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Scramble for funds in a harsh climate

Green technologies are often heavily dependent on intellectual property, writes **Fiona Harvey**

Nearly six months ago in Copenhagen, at the biggest summit ever held on climate change, world leaders failed to come to a comprehensive agreement on greenhouse gas emissions. But what did emerge was an agreement by which the biggest economies – developed and developing – all pledged to curb their emissions, by varying degrees, over the next decade.

This week, officials are meeting again to flesh out some of the details and to try to formalise the accord further. If governments are serious about fulfilling the promises they made in Copenhagen, much more investment into green technology will be required.

In the energy sector alone, the International Energy Agency says \$10,000bn of investment will be needed globally over the next 20 years, though it estimates that \$8,600bn of this will

be recouped in fuel savings and other benefits.

Like any other industry, however, the green technology sector is fighting for funds in a harsh climate. Would-be borrowers report that little money is available, and where there is, it comes with onerous conditions.

In the aftermath of the financial crisis, many politicians – including US President Barack Obama, Angela Merkel of Germany, and Gordon Brown, then UK prime minister – heralded the prospect of “green” economic growth and “green” jobs. Governments around the world decided to devote a large tranche of their stimulus spending to environmental projects, such as insulating homes and offices, investments in renewable energy, and a mass of new rail projects – the latter particularly in China.

In all, according to HSBC bank, governments promised about \$521bn in spending. By the bank's calculations in March, only 16 per cent – about \$82bn – of these funds had so far been spent. Nick Robins, head of the HSBC climate change centre, says that if the remaining funds are not spent quickly,



New light needed: the International Energy Agency says \$10,000bn of investment will be needed globally over the next 20 years

Alamy

they could be lost or diverted. Most renewable energy is still more expensive than fossil fuels on the open market, so green energy companies are calling for special treatment for their industry, including tax breaks on the US model, or subsidy schemes such as the “feed-in tariffs” popular in Europe.

In the US, green companies are lobbying heavily for the passage of a proposed new American Power Act. “Passage of comprehensive clean energy and climate legislation will allow the US to be a worldwide leader in the next great global industry:

green technologies,” says John Doerr, partner at Kleiner Perkins Caufield & Byers, the venture capital company.

There is more to the low-carbon market than lots of expensive, large-scale infrastructure projects.

At a smaller scale, there are scores of new products vying for attention, from low-energy light-bulbs to more efficient boilers, electric cars, enhanced air-conditioning and insulation.

There is some evidence that, despite the recession, some companies are continuing to cut greenhouse gas output, which

analysts say may help sustain interest in these products.

Some business leaders have continued to trumpet their environmental efforts throughout the recession. Sir Terry Leahy, chief executive of Tesco, told the Financial Times: “We see this as a core part of what we do. We haven't changed our minds on this.” The company continues to open flagship “green” stores, and embark on programmes such as reducing the greenhouse gases that come from its refrigerators.

Jeremy Darroch, chief executive of BSKyB, also told the FT

that the company was pressing ahead with its environmental programmes because “that is what our customers expect of us”.

Another attraction, he adds, is the cost savings from improving energy efficiency and using fewer resources.

Vincent Neate, head of sustainability at the consultancy KPMG, says these experiences are mirrored elsewhere. “Over the past two years, we've not seen significant cutbacks in the environmental programmes of our clients,” he says.

“If there is a perception that

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China One company is hoping to clean up with an innovative combustion catalyst, says Kathrin Hille



Developing nations count up the opportunities

Emerging markets

Profitability is driving progress, says **Sarah Murray**

Leading developing countries for the first time made commitments to limit or curb their greenhouse gas emissions as part of the Copenhagen accords at the end of last year.

What remains to be seen, is whether the targets are sufficiently ambitious and how fast companies in these countries can respond.

To assist them, developed countries have pledged technical and financial assistance. Loans such as the World Bank's climate investment funds (CIFs) have been put in place to help finance projects in emerging markets that reduce greenhouse gas emissions.

Other support is available from non-governmental organisations (NGOs), such as the Joint US-China Co-operation on Clean Energy (Jucce). One of its initiatives brings together experts, companies and utilities to promote understanding in China of how smart grids – which manage power flows more effectively – could increase energy efficiency.

However, while targets set at Copenhagen – supported by multilateral assistance packages and NGO initiatives – will prompt developing countries to embrace energy efficiency, these will not be the only factors driving progress.

“There's ample reason to be optimistic about efficiency generating enormous savings,” says David Yarnold, executive director of Environmental Defense Fund, a US-based non-profit environmental advocacy group.

“But having said that, are the voluntary targets going to drive that? What's actually going to drive it, is bottom-line profitability.”

At least developing countries embarking on carbon-

reduction strategies can leapfrog technologies.

“In these countries, you have old factories that are very inefficient from an energy perspective,” says Ramon Baeza, a Madrid-based senior partner in the Boston Consulting Group's energy practice. “But because of the growth in some of these countries, you also have some very modern facilities.”

The same is true when it comes to the built environment. While owners and managers in US and European cities struggle to put more efficient technology in old infrastructure, developing countries are often building residential and office districts from scratch.

Allan Schurr, head of strategy for IBM's energy and utilities unit, compares cars. “Old cars are less efficient because energy was cheaper when they were manufactured. New cars are more fuel-efficient,” he says.

“That's happening with buildings in China, India and other developing markets – where there's more growth. New ones tend to be more efficient.”

Because the economies, climates and topographies of developing countries vary, so should their carbon-reduction strategies, says Mr Baeza.

While in China the focus

might be on industrial energy efficiency, in Latin America the most effective way to fight climate change could be to invest in measures such as reducing emissions from deforestation and land degradation.

Moreover, while there is much talk of technology transfer to assist less developed nations, in some areas those countries are emerging as leaders. In Brazil, for example, the government has set deforestation reduction targets. Meanwhile, the

‘Brazil plays a crucial role in leading the development of green technologies’

country has forged ahead with sugarcane-based ethanol production, with most of its new vehicles able to switch between petrol and ethanol.

“The best opportunities are in emerging markets,” says Joao Geraldo Ferreira, president and chief executive of GE Brazil, citing the January launch in Brazil by GE and Petrobras of the first power plant able to generate electricity based on ethanol.

“Brazil plays a crucial

role in developing green technologies,” he says.

As in mature markets, regulation plays a big role. In India, government subsidies have supported the growth of a wind power industry, with Suzlon Energy, a former textile business, emerging as the world's third largest wind turbine supplier.

At the same time, small-scale initiatives can make a difference. In Ghana and Kenya, the World Bank is financing a project called Lighting Africa to make light-emitting diode (LED) lanterns available in rural areas that are not connected to the electricity grid, providing an affordable, non-polluting alternative to kerosene lamps.

“The use of kerosene in rural parts of developing countries is a surprisingly large market,” says Alan Miller, climate change specialist at the International Finance Corporation, part of the World Bank Group.

“And if you can get the price low enough, [LED lighting] is something that doesn't need a big subsidy because people are already paying \$1 to \$2 a month for a kerosene lamp,” he says.

However, while progressive policy commitments, technology innovations and carbon reduction strategies are starting to be seen in emerging markets, climate change strategies come against a pressing need to accelerate growth in gross domestic product, particularly in countries such as India and China.

Moreover, in some countries – notably China – industrial expansion has been supported by power generated in large part by highly polluting coal-fired power stations.

For this reason, Mr Yarnold says, developing countries need to do more. “It's terrific that for the first time these countries have made commitments,” he says.

“But those commitments are like sales targets that you know you can achieve. It's a net plus – but I wouldn't get carried away with the potential impact.”

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Fast-growing: a Suzlon Energy windfarm in India

Bloomberg

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The Environment & Intellectual Property

Non-fossil options vie for funders' attention

Renewables

Energy generation is a compelling prospect for investors, says **Jane Bird**

Why drill for oil and dig for coal, when you can harness clean and renewable energy sources such as sun, wind, sea, biomass and hot rocks? But the challenge for renewable pioneers and their backers is to know which sectors offer the biggest returns and in what timeframe, and how returns compare with reducing energy consumption.

"One of the few certainties in an unpredictable world is that we are gradually going to move away from fossil fuels," says Bart Markus, general partner at Wellington Partners, a pan-European venture-capital firm. So for anyone keen to invest in green technology, energy generation is compelling.

Wind power has been maturing rapidly and has lots of associated intellectual property (IP), so there are few opportunities, says Garry Staunton, technology director of the UK's Carbon Trust, which helps businesses commercialise low-carbon technologies.

The emphasis shifts to making something more cheaply, rather than a technological advance. Offshore wind, which is less mature, provides more possibilities, such as stronger cables, deep-water foundations, safer access in rough conditions, and more efficient turbine arrays.

Solar is relatively established, but has gone through a rocky period in Europe, following the introduction of heavy subsidies in Spain. Huge growth was suddenly cut off, when

the subsidies were withdrawn in 2008. More recently, Germany, which represents 50 per cent of the world market, has also reduced incentives.

Jens Rosebrock, head of clean technology and renewables in Europe for Piper Jaffray, the US investment bank, says solar is still volatile. "It has not shed the image of a travelling circus," he says. The bulk of solar panel production has now gone to China and companies such as Yingli Solar, Trina Solar and Suntech.

Plunging panel prices have proved beneficial to users and installers. In Italy, the technology has now reached the stage where it is cheaper than using the national grid. Germany and the UK are expected to reach this point within the next five years.

Rolls of photovoltaic plastic that would be light, cheap and simple to install on flat roofs are at an earlier stage of development by Heliatic, based in Dresden, Germany. The company has attracted two rounds of investment and is developing the product with BASF and Bosch.

Most solar panels use silicon, but US-based First Solar is developing a revolutionary thin-film technology that, while more complicated to produce, is highly efficient. However, some observers have raised concerns about the fact that it is based on cadmium, which is toxic. First Solar, which received large-scale investment and was floated in November 2006, is capitalised at \$11.4bn.

Marine power is now attracting interest, says Mr Staunton, with Edinburgh-based Pelamis Wave Power demonstrating the technology's first commercial production. "Another radical idea is the Anaconda. It is basically a giant rubber tube just under the surface that creates a pulse when a wave passes above, which can be captured and turned into energy."

In spite of Europe's lead on wave



Surface tension: despite successes wave power is struggling to find backers AFP

and tidal power, and the large potential, investors remain to be convinced.

"We are not too bullish because wind and solar are so far ahead and have considerably lower costs," says Mr Rosebrock. "It probably makes sense to work in these areas, but it's difficult to find private investors that would back them to a level where they become competitive." More public support is needed to get the technology ready, unless there is a brake on the number of wind and solar farms that can be built, he says.

The same goes for carbon capture and storage, which also requires high levels of funding. And geothermal technology is seen as high-risk, following problems in Switzerland, where drilling was blamed for a small earth tremor, and southern Germany, where there was structural damage to buildings. Further disincentives for would-be investors include the cost of drilling and the difficulty of knowing where to do it.

Often investors are as much

attracted by improved processes as patents. In the UK, the Drax power station has experimented with adding up to 20 per cent biomass feedstocks into coal-burning plants. Germany's Agnion is developing technology to convert biomass feedstock to gas.

Biochemical companies are investigating new sources for biofuels, such as the cellular waste left after sugar cane is pressed. And companies such as Denmark-based Novozymes, DSM in the Netherlands, BASF, Wacker and DuPont are developing organic compounds that could replace petrochemicals. "In contrast to energy, this often happens without subsidy," says Mr Rosebrock.

In lighting, a "tectonic shift" is taking place, says Mr Markus, as incandescent bulbs, with their dismal 5-6 per cent efficiency, are replaced with compact fluorescent lighting and light emitting diodes (LEDs) that bring efficiency closer to 50 per cent. The latest generation can be colour-tuned to match conventional lighting.

Energy Scientific breakthrough is just the start

Creating a new field of science is an impressive starting point for a new technology. But no matter how good the beginning, turning a scientific breakthrough into a saleable product is a tough way to make money.

MTPV, a US company specialising in energy generation from thermal photovoltaics, is in the business of doing just that. Armed with a fundamental patent governing a new area of physics known as the 'near field', the company could not have asked for a better head start.

A decade later, the company is only now close to a product on which it can make money by exploiting industrial waste heat.

"Having created this area of science, it is relatively obvious if someone is infringing on our fundamental patent," says David Mather, MTPV managing partner and founder, "as the performance would go beyond the laws of physics. But getting our intellectual property recognised and enforced is expensive."

So how does MTPV's technology work? Thermal photovoltaic (TPV) energy takes the concept of a photovoltaic cell – using the photons from light to generate electricity as in a solar panel. But instead of using the sun as the source of photons, it uses heat to light up a material on one side of a chip which then provides the photons for the PV cell that forms the second layer of the chip.

The concept is not new. However, until 1998, it was thought to be limited by Planck's law, which governs the intensity of energy that radiates from a heated body. The problem with thermal photovoltaics – indeed with photovoltaics in general – is efficiency. To generate enough electricity, either the size/number of the cells has to be huge or the heat astronomical.

The breakthrough upon which MTPV's technology is based – the "near field" – came by exploring a caveat noted by Max Planck himself. He said his theory held true only when the gap between the heated body and the body trying to capture the photons was large in comparison to the size of a photon.

The "near field" means working with an extremely small gap between the layer generating the photons and the layer collecting them. In MTPV's first-generation chips, that gap is 100 nanometres – about 500 times thinner than a human hair.

It took the company from 1998, when it proved the science, to 2001 to create a device that turned the theory into practice and could win a patent. It then took until 2007 to scale that device from 1mm² to 1cm².

The company now has three

patents, with another six pending relating to different aspects of the design of the TPV arrays.

"In the next three to six months, we expect to start building commercial products," says Mr Mather. "From there, we have a roadmap for the next 10 to 20 years, as the technology will follow the same pattern as Moore's law – the chips will double in performance every two years."

"Our first generation of chips can generate about 1 watt per square cm," he says. "The science says second-generation chips will be capable of 50-100 watts per square cm."

The first market that MTPV is looking to exploit is waste heat from industries such as glass manufacturing and energy exploration.

"In the US manufacturing and mining sector alone, 148bn kilowatt hours (kwh) of waste heat is generated every year, while US retail sales of energy amount to just 338bn kwh," says Mr Mather.

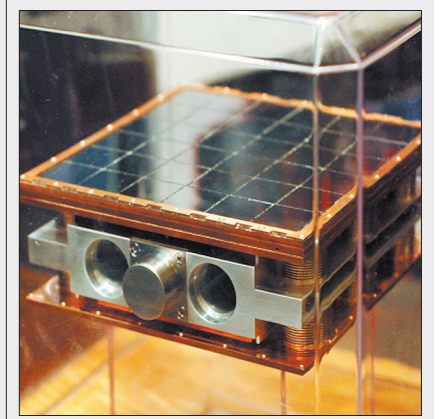
However, while a relatively high number of factories around the world generate the temperatures of 800-1,400 degrees needed to make the first-generation products worthwhile, it is the potential uses of second-generation chips that are more impressive, as the temperatures needed would be far lower.

"Once we get up to 50w/cm the solid-state chips could be used for central power distribution. By that, I mean the chips would be the primary source of electricity," says Mr Mather.

Exciting as the concept of a solid-state chip that can generate electricity appears, MTPV has just 11 years left on its first patent. "We are already looking at blocking patents to cover our second generation products," says Mr Mather.

In a highly competitive marketplace, even a fundamental scientific discovery is only the first step on a long and tortuous road.

Tom Griggs



Chip sandwich: MTPV prototype

Protecting ideas is crucial for eco-technology to succeed

Intellectual property

Sunjata Das says the global distribution of technologies will mean making sure of patents in varied markets

As governments worldwide address climate change, they are looking to inventors and research organisations for ideas. They are also hoping that investors and manufacturing companies will play a part in development, motivated by the prospect of getting a return on investment through the exploitation of intellectual property (IP) rights, such as patents.

IP rights accrue to inventors and developers, and offer legal

protection against plagiarists, as well as the right to decide who can use the technology and what it will cost.

Most green technologies will be protected by patents for new and industrially useful processes, methods, manufacture or machines, or for notable improvements to existing ones.

Although the application process can be long and costly, the owner of the patent has an exclusive right that stops others from making, using, selling, importing or copying without permission.

The success of eco-technology will owe as much to strategies for using and protecting IP as to the underlying processes or concepts.

Global distribution of technologies will mean having to make sure IP is protected in other

jurisdictions and, as exclusivity is limited to 20 years, owners will need to capitalise on "newness" to break into important markets and then licensing for continuing revenue.

Green innovation is so important that the world's largest economy has invested heavily. US patents for clean energy technologies in 2009 were at an all time high, at 1,125.

The UK, US and Australia have all introduced fast-track schemes. "This 'Green Channel' should bring low-carbon technology to markets quicker, by avoiding a backlog of applications," says Justin Watts, IP partner at Freshfields, the law firm.

Despite a decline during the economic downturn, the UK Patent Office receives more than 20,000 applications a week – of

which 200 are "green" focused. The US pilot scheme aims to reduce the application process from as long as four years, to 12 months. Patent offices warn, though, that public disclosure will come earlier so details may be discovered by competitors.



'Automobile companies are top for owning clean energy patents'

Isabel Davies

In the decade following the 1997 Kyoto Protocol, the European Patent Office has seen steady growth in environmental patent applications, particularly for clean energy technologies.

According to David Sant, a patent attorney at law firm CMS

Cameron McKenna, "Fuel cell patents dominate, at quadruple the number of competing eco-technologies. Wind energy has shown significant increases over seven years although solar energy is up 60 per cent on last year and is likely to overtake it."

"There has been a huge jump in biomass, too. In contrast, hydro-electric and tidal patents decreased during 2009."

The highest number of clean energy patent applications is lodged by the US, which accounts for a quarter, followed by Germany and Japan at 18 and 16 per cent respectively in 2008. The same countries dominate in ownership of patents, with the US estimated to own about half, Japan just under a third and Germany almost a 10th globally.

Among emerging economies,

most international applications came from South Korea, China, India, Singapore and Brazil, with China accounting for 10 per cent. South Korea owns three times as many clean energy patents as the UK.

"Surprisingly," says Isabel Davies, an IP partner at CMS Cameron McKenna, "the top companies for owning clean energy patents are automobile companies, namely Honda, General Motors, Toyota and Nissan."

"Other less obvious players are General Electric – a leader in wind patents – Samsung for fuel cells and Canon in solar power."

"The Eco-Patent Commons, set up in 2008 through the World Business Council for Sustainable Development and in partnership with large corporations, has resulted in 100 pat-

ents being donated by companies (including Bosch, Dow, DuPont, Fuji-Xerox, IBM, Nokia, Pitney Bowes, Ricoh, Sony and Xerox) to facilitate collaboration to discover products that are environmentally beneficial."

Green branding has become big business, as increasing consumer awareness has made eco-credentials valuable. Companies are registering eco-trademarks to prevent competitors from copying branding symbols or attempting to pass off their products as those of others.

Andrew Hobson of law firm Reynolds Porter Chamberlain points out that "there is a 'second tier' of green technology consisting of low-technology and low-cost products, which are nevertheless widely used, such as environmentally friendly cleaning products".

Scramble for funds

Continued from Page 1

a different picture. He points to a survey the company undertook with large organisations about their green agenda. Half had invested less than €1m in the past two years, equating to less than 0.1 per cent of their turnover.

"The same is true for the level of investment over the next couple of years, with only minor increases planned," he says. "Whatever the reason, it is clear that the environmental awareness and intentions of companies are not being translated into action."

If investment in green technology does continue, that would mean new questions over intellectual property, says Mark Esper, executive vice-president of the US Chamber of Commerce's Global Intellectual Property Centre.

"Many green technologies are very IP-intensive," he says. "A significant amount of research and development is put into turning an idea into a product that will improve energy efficiency, reduce harmful emissions, and help us preserve our environment."

This is good news for jobs, Mr Esper says. The US Chamber of Commerce

released a study in April showing that IP-intensive industries "create jobs, pay their workers higher wages, generate more exports, help reduce the deficit, and drive economic growth in a variety of sectors compared with non-IP-intensive industries".

It also found "IP-intensive industries employ workers of all educational backgrounds and skill levels, creating white- and blue-

"The environmental intentions of companies are not being translated into action"

collar jobs that pay better and are growing faster".

But one of the crucial conditions for such industries is a strong legal framework to protect IP, says Mr Esper. "Without the protections that patents provide, many of these entrepreneurs – and the investors who support them – would not commit the time, effort, and capital to pursue their ideas if others are free to steal their inventions."

This is particularly important in relation to

climate change, because a key sticking point in long-running international negotiations has been over IP. For years developing countries including China and India have sought access to IP from the developed world as part of a deal. Developed countries refused.

In the run-up to the Copenhagen summit, developing countries seemed to be softening these demands, downgrading "technology transfer" to "technology collaboration". In other words, instead of free access to patents, a commitment to helping private companies from the industrialised world invest in developing countries.

But as the talks floundered, developing countries were less willing to compromise. As the talks resume, developed-country negotiators are hoping the old argument is not reopened.

Mr Esper said a study from his organisation last year had found that, if green IP rights were weakened to accommodate demands from some developing countries, companies would be reluctant to invest and the US could lose up to 1m jobs by 2020. As investors look beyond the recession, he concludes: "Strong IP rights are essential."

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States aim to cut carbon footprints and increase jobs

Government help

Jane Bird explains why funds are pouring into green technology

For green technology pioneers, government funding can make all the difference, as they strive to transform a clever idea into a successful product. For governments, the goal is a thriving sector that can cut carbon footprints and create jobs.

Many are dedicating substantial funds to the sector. The European Union has earmarked €1.8bn for environmental research projects under the Framework Programme 7. In the US, more than \$80bn has been allocated in clean energy investments, under President Obama's pledge to invest \$150bn over 10 years on clean energy.

China's green technology spending is soaring, according to figures compiled by Bloomberg New Energy Finance. It reached \$34.6bn last year, compared with \$2.5bn five years ago. The UK has set aside £22m for marine energy, part of an £80m budget for green technology announced in October 2009.

Even small amounts can be crucial at the early stage, says Michael Black, chief financial officer of AlertMe, a Cambridge, UK-based start-up developing energy control systems that help monitor domestic power usage. AlertMe received about £20,000 from a Regional Development Agency (RDA) to assess potential markets and price points.

"RDAs are good at early-stage small-scale funding because they are low-bureaucracy and quick," says Mr Black. "Covering this sort of out-of-pocket

expense is useful for small start-ups."

However, he says that tax credit schemes via tax returns are "the most significant government funding and the easiest to operate".

Stuart Evans, executive chairman of Novacem, a spin-out from Imperial College London, also praises the simplicity of the tax credit system. Novacem, which is developing a cement that absorbs carbon dioxide from the atmosphere, has had a range of government grants, including £750,000 from the Technology Strategy Board as part of a £1.5m funding involving Laing O'Rourke, WSP Group, and Rio Tinto.

Where sums of £500,000 to £1m are required, companies often need to form consortia to share administrative costs.

The trouble is that, almost inevitably, some participants

will change their minds, or even go out of business, during the bid. This complicates and jeopardises applications.

Government funding can be a big incentive for companies deciding where to locate. Australia-based Dyesol chose the

'It definitely helps that we don't look like a tin-pot company but have substance behind us'

UK to develop its dye solar cells. It has received £5m from the Welsh government for a collaborative project with Corus to integrate Dyesol cells into steel roofing.

Dr Gavin Tulloch, Dyesol's managing director, says: "The

company needs to go wherever there are governments and industries that want to develop the technology, and the UK is good at funding these projects."

Germany, the Netherlands and Ireland also have good government grants, he says.

US companies tend to enjoy larger grants. Some \$2bn has been awarded solely to develop the next generation of batteries. In solar, three Californian companies, Alta Devices, Solar Junction and Tetra Sun, along with North Carolina-based Semprius, are to receive up to \$3m each for early stage development.

Grants awarded in the US recently for solid-state lighting, include \$23m for manufacturing, shared by eight companies including Applied Materials, GE Lumination, Ultratech and Veeco Instruments. Other companies are sharing \$4m for core technology research, and \$10.3m

for product development. And in biofuels, two US consortia have been awarded nearly \$80m.

Government funding helps establish credibility, and enables entrepreneurs to punch above their weight. Mr Evans of the UK's Novacem, recently returned from China, a "massive opportunity" with more than half the world's concrete market. He says: "It definitely helps that we don't look like a tin-pot company but have substance behind us."

Magnomatics, a Sheffield, UK-based specialist in magnetic transmission systems that make motors and generator turbines lighter and more compact, says government funding enabled it to persuade Volvo to become a partner on hybrid vehicles.

Since the Volvo deal, Magnomatics has attracted interest from companies in battle tanks, wind and tidal power, aerospace

and marine propulsion. "We can't find all these markets ourselves. But a little government money facilitates working with multinationals," says Chris Kirby, managing director.

Intellectual property (IP) issues can be a problem for small companies working with larger partners on government-funded projects. Usually the inventor retains the IP rights, but difficulties can arise when there is joint development.

Junior engineers and scientists need to be made aware that they should not blurt out new ideas, in case there is a disagreement about where they originated. Accurate minutes should be signed off by all participants in joint-venture meetings.

"If you're a young high-tech company your IP is your main asset and you have to cling on for dear life, because someone is always trying to grab it."

Stronger links would benefit gown and town

University spin-outs

Joseph Milton examines some of the problems of bringing ideas from academia to market

To tackle climate change without sacrificing our standard of living, we need to "green" the global economy, using more environmentally friendly technologies or "clean tech", to make transport, manufacturing and other energy-hungry processes more efficient.

Much of the initial research and innovation in the field takes place in academia.

In recent years, universities and the government have been looking at more effective ways of bringing ideas to market. This requires strong links between universities and private investors.

Many universities have established inhouse enterprise companies to assist in the commercialisation of intellectual property (IP).

Typically, academic ideas reach the market in one of two ways. Either a com-

pany is "spun out", attracting investment or partnership with an existing business to become a company in its own right; or the technology is licensed from the university for use by an external company.

University enterprise companies typically take care of patent applications for inventors, and provide access to two main types of funding to help academics get ideas off the ground.

The first of these is proof-of-concept funding, which takes ideas to the stage of a working prototype. Then seed funds provide money to help start-ups establish themselves as businesses.

After these early stages, universities do not tend to provide follow-on funding and companies must attract private investment.

To help find follow-on funds, university enterprise companies provide access to directories of investors who are interested in start-ups, and of "business angels" - affluent individuals who provide capital to young companies.

However, after early-stage funding has run out, many university start-ups struggle to find follow-on investment.

They often end up in the

"valley of death", failing during the period when university funding has run out, but private investment has yet to arrive.

Academia and commerce make uneasy bedfellows because of their fundamentally differences.

Ian Page, Business Development Director at Seven Spires Investments, says: "Ideas count in academia, but not in commerce. The IP must connect to an actual market quickly." He adds that investors need to know "what the idea will turn into, how much it will cost and who will buy it".

These are factors that academics sometimes overlook, and many universities do not have enough access to industry professionals, who might be able to flag up potential problems at an early stage.

Academics do not always make good business-people, which can also turn off potential investors. Confidence in the company management team can be more important than the IP itself.

A big problem in attracting money is that university start-ups are often very early-stage companies.

Investors are understandably wary about sinking money into companies that



Ideas factory: longer incubation within universities may be the ideal compromise

Chris Young / PA

consist of little more than an academic, an idea and a patent application. They tend to be more interested in larger companies with proven market interest and established revenue generation.

An additional sticking point is the tendency of universities to retain ownership of a spin-out company's IP. Geraldine Rodgers, head of Seed Funds at Cambridge Enterprise, the University of Cambridge's enterprise company, says this is necessary "in case the company fails".

But Pat Burtis, an investment manager who specialises in green technology at Amadeus Capital Partners, says: "If not handled well, [IP issues] can be an absolute deal-killer."

Mark Preston, a principal at Web Ventures, an investment firm which specialises in clean technology, says his company will not even consider investing

unless spin-outs own the IP.

Venture capital firms also generally require relatively rapid returns on their investments. Mr Burtis says: "The typical fund-life for a venture capital firm is 10 years, which is not always possible with university start-ups."

Finding investors who are

willing to take a gamble on start-ups may also be harder than usual in the current economic climate.

Mr Page says: "Investors are looking for safer bets, lower risk and shorter-term returns."

But Tom Hockaday, managing director of Isis Innovation - The University of

Oxford's enterprise company - is more optimistic: "There's no shortage of money... It's just a question of finding it."

Investment in green technology start-ups could be encouraged by increasing seed funding and government grants within universities, allowing companies

to develop further before they are spun out.

Mr Preston describes the incubation step as "really critical". This would give companies a chance to prove there is a market for their products and to start generating revenue, setting potential investors' minds at rest.

Specialist funds are keen to invest in clean technology

Private equity

Martin Arnold finds investment by funds is steadily increasing

Private equity bosses were dubbed the masters of the universe a few years ago for their apparent ability to acquire almost every company, however large, during the debt-fuelled leveraged buy-out bubble.

Now the credit crisis has shattered this superhuman image. But some private equity bosses still believe they can help to save the world, this time by investing in one of the hottest areas: clean technology.

The number of funds investing in private-equity clean tech - including renewable energy, recycling, anti-pollution, conservation, and power supply - is up more than fivefold from 90 five years ago to 530 this year, according to Preqin, the research house.

"These businesses are growing at 20 to 30 per cent a year," says Shai Weiss, a London-based partner at Virgin Green Fund, a \$220m fund backed by Sir Richard Branson and other big investors including Macquarie, Credit Suisse and Calpers.

"There are structural drivers of growth, such as regulatory limits on landfill in Europe, which are driving demand for resource-efficiency products and services and which are completely separate from the economy in general," says Mr Weiss.

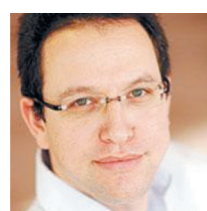
While the financial crisis has taken some froth out of clean tech, most specialists believe it is emerging stronger from the crisis than other parts of private equity.

James McNaught-Davis, managing partner of UK-based clean-tech investor WHEB Ventures, says the shortage of financing from banks and other sources may be creating more opportunities for specialist funds in this

area. "There are quite a few clean tech businesses that need capital to develop and have owners who can't or won't provide the money, and these are being sold quite cheaply," says Mr McNaught-Davis. "It is currently a buyer's market."

As in all areas of venture capital, he says protecting intellectual property rights in the fast-moving world of clean tech is crucial. "A core asset is intellectual property. When it comes to selling a business or even taking it public, if you have some crown jewels in the form of patents, or at least proprietary industrial know-how, that increases the value of a company materially."

While total venture-capital investment fell 9 per cent from the last quarter of last year to the first of this year, investment in clean-tech deals



'There are structural drivers of growth which are separate from the economy in general'

Shai Weiss

increased markedly. Renewable energy and green technology companies received six of the 10 biggest venture capital investments in the first quarter.

Global venture capital investment in clean tech reached \$773.5m in the third quarter, an 87 per cent rise from the previous quarter and more than treble the year-ago period, according to a report by Thomson Reuters, PwC and the National Venture Capital Association.

Yet governments say more is needed. Total clean-tech investment needs to reach \$500bn a year to hold global warming to less than 2 degrees celsius, beyond which scientists say climate change becomes irreversible

and catastrophic, according to the consultancy New Energy Finance.

Last year, 77 clean-tech funds raised a total of \$26.9bn, down sharply from the 104 funds that raised \$48.5bn in 2008, according to Preqin.

However, there are currently 91 clean-tech-focused private equity funds on the road seeking to raise an aggregate \$26.7bn, which is an increase from the 78 funds seeking to raise \$19.9bn a year ago.

Private equity's role in clean tech is hard to quantify, partly because it comes in various forms.

First there are venture capitalists, such as Kleiner Perkins Caufield & Byers and Element Partners in the US, or WHEB Ventures in Europe, which have raised funds to invest in early-stage clean tech companies.

Second, there are private equity groups looking to make growth capital investments in more mature clean tech companies, such as Climate Change Capital in the UK and Ambianta, a new Italian group that raised €217.5m last year.

Third, specialist infrastructure groups, such as US Renewables Group, Triodos Investment Management in the Netherlands, and HG Capital Renewable Power Partners in the UK, are developing wind, solar, hydro and biomass projects.

Finally, generalist buy-out groups are investing more in clean tech. Blackstone, the world's biggest private equity group, in 2008 announced a €1bn investment in a wind farm off Germany's North Sea coast, while last year Terra Firma, the UK buy-out group, invested \$350m in Everpower, a US wind farm developer.

Mr Shai at Virgin Green Fund says that, like many investors in the sector, he is approached by many entrepreneurs too early - before they have real revenues or even a saleable product. "We are about backing proven companies and helping them grow," he says.

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The Environment & Intellectual Property

Green issues are still a concern for food buyers

Consumers

Supermarkets have seen a lasting shift in sentiment, writes **Elizabeth Rigby**

Just before the credit crunch, supermarket bosses were vying to out-green each other with promises to cut carbon emissions, packaging waste and food miles. But once the gloom of recession descended, the lexicon changed. No longer were supermarket chiefs intent on telling their customers how they could help them save the planet. It became all about ways of saving money, as they sought to stop their shoppers defecting to the discount chains such as Lidl and Aldi in the hunt for cheaper food bills.

Organic food producers found that some supermarkets were removing their products from the shelves, as attention shifted to offering customers cheaper food. Organic food sales fell 9.7 per cent in 2009, according to Kantar, the grocery research company, from double-digit growth just a couple of years earlier.

But as the storm clouds begin to recede, green is moving back up the agenda. "I don't think consumers did stop caring," says Richard Evans, President of PepsiCo in the UK. "But if you've got no money, you have to make tough choices."

"So it is not that you don't care; it is about what you can or can't manage."

The evidence suggests that while customers may have been trading down during the recession, they still keep the environment and where food comes from in minds when shopping. Marks and Spencer, which has an

entire programme – "Plan A" – dedicated to becoming a greener business, conducted research this year that showed that shoppers were still engaged in the issues.

Nearly three-quarters of 2,000 people interviewed said the recession had not changed their level of concern, with one in two interviewees saying they would do more to help protect the environment if it was made easier for them to do so.

IGD, the food and grocery analysis company, says research this year shows that the provenance of food is still important for many consumers, with demand for locally produced food and fairtrade products on the rise against three years ago.

It found that 30 per cent of shoppers interviewed bought local produce in January, up from 15 per cent in 2006, while 27 per cent of shoppers had bought fairtrade products, against 9 per cent three years ago.

"Shoppers are looking for both value and values," says Joanne Denney-Finch, IGD chief executive. "They are not simply looking for cheaper food in tough times. They also expect the grocery industry to support their moral and ethical values."

Consumers are asking more of their supermarkets, says Lucy Neville-Rolfe, executive director of corporate and legal affairs at Tesco, the world's third biggest retailer by sales.

She says: "Climate change is going to happen and that brings risks to business. Consumers want to know what they can do to help. I believe we have to work with suppliers and consumers and government, because we are interdependent when it comes to tackling these issues."

To this end, many of Britain's biggest retailers stepped up their environmental commitments during the recession. Tesco, which pumps out



Ethics in action: the source of food is important to shoppers Justin Sullivan/Getty Images

4.5m tonnes of carbons a year, last year promised to become a zero carbon business by 2050, with a shorter-term pledge to cut emissions from existing stores and distribution centres in half by 2020.

Marks and Spencer has been looking at ways to make being green easier for shoppers. One scheme has been to encourage customers to recycle clothes by offering them an M&S voucher when they take M&S clothes to an Oxfam charity shop.

Tesco has worked with Oxford Uni-

versity's environmental change institute to create an index to measure the carbon required to produce, transport, and consume every product it sells. The retailer has worked out the carbon footprint of 500 products while labelling more than 100 products.

It has also provided £25m of funding to the University of Manchester to set up a sustainable consumption institute that looks at how consumers can lead greener lives.

Last October, Tesco teamed up with some of the world's biggest consumer goods companies – including Coca-Cola and Unilever, with a combined turnover of \$700bn – to work further on helping consumers limit emissions.

If anything, the recession has invigorated the green consumer, says Ms Neville-Rolfe. "It became good to be green because it saves money. People were cooking from scratch, growing their own [vegetables]."

"It is interesting to see how consumers and businesses are coming together on the need to save money. People don't want to be wasteful and, on the back of that sentiment, you can make progress on tackling climate change."

Guest Column by Sir Stuart Rose, Marks and Spencer chairman, Page 6

Frosty welcome for HFC gases in supermarkets

Retailers

Andrea Felsted finds store groups adopting alternative systems of refrigeration

From ditching free plastic carrier bags to creating environmentally friendly stores, retailers are making efforts to improve their green credentials. One problem they still face is the cooling gases in supermarket refrigeration.

According to the Environmental Investigation Agency (EIA), a campaigning group, as much as a third of the carbon footprint of most supermarkets comes from this source.

The gases are hydrofluorocarbons, or HFCs, which can contribute to global warming if they leak into the environment. In the 1990s, these gases replaced chlorofluorocarbons, or CFCs, amid concerns about CFCs' harmful impact on the ozone layer.

Mike Barry, head of sustainable business at Marks and Spencer, says that, while HFCs are not bad for the ozone layer, they are pretty bad for global warming. "The most frequently used HFCs contribute to global warming about 3,500 times more than carbon dioxide."

The EIA's first Chilling Facts survey, carried out in summer 2008, found no supermarket had more than four stores using HFC-free alternatives, a level the EIA described as "totally inadequate".

The second survey, the results of which were released this year, found some significant improvements. The survey found 46 stores across the UK using carbon-dioxide-based technology, up from a total of 14 last time.

"This is a great improvement, showing HFC-free refrigeration is not just viable technically but commercially too," the EIA says.

"However, the overall percentage of UK supermarkets using this technology is still less than 2 per cent, so the supermarkets still have a way to go in proving their commitment to the climate."

But Bob Gordon, head of environment at the British Retail Consortium, the trade body for store groups, says that when it comes to refrigeration, the picture is complex.

Some store groups are moving to CO₂-based systems, where if "you lose a bit of CO₂ it's thousands of times better". Others have chosen propane.

Ammonia-based systems are another possibility, but Neil Sachdev, commercial director of J Sainsbury, says that Britain's third biggest supermarket group steered away from this option, because it did not feel comfortable having ammonia near customers.

According to the EIA, nine retailers have announced measures to reduce their use of HFCs: Marks and Spencer, Tesco, Wm Morrison, Lidl, the Co-operative Group, Aldi, Midlands Co-operative, J Sainsbury and Waitrose. Waitrose, the grocery arm of the

John Lewis partnership, is replacing an HFC-based system with propane. Steve Isaia, head of development and engineering at Waitrose, says it plans to remove HFC-based refrigeration from its stores by 2020.

"Our view was that it was very important for us from an environmental standpoint. We thought 10 years was just about as fast as we could go. But at the same time, we didn't want it to be any longer than that. That is really the test we have set ourselves," he says.

Waitrose has converted seven stores to the system, and it has gone into four new supermarkets. This year, it plans to have the system in another 26 stores, through a combination of conversions and new stores. From next year, it will convert 20-25 stores a year, while the new system will go into all new supermarkets.

Waitrose has also taken the unusual step of adding a "Bakewell tart" smell to HFC gases, so they can be more easily detected, in an effort to help it halve leaks from refrigerants over the next three years.

M&S, which has set 180 environmental goals under its "Plan A" commitment, has opted for a more pragmatic approach, using CO₂. It already has CO₂ systems in 16 stores, and has



"We need a team of technicians who know how to install and maintain these systems" Bob Gordon

a commitment that all refrigeration going into stores will be CO₂-based.

M&S expects that by 2020, the majority of its stores will have CO₂-based systems, and by 2030 it aims to eliminate HFCs from refrigeration.

As an interim step, by 2015, it plans to have at least halved the carbon footprint of its refrigeration. It aims to achieve this through halving leaks and putting a kinder form of HFC into its systems. It has put this form – with half the harmful impact of regular HFCs – into existing systems in 100 stores, and plans to roll it out to all remaining stores over the next two years.

Sainsbury also recently committed itself to targets for its refrigeration systems.

It has pledged to switch to CO₂ fridges in all stores by 2030, and has earmarked the first 135 stores for conversion by 2014. From this summer, no new HFC systems will be installed. M&S has developed a training school in CO₂ refrigeration technology, and has so far trained more than 150 engineers.

According to the British Retail Consortium's Bob Gordon: "If we are going to install these refrigeration systems across the UK, we need a team of technicians who know how to install and maintain them."

Climate change Winners and losers within sectors start to emerge

The response to climate change has been uneven across sectors. Some have taken the opportunity to make widespread changes, while others have moved less quickly.

Two types of companies have been most affected by climate change. First, fossil-fuel-intensive ones, such as energy producers, miners, steelmakers and cement groups, and, second, businesses with a strong consumer focus.

The Carbon Disclosure Project found that utilities and energy companies stood out when it came to identifying risks and opportunities of climate change, but financial services companies – which are very consumer-focused – also did well.

In terms of overall performance, however, the information and communication technology (ICT) sector performed best, probably because it sees real opportunities in dealing with climate change.

"The sectors doing best are those that are able to grow profitably in a rational response to climate change," says Paul Dickinson, CDP chief executive. "Anyone involved in the process of dematerialising the economy – doing more with less, essentially – is well placed."

He cites the example of video-conferencing. Companies such as Cisco, with its slogan "Work is not a place, it's an activity", are taking advantage of high fuel prices, the impending inclusion of aviation in the EU

Emissions Trading Scheme, and advances in technology to create an alternative to business travel. The sector has repackaged itself as "telepresence" and analyst Gartner estimates it will replace 2.1m airline seats by 2012.

"In the past two years, the ICT sector has started to create business models and has discovered areas where ICT can be embedded, from smarter buildings and grids to logistics," says Peter Lacy, head of Accenture's Europe, Middle East and Africa sustainability practice. "Some disruptive changes are coming, and business leaders understand that."

Renewable and nuclear energy providers, electric vehicle makers and energy efficiency companies are also likely to see growing markets.

However, performance within sectors remains variable, Mr Lacy warns. "About a third of companies are really making progress, another third are muddling along doing the bare minimum, and the final third are not really doing enough."

David Symons, a director at environmental consultancy WSP, agrees: "Responding to climate change is less about sector, and more about the performance of individual companies in those sectors."

This difference in performance is important, not just for the companies themselves but also for their investors. In a report on the carbon risks in UK equity funds, Trucost, an analysis outfit, found that the carbon footprints of individual portfolios ranged from 209 tonnes of CO₂ equivalent per £1m to 1,487 tonnes of CO₂ equivalent per £1m.

"The significant variation in the carbon footprints of portfolios indicates varied exposure to carbon costs," the firm says. An analysis of US mutual funds found an

'Those identified with the problem will face trouble'

even starker division – the lowest carbon footprint was 40 tonnes of CO₂ equivalent per £1m while the largest was 1,549 tonnes of CO₂ equivalent per £1m.

In general, the best records on climate change tend to be in Europe, followed by North America. However, a transformation is under way in some emerging markets triggered by the economic stimulus packages that emerged from the financial crisis, says Nick Robins, head of the Climate Change Centre of Excellence at HSBC.

"These funds – in places such as South Korea – are going towards energy efficiency and transport projects that will position

Video stars: technology and fuel prices are boosting video conferencing

both national economies and companies to benefit from green growth."

Companies in consumer-focused businesses are at the forefront of many business sustainability initiatives because "the biggest democracy in the world is how people spend their money – every time they buy something, consumers are voting," says Mr Dickinson.

"People are worried about climate change, and it will only increase in importance. Those identified with the problem will face trouble, while those identified with solutions will clean up."

Consumer-focused companies such as retailers have moved on from greening their own operations to driving down the environmental impact of supply chains.

Wal-Mart has announced plans to cut 20m tonnes of CO₂ emissions from its supply chain by 2015, for example.

"It is something customers and employees expect us to be involved in," says Lucy Carver, director of The Bigger Picture, Sky's responsible business initiative. The company's activities extend from more efficient set-top boxes for customers to a top-rated broadcast centre and into its programming.

"We want to take climate change to consumers who may not have engaged with the issue before. We are in 9.7m homes – this is a way of playing to our strengths," Ms Carver says.

According to HSBC's Mr Robins, "Climate change is a necessary competence that all companies must have. For some it will be a key revenue driver."

Mike Scott

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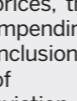
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Food for thought: a Wal-Mart truck fuelled by reclaimed fat

Profligacy in a cup of coffee

Beyond carbon

Sarah Murray finds companies looking at more than just greenhouse gases

Wal-Mart's plan to extend carbon dioxide emissions reduction targets to its suppliers – aiming to cut 20m tonnes from its supply chain by the end of 2015 – indicates that, for some companies, climate change is integrated into corporate strategy.

However, World Biodiversity Day in May was a reminder that greenhouse gases are just one of a range of environmental impacts the corporate sector has to worry about.

"There are different ways of looking at resource use, and it's not just about energy," says Dominic Searle, head of clean technology and renewable energy at RSM Tenon, a member of the global accountancy network RSM International.

He cites the case of a cup of coffee and its water use. "The hundreds of litres it takes to produce that cup has an impact on the rest of the world, particularly in water-distressed areas where the beans are produced," he says. "This message has yet to emerge, whether in financial markets or among individual consumers."

Among some companies, however, a more integrated approach is emerging. "We are seeing some great examples," says Mindy Lubber, president of Ceres, a coalition of investors and environmental groups.

She cites the case of General Mills,

and its strategy on water and other environmental impacts. In its Green Giant division, the US group has worked with growers not only to cut water consumption but also minimise use of agricultural chemicals for all its main crops, setting tangible goals in areas such as insecticide application on maize, where it aims to make a 30 per cent cut over three years.

This integrated approach appears to pay off for companies. In research conducted by Accenture, the consulting firm, of Fortune 1,000 companies, it found that the 30 highest financial performers also did well on sustainability. "And almost all those companies are looking beyond pure carbon,"

'There are different ways of looking at resource use, and it's not just about energy'

says Peter Lacy, who heads Accenture's sustainability services practice across Europe, Africa and Latin America.

Mr Lacy points to Diageo as an example of a company that has taken an integrated approach. In addition to establishing aggressive carbon targets, he explains, the company is also focusing on reducing water consumption, introducing sustainable packaging codes and coming up with alternative materials to reduce waste.

However, the integrated strategy embraced by General Mills and Diageo is not being universally adopted. For water consumption alone, even among organisations espousing sus-

tainability, not all companies are factoring consumption into their decision-making processes.

Mr Lacy sees a 20-40-40 division of companies, with 20 per cent now very concerned about water resources and the extent to which they could threaten their cost base and operations in the short term.

He believes 40 per cent may be aware of water as an issue but do not yet know what it means for their business, while another 40 per cent have not even considered water as a risk.

Ms Lubber would agree. She argues that sustainability practices are often piecemeal and seen only in a small group of high-profile companies. "We have to move from anecdotal, one-off projects to systemic, strategic movements," she says.

A recent study commissioned by IFS, a software company focused on lifecycle management, found that nearly half of top executives admitted their company did not have technology to track its environmental footprint on a continual basis.

Moreover, if the number of companies considering waste, water and other environmental issues in their business strategies is increasing, those addressing the full spectrum of their impact on natural resources remain in the minority.

Few companies, for example, have an understanding of their impact on biodiversity or their business exposure to its loss.

And yet – in the food and agriculture sector in particular – many rely on healthy ecosystems and biodiversity to prevent soil erosion and provide protection from storms. Diverse natural resources also provide raw

materials such as crops for food and fibres for textiles.

Some sectors, such as mining, have been forced to address biodiversity. Often as a result of activist pressure, companies have developed not only mitigation strategies to address their impact on biodiversity but also rehabilitation plans, particularly after closure of a mine or quarry.

However, few other companies have yet considered their impact on biodiversity. "I'm not sure biodiversity has been thought through, either on the downside, in terms of the impact, or the upside in terms of how you can harness biodiversity, particularly in supply chains," says Mr Lacy.

He believes biodiversity and ecosystems will start to enter the corporate consciousness. "This will become increasingly central," he says.

"Particularly as a number of organisations are beginning to think about the broader environmental services impact of their business."

Finance Credit crunch throws up opportunities

The credit crunch was not good news for clean technology. Full of start-up, high-tech companies with unproven technologies and only dreams of profitability, the sector was one of the hardest-hit.

Investment in clean energy fell by 6.6 per cent to \$162bn last year from \$173bn the previous year, having grown threefold from 2004 to 2007, according to analyst Bloomberg New Energy Finance.

"The dip in investment between 2008 and 2009 shows the effect of the credit crunch on the availability of debt for projects and the impact of the stock market downturn on initial public offerings," says Michael Liebreich, chief executive.

Even in the more established parts of the industry, such as wind power, investment in project finance dried up, says James Macnaught-Davis, managing partner at WHEB Ventures, the clean-technology venture capital firm. "Building a renewable energy project is quite capital-intensive and the credit crunch froze bank lending."

"The setback would have been a lot more significant but for record clean-energy investment in China and a pick-up in project finance in Europe and the Americas in the second half of last year, driven by the first instalments of stimulus funding."

A large proportion of stimulus funding around the world was directed at green investment. HSBC, the bank, estimates that governments allocated more than \$430bn in fiscal stimulus globally to "climate change themes". The US, China and South Korea were among the biggest green stimulus spenders, with South Korea allocating almost 80 per cent of its funding to greening its economy.

However, by February of this year, only 9 per cent of the allocated total had been spent, according to Bloomberg New Energy Finance.

"There is still strong momentum behind green growth, driven by resource fundamentals," says Nick Robins, head of the Climate Change Centre of Excellence at HSBC.

The part of the environmental sector that was reliant on a deal emerging from Copenhagen climate conference last December has suffered a big fall, however. "The carbon trading theme has drastically underperformed," he says, "but sectors with their own resource logic have

done well." Carbon trading has fallen significantly in the bank's Climate Change Index, but energy efficiency and energy storage stocks have outperformed because these companies help their customers use fewer resources and save money.

As the sector deepens and smart-grid infrastructure is rolled out, aggregated savings from energy-efficiency measures are coming to be seen as another form of energy supply. In addition, energy efficiency requires little capital expenditure and offers rapid payback.

Bruce Jenkyn-Jones, managing director at Impax Asset Management, a specialist investor in clean technology, is bullish.

"The key drivers of these sectors are government policy, legislation, rising energy prices and energy security," he says.

Renewable energy sectors, particularly solar and wind, became massively overvalued in the run-up to the recession, but valuations are now much more realistic, he says.

"The sector is likely to remain volatile but there is potentially a real opportunity because valuations are at their lowest point for seven years."

Energy prices, having fallen hugely in 2008, continue to rise and steps such as the UK's introduction of feed-in tariffs, Australia's Renewable Energy Target, China's latest Five-Year Plan and the EU's challenging 2020 targets are driving investment.

The public markets are also slowly coming back to life. The clean-energy IPO market was worth \$14bn in 2007, but dropped to \$3.4bn last year, says Bloomberg New Energy Finance, with none at all recorded in the first quarter of this year.

There is a huge backlog of companies looking to access the public markets – Jefferies, the investment bank, estimates that in the US alone, 78 companies are

hoping to come to market hoping to raise \$13.7bn.

Early-stage companies are still finding it difficult to raise capital, says Mr Macnaught-Davis. "But we have found later-stage growth businesses quite cheap. There are good deals to be had below the radar of most mid-market buy-out firms."

Mike Scott

Macnaught-Davis: renewables projects are 'capital intensive'



Respectability that provides investors with peace of mind

Certification

Mike Scott explains the benefits of a universal standard

It is possible to get some kind of environmental certification for everything from building a dam to buying a pack of crisps. What has driven this proliferation of green certification and what are the benefits?

While most areas of the economy have environmental leaders that take action individually, certification can drive changes across sectors, says Chris Stubbs, director at WSP Environmental.

Certification schemes range from the specific – the Voluntary Carbon Standard for carbon offsets, for example, or the Leed and Breeam certification schemes for buildings in the US and the UK respectively – to the almost universal such as the ISO14001 standard that can be applied to any sector of the economy.

Certification to ISO 14001 allows you to achieve a range of benefits, according to the British Standards Institute.

The standard provides a "solid framework around which to build an environmental management system," says Jay Dietrich, corporate environmental affairs manager at IBM. "It is consistent across the whole organisation worldwide, which leads to a global set of standards and expectations."

Certification can be important when it delivers value in return for the efforts you have to put in, he adds. "When a scheme addresses a need and has broad coverage it can be useful. Country- or region-specific certification can be troubling, however, because you can very quickly become snowed under."

This universal approach allows organisations to compare themselves with other companies and other sectors, says Cindy Cahill, a partner in the sustainability practice at Deloitte.

It also allows investors to weigh up the merits of sectors when it comes to sustainability. Standards such as FTSE4Good and the Dow Jones Sustainability Index allow investors to see which companies perform well on sustainability issues, and may face lower risks.

Signing up to certification schemes can also have more immediate and concrete benefits. In the UK, the Carbon Trust Standard – which encourages good practice in carbon measurement, management and reduction – allows businesses to gain credit for early action under the recently introduced Carbon Reduction Commitment.

Harry Morrison, general manager of the standard, says: "We recognised there is huge business interest and concern about climate change and a desire to do something about it. But there was a limited level of expertise on the issue."

"It was difficult for companies to take action and for customers to differenti-

ate between organisations that were talking a good game and those that were really making a difference."

However, there is a danger of certification being used as a form of green-wash, warns Ms Cahill, unless there is a proper auditing process attached to the standard.

"The Equator Principles, for example, [which govern project finance lending by banks] are pretty woolly," she says. "A set of principles is more or less worthless unless it is backed up by some kind of auditing."

"Consistent and robust measurement standards with very little room for

'Principles must be backed up by auditing'
Cindy Cahill

manoeuvre are vital."

Having an independent third party, such as the Carbon Trust, assessing performance gives credibility to companies, agrees Mr Morrison.

"Standards play an important role in the early stages of a market that is dealing with a complex problem and where regulation has not yet caught up with the challenge," he adds. "They are a good way of moving the market without the government having to intervene."

As legislation catches up with the market, regulation will set minimum standards, but certification will retain a role in allowing

industry leaders to go beyond minimum requirements, suggests Ms Cahill.

Many companies, having taken steps to put their house in order, are focusing on their supply chains. Achieving certification standards such as ISO14001 will be a prerequisite for suppliers to retain the business of companies such as Marks and Spencer or Volvo.

The most effective standards do not just promote consistency, says Mr Morrison. They also incorporate an element of continuous improvement. "The Carbon Trust Standard is about raising the bar and rewarding those organisations that are making progress."

This is a useful approach, says Mr Dietrich. "Creating change requires patience and persistence. Even if you have a clear goal in mind, it is better to make incremental changes rather than trying to take giant leaps."

Certification helps consumers to make more sustainable choices, too.

Good Energy, a UK renewable energy provider, was one of the first companies to sign up to the Green Energy Supply Certification Scheme.

"Our customers want to know they are buying 100 per cent renewable energy," says Juliet Davenport, chief executive.

"Consumers want to be green, but don't want to look stupid if it turns out that the energy they are buying is not as green as they thought. This accreditation scheme gives them peace of mind."

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The Environment & Intellectual Property

Corporate use comes under the spotlight

Water

Sarah Murray looks at monitoring and management

Institutional investors will soon be able to obtain a clearer picture of how the companies they invest in manage their water use.

The Carbon Disclosure Project (CDP), which since 2000 has used corporate data to report on the business risks and opportunities of climate change, recently launched a programme on water use. It poses challenges not encountered when measuring carbon emissions.

The format is modelled on the one the CDP uses for carbon disclosure, in which it acts as an intermediary between investors and companies. On behalf of investors, it asks companies – in this case about 300 large businesses in water-intensive sectors – to fill out a questionnaire.

It plans to publish the report by the fourth quarter of this year. And while water reporting is a new initiative, the CDP has one big advantage – a ready-made list of investors signed up to the carbon disclosure version.

The CDP has 534 signatory investors with about \$64,000bn in assets under management and, so far, the CDP Water Disclosure initiative has 137 signatory investors with \$16,000bn in assets. “I’d hope that in

time the vast majority [of CDP investors] would become signatories,” says Marcus Norton, head of the water initiative at CDP.

For investors that sign up to the water initiative, the motivation will be similar to that of wanting greater disclosure on carbon emissions – the need to understand how resource constraints will affect the companies in which they invest.

In the questionnaire, companies are asked about management and governance of water. Does the business have a water strategy, for example, or management plan with targets for consumption?

Companies can also report on risks and opportunities relating to water use. This might include any physical or regulatory constraints that would negatively affect operations.

Constraints may be experienced not only in terms of quantity – quality of water is also critical, as pollution could prevent companies from using the local supply. Conversely, there might be opportunities for companies to save money by reducing consumption in their production processes or recycling.

Indirect water use is covered, too, as some companies make products that may not be water-intensive in manufacture but become so in use – shampoos and detergents fall into this category.

Similar questions on physical and regulatory risk cover water use by companies’ suppliers.

In devising the question-

naire, the CDP had to strike a balance, says Mr Norton.

“Water is a new subject to many companies, so we want to make the process as painless as possible and encourage participation,” he says. “But at the same time, we want information that’s relevant to investors.”

Unlike the approach to carbon emissions reporting

‘Water is a new subject to many companies, so we want to make the process as painless as possible’

– in which companies in every sector are approached – the CDP is following a more targeted strategy in this initiative, only approaching businesses for whom water is a material risk to their operations and profitability.

Companies being contacted therefore include those in sectors such as food and beverages, chemi-

cals and pharmaceuticals, mining, paper and semiconductor manufacturing, while those in the financial sector are not being asked to participate.

Moreover, measuring the impact of water use differs significantly from assessing carbon emissions. For a start, carbon and greenhouse gases have a universal form of measurement – a tonne – and their impact is the same whether emitted in London, New York or Delhi.

By contrast the impact of water consumption varies tremendously. “Parts of Scotland are clearly water-abundant so using a gallon will have no negative impact,” explains Mr Norton. “By contrast, using a gallon in parts of the Murray-Darling Basin in Australia will have an impact.”

Measurement is complicated. You can’t just look at global figures – you need to look at the context.”

The science is in its infancy. “With carbon and greenhouse gases, we have the GHG Protocol, which is pretty well established and has a standard approach

towards measuring and accounting for greenhouse gas emissions,” says Mr Norton. “We’re not there with water.”

The other variable when it comes to water is quality. Assessments need to account for the quality of water when it is extracted, and the condition in which it is returned to the system.

Accordingly, helping to accelerate standardisation of water reporting is part of CDP’s mission, as is raising awareness of the need for standardisation.

“We’re not seeking to set standards but if we can help to advance thinking, that’s a role we want to take on,” says Mr Norton.

But if assessing the risks and opportunities of water use is more complex than doing the same for greenhouse gases, the incentives are no different.

“The world is going to be water-constrained, just as it is going to be carbon-constrained,” says Mr Norton.

“So there will be pressure on companies from all stakeholders to reduce their water consumption.”



Slippery subject: assessing the impact of water use is complex

Yusuf Ahmad/Reuters

Moral good, financial gain

Guest Column

SIR STUART ROSE

The law of unintended consequences, made popular by Robert Merton in the 1930s, has received renewed interest of late – perhaps now that life is less predictable and at the same time more documented.

The unforeseen outcome of an event can be good (aspirin also prevents heart attacks) or bad (1920s prohibition also produced organised crime). It is rarer that a moral good produces a commercial one. But in the case of Marks and Spencer’s Plan A, that is what has happened.

We set up Plan A in 2007 to pursue 100 commitments on social, environmental and ethical challenges in climate, waste and recycling, sustainable raw materials, fair partnerships and health. We have achieved 62 – and are also gaining financial returns from Plan A.

This month we publish our audited report on Plan



‘We know now that there is a significant commercial return for going green’

A for 2009-10. It shows additional profits of £50m – rather than a planned cost of £40m – from a range of eco-efficiencies: less waste, less fuel, less energy, less packaging; and from new income streams such as M&S Energy.

We know now that there is a significant commercial return for “going green”, not just a moral one. It is almost classic utilitarian “greatest good for the greatest number”.

Companies such as Wal-Mart, O2, Unilever and Nike understand the green imperative commercially and have embarked on their own eco-ethical journeys.

Yvon Chouinard, chief executive at Patagonia, the clothing company, simply says: “Every time we do the right thing, we make money.”

What happens when we put Plan A at the heart of how we do business? First, Plan A has driven cultural change within M&S, where countless altered operating procedures have produced incremental savings; small aggregated changes in behaviour have amounted

to large energy savings; and new eco-technologies in store design or refrigeration have had a marked commercial impact.

Second, Plan A has driven us to innovate and discover new markets. For instance, M&S Energy has nearly 300,000 customers; and we have launched a home insulation service. This “greening the home” market will be worth billions; we want a significant share of it.

Third, in operations, Plan A has helped us align interests and apply performance measurement. Board remuneration is in part based on Plan A; store managers have incentives to cut energy use. Getting the support and ownership of our finance team has been crucial in creating the right incentives for sustainable business behaviour.

And fourth, our supply chains benefit from what we have learned: “ethical and eco model” factories in Bangladesh, Sri Lanka and the UK are teaching thousands of other suppliers through our Supplier Exchange website.

Last year we shared our Bangladesh best practice with others (including Gap, Nike, Levi Strauss, Disney, New Look, Hennes, and Wal-Mart). We encouraged them to join or replicate the programmes, benefiting workers irrespective of retailer or brand. We in turn have learned from Unilever and Wal-Mart.

We are now accelerating Plan A, and to support this effort we have established an innovation fund to help build a sustainable business. We aim to be the world’s most sustainable leading retailer by 2015. Sustainability is crucial to our success.

The programme has to be thorough and well considered, as benefits in conjoined areas maintain a dynamic equilibrium. For example, how do we balance the environmental impact of air-freighting some food and flowers from Africa with the benefits that arise from creating secure jobs there?

In a McKinsey survey last year of 1,500 executives, about half picked the environment as one of three issues they thought would attract the greatest amount of public and political attention, and most affect shareholder value. Plan A is starting to do both, positively.

Sir Stuart Rose is chairman of Marks and Spencer.

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