodmiles/final.pdf>

Zealand lamb, dairy and apples shows, it is actually better for the environment to import them from countries whose climates favour their production instead of trying to grow them in the UK.

In addition to this, a tax on food miles would have international legal implications, as well as wide-ranging negative effects on poverty, both at home and abroad. The effect on the poor in the UK, who would have to pay more for their food, and on the poor in developing countries, whose livelihood hinges on access to markets such as the UK's, is rarely mentioned by food miles campaigners.

Furthermore, the gradual reform and eventual phasing out of the CAP, coupled with the strategies suggested by the Policy Commission above, would reduce the incentive to overproduce and create the necessary conditions for financially and environmentally sustainable farming. It would also bring considerable financial relief to European consumers. EU citizens pay for the CAP twice: first, through the taxes used to finance the €44 billion behemoth, the largest item on the EU budget, and then in the market, where, due to the price intervention, EU citizens pay on average three times the world price for food.

Finally, the adoption of relatively simple strategies, such as home delivery services, would complement the efforts to increase food industry efficiency in general, eventually reducing congestion costs and impact on the environment.

## Conclusion

Alex Singleton & Tom Clougherty

We believe that all policy proposals should be analysed dispassionately to assess whether they would actually work, and whether their benefits justify their costs. The potential solutions to our environmental problems are no exception.

It is clear that international agreements are not the answer. The Kyoto agreement has not worked, and a successor treaty is not on the cards. India and China, who are set to be the greatest greenhouse gas emitters of the twenty-first century, will not sign up to any agreement that would limit their economic growth and condemn their most vulnerable citizens to continued poverty.

However, this is no reason to give up hope. Throughout history innovation has been man's saviour and there is little doubt that this will continue to be the case. Technology has given us cleaner air, cleaner water, and has brought once unimaginable luxuries to us all. There are those who dismiss technology's potential, who regard it as the problem and not the solution. But such pessimism is misplaced. Already there are technologies in use that have the power to ensure a cleaner, greener future for generations to come. This is the key to a truly global solution: once cost-effective technologies are developed they will spread around the world.

In order to "incentivise" the development of new technologies a range of environmental measures have been proposed or implemented. Chief among these are green taxes and emissions "cap and trade" schemes. While both have a theoretical appeal, each has serious drawbacks in practice. Most green taxes do little to encourage greener behaviour, and fall disproportionately on the poor. The Chancellor of the Exchequer's recent increase in the air passenger duty is one such measure.

Emissions trading has also proved problematic. The power-generation sector has profited enormously from the scheme while consumers have been left to pick up the bill. Rising energy costs have hurt businesses and squeezed household budgets, especially in lower income groups. If the emissions trading scheme is to continue it must be reformed: permits should be auctioned

to prevent the Energy industry ripping off consumers, and the proceeds should be used to finance a cut in corporation tax to stop wealth-creating businesses fleeing overseas.

The proposal that “food miles” should be taxed is particularly badly thought out. The claim growing food abroad is not as environmentally friendly as food production in the UK is inaccurate. For example, even when transport emissions are taken into account it takes four times more carbon dioxide emissions to produce tomatoes in the UK than it does in Spain.

As well as being ineffective taxing foodmiles would have severely negative consequences for the poorest members of society, whether at home or abroad. In the UK it would lead to higher food prices – the burden of which would fall most heavily on those with lower incomes, since they spend more of their money on necessities. Even worse, the foodmiles tax would hurt farmers in the developing world, many of whom rely on access to the UK market for their livelihoods. To those who care about the plight of the world’s poorest people such an outcome is simply unacceptable.

But despite the problems with many policy ideas currently on the agenda there are better approaches we can take. While empirical evidence does not back up the view that directly subsidising research and development has any effect on innovation, there is another way to encourage innovation. Britain has a long historical record of prize-funds for inventors, stretching back to the reign of Charles II. We propose that prize funds should be reinvented for the 21<sup>st</sup> century. Why not set up a large prize fund available to the first person that can produce a workable system that effectively harnesses the power of waves? Many of history’s greatest inventions have come from gifted individuals working alone, and prize funds are perhaps the best way to appeal to the inventor’s entrepreneurial spirit. The further merit of prize funds is that technology developed to win them would be unpatented and made freely available to developing countries.

Another proposal that would ensure the speedy flow of green technology around the world was recently made by EU Trade Commissioner Peter Mandelson in a letter to Pascal Lamy, director-general of the WTO. He suggested scrapping tariffs on renewable energy and clean power generation equipment worldwide: in essence, global free trade in green technology.

Above all, it is vital that we recognize that continued economic growth and prosperity is essential to resolving the problems we face. Any measures that would restrict it will do more harm than good. Wealth is vital if we are to adapt, and help poor countries adapt, to climate change if that becomes necessary. And wealth is also essential to the development of those new technologies that truly have the potential to set us free from environmental danger.

The convenient truth is that becoming wealthier and more prosperous in the coming century is not the enemy of environmental progress: it is its very heart and soul.