50 people who could save the planet

Stranded polar bears, melting glaciers, dried-out rivers and flooding on a horrific scale - these were the iconic images of 2007. So who is most able to stop this destruction to our world? A Guardian panel, taking nominations from key environmental figures, met to compile a list of our ultimate green heroes

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Last year ended with the incongruous image of 10,000 politicians, businessmen, activists and scientists from 190 countries emitting vast quantities of greenhouse gases as they flew home from Bali clutching the bare bones of a global agreement on climate change. The agreement was to keep on talking to try to reach a deal by 2010. It was a diplomatic triumph, achieved after rows and high dramas, but it leaves all nations a mighty hill

to climb. There is no agreement on what emission cuts need to be made by when or by whom, and the US is still deeply reluctant to do anything. It is a roadmap with no signposts.

Some were optimistic that a start had been made; some said that the earth's ecological situation was in a far more perilous state than had been thought. The iconic images of 2007 - polar bears stranded, glaciers melting in the Himalayas, forests coming down all over Africa and devastating floods and droughts from Bangladesh to Ghana - may be as nothing to what will happen if people do not take immediate action.

But who are the people who can bring about change, the pioneers coming up with radical solutions? We can modify our lifestyles, but that will never be enough. Who are the politicians most able to force society and industry to do things differently? Where are the green shoots that will get us out of the global ecological mess?

To come up with a list of the 50 people most able to prevent the continuing destruction of the planet, we consulted key people in the global environment debate. Our panel included scientists - former World Bank chief scientist and now the British government's scientific adviser on climate change, Bob Watson, Indian physicist and ecologist Vandana Shiva, Kenyan biologist and Nobel prize-winner Wangari Maathai; activists - Guardian columnist George Monbiot and head of Greenpeace International Gerd Leipold; politicians - Green party co-leader and MEP Caroline Lucas, and London mayor Ken Livingstone; sustainable development commissioner for the UK government Jonathon Porritt and novelist Philip Pullman.

Then the Guardian's science, environment and economics correspondents met to add their own nominations and establish a final 50. Great names were argued over, and unknown ones surfaced. Should Al Gore be on the list? He may have put climate change on the rich countries' agenda, but some felt his solution of trading emissions is not enough and no more than what all major businesses and western governments are now saying. But in the end he squeaked through.

There was also debate over Leonardo DiCaprio. It would be easy to sniff at someone who seemed to have merely pledged to forgo private jets and made a couple of films about the environment, but we felt the Hollywood superstar who has grabbed the green agenda had to be included because of the worldwide influence he is expected to have. Thanks to his massive celebrity status DiCaprio could be a crucial figure in persuading and leading the next generation.

Some people made it to the final 50 not just because of their work but because - like the man who has found a simple way to save energy in a refrigerator, or the boy who collects impressive amounts of money for the

protection of tigers - they represented a significant grassroots technological or social movement. And some got on the list because they were considered the driving forces behind the decision-makers. One church leader, for example, made it largely because the world's religions have huge investments and are shifting the political landscape in the US and Europe.

The final list includes an Indian peasant farmer, the world's leading geneticist, German and Chinese politicians, a novelist, a film director, a civil engineer, a seed collector and a scientist who has persuaded an African president to make a tenth of his country a national park. There are 19 nationalities represented. Nearly one in five of those listed comes from the US, and one in three is from a developing country, suggesting that grassroots resourcefulness will be as important as money and technology in the future. Nearly one in three of the people chosen has a scientific background, even if not all practice what they studied. It's not a definitive list and there are no rankings, but these 50 names give a sense of the vast well of people who represent the stirrings of a remarkable scientific and social revolution, and give us hope as we enter 2008.
John Vidal

Terry Tamminen
Climate policy adviser

Born in Australia, Terry Tamminen, 57, has been a sheep farmer, a sea captain, a property dealer and, until last year, environmental adviser to California governor Arnold Schwarzenegger. Largely because of Tamminen's influence, Arnie greened up, passed a raft of groundbreaking environmental laws, put pressure on polluting industries and is now politically popular. The world's seventh largest economy now has targets and timetables to shame nearly every country in the world - a 25% cut in emissions by 2020 - and is hailed as a beacon of eco responsibility. Tamminen has moved on to run the state's climate plan and is working with other US states and cities to create a de facto national climate change policy, and in so doing forcing President Bush's hand. Tamminen argues that the 5% of the world population who live in the US are responsible not for 25% of the world's climate emissions, as the textbooks say, but for at least 50% of them if you include the energy needed to power the Chinese factories that are churning out plastic toys and other mass consumer goods for the voracious US market.

Capt Paul Watson
Marine activist

Paul Watson, 57, is the man Japanese whalers, Canadian seal hunters and illegal fishermen everywhere fear the most. The ultimate direct action man, he

co-founded Greenpeace in the 70s and now has two boats that patrol the world 's oceans and confront anyone he has evidence of acting criminally. He is regularly denounced by governments as being an eco terrorist and a pirate after ramming and scuttling whalers, but Watson knows the law of the sea and has never been prosecuted. Now he is opening up a new role for environment groups. Last year the Sea Shepherd Conservation Society became an official law enforcement agency in Ecuador. Sea Shepherd partners the Ecuador police and can go on official patrols and make arrests in the Galapagos national maritime park. In one month last year he intercepted more than 19,000 shark fins and 92,000 sea cucumbers, and confiscated more than 35 miles of illegal longline. The idea of environmental activists becoming a new green police force may develop in years to come.

Vicki Buck
Entrepreneur

As the world scrambles to find a fuel supply that doesn't exacerbate global warming, New Zealander Vicki Buck, 51, has emerged as the acceptable face of biofuels. She's one-third of Aquaflow, a small company that was one of the first to crack the technology needed to harvest wild algae from sewage ponds, then extract fuel from it suitable for cars and aircraft. Companies from Boeing to Virgin are now beating a path to her Christchurch door. They're excited by the fact that it's theoretically possible to produce 10,000 gallons of algae oil per acre, compared with 680 gallons per acre for palm oil. Moreover, Buck has form: she was mayor of Christchurch, set up top eco-website celsias.com, is a director of NZ Windfarms, and is now working on a start-up to reduce one major cause of climate change: the methane gas emitted from billions of animals which make up 49% of NZ's greenhouse gases - chiefly by changing their diet.

Elon Musk
Entrepreneur

Elon Musk, 36, struck gold with PayPal (a system for paying bills online) during the 90s dot com boom and the South African wunderkind is now the major investor and chair of the board at Tesla Motors, a Silicon Valley electric car startup. The company plans to shake up the moribund US auto industry and dramatically curb CO2 emissions, ripping out the internal combustion engine and the petrol tank, and replacing both with a motor that boasts few moving parts and the sort of lithium batteries found in laptops. A limited-edition Tesla Roadster, a sports car that reaches 60 mph in less than four seconds, and can do 245 miles per charge, is due this year. Hollywood eco-stars such as George Clooney and Leonardo DiCaprio have bagged the first of a 600-car production run being built by Lotus in the UK. Next up, says Tesla, is a mass-market family sedan that could be fuelled by solar panels on the garage roof.

Angela Merkel
German chancellor

Angela Merkel, 53, has inherited Tony Blair's mantle as the politician forcing climate change the hardest on to the world stage, and she is a formidable advocate. The only major player left who helped hammer out the original global warming agreement at Kyoto in 1997, she is one of the very few with a grasp of what it means if humanity fails.

But it's what Germany does at home that gives Merkel authority. A quantum chemistry researcher brought up by a Lutheran pastor in communist East Germany, she was made German environment minister in 1994. The country now leads the world in turning away from coal and oil, and setting the highest targets for renewables and emission cuts.

She's not so popular with Greens, who accuse her of being a lackey to nuclear power and a friend of Bush, but they accept that she gets things done. Ten years ago, she shocked people when she said Germany should aim to raise the proportion of its electricity generated from renewable energy to 50% by 2050. It's now 12% - compare Britain's 3% - and is on track to be 20% in 12 years' time. She asked Germans to believe her when she said renewables would provide more jobs. There are now nearly 250,000 people working in the sector. And at the UN meeting at Bali last month, she told the EU it had to stick together and be ambitious. It led the fight against President Bush.

The speed at which Germany under Merkel is pursuing climate change policies is embarrassing the UK and other countries, which talk up the need for action, but deliver little. The UK aims to cut emissions by 60% by 2050 and argues that it needs nuclear power to do so. Germany, meanwhile, wants 40% cuts within 13 years without resort to nuclear power - something far harder.

"The faster industrialised countries cut their emissions, the more willing other countries will be to do their bit," Merkel says. "An intelligent and fair regulation of CO2 reductions is in everyone's best interests."

It's heady stuff for the world's energy watchers. German energy efficiency is to be improved by 3% a year for 20 years. The country expects to use 10% less electricity within a decade; all power stations are to be modernised; there's £30bn for more renewables; railways will be further subsidised to lure people out of their cars and away from aeroplanes; plans for more wind turbines, photovoltaic electricity and biofuels will all be fast-forwarded;

there is £1,500m to reduce CO2 in existing buildings; and the solar market is growing by 40% a year. Few doubt that Germany is on track to achieve one of the greatest transformations in any country's use of power.

Merkel is matter of fact about the costs. One leading thinktank recently calculated that climate change would cost Germany nearly £100bn a year by the middle of the century, so stumping up £4bn over the next few years to avoid that is cheap, she reckons.

"The costs of reducing emissions should be seem as a sound investment," Merkel says. "Unabated climate change will slash prosperity by between 5% and 25%. Rigorous climate protection will cost only 1% of this prosperity and makes economic sense."

She is lucky in that Germany has a secret weapon in the battle against global warming: called the Renewable Energy Sources Act, it sets minimum prices for generating electricity. Anyone generating electricity from renewables now gets a guaranteed payment of up to three to four times the market rate, guaranteed for 20 years. This has not just kickstarted the whole German renewable industry beyond its wildest imaginings, it also reduces the payback time on such technologies and offers a high return on investment. The idea has since been adopted in many other countries, and was picked up by the Conservatives in Britain in mid-December.

Germany is far from green. It has immense ecological problems and is still the world's sixth greatest polluter, but for now it has gone renewable-mad with farmers, householders and businesses competing with each other to profit the most. If under Merkel Germany doesn't meet UN and EU targets, then it's nowhere will.

Caroline Lucas
Politician

Caroline Lucas, 47, is Green MEP for SE England and is likely to be elected the Greens' first sole leader next year when members have a referendum (hitherto the party has had a joint leadership). She was nominated here by Jonathon Porritt: "She is the most inspiring politician the Green party has had since its inception - honest, articulate, passionate." In the meantime, she is intensely disliked by EU commissioners and much of big industry after drafting laws to force airlines to pay the true environmental and social costs of flying, forcing a legal investigation into nuclear power, taking on chemical companies and harassing the commission at every opportunity on trade, GM crops, globalisation and animal diseases.

Bob Hertzberg
Financier

Bob Hertzberg, 53, founder of venture capital firm Renewable Capital, is one of a new breed of financier piling unprecedented amounts of money

into renewable technologies. He ran for mayor of Los Angeles in 2005, finishing in third place. Renewable Capital has holdings in electric car companies, solar electric firms and windfarms. He is also backing a company in Cardiff that produces solar cells that do not need direct sunlight to generate electricity. In a process similar to photosynthesis, it uses nano-sized titanium crystals to turn light into electricity.

Carlo Petrini
Food activist

Carlo Petrini, 58, is the only anti-McDonald's activist who has been welcomed to the offices of David Cameron, David Miliband, Prince Charles, Al Gore and Barack Obama. The founder of the international Slow Food movement, nominated here by Vandana Shiva, is idolised by rich and leisured foodies for promoting high-quality, small-scale farming and organising a relaxed life around long lunches. But Petrini, an Italian leftie of the old school, has a far more serious purpose than saving the pilchard or Parma ham. The Slow Food movement has now expanded across 100 countries and is throwing poisoned darts at the whole fast food culture and the multinational food producers that between them have wrecked so much of the environment.

Tewolde Egziabher
Scientist

Tewolde Egziabher, 67, a slight, Gandhian figure, is a UK-trained biologist who runs Ethiopia's environment protection agency and has proved himself an extraordinarily effective negotiator. At 2am at the 2002 Earth Summit , he made one of the most impassioned speeches heard at a global meeting. It had looked certain that the world's politicians would back a US proposal giving the World Trade Organisation the power to override international environment treaties, but he shamed the ministers into voting it down. No one could remember a personal intervention having such an impact, and his battles on behalf of developing countries to protect them from patents, unfettered free trade and GM crops are legendary. He was nominated by Vandana Shiva.

Amory Lovins
Physicist

Think of a world where cars burn no oil and emit drinking water - or nothing at all. Where central power stations are redundant and buildings and parked vehicles produce enough energy to drive factories. Where no house is built that cannot generate electricity for others. Where carbon emissions have long been declining, and industries no longer waste almost all their material. This is not a pipe dream, but an increasingly likely scenario, here within a generation or two; that is the prediction of Amory Lovins, 60, an experimental physicist turned energy reduction pioneer

who has had as profound an influence on the way people use energy as any man alive.

From a base in the Rockies, Lovins and his team of engineers and analysts show governments and large car, aviation and energy companies, as well as the likes of Walmart and Monsanto, how to profit from using less energy by applying knowledge of composite materials, engineering, design and energy storage. He says: "Optimism beats fear or despair any time. There are excellent reasons to be encouraged. The global consciousness is higher at all levels. Revolutionary changes are taking place."

The car industry is speeding towards solutions Lovins proposed nearly 20 years ago, when he developed the idea of a "hyper car" - a carbon fibre hybrid petrol- and electricity-run machine that weighs next to nothing, has far fewer parts than conventional cars, does 150-200mpg and emits practically nothing. Last November, Toyota unveiled just that: a four-door carbon fibre model the same size as its green Prius but about a quarter of the weight of some Minis. It emits only one third of the Prius's greenhouse gases and does more than 100mpg. Now most car makers, with one eye on $100 dollar a barrel oil prices and an understanding that there is a vast market for green, are playing catch-up with Lovins' ideas.

While at Oxford in the 70s, Lovins helped set up Friends of the Earth in Britain and stopped Rio Tinto digging up Snowdonia. By the age of 28, he had worked out that the US could phase out fossil fuels not at a cost, but at a profit. "We stand here confronted by insurmountable opportunities," he wrote. Now the revolution he helped shape is coming, and Lovins says the US can eliminate all oil use by 2050, "and know unprecedented prosperity".

"We're finding in the auto sector speed of change at a fundamental level," he says. "Change is coming out of fear and the car makers are gazing into the abyss. It is widely understood that incremental change is a high-risk strategy. Those who take the opportunity to change will do very well. We can save half the oil we use and the rest we can save with advanced biofuels."

He dismisses nuclear power as the fantasy of control and command states stuck in the 50s. "New nuclear plants are so costly that spending the same on micropower can save two to 10 times more CO2, and sooner. In 2005, renewables produced one sixth of the world's total electricity and a third of new electricity. This revolution already happened - sorry if you missed it!"

Lovins works by seeking efficiency at every point. Take the most energy-efficient existing hybrid car, he says. Drive it carefully and you can double efficiency. Make it ultra-light, and you can redouble it. Run it on an advanced biofuel, and you can quadruple its oil efficiency again. If you then give it batteries that can be recharged by connecting a plug to an

electric power source and have a good economic model to pay for the batteries, then you at least double efficiency again. Put all this together, and you can be down to about 3% of the oil per mile you started with. And Lovins says he has never known any company invest in energy and not make a profit.

He's working with the Pentagon, which spends nearly a third of its vast budget on moving troops and equipment around. If it invested in really energy-efficient goals, in the same way as, say, it invested in the internet, GPS and chips, Lovins says it would shift the entire global energy landscape. The knock-on effect would transform civilian car, truck and plane industries, too. The cost? It's a $180bn investment, he reckons - or roughly what the UK spends on its health service in a year.

Madhav Subrmanian
Schoolboy

Madhav Subrmanian is the next generation's face of conservation, a 12-year-old Indian boy who goes round Mumbai collecting money for tiger conservation. With his friends Kirat Singh, Sahir Doshi and Suraj Bishnoi, he set up Kids For Tigers which works in hundreds of schools. He writes poems, sings on the streets, sells merchandise and has collected Rs500,000 (£6,500) in two years. Conservation awareness is growing in middle-class India, largely through young activists like him.

Marina Silva
Politician

Marina Silva, 49, is Brazil's environment minister. The daughter of a Brazilian rubber tapper, she spent her childhood collecting rubber from the Amazon forest and demonstrating against the destruction wrought by illegal loggers. In one of the great political journeys, she rose from being illiterate at 16 to become Brazil's youngest senator, and is now the woman most able to prevent the Amazon's wholesale ruin. Under her watch, deforestation has reduced by nearly 75% and millions of square miles of reserves have been given to traditional communities. Last year 1,500 companies were raided and one million cubic metres of illegally felled timber were confiscated. But the future, says Silva, is peril ous. The only way that long-term loss will be averted is with foreign help. "We don't want charity, it's a question of ethics of solidarity," she says.

Robin Murray
Industrial economist

Central government and local authorities in the UK turn to Robin Murray, 67, when they need to reduce waste. The author of three influential books, he came up with the phrase "zero waste" - the idea that people can mimic biology and produce, consume and recycle everything without throwing anything away. Instead of seeing waste as a problem, he argues that it can

become a resource for someone else, and instead of thinking about recycling, he says it is more sensible to think about design so that products do not need to be recycled - instead they could be used repeatedly or composted. It may need an industrial revolution and a total makeover of the global economy to achieve Murray's truly wasteless society, but zero waste is now the goal of hundreds of local authorities and is spreading around the world, back ed by designers, planners and companies from San Francisco to Wellington in New Zealand.

Laurie David
Activist

Laurie David, 49, is a powerhouse with some heavy-hitting connections even by Hollywood standards. Whether spreading the word about global warming on Oprah, writing a children's bestseller on the subject, producing Al Gore's breakthrough film, An Inconvenient Truth, or making the HBO documentary Too Hot Not To Handle, which shows what lies in store for the US if it does not reverse its policies on climate change, David has become a showbiz standard-bearer. She has reached across the US political chasm by co-founding the Stop Global Warming Virtual March with Robert Kennedy Jr and Senator John McCain, though her critics say her lifestyle leaves a hefty carbon footprint.

Patriarch Bartholomew
Leader of the Orthodox Church

Patriarch Bartholomew I, Archbishop of Constantinople and New Rome, is the spiritual leader of 300 million Orthodox Christians around the world. He's also extremely green, each year taking church leaders of all denominations to areas of the world beset with environmental problems - including the Amazon, the Arctic and the Danube. After announcing, on an island in the Aegean, that attacks on the environment should be considered sins , he called pollution of the world's waters "a new Apocalypse" and led global calls for "creation care". Way ahead of his time, he has made the environment an increasingly powerful strand of Christian thinking in Britain - and latterly the US, where traditionally right wing churches have followed his lead and now openly counter President Bush's stance. Bartholomew, 67, is now heavily influencing the Pope and has shared a green stage with him several times in Rome. It all suggests institutional Christianity is greening up fast after centuries of ambivalence and outright hostility.

Leonardo DiCaprio
Actor

Icebergs are becoming a recurring theme in the life of 33-year-old Leonardo DiCaprio.

First, his acting career went stellar after playing the lead in Titanic. Now it is dramatic footage of icebergs and polar bears, both threatened by climate change, that is a striking feature of his documentary The 11th Hour (released in the UK next month), a powerful call to arms for our species to protect the environment a great deal better.

Combining the diametrically opposed worlds of the A-list Hollywood star and the impassioned environmentalist is a fraught, sometimes contradictory process, but DiCaprio has pulled it off, becoming one of the world's most high-profile campaigners.

His primary aim, he says, is to raise awareness, not to preach: "It's not about imposing a certain belief system or a way of life on people in any economic background. It's about just being aware of this issue - that's the most important thing - and really trying to say, 'Next time I vote, next time I buy something, I'm just going to be aware of what's really going on.' "

The first campaigning steps were taken a decade ago after he found himself the target of angry environmentalists. During the filming of The Beach, the bestselling novel about backpackers seeking a shangri-la off the Thai coast, the production team was accused of damaging a pristine beach in a national marine park - in an attempt to make it look even more "perfect" for the cameras, some palm trees were temporarily planted and sand dunes moved. Despite the authorities giving the film-makers permission, their actions made headlines around the world.

Evidently stung by the criticism, in 1998 DiCaprio established the Leonardo DiCaprio Foundation, which has since collaborated with the likes of the International Fund for Animal Welfare, Oceana, the Natural Resources Defence Council and the Dian Fossey Foundation to raise awareness, particularly among children, of environmental issues.

In 2000, he was the US chair of Earth Day, the annual celebration of the environment. "Enough is enough," he told the crowd in Washington DC. "We must set an example now and move environmentalism from being the philosophy of a passionate minority... to a way of life that automatically integrates ecology into governmental policy and normal living standards. We are entering an environmental age whether we like it or not." But it was his Earth Day interview with President Clinton on ABC News that caused the biggest ripples: ABC journalists were said to be furious that a young, heart-throb actor had been allowed to do such an important interview. The final edit of the interview itself was fairly soft in tone, but it did include questions that now seem ahead of their time - namely, about the science of climate change, the lobbying power of Big Oil, ways to decrease the use of SUVs and how vulnerable New Orleans was to sea-level rises. There was even a lengthy exchange about hybrid cars, long before they became the car du jour of Hollywood stars.

As DiCaprio's acting career matured, he continued his parallel life as an environmental activist, speaking at colleges and campaigning on behalf of John Kerry in the 2004 presidential campaign. And for his new documentary, he has mustered the likes of Stephen Hawking, Bill McKibben, David Suzuki, Mikhail Gorbachev and Wangari Maathai (below) to take part. He limits his own appearance in the film - essentially a series of talking heads set against library footage - to that of host and narrator. Since its release in the US last year, it has been dubbed the unofficial sequel to Al Gore's The Inconvenient Truth.

"It was a learning process," says DiCaprio, "and I wanted to play the role of investigator - from watching documentaries at a young age, from seeing films on rainforests in Brazil and really appreciating the beauty of our planet, and then learning more and more about human impact and wanting to do something about it."

His next eco-project is already in production - he's a producer for a Discovery Channel show called Eco-Town, which records how a Kansas town devastated by a tornado in 2006 attempts to rebuild itself as a "model of green living".

Andrew Kimbrell
Lawyer

Andrew Kimbrell, 51, was a concert pianist and music teacher in New York before he joined an emerging breed of activist lawyers forcing governments to take the environment much more seriously. Last year in the US Supreme Court, he defeated the Bush administration's policy of refusing to regulate global warming. It was a defining moment in the American debate and forced Bush to regulate carbon dioxide pollution from motor vehicles under the Clean Air Act. Kimbrell is now working with others to devise a new concept of 'natural law' based on the idea that humans are just one part of a wider community of beings and that the welfare of each member of that community depends on the welfare of the earth as a whole. It sounds heretical now, but is traditional in many societies and one to watch in the west.

René Ngongo
Biologist

Congo DRC is home to the world's second greatest stands of tropical forest after the Amazon, mainly because no timber company could work there during the decades of civil war and insurgency. Now that the war is over, European, Asian and US logging companies are piling in, with the help of the World Bank and international donors, to strip Congo of its most valuable wood. Potentially, it's an ecological and social disaster: more than 20 million people, not least the Pygmies, depend on the forest for their living. Ngongo, 36, is a biology academic from Goma, who has travelled the

country investigating the corrupt timber industry and taken his findings to London, Washington and Brussels. He's the new face of environmentalism in the south and was nominated by the head of Greenpeace International, Gerd Leipold, as the kind of activist who will make waves in the next 20 years.

Zhengrong Shi
Scientist

Dr Zhen grong Shi, 44, is living proof of the cliché that every crisis presents an opportunity. China's search for alternative energy has made the solar cell scientist and businessman one of the country's richest men. The value of his company, Suntech Power, one of the world's 10 biggest manufacturers of solar panels, has risen above the $6bn mark since it became the first Chinese firm to list on the New York stock exchange. Dr Shi is a farmer's son from Jiangsu province, and was put up for adoption because his family were too poor to raise him. He set up Suntech in 2001 , and the company expects to grow far bigger, possibly helping China overtake Japan as the world's leading supplier of the technology. Shanghai plans to subsidise 100,000 solar panels for the city and the state is preparing to build the world's biggest solar generating facility in the Gobi desert.

Joss Garman
Activist

Joss Garman, 22 and just out of university, has been a British environmental activist for eight years. Dubbed the "new Swampy", he has been arrested more than 20 times and helped set up Plane Stupid, a direct action group which in its short-haul life has infuriated airline companies and airports, disrupted the transport select committee and shut down easyJet's London offices. BAA tried to stop Garman and others organising the climate change camp at Heathrow last summer, but the camp went ahead and Garman demonstrated elsewhere. He was nominated by George Monbiot and Philip Pullman as one of the activists of the future. "He's now a campaigner at Greenpeace, though he's only about 12," Monbiot says.

Craig Venter
Geneticist

Craig Venter is often referred to as a "maverick" scientist, with the implication that he is a rogue, a bad boy of biology. Yet it is the strict dictionary definition of the word that suits him best: a person of

independent or unorthodox views. And when it comes to addressing the world's environmental problems, that may be just what we need.

As the head of various firms and institutes, some public and some private, Venter has ambitious plans for the planet. By harnessing the power of microbes that his scientists have discovered deep in the sea and under the ground, he thinks we could revolutionise fuel production and bring down emissions. Venter has put his army of bugs to work on everything from renewable supplies of energy-rich gases such as methane, to advanced biofuels that don't threaten food production and could be used to fuel aeroplanes.

One has the ability to turn the carbon dioxide into methane; it could be put to work converting CO_2 captured from coal power plants and stored underground. "You could pump the CO_2 down, convert it into methane and burn it all over again," he says. Another turns coal into natural gas, speeding up what is essentially a natural process and reducing both the energy needed to extract the fossil fuel and the amount of pollution caused when it is burned.

"Theoretically, there's no limit to what we're doing," Venter says. "Most people working on these problems talk about linear progress. I like to think in terms of exponential patterns of change."

He talks of hundreds of thousands of biological refineries spread across nations, each churning out green replacements for fossil fuels. "It's the sheer volume we're talking about with oil, gas and coal that makes the problem so large. But what I've made work really well is massively parallel processes [a system of linked computers tackling problems on a super scale]. Now I would like to apply that to fuel production."

A former high-school drop-out, surf bum and Vietnam veteran, Venter earned his reputation for working outside the boundaries of conventional science with his efforts earlier this decade to decode the entire human genetic code, the genome. At the time, scientists believed that deciphering this alphabet soup of genes would unleash a revolution in medicine. Venter agreed, and saw commercial as well as medical gain.

He envisaged a giant DNA database that drugs companies would pay to search through, and led a company aiming to do just that. His vision clashed with a publicly funded scientific initiative to sequence the genome and make the information available for free, led by numerous Nobel prize-winners. The acrimonious race that ensued was eventually declared a draw, though Venter's notoriety was complete when he subsequently revealed that most of the DNA his team had decoded was, in fact, his own.

Venter is not giving up his human genomics work, but says that he is now drawn to environmental problems by their urgency - and by the rapidity with which he thinks he can find solutions. Rather than the two decades or

so it can take to bring a drug to market, he envisages his modified micro-organisms producing commercial fuels within just a few years.

Recently, Venter has spent much of his time cruising the world's oceans, sifting them for useful microbes, and was distressed by what he found. "Not a day went by when we didn't see huge amounts of plastic trash in the water. We're treating the planet as our toilet and we think when we flush the chain the problems disappear, but they don't. We have to find ways to change."

One of Venter's more controversial suggestions for tackling environmental problems involves a synthetic lifeform. Not content with setting existing microbes to work, he wants to create an artificial bacterium, with genes, traits and abilities introduced from beyond nature's catalogue. He hopes to announce its creation next year, a step forward that will place him firmly back in the spotlight. "We need advances in every field," he says. "We're not going to come up with a miracle solution - we'll need thousands or tens of thousands of solutions."

Henry Saragih
Union leader and farmer

Henry Saragih is a small farmer who has hardly seen his wife and children in 15 years since taking on the Indonesian government and the palm oil barons of Sumatra and Kalimantan. Companies with links to government are devastating vast areas of Indonesia and southeast Asia to grow palm oil to supply Europe's cars and kitchens with biofuel and cooking oils, and Saragih is one of the few people standing in their path. Not only does he lead a union of several million agitated Indonesian peasants, but he also heads Via Campesina, the global movement of increasingly militant peasant farmers which campaigns for land reform in 80 countries. Saragih and his colleagues are lobbying the UN and the World Trade Organisation. How this struggle plays out in the next 20 years will determine whether there is any rainforest left intact south-east Asia in 50 years' time, and possibly the political future of many developing countries.

Eric Rey
Bioscientist

Eric Rey is not a natural ally of the broad green movement, at least in Europe. He leads a biotechnology company, Arcadia, that develops GM crops. One of his biggest customers is Monsanto. Yet Arcadia's GM technology could help the fight against climate change. Its plants are engineered to require less nitrogen fertiliser, so lowering emissions of nitrous oxide - a greenhouse gas some 300 times more potent than carbon dioxide. World agriculture accounts for 17% of industrial greenhouse gas emissions, more than the transport sector. Arcadia's first commercial crop could be rice. Swapping global rice supply to the GM version, the company says, would save the equivalent of 50 million tons of carbon dioxide each

year.

Bjørn Lomborg
Statistician

Bjørn Lomborg, 42, has become an essential check and balance to runaway environmental excitement. In 2004, the Dane made his name as a green contrarian with his bestselling book The Skeptical Environmentalist, and outraged scientists and green groups around the world by arguing that many claims about global warming, overpopulation, energy resources, deforestation, species loss and water shortages are not supported by analysis. He was accused of scientific dishonesty, but cleared his name. He doesn't dispute the science of climate change, but questions the priority it is given. He may look increasingly out of step, but Lomborg is one of the few academics prepared to challenge the consensus with credible data.

Gavin Schmidt
Climatologist

Gavin Schmidt, 38 and British, is a climate modeller at the Nasa Goddard Institute for Space Studies in New York. He founded RealClimate.org with colleagues in 2004. Offering "climate science from climate scientists", the site has quickly become a must-read for interested amateurs, and a perfect foil to both the climate sceptic misinformation that saturates sections of the web and the overexcitement of the claims of some environmentalists. Unapologetically combative, technical and high-brow, the site and its contributors - essentially blogging in their spare time - nail the myth that scientists struggle to communicate their work. Whenever a major flaw is pointed out in the global consensus on climate change, or new evidence is discovered to blame it on the sun, it is always worth checking RealClimate. The site has a policy of not getting dragged into the political or economic aspects of science, but it's fairly easy to guess which side it's on.

Rajendra Singh
Water conservationist

In 1984 Dr Rajendra Singh, now 49, was working in the semi-desert Indian state of Rajastan. He planned to set up health clinics in the rural villages, but was shocked when he went to a place called Gopalpura. "This area was devastated and people were fleeing, leaving their children, women and older people behind," Singh says. "It was then an old man told me that they needed neither medicines nor food. He said all they needed was water.

"It moved me so much and I started finding out ways to help. But the region

was arid, all the rivers were dry and the land was parched. The only source of water was rainwater, but that was scarce and there was not nearly enough for all the needs of the region."

A mix of modern technology and villagers simply neglecting traditional ways of conserving water had led to an ecological disaster. Singh found that the villages no longer used small earth dams - or johads - to collect surface water but instead now relied on "modern" tube wells. As they bored their wells deeper and deeper into the ground and sucked out ever more underground water, so the water table had dropped alarmingly and ever deeper wells were required.

Lower water levels meant that the wells were not full, the forests and trees were dying off, and erosion was worsening. It was a vicious circle. With less irrigation water, farming declined and men migrated to cities for work. Women and children then had to spend up to 10 hours a day fetching firewood and water, and the shrinking labour force sapped people's will to maintain the old johads. The whole region faced disaster.

Singh and his colleagues began digging out an old johad pond in Gopalpura. Seven months later, it was, almost miraculously, nearly five feet full of water. And once the rains eventually came, not only did it fill to the brim, but a nearby long-dry well began flowing again. The following year, the village joined in to rebuild a second dam, and by 1996 Gopalpurans had recreated nine johads that between them held millions of litres of water. Meanwhile, the groundwater level had risen to 6.7m, up from an average of 14m below the ground. The village wells were full again.

"It was only due to political reasons that the [johad] system fell apart," Singh says. "We worked for four years in Gopalpura and slowly a huge area turned green. People came back, they started farming again and the visual impact was so impressive that people from adjoining areas started calling us for help."

Singh is now known as the Rain Man of Rajastan, having brought water back to more than 1,000 villages and got water to flow again in all five major rivers in Rajastan. He has so far helped to build more than 8,600 johads and other structures to collect water for the dry seasons. The forest cover has increased by a third because the water table has risen, and antelope and leopard have returned to the region. It has also been one of the cheapest regenerations of a region ever known - in Rajastan, villages have been brought back to life sometimes for just a few hundred pounds, far less than the cost of the single borehole that almost destroyed them.

"See the earth like a bank," Singh says. "If you make regular deposits of water, you'll always have some to withdraw. If you are just taking, you will have nothing in your account."

Erratic rains and longer droughts are becoming more frequent around the

world with changing weather patterns and climate change, and the lessons taught by Singh in Rajastan are now being applied all over India and Africa. In the next 30 years, water "harvesting" is expected to become an essential way to save water everywhere from England to Uganda and Arizona. In south-east England, there is barely enough rainfall now, let alone for the expected population within 20 years. Procedures likely to be introduced will include gadgets that ensure you can't leave a running tap, baths that hold less water, gutters that collect water, systems for using waste water for gardens. "It's the same principle everywhere, but we all have to learn it," Singh says.

Ken Livingstone
London mayor

Ken Livingstone. Photograph: Michael Stephens/PA

Ken Livingstone, 62, has dragged the capital to the top of the major world cities' environment league. He shocked the more timid Tony Blair and Gordon Brown when he set an ambitious 60% CO_2 reduction target by 2025 - and now he is championing renewables, energy from waste, heat and power systems, and ways Londoners can adapt their homes. The capital has seen a huge increase in cycling, and from this month most of the city's public buildings will be "retrofitted" to save energy. It's beginning to work, he says: four years ago, more than one in three Londoners used their cars every day; now few er than one in five do. But he can do little about airports. Almost one-third of London emissions come from City airport and Heathrow, and there are plans for both to nearly double in size. He was nominated by Jonathan Porritt.

Ken Yeang
Architect

Ken Yeang, 59, is the world's leading green skyscraper architect. In the tropics especially, high-rises are traditionally the most unecological of all buildings, often wasting up to 30% more energy than lower structures built with the same materials. Yeang uses walls of plants, photo voltaics, scallop-shaped sunshades, advanced ventilation and whatever he can to collect water and breezes. The idea is to make buildings run as complete ecosystems with little external energy supply. He's not there yet, but the possibility of the green skyscraper is developing fast as ecological imperatives filter into the consciousness of the startlingly backward world of international architecture.

Massoumeh Ebtekar

Politician

Appointed Iran's first woman vice-president by President Khatami in 1997, Massoumeh Ebtekar, 47, later became an inspired environment minister. She made a name for herself in 1979 as the 19-year-old revolutionary student who became chief interpreter in the 444-day US embassy siege in Tehran. She left government office in 2005, is now a Tehran city councillor and heads the Centre for Peace and the Environment. Anything green has taken a back seat since Mahmoud Ahmadinejad took power, and Iran's cities are choked with incredible pollution - but because of Ebtekar there are now thousands of environment groups led by women seeking change. 'We need to put spiritual and ethical values into the political arena... You don't see the power of love, you don't see the power of the spirit, and as long as that goes on, the environment is going to be degraded and women are going to be in very difficult circumstances," she says.

Rebecca Hosking
Camera operator

Rebecca Hosking, 33, is the young BBC camerawoman who went to an atoll in Hawaii, found wildlife dead or dying after ingesting bits of plastic, and returned to the small town of Modbury in Devon with a fine film, and a desire to try to ban plastic bags. In May 2007, the town became the first in Europe to go plasticfree and since then at least 80 other places have decided to follow suit. London Councils, the umbrella group for 33 local authorities, aims to reduce the 4bn plastic bags sent to landfill from the capital each year and has proposed a law that would force shoppers to use their own bags or buy reusable ones at the tills. Hosking has clearly tapped into a new public mood and has found that there is no need to wait for governments to effect change. Just do it yourself.

Wangari Maathai
Environmentalist

No one can doubt the persuasive powers of Wangari Maathai, Nobel peace prize-winner and 67-year-old former assistant minister of the environment in Kenya. It is she who has coaxed the Mexican army, Japanese geishas, French celebrities, 10,000 Malaysian schools, the president of Turkmenistan and children in Rotherham to roll up their sleeves, dig a hole and plant a tree.

It was an off-the-cuff remark of hers in 2006 that led to this far-flung initiative. She was in the US accepting an award when a businessman told her that his company was planning to plant a million trees. Jokingly,

Maathai, who has spent most of a lifetime planting saplings, responded, "That's great. But what we really need is to plant one billion trees." The UN - and the Green Belt Movement Maathai founded among African women - picked up the challenge.

In just over a year, in one of the largest mobilisations of people for a cause since the Asian tsunami, 1.5bn trees have been planted in nearly 50 countries, and a further billion more are pledged. Countries have fallen over themselves to plant the most and be linked with Maathai: Indonesia planted 79m in a day; Turkey says it has planted 500m, Mexico 250m, and India says that it will replant six million hectares of degraded forest.

Many of these saplings may not survive more than a few weeks, and the numbers are not to be trusted, but the billion tree campaign shows that Maathai - a professor of biology and mother of three children - has gone from being almost unknown in 2003 to a global treasure in just a few years. There is now barely a president or prime minister in Europe, Asia or Africa who has not invited Maathai to endorse their plans or tried to sign her up as a goodwill ambassador to show off their newfound enthusiasm for the environment. She has addressed the UN general assembly, carried the flag at the Olympic games, and received sackfuls of citations and awards. Maathai has succeeded in putting deforestation high on the agenda in developing countries, just as Al Gore made people in rich countries aware of climate change.

She has made tree planting an act of transformation in which everyone can engage. "The planting of trees is the planting of ideas," Maathai says. "By starting with the simple step of digging a hole and planting a tree, we plant hope for ourselves and for future generations.

"The first steps were really to talk to women," she explains, "and to convince them that we could do something about their environment. They didn't have firewood, they didn't have clean drinking water and they didn't have adequate food. A tree brings transformation."

Maathai has also made it a political act. Like many others in developing countries, she has been beaten up, arrested and imprisoned for speaking out against environmental destruction, government oppression and abuse of human rights. "When we were beaten up, it was because we were telling the government not to interfere with the forests," she says. "We were confronted by armed police and guards who physically removed us from the forests as we sought to protect these green spaces from commercial exploitation."

While Maathai is feted abroad as the first African woman Nobel laureate, she has always had a rocky time at home with party politics. She tried to stand for president in 1997, but her party withdrew her candidacy. She was finally elected an MP in 2002 with a 98% vote, but just before Christmas

she failed to win even a nomination from the ruling party for the end-of-year election.

Maathai's strength now lies in what she stands for. "If I have learned one thing," she says, "it is that humans are only part of this ecosystem - when we destroy the ecosystem, we destroy ourselves, for on its survival depends our own."

Peter Garrett
Politician

Peter Garrett, 54, is the former punk lead singer of the disbanded Australian rock group Midnight Oil, who continued his weird journey from radical muso to establishment politician when he was appointed Australia's environment minister in November. He began with gigs outside Exxon offices and protests at the Sydney Olympics about Aboriginal rights, and found himself labelled a turncoat by some at the election. However, he was nominated here by Jonathon Porritt, for being "instrumental in shaping the Australian Labour party's climate change and environment policies". Within days of his taking office, Australia signed up to the Kyoto climate change treaty, and has broken with the obstructivist policies of President Bush.

Jockin Arputham
Urban activist

Jockin Arputham, 60, has lived in a slum outside Mumbai since 1963. As president of the National Slum Dwellers Association and Slum Dwellers International, he is rallying the world's poorest city dwellers to improve their environment. Urban squalor is one of the biggest problems of the age, and by 2030 the number of slum dwellers is projected to reach two billion - a recipe for poverty, disease and political instability. Arputham has pioneered a way to help the poor negotiate with city authorities to secure land ownership - the greatest barrier to improving slums. Dozens of other new urban groups are working in 70 countries and hundreds of thousands of people have benefited. Global urbanisation is inevitable, and these new federations will have more and more ecological influence.

Hermann Scheer
Politician

Hermann Scheer, 43, is the MP who persuaded the German government to get rid of nuclear power and invest heavily in renewables such as wind and solar power. As a result, in less than 10 years, Germany is heading towards selfsufficiency in energy. His greatest success has been a "feed in tariff law".

This forces power companies to buy electricity generated by the public at more than triple market prices; 300,000 homeowners, farmers and small businesses have leapt in and started selling. Nearly 3% of Germany's electricity now comes from the sun. Spain, Portugal, Greece, France and Italy are all now introducing their version of Scheer's law and pressure is building in Britain and other countries.

Mohammed Valli Moosa
Civil servant

Mohammed Valli Moosa, 50, was South Africa's environment minister from 1999 to 2004. He has campaigned for transnational African "Peace Parks" for wildlife and pushed for reduced use of plastic bags. But he may play a much greater role in the global environment debate as chairman of Eskom, the state-owned power company that runs South Africa's only nuclear plant and, starting in 2008, is hoping to build dozens of fourth-generation small-scale nuclear stations. Known as pebble bed modular reactors, these are smaller, cheaper and reportedly safer than other designs and Valli Moosa says they could be the base of the 21st eco-economy - ideally for desalination plants and creating the raw material for the heralded but slow to appear hydrogen economy. South Africa has some of the world's greatest reserves of uranium: put them with the technology and it could start looking like a superpower.

Aubrey Meyer
Musician and activist

Can a 60-year-old South African violinist living in a flat in Willesden, north London, actually change the world? It's a serious question because the odds are increasing that over the next two years rich and poor countries will come round to Aubrey Meyer's way of thinking if they are to negotiate a half-decent global deal to reduce climate change emissions.

Nearly 20 years ago, Meyer devised what he believed was the only logical way through the political morass dividing rich and poor countries on climate change. After a letter from him was published in the Guardian, he gave up playing professional music to set up the tiny Global Commons Institute in his bedroom. There he developed the idea that not only did everyone on earth have an equal right to emit CO2, but that all countries should agree to an annual per capita ration or quota of greenhouse gases.

That was the easy bit. But then the musician, who had played with the LPO and had written for the Royal Ballet, went further. Meyer proposed that each country move progressively to the same allocation per inhabitant by an agreed date. This meant that rich countries would have steadily to cut back their emissions, while poor ones would be allowed steadily to grow theirs, with everyone eventually meeting in the middle at a point where science said the global maximum level of emissions should be set. He

called it "contraction and convergence" (C&C).

Meyer is nothing if not determined. Since 1990, earning next to nothing and sometimes practically begging for money so he could lobby international meetings, he has pressed C&C at every level of global government. Early opposition came from British civil servants, who said it was akin to communism, and major environmental groups, which were ideologically opposed to any kind of trading emissions. For many years the US government had no interest in any such deal.

But the climate stakes have risen with every new scientific report, and the politicians and environment groups have moved on. As the urgency for a global agreement has grown, so C&C has emerged as one of the favourites to break the international impasse.

"Its advantage is that it is far simpler and fairer than the Kyoto agreement, which applied only to a few rich countries," Meyer says. It also allows science to set the optimum level of emissions; it gets round long-standing US objections that poor countries should be part of a global agreement; and it is inherently pro-business, because it encourages rich and poor countries to trade emissions between themselves.

The long years of single-minded lobbying mean that Meyer's idea now has some powerful backers, including, in Britain, the Royal Commission on Environmental Pollution; 180 MPs have supported it in an early day motion, and the government, equivocal so far, is moving towards a version of it. It has become official policy in India, China and most African countries. Germany and India are expected to run with it in UN meetings. Angela Merkel, the German chancellor, has backed C&C publicly.

Other proposals are emerging and it will take two more years to thrash out a system that will please everyone. But few have the elegance of C&C. "It's the least unfair of all the proposals that have been put forward," Meyer says. "It secures survival by correcting both fatal poverty and fatal climate change in the same arrangement."

Writing music and calculating emissions have a lot in common, he says. "Look at a sheet of music and you would not know what it was. But when you hear it played, then it's beautiful. Equally, when you read the calculations on countries' gases, they mean nothing. But when you work out how you can reduce them, it's clear that it's the best thing for humanity."

Meyer still plays the violin every day, but seldom with an orchestra. "I just did not realise that it would take quite so long to change the world," he says.

Monica Howe
Bike activist

Monica Howe, 31, is the sharp end of the grassroots debate in Los Angeles, the global car culture's smog- choked, road-raged, increasingly grid locked

spiritual home. Her Bicycling Coalition group is remapping the megalopolis's mean and potholed streets by forging bike routes, organising cycle rallies, helping fledgling cyclists overcome traffic fears, and challenging the mindset at City Hall, where cyclists tend to be greeted with disbelief. Howe says membership is rising, and cyclists are pedalling into the cityscape as public attitudes, swayed by concerns about air quality, traffic congestion and global warming, begin to shift. She's no Al Gore, but she is winning the battle for American hearts and minds, despite the overwhelming odds.

Al Gore
Politician

More force of nature than wooden presidential candidate now, Al Gore's reinvention as Mr Climate Change is based on a long-standing passion for the environment. As a boy he worked on his family's farm, as a young congressman in the 70s he held the first hearings on greenhouse gases, and shortly before becoming Bill Clinton's vice-president in 1992, he wrote a bestselling clarion call - Earth In The Balance. And despite or because of the hanging chads debacle in 2000, he is still beating the drum. It was his Oscar-winning slideshow-cum-documentary An Inconvenient Truth, that helped gain him a half-share in the 2007 Nobel peace prize, and he can be heard tirelessly lecturing around the world (at a reported $100,000 a throw). His latest book, The Assault On Reason, takes swipes at the media, cowardly politicians and the Bush administration. But his speech last month at Bali, where he managed to criticise the US without saying it should commit to anything, shows that, at 59, he remains a politician at heart.

Chris Tuppen
Businessman

Chris Tuppen, BT's head of sustainable development, wrote the company's first environmental report in 1992. Since then his lead has been followed by thousands of other companies, yet BT has managed to stay one step ahead. It was a pioneer in buying electricity from renewable sources and has cut down on travel. Last year the company announced it would build its own windfarms to help meet its mammoth demand for electricity, and published a set of ambitious targets which include reductions in the carbon footprints of its employees. Chief is a pledge to slash its greenhouse gas emissions within a decade to 80% below what they were in 1996. BT is an example of how being green pays: the company says its efforts have saved more than £119m in power bills since 1991.

Dieter Salomon
Mayor of Freiburg

Freiburg in southern Germany is the most ecologically-aware town in Europe and possibly the rich world. The city of 250,000 people dubs itself a "solar region" and gathers nearly as much power from the sun as is collected in all of Britain. It's stacked with research establishments and its solar firms employ thousands of people. It is also the playground of architect Rolf Disch, who builds houses that need to be heated for only a week each year and whose cost is paid for by the electricity generated by the panels on their roofs. Salomon, 47, says that by 2010, at least 10% of all the energy consumed in Freiburg will come from renewables. To attain this, a huge area of the city centre has been turned into a pedestrian zone and there are 500km of bike paths. More than a third of all journeys are made by bike, and there are fewer than 200 parking places for cars in the centre compar ed with 5,000 for bikes. The snag? The quality of life is so good in Freiburg that too many people want to live there and it's hard for anyone to buy a house.

Bija Devi
Farm manager

Bija Devi saves seeds for future generations. She already has in her "bank" 1,342 types of cereals, pulses, fruits and vegetables, though she has no idea of their scientific names. She has worked as a farmer since the age of seven, never went to school and has never heard the words "wheat" or "turnip". Yet she now heads a worldwide movement of women trying to rescue and conserve crops and plants that are being pushed to extinction in the rush to modernise farming. And in so doing she is helping rejuvenate Indian culture.

Apart from collecting and storing seeds from all over the country, Devi is teaching farmers, distributing seeds and experimenting with them. It's called the Navdanya (Nine Seeds) movement because it was inspired by a southern Indian custom of planting nine seeds in a pot on the first day of the year. Women would take the pots to the river nine days later to compare and exchange seeds so that each family could plant the best seeds, thus optimising food supplies.

Today, Devi has farmers queueing up for seeds at her project's base, a 40-acre farm in the foothills of the Himalayas in Dehradun. When she started 14 years ago, with ecologist Vandana Shiva, she had to plead with the farmers to accept that ecological security was of fundamental importance, and that there were advantages to sowing older, indigenous seeds rather than the newer, high-yielding "hybrid" or GM seeds. These give larger crops but require considerable input of pesticides and fertilisers, and more water.

Women are responsible for sowing, harvesting and storing food, while it is up to the men to prepare the soil. "There was no tangible benefit for them in using our seeds," Devi says. "But over time they realised how the soil was retaining its fertility, how the crop was free from diseases and pests. Now they come to us on their own."

She now has 380 varieties of rice seeds alone. There are something like 200,000 people benefiting from 34 similar community seed banks set up in 13 states across the country. The banks are seen as an insurance against changing conditions, such as climate, new pests or consumer demand. People who receive the seeds pay nothing for them, and in return pledge to continue to save and share them. "Indiscriminate use of chemicals has harmed the soil to an enormous extent," Devi says, "but we can still restore fertility and conserve water if we act now."

The work is backed by Dr Debal Deb, an ecologist who has established the only gene bank of indigenous rice in India. The Green Revolution was environmentally disastrous in India, he says: "In the 80s, the drastic erosion of the genetic diversity of rice and other crops was irreversible. Thousands of rice varieties no longer exist in the farms where they evolved over centuries. They are extinct for good and not even accessed in the national and international gene banks." This, he says, translates into a threat to the country's food security.

Collecting seeds from a large and diverse country such as India is no easy task. "I depend on the traditional knowledge of the farmers and go to different corners in the region in search of new varieties," Devi says. "The farmers explain the qualities of a particular strain and how to cultivate them. We then collect the seed, cultivate it on an experimental basis and note down the results. If it is satisfactory, we distribute it among the other farmers. We also need to sow the seeds regularly to continue with the strain. Today, traditional knowledge is almost lost in the euphoria over new varieties."

Pan Yue
Environmental adviser

Arguably, the best news of 2007 was a promise by China, the world's biggest polluter, to blaze a greener path of development rather than follow in our filthy footsteps. One of the worst was the attempted sidelining of the man who has done more than anyone to secure that promise. Pan Yue, 47, deputy director of the state environmental protection administration, has become a hero for his willingness to stand up to corporations and local governments that jeopardise public health in the rush for economic growth. In so doing, he has won the ear of the PM and president, whose political mantra of "scientific development" emphasises the need for sustainable, not just rapid, growth, and has helped set ambitious energy efficiency and pollution controls targets.

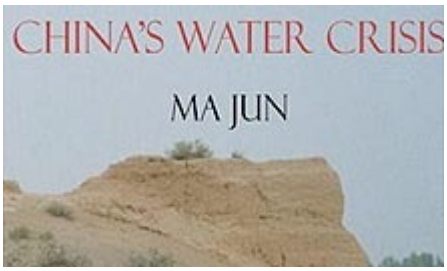
All this has made him some powerful enemies, particularly in energy, steel and construction, who seemed to have won a victory over Pan late last year at the 17th Communist Party Congress where more business-oriented cadres were promoted, but Pan was left a deputy director and must now fight for his political life.

Even so, Pan's warnings that the economic miracle will end soon because the environment can no longer keep pace have goaded China's leadership into action. He has also warned that 26% of the water in the seven biggest river systems is so polluted that it has "lost the capacity for basic ecological function".

The International Energy Agency estimates that China will overtake the US as the world's biggest emitter of greenhouse gases by the end of next year - some say it's already done so. In November, China belatedly released a five-year plan for environmental protection, for the first time mentioning the need to cut greenhouse gas emissions, but it gave no targets or deadlines for doing so. "Currently the conflicts between China's economic and social development and its limited environmental resources are getting more and more serious each day," the paper said.

Pan Yue is on the frontline of that conflict. Given its global importance, the world - as well as China - needs him to succeed.

Ma Jun
Writer and activist



Ma Jun, 39, became an environmentalist in 1997 after hearing Chinese engineers boast that the Yellow River was a model of water management, even though he knew it was so over-dammed and exploited that it failed to reach the sea on more than 200 days each year. Now he is one of a growing number of people challenging the Chinese culture of official secrecy and saving face. His website names and shames companies and local governments that violate environmental standards, and the former journalist has called to account corporate executives and Communist party cadres with pollution maps. Ma Jun set up the Institute of Public and Environmental Affairs, which cooperates with the central government in a non-confrontational - but highly pragmatic - campaign strategy. Despite the tight controls imposed on independent organisations by the Communist party, there are now 3,000 registered green NGOs, up from fewer than 50 five years ago.

Michael Fay
Conservationist

In 1999 Michael Fay, an American, set off on a 15-month 2,000-mile expedition to cross the forests of Gabon. He returned with an extraordinary set of pictures and visited President Bongo of Gabon in his New York hotel room. "I showed him pictures of surfing hippos, gorillas in clearings, elephants in the forest and gorillas and chimpanzees caressing their young. The president was transported into the computer. He was there. You could see right away that he was completely blown away by what he saw. He kept asking his foreign minister, 'How come I don't know about these things? We must act quickly.' He said, 'We're going to do something dramatic.' " Bongo set up 13 new national parks, covering more than 10,000 sq miles, thus immediately protecting 10% of the country. Fay, 51, continues to press for conservation in central Africa.

Guy Lamstaes
Inventor

Guy Lamstaes and colleagues have invented a way to make fridges far more energy-efficient. Barely a few inches across and made of wax, his device had little impact until last year, when it was reinvented as a simple way to reduce household and industrial emissions. Now called the eCube, the box has taken sectors of British industry by storm, and is now doing the same in the US. It won't save the planet, but it offers a perfect example of the simple steps that can make a difference. The cube mimics food and fits around a fridge's sensor, which usually measures the temperature of the circulating air. Because air heats up more quickly than yoghurt, milk or whatever else is stored inside, this makes the fridge work harder than necessary. With the cube fitted, the fridge responds only to the food temperature, which means it turns on and off less often as the door is open and closed.

Jia Zhangke
Actor/director

Jia Zhangke, 37, is among the most prominent artists raising awareness about the environment. His film Still Life, which won the 2006 Golden Lion award at Venice, is a tale of social upheaval and ecological destruction set against the backdrop of the Three Gorges Dam in China - one of the world's biggest hydroelectric projects which has forced millions of people to move. It tells the story of a man and a woman who are searching for their spouses in a town that has been flooded by the rising waters of the mighty reservoir behind the barrier. The film was passed by the Chinese censors despite its portrayal of official corruption, land seizures and thuggish violence. This is the best-known cinematic critique of the ecological destruction in China, but many other artists and film-makers are now addressing the problems of the country's breakneck race for economic growth.

Bunker Roy
Educationalist

Bunker Roy, 62, set up the Barefoot College in India, the only school in the world known to be open only to people without any formal education. Roy's idea is that India and Africa are full of people with skills, traditional knowledge and practical resourcefulness who are not recognised as engineers, architects or water experts but who can bring more to communities than governments or big businesses. The college trains the poor to combine local knowledge with new green technologies : 15,000 people have learned to become "barefoot" water and solar engineers, architects and teachers. It has helped hundreds of communities across India - and now in seven other countries - install water supplies and solar voltaic lighting systems, develop bicycles that can cross rivers and design buildings that collect every drop of water.

Olav Kårstad
Chemical Engineer

Olav Kårstad, 59, is the world's leading collector and storer of carbon dioxide. He works for Norwegian oil company Statoil which, rather than pay a carbon tax on the 1m tonnes of CO2 it produces a year, has learned to compress it into liquid form, transport it by pipeline out to sea and then inject it into deep, porous rocks, instead of releasing it into the atmosphere. The plan now is to collect the exhaust gases of power stations. This could save 90% of CO2 emissions, but the snag is that it costs hundreds of millions of pounds for every station and it uses as much as 35% more energy to collect the gas, transport it and bury it. But many oil and power companies, as well as the UK, US and Australian governments, are now plunging billions of dollars into the technology which they hope will provide them with a carbon "get out of jail" card within 10 years.

Cormac McCarthy
Writer

The Road, by the 74-year-old American writer Cormac McCarthy, imagines a father and his son trudging south through a landscape where nature and civilisation are in their death throes. It's oppressive, horrifying and poetic, and is widely seen as both a parable and the logical extension of the earth's physical degeneration. His predictions may be scientifically fanciful, but the book, published last year, may have far more influence in the next 30 years than any number of statistics and fro nt line reports. It was nominated by George Monbiot, who says, "It could be the most important environmental book ever. It is a thought experiment that imagines a world without a biosphere, and shows that everything we value depends on the ecosystem."

Peter Head
Civil engineer

Peter Head, 60, is an unlikely man to be leading a cultural revolution. The

soft-spoken Englishman, a director of Arup and one of the world's leading bridge builders, is now the master planner of the world's first true eco city.

His brief from the Shanghai city authorities may have been simple, but in building and design terms it was the equivalent of a moonshot: to build on an island at the mouth of the Yangtze a city for 500,000 people that can lead the world's fastest growing economy out of the industrial age into the ecological one. Dongtan will cost $50bn or more, and be a prototype for 400 or more similar Chinese cities over the next 30 years.

Nothing like this has been tried before, Head says. "It's a complete paradigm shift. It is to be three, four or five times an ecological improvement on anything that exists. China is trying to use ecological efficiency to detach resource use from economic growth, the traditional development path. It's a different way of thinking. They believe a new economic model will come out of it."

Dongtan will be all but self-sufficient, powered by wind, wood and sun. Its cars will be electric or hydrogen-fuelled, and its buildings will be mini power stations. There will be no landfill sites and 80% of waste will be recycled. Enough local food will be grown to supply much of the city's needs. Turf-covered rooftops will collect, filter and store water, and solar panels will heat it; wind turbines will provide nearly 20% of its energy needs.

"China came to us with the idea. I was shocked by the scale of their ambition but they're deadly serious. Every province in China is building a demonstration eco city like this."

Other countries are catching up, too, and Head sees a 21st-century revolution gathering pace: "We will look back on Dongtan and say it was a pretty crude effort, but it will be seen as a first step. It's significant but it's nothing like the answer. What will develop over the coming years is an 'ecological systems approach' to cities, one that uses nature to get us out of the mess we're in."

• Words by John Vidal, David Adam, Peter Huck, Jonathan Watts, Leo Hickman, Philip Oltermann, Ian Sample and Aditya Ghosh