

ECOLOGIST

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Newsletter 22

April 2011

NIGERS'S WATER CRISIS

Special Report
Page 12



Biodiversity
Why invasive species pose a major threat...
Page 3



Oil
One activist challenging the oil industry
Page 5



Energy
The scramble to design new turbines
Page 14

CONTENTS

>> page 3 BIODIVERSITY

In March, experts gathered in London for a major conference addressing the often overlooked threat of invasive species to biodiversity. Carrie Madren reports

>> page 6 OIL

A remarkable young environmentalist is standing in the way of a controversial Canadian oil pipeline which campaigners fear could become the next Exxon-Valdez or Deepwater Horizon disaster. Eric Keen reports

>> page 9 WIND POWER

Offshore wind power is crucial if the UK is to meet its renewable energy targets - but a lack of suitably powerful and reliable technology could hamper efforts. reports David Strahan

>> page 12 PHOTO SPECIAL

Drought, food insecurity and desertification blight Niger

>> page 22 OLYMPICS

Already hit by rows over radioactive waste and airport expansion, the London 2012 Olympic Games are accused of degrading green land vital to local communities and wildlife. Tom Antebi reports

ONLINE NOW

>> **Revealed: Barclays' secret profit from food price speculation**

>> **Norway's whaling shame**

>> **Clicktivism & activism**

Avoiding 'churnalism'

As you may have noticed, last month saw some important changes to the Ecologist's news section at www.theecologist.org. Our two previous sections, News in Brief and News Analysis, were amalgamated into a new section called 'News Focus'. This was largely in recognition of the fact that the Ecologist's strength is, and always has been, covering stories in a way that others in the more mainstream media are unable to.

After careful consideration, we took the decision that we want the Ecologist to look at issues in a more in-depth and a more critical fashion. Round-the-clock news and commentary can all too easily degenerate into 'churnalism' - where press releases, agency copy and other pre-packaged materials are churned out as 'news'.

You can expect more stories reporting the unreported - and tackling quite often difficult or complex issues. You can expect more investigations. You can expect more photo, or data-led, pieces.

This new approach has already seen the publication of some exclusive, detailed and otherwise unreported pieces. We investigated the UK's little-known Export Credit Guarantee Department (ECGD) and its murky role in financing projects internationally that have been linked to serious human rights and environmental issues; we documented the brave film makers that stood up to fruit giant Dole with a film examining the plight of Nicaraguan banana plantation workers who brought a landmark legal case in the US against the use of the banned pesticide DBCP.

We also highlighted some worrying concerns over the possible health impacts from radiation in the increasing number of CT scans taking place. Most recently, we exposed how the well-known high street bank Barclays could be making up to £340 million profit annually through controversial food price speculation - campaigners say this process is driving up global food prices and leaving millions facing hunger and malnutrition.

You may have also noticed that in recent weeks we've reorganised our content to better highlight the work of the world's campaigners and others involved in 'Making A Difference' - much of the material in this section is unique to the Ecologist and again stands us apart from other, more conventional, outlets.

Over the coming weeks (and months) they'll be more important developments - there's a number of special reports in the pipeline as well as new columns and features, which will ensure we build on 40 years of setting the environmental-agenda.

Meanwhile, here, this month we're covering the hidden cost of the London 2012 Olympic Games; reporting on a remarkable activist in Canada who is standing up the oil industry; examining the threat from invasive plants; and highlighting some of current issues facing the renewables sector.

Andrew Wasley, editor

Front Cover: Water crisis in Niger. Matilde Gattoni - Page 12.

Why invasive plants are the 'second biggest threat to biodiversity' after habitat loss



In March, experts gathered in London for a major conference addressing the often overlooked threat of invasive species to biodiversity.

Carrie Madren gets a briefing from those on the frontline in the battle against 'pest plants'

We can eat oranges from South Africa, buy electronics made in China

and can fly from the US to Europe in a matter of hours. As trade and travel have skyrocketed around the world, so too has our ability to bring exotic and foreign things back with us.

For centuries, horticulturists, plant lovers, ecologists, landscapers and others have imported plants for exotic aesthetic appeal, or usefulness in righting a degraded landscape.' As trade increased and travellers had the capacity to bring more things with them, it [the trade in invasive species] has proliferated,' says Lori Williams, executive director of the U.S. National Invasive Species Council. Enthusiastic flora introductions have brought a raft of unintended consequences with them: at first a new plant succeeds but then adapts too well to its surroundings and spreads out of control. Some of these plants flourish so much in new territories that they became threats to native species' very survival.

As well as intentional introductions, pest plants also travel 'undercover' - hitchhiker seeds and plants arrive in crates or crevices and sneak past border controls. Seeds get stuck in tyre or shoe treads or creep in as soft packing material. Such unintentional introductions have brought in invasive grasses and other plants before stricter trade regulations were put into place.

Ecological harm

In Africa, an unexpected source of alien plants is their accidental introduction through emergency food aid involving grains, according to ecologist Geoffrey Howard,

African global invasive species coordinator for the International Union for Conservation of Nature. Contamination can occur because such aid is often urgent and the main emphasis is on feeding people, so paying attention to possible plant invasions rarely happens. Once there, alien plants spread through the continent in vehicles tyre treads, through local trade and by a host of other means. Invasive species, both plant and animal, are considered to be the second most important threat to biodiversity after habitat destruction, yet haven't retained the limelight like other global environmental problems. As invasive plants claim more acres worldwide, these hidden green threats cause ecological harm as well as wreaking havoc on economies and humans. 'Invasive plants have an impact on wild fires, soil erosion, siltation of dams and estuaries, flooding, water quality and more,' says Guy Preston, chairperson and national programme leader for the Natural Resources Management Programmes in South Africa. The most serious plant threats have the ability to create monocultures - crowding out food sources for native animals, altering soil chemistry and canopy composition. Islands are particularly vulnerable. 'If you saw miconia in Hawaii, you'd think it was pretty,' says Williams, 'but it shades other plants - Maui [one of the Hawaiian islands] is covered in it.' According to Preston, in South Africa, invasive plants are using six percent of the country's mean annual run off of fresh water, and that this figure could rise to 20 percent if they are left unchecked. The impact of invasives is heavily felt in Africa since the vast majority of people rely on natural resources

for their survival. 'In many African countries, food security, education and general development must take priority for government funding and so resources for such management are often absent or unsustainable,' says Howard.

Economic cost

These unintentional imports cost economies around the world millions of dollars. In China, invasive species cause an economic loss of US\$29.3 billion every year, according to the Department of Nature and Ecology Conservation. Invasive weeds such as water hyacinth contribute to some US\$7 billion in economic losses. In the UK, invasive non-native species (plants, plant pathogens and animals) are estimated to cost the economy £1,700,000,000 annually, with plants inflicting the highest costs, according to Sophie Thomas, invasive plants officer for Plantlife in the UK.

Most countries - even in regions that have relatively few invasive species, such as Alaska - have seen a rise in invasive plant species in past decades. North American ecosystems struggle against Asian and European plants, such as Japanese honeysuckle and cogongrass. In the Caribbean, the highly invasive Australian native melaleuca tree was deliberately brought to Florida and the Bahamas Islands; now the species poses a severe threat to biodiversity because of its dominant nature and ability to form virtual monocultures. Just as Asian plants have invaded American and European environments, plants originating in the U.S. and EU have invaded Asia. Smooth cord grass, from the U.S.A, was introduced to protect Chinese beaches in 1979. Now, the grass dominates salt marshes

and threatens to displace coastal mangrove forests. Problem plants in Africa originate from Mexico, the Meso-American Peninsula, the Amazon drainage basin and other tropical parts of Latin America, according to Howard.

South Africa, in particular, has had more plant introductions than its African neighbours. An established nursery industry has contributed to the fact that South Africa has almost 300 invasive plant species while the country's large number of different biomes and a range of climatic zones has also played a role. Asia and Australia have, in turn, received alien species from Africa.

'Compared to other parts of the world such as Hawaii, the biodiversity problems we face as a result of invasive plants may be considered comparatively small,' Thomas states. Plants such as Japanese knotweed, giant hogweed and false acacia are inflicting ecosystem damage, he adds. This global spread could worsen with climate change, too, as plant ranges inch further north and south with changing temperature zones.

Outlawed flora

The world's worst plant invaders are listed among the '100 of the World's Worst Invasive Alien Species,' compiled by the Global Invasive Species Database. The worst global plant threats include leafy spurge, native to Europe and temperate Asia, but found throughout the world (except in Australia), where it's one of the first plants to emerge in the spring, displacing native vegetation. Purple loosestrife originated in Europe but has made itself a nuisance in North America, Australia, and South Africa, where it competes with native fauna and can overrun wetlands and open

water habitat. Mile-a-minute weed, a stringy vine covered in tiny barbs, originated in South and Central America, is now one of the most widespread and problematic weeds in the Pacific region and is a pest throughout the world.

Water hyacinth has proved itself a scourge in open waters from China through to Africa and southern Europe by forming dense mats on acres of open water. These mats block sunlight and air from entering the water, prevent fishing and water collection, and clog drainage canals and hydroelectric power systems. Feverfew, an invasive herb, is taking hold in eastern, southern and western Africa, spreading along roadsides as well as both farmed and wild areas across several countries, says Howard, displacing crops and pasture plants in the process, and causing respiratory diseases in people.

Solutions and enforcement

'The solutions to these problems are easily stated but extremely difficult to implement,' Howard told the Ecologist, 'especially in the long term.' Prevention is the best measure, but figuring out which species are likely to become invasive is a gargantuan undertaking requiring time and resources.

In the US, the Department of Agriculture can regulate plant pests but only the species listed as '110 official noxious weeds.' 'A lot of plants aren't regulated unless they're found to be a plant pest,' says Williams. More research is needed to find out with non-natives are likely to cause trouble. Solutions, however, are forth-coming. Researchers champion biological controls in the fight against invasives, though the search to find bio-controls

that don't cause new problems themselves takes time and funding. In Lake Victoria, water hyacinth once engulfed the edges of the lake, but the three countries bordering the lake — backed by funding from the World Bank — used small Amazon beetles to control the aquatic invader. Within ten years, 95 percent of the water hyacinth was gone.

In addition, stronger laws - and enforcement - are essential. In regions throughout the world, problems can occur when private landowners allow invasives to go wild. Many countries have ramped up legal barriers to non-native plants crossing national borders. Australia in has cracked down with tight bio-security laws that cover all invasives. 'Australia is the world leader, with the strictest plant protection laws,' says Williams. A screening system for imports uses a blacklist for known invaders and a white list on plants that they don't have enough information on.

In the UK, the government is currently considering whether or not to ban the sale of some of the most invasive plants. Europe has measures in place to inspect plant imports for potentially invasive pests, but is currently missing measures to control hitchhikers (stock contaminated with invasive plants) or the powers to stop known invasive plants passing between borders, says Thomas of PlantLife.

'We need to address our bio-security at our borders,' says Preston. 'We have 346 invasive alien plant species proposed for our new lists. This figure will continue to escalate unless we tighten our controls over what is coming into the country.'

Environmentalists claim the habitat of much wildlife, including humpback whales, is under threat from the proposed oil project



How one young activist is challenging the oil industry over Great Bear Rainforest pipeline

A remarkable young environmentalist is standing in the way of a controversial Canadian oil pipeline which campaigners fear could become the next Exxon-Valdez or Deepwater Horizon disaster. Eric Keen reports

A lone in his shack, tucked deep within a maze of British Columbian fjords, one young naturalist is waging war against a consortium of the world's largest oil companies. His arsenal: gum boots, binoculars, and data – lots of it. Enbridge, Canada's largest pipeline corporation, has submitted a federal proposal that

could establish twin lines between the Albertan oil sands and the B.C. port town of Kitimat. From there, supertankers measuring three by one football fields in size would take the oil through the coast's winding channels and onwards to its chief clients: to the south, the United States, and China overseas. But first they have to get past James Pilkington. For the last three summers, this 27-year old Ontarian has lived

among ravens and orcas on a rock overlooking Caamano Sound, a fjord-wreathed body of water in the rugged upper reaches of British Columbia. Being a day's boat ride from the nearest store, James sleeps under a tarp, goes weeks without seeing another soul, and protects his food from the coastal wolves and bears using barrels suspended from the trees by a system of ropes. What is it that drives this man to such ascetic, empiricist extremes? Is his love for whales so perverse? Well, yes, but there's more to it than that. There's Enbridge. He repeats the name and sighs, 'It's one of my biggest motivations.'

Pipeline politics

The Northern Gateway Pipeline issue has by now escalated far beyond that of a mere oil duct. The Federal Joint Review Panel will not only rule on whether the pipeline and its environmental impacts are ultimately within 'public interest', it will also determine the tone of Canada's domestic and foreign relations for decades to come. First Nations have certainly been more than clear: over 80 potentially affected nations have opposed the proposal with adamancy and political tact. Failing to recognise their unanimous refusal would surely establish a grim precedent for diplomatic relations in the decades following peak oil – but so would be a pass on tapping into Asia's booming demand for oil. A tricky predicament, indeed. In the still-fresh wake of Exxon-Valdez (just north of the proposed tanker route), BP's Deep Horizon disaster, and the rupture of an Enbridge pipeline on the Kalamazoo River last year, the environmental implications seem obvious. The route Enbridge hopes to squeeze tankers through is notorious both for its navigational difficulty and its remarkable densities of endangered whales – in the eyes of the concerned citizens, a disastrous combination. It's an ironic prospect: parading oil from Canada's most desolate and exploited region, the oil sands, through its most pristine, the Great Bear Rainforest. Being the largest intact temperate rainforest in the world, it is difficult to overstate the value of the Great Bear. It teems – boils over – with heart-wrenching wildlife. In addition to the whales that rely on its pristine and sheltered waters, it is a critical habitat for all five Pacific salmon species, coastal wolves, bears, and a vast interdependent ecosystem - not to mention vibrant coastal First Nation cultures, as well as the combined multi-billion dollar commercial fishing and ecotourism sectors.

One of the Great Bear's most remote corners, Caamano Sound has enjoyed the stewardship of the Gitga'at First Nation, whose people depend on the territory for food and cultural vitality. More recently, the North Coast Cetacean Society (NCCS) has also become a companion voice in the Sound. Both groups are deeply passionate about the conservation and celebration of this cultural and biological gem, and James' research would be impossible without either's friendship or yearly support, both financial and supervisory.

Gambling with nature

If Enbridge has its way, however, the Sound's spectacular diversity would surely be chased out by industrial runoff and vessel traffic. We're not talking about oil spills – although such things tend to be matters of time. This is just if all goes according to plan. With tankers that size, and the desolation that surfs in on their bow waves, the dilution of the Great Bear's fjord-lands is not a risk – it's a promise. 'And people need to know what is at stake,' James explains. 'I would like everyone to know the scale of the treasure we are gambling with.' This is why James is out there, watching from the gale-beaten rocks of Caamano's lonely shore. This is also why two Gitga'at researchers were out with him last season, conducting boat surveys to coincide with James' land-based work. What exactly is James doing all day? For the most part, he simply looks. More precisely, he looks hard. Every half hour, James does a 15-minute dedicated scan of Caamano Sound, no distractions, with binoculars and a tripod-mounted high-power scope. During which, he records every single marine mammal, vessel, and environmental condition that his eagle eyes can detect. That's 15 minutes on, 15 minutes off, all day, 14 hours per day. (But in truth there is no 'off'. He's always looking, only sometimes less intensely.) Seven

hours per diem, minimum, peering through magnified lenses. His pile of data notebooks tell the rest of the story: in addition to the binder of scans, there are the sighting sheets, a page of scribbled detail devoted to every single whale seen. There's the hydrophone log, which contains all acoustic activity – be it whales or motorboats – picked up by the underwater microphone anchored just off his rock. There are even logs devoted to everything that might happen outside of the scans, the so-called 'opportunistic logs.'

In one he narrates the movements of every marine mammal, down to the otter, that enters the Sound. In another is a meticulous record of all the vessel traffic. Another for rare or migratory birds. A separate notebook contains the formal bird surveys that James conducts during his 15-minute 'off' periods. Such thorough ornithological surveys have never been completed in the Sound, ever.

So, all day, every day, James looks, and James writes. Ad nauseum. The result: a fluid, intimate portrayal of a typical Caamano Sound summer, an absurdly high-resolution insight into what might become mere memory should Enbridge have its way.

Widespread opposition

James is not the only one fighting, of course. The Gitga'at have been gathering data on the region for decades, and the NCCS for years, and both remain earnest voices in the Fight for the Great Bear. In fact, almost 80 per cent of British Columbians are reportedly in opposition to any and all coastal tanker traffic. Legislation for a permanent moratorium along the northern coast will be debated and voted upon sometime in 2011. 'If passed,' James says, 'this would stop Enbridge and any other northern crude-oil transportation projects in their tracks...but the likelihood of it passing is a different story.' Throughout my days of research last

summer at NCCS's headquarters, James's voice would drift in over our VHF, seeming to catch me at my least attentive moments. His shack was some 16 miles from ours, an outcamp of our outcamp, on an island called Rennison. Alone out there, his only connection to the outside world was us at Whale Point.

Then in late July, I found myself out there too, an unwitting Rennison volunteer. Before the Gitga'at Spirit had pulled away from the rocks, James was already briefing me entirely too fast on his vast system of data collection. He walked me through his 1,301st scan. I whimpered. He moved on. In showing me the rest of the camp, his words and actions bore a hard efficiency, an economy streamlined by the months of solitude and the demands of 'the project.'

The educator

This understandable lack of social patience was most obvious when data was on the line; he wanted things done right. 'I'm an educator,' he explained. He would mention that a few more times during my stay. He's been a sea kayak guide, instructor at the Bamfield Marine Sciences Center, and student of Outdoor Education. Common denominator: teacher. He would not cook, repair anything, or analyze data without showing me how in the process.

He showed me how to work the stove, how to store our food, where the first aid kit was, and how to clean dishes with ocean water down on the intertidal rocks. He explained the bathroom: you take a roll of TP, a lighter, and hand sanitizer out to the beach, and you find a nice flat rock. Go on it. Wipe, set the paper atop your deposit, and light it on fire. Then, with pomp and ceremony, you march it out to the water and chuck it as far as you can. 'I call it "Shit-put;," says James with a big grin. Don't forget the hand sanitizer.

This might sound like an island

getaway to some or an internment camp to others, but there is no arguing the daunting scale of his Herculean, self-imposed tasks. This was the reason I was sent to Rennison, to relieve James of some of the work load. But he simply wouldn't have it. Instead, he used me as an opportunity to do two-person scans. He preferred doubling the chances of seeing something over giving his eyes a rest. 'But can't you use statistics to adjust for effort in your results?' I asked. 'As long as we do the right math, we can take turns on shifts and still get robust outcomes, right?' James gave a pause before his axiomatic response: 'Observation speaks louder than extrapolation. Ready to start the scan?'

He had a point: a seen whale has much more oomf than a predicted one. Nowhere else had I seen the Naturalist's Code seem more ominous. The more data, the better – and if it can be done better, it hasn't been done well enough. Not when the region he loves is on the line. The Code. Obvious, perhaps, but its implications are grave. The result, of course, is that James is burying himself under a paralyzing amount of data. Each time our conversation turned to the task of data analysis, James glanced at his piles of notebooks, let out a soft whimper and fell quiet. Where to begin? It may take months simply to enter the data into a computer.

Photography and passion

If it were not for his photography, James might seem robotic, in desperate need of a vacation from spreadsheets. But over three lonely seasons, he has compiled a stunning visual anthology of Caamano Sound, one that portrays both its truly immaculate value - as no one else ever could - as well as his bandwidth of ability as an educator and naturalist. Photography, after all, is just another way of looking, of seeing, of showing. His images also betray the deep

passion underlying his ascetic devotion to 'the project.' Enbridge's threat may be the reason he goes to such extremes, but his summers of exile from those he loves are doubtlessly a labor of love in their own right. How refreshing it is to see the artistic aspects of a mind so obviously adroit at scientific rigidity. It is a true teacher who understands the interdependence of data and inspiration. The working title for his book: A Place Worth More Than Oil.

Who knows if James' bird counts, whale sightings or photography will make the splash he hopes they will. Perhaps Enbridge will step right over his labour of love. But this is why his story becomes so important. His three summers of dedication, perhaps more so than his data, leave the rest of us without any excuses. If this man can challenge an issue as daunting as the Northern Gateway Pipeline simply by looking, surely each of us can find a way to make our own difference for the places we value. After only a week, it was time for me to switch with another researcher. At sunset, the Gitga'at Spirit pulled up and my replacement hopped onto the rocks. James immediately began briefing him on the Rennison Rules. He explained his system of data notebooks, and the new guy's eyes glazed over. He explained the kitchen and how to poop on a rock. I made sure he mentioned 'Shit-put'. As I was shouldering my bag, James held up the canister of bear spray. The recruit's eyebrows shot up. 'Do you really need to use that here?' 'Oh, I always carry this with me,' James rebutted. 'Every time I leave my post. I wouldn't want anything to happen to the project.'

Useful links

<http://www.pacificwild.org/>
<http://saveourseas.com/>

Scramble to design supersized turbines to maximise wind power potential



Offshore wind power is crucial if the UK is to meet its renewable energy targets - but a lack of suitably powerful and reliable technology could hamper efforts, reports **David Strahan**

When Thanet wind farm off the Kent coast opened to great fanfare last September, it was no surprise that Energy Secretary Chris Huhne was there to cut the ribbon. At 300 megawatts (MW), Thanet is the world's largest offshore wind farm, and offshore wind is central to Britain's energy policy. The government is counting on it to deliver the bulk of its target to generate around a third of UK electricity from renewables by 2020 – a stretching six-fold increase from today. Building wind farms offshore makes perfect sense: that's where the wind blows hardest, and where turbines are least likely to raise NIMBY hackles. And the potential is vast. According to a report from the Offshore Valuation Group, a

government-industry body, if Britain exploited just a third of the practical offshore resource by 2050, it could produce the energy equivalent of a billion barrels of oil, avoid over a billion tonnes of CO₂, become a net electricity exporter and create 145,000 new jobs. The prize is huge, but offshore wind is also fraught with difficulties. At sea, wind turbines are constantly battered by the stronger wind and the waves, which makes them more likely to break down and harder to fix when they do. They are much more expensive to install and maintain – costs have risen over the past decade, rather than fall as you might expect, according to a report from the UK Energy Research Centre – and that makes projects difficult to finance. Although the rate of construction is forecast to rise strongly over the next few years,

it still falls short of the pace needed to hit the government's renewables targets. All of this creates an urgent need to produce more energy from each turbine, meaning they must become both more powerful and more reliable than their land-based predecessors.

Stalled growth

But some experts doubt whether turbines can grow much further using existing materials and technologies. Growth in the power rating of new models has stalled over the past five years, according to Peter Jamieson, Principal Engineer at Garrad Hassan, the renewable energy consultancy, after rising exponentially for decades. While the industry talks of building a 10MW machine, the biggest operating offshore today is just 5MW. He

suspects the plateau is due to a curious property of wind turbines: the bigger they get, the less economic they become.

That's because the energy turbines generate depends on the size of the area swept by the blades, and the area of a circle is proportional to the square of the radius. So as you increase the length of the turbine blades, the electricity and income generated rise to the power of 2. But longer blades need bigger gearboxes, generators, towers and foundations, which expand in three dimensions, so weight and material costs increase to the power of 3. If turbines are going to be more powerful, says Jamieson, 'they need to lose weight'.

This is forcing the industry to rethink almost every element of turbine design. 'In ten years' time offshore wind turbines could look very different from the ones we have today', says Professor Feargal Brennan of Cranfield University Offshore Engineering Department, who has helped develop a new vertical axis turbine design.

At the same time, offshore turbines must become much more reliable. Repairing a turbine on top of a 100 metre tower is far harder at sea than on land, and can be delayed by bad weather and a scarcity of floating cranes – which all cuts energy production and adds cost. The gearbox, with many moving parts working under great stress, is particularly prone to fail; the Thanet project was delayed two years because of gearbox problems with the developers' preferred model at another offshore wind farm. The industry has spent a lot of effort developing alternative approaches, but until now they have all come with major drawbacks including extra weight and expense. Gearboxes were necessary only because turbine blades move slowly – at about 15RPM – and because early turbine developers used off-the-shelf industrial generators that need to spin at around 1500RPM. You can do away with the gearbox if you replace the relatively small high speed generator with a low speed one, but these 'direct drive'

machines need up to twenty times more electromagnets to deliver the same power, and are therefore bigger and heavier. The largest direct drive generator – also the world's biggest onshore turbine – is a 7.5MW machine made by Enercon of Germany that measures 12 metres in diameter. The company refused to answer questions about whether its design is too heavy to grow any further.

Efficiency

To reduce the weight of direct drive machines, other manufacturers such as Siemens, and Goldwind of China, have replaced the heavy electromagnets made of wound copper wire with powerful permanent magnets made from neodymium, a rare earth metal that is naturally highly magnetic. This makes the generator more efficient, smaller and lighter, but the downside is that rare earth metals are, well, rare.

It's not that there is any shortage underground, but production is now concentrated in China, which controls 97 per cent of the world's supply and has a policy of restricting exports. There are large deposits in the US, Russia, Australia, Greenland, and Tanzania, and a number of supply deals have been announced recently, but new mines will take many years to develop. The British Geological Survey and other forecasters predict shortages within the next few years, and these look likely to worsen as green technologies proliferate. But if the industry seems confounded at every turn, several solutions are now on the horizon, which each claim to unblock the way for double-digit megawatt turbines.

One recent idea has been to adapt the superconductor technology used in MRI scanners and specialized electricity transmission cables. Superconductors are materials that offer zero electrical resistance when cooled to very low temperatures, which means a superconducting wire can carry 100 times more current than a copper wire of the same diameter. And that

means superconductors can be used to make electromagnets with an even higher power-to-weight ratio than neodymium permanent magnets.

Cutting investment

American Superconductor has designed a 10MW direct drive turbine called the SeaTitan based on superconducting magnets cooled to around minus 240C that it claims will transform offshore wind market. The company says the machine will weigh the same as a 5MW direct drive turbine with conventional electromagnets, yet produce twice as much power. This could cut overall investment costs by 20 per cent or more, and allow turbines to grow much larger. 'Conventional turbines have a real hurdle at around 5-6MW', says company spokesman Jason Fredette, 'but superconductors open the way to 20MW machines'.

So far the SeaTitan exists only on paper. The company has not yet built a prototype, although it has successfully demonstrated the technology in a 36MW superconducting ship motor it built for the US navy (an electric motor is just a generator working in reverse). American Superconductor says it expects to build the first SeaTitan 'in the next few years' and enter volume production by 'mid decade'. Another superconductor manufacturer, Zenergy Power of Germany, has also designed 10MW machine, and has begun to build a 500kW prototype with a British company, Converteam, which it expects to finish next year. Chief executive Jens Müller is confident of securing the funding to build the full-sized machine and claims the technology will be fully established by the end of the decade. 'The challenge now is to industrialize the supply chain', he says. Superconducting turbines are intended to slash the weight and increase the power of large, low speed generators, but that's only necessary if you have got rid of the gearbox. An alternative approach would be to stick with the traditional high-speed generator

– which is small and well proven
– and try to replace the gearbox with something lighter and more reliable.

Digital displacement

One obvious contender is hydraulic transmission, which is widely used where a fast, steady source of power like a diesel engine has to drive slow, heavy and irregular work – in diggers or rock crushing machinery for instance - the problem of wind turbines in reverse. But the drawback is that hydraulics are typically very inefficient: even in the best systems, scarcely 80 per cent of the energy pumped in does useful work, and the rest is lost to the process. But now a small British company, Artemis Intelligent Power, thinks it has cracked this with a computer controlled hydraulic transmission technology it calls Digital Displacement.

With Digital Displacement the wind turbine blades are connected to a cam shaft that drives a series of hydraulic piston-cylinders arranged around it. These pump fluid through a pipe to drive the cylinders of two hydraulic motors, which in turn drive a pair of standard high speed generators. A computer controls how many of the cylinders are used from one millisecond to the next, using only as many as needed at any given moment, creating an infinitely variable transmission ratio.

This dramatically raises the efficiency to well over 90 per cent, and the company hopes to reach 95 per cent eventually. It also means the system can respond instantly to changes in wind speed and keep the generators running at exactly the right, steady speed to deliver grid-quality power - however wild the gusts. That in turn means a Digital Displacement machine can dispense with the expensive power electronics that almost all other turbines need to do that job. Because the system contains far less steel than a gearbox it weighs about half as much, and that should help produce more powerful turbines. 'We see our technology getting more competitive as machines get bigger', says managing director Win

Rampen.

Mustafa Kayikci, of Manchester-based energy consultants TNEI, whose PhD thesis was on how to incorporate wind power into electricity grids, is impressed with the Artemis approach. 'It's not proven yet', he says, 'but it could be the ideal solution'.

The Japanese engineering giant Mitsubishi Heavy Industries seems to agree. Last December it bought Artemis as part of a £100 million deal, and plans to incorporate Digital Displacement in North Sea turbines by the middle of the decade. 'This is a massive vote of confidence in our technology', says Rampen.

However much weight newer turbine designs can shed, they would still sit atop a 100 metre tower. And some say that's the real problem: not so much the weight per se, but where you put it. Structurally conventional wind turbines are 'trying to hold up a sledgehammer in the wind' says entrepreneur Theo Bird, the founder of Wind Power Ltd, a British company developing a turbine that turns conventional thinking if not on its head, then at least on its side.

Today's turbines make life difficult for themselves by putting all their weight at the top of a long lever that the wind is constantly trying to knock down. That creates huge forces that will ultimately limit the size and power of all conventional machines, says Bird.

Reduced costs

His answer is the Aerogenerator X, a 10MW vertical axis design featuring two diagonally outstretched arms with rigid sails at the end, which is shorter and wider than a normal turbine. There is no tower, and the arms rotate horizontally around a base that houses the generating equipment. Because the weight is concentrated at the bottom of the structure it is not so critical, and this means the design could work with any type of generator or gearbox. It also makes the structure more stable, meaning the foundations can be smaller. The company claims its machine would be half the cost of a

conventional turbine, but refuses to disclose detailed figures.

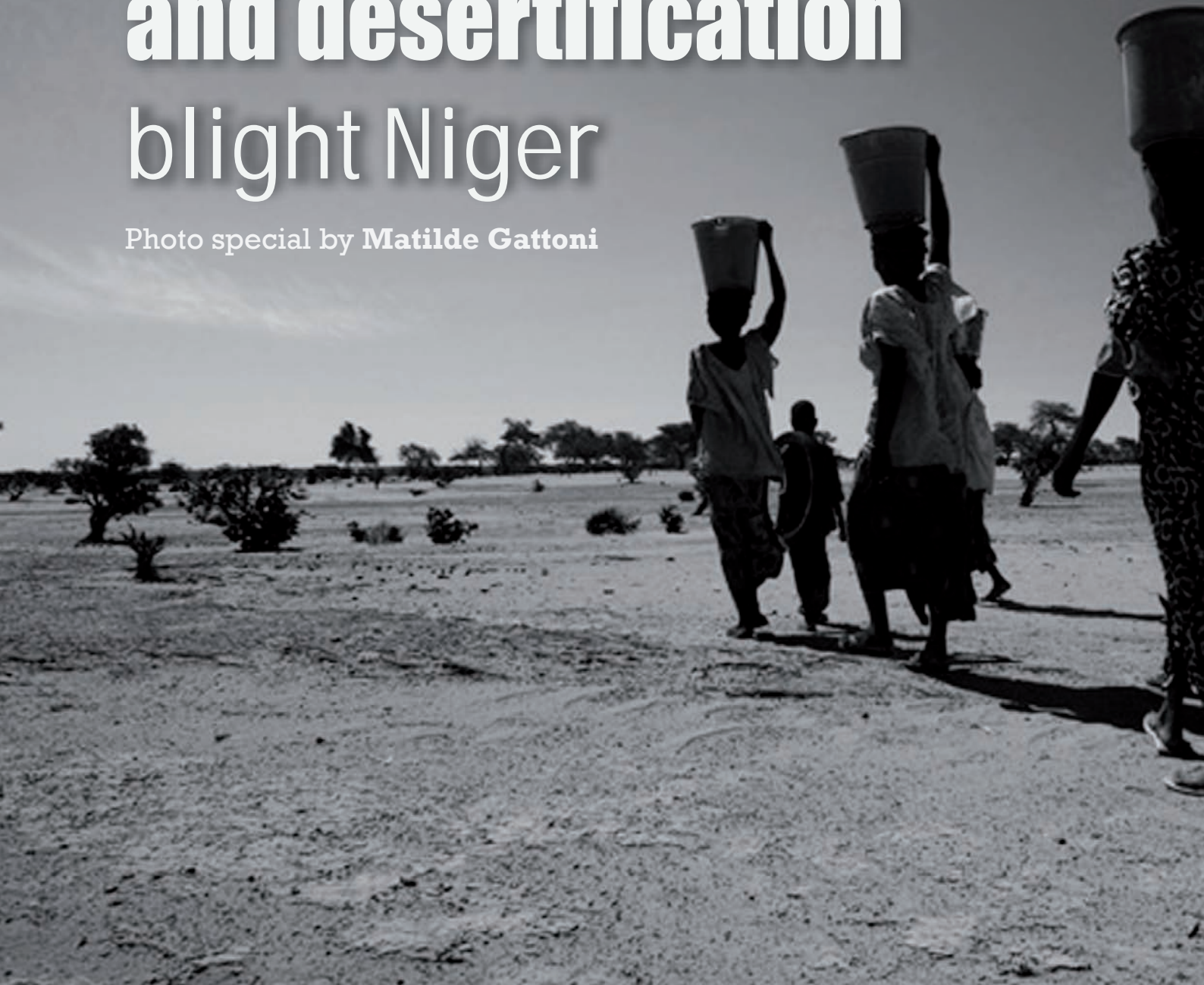
The Aerogenerator would have a number of practical benefits. The generating equipment should be much easier to access and maintain, cutting downtime and cost, and the stability of the design makes it well suited to floating platforms that could operate in deeper water where the wind is stronger. And critically the design also lends itself to much larger machines. 'Vertical axis machines are not limited by the strength of existing materials in the same way as conventional turbines', says Professor Feargal Brennan of Cranfield University Offshore Engineering Department.

Cranfield was part of a group of British universities and specialist engineering companies that helped Wind Power develop the Aerogenerator, with funding from the Energy Technology Institute (ETI), whose remit is to bring the cost of offshore wind down to the level of onshore. Wind Power is waiting to hear if the ETI will fund the next phase of detailed design work, but either way Bird plans to build a 1MW machine in 2012, and a wind farm of 5MW machines by 2015. 'It's a pretty whacky concept at first sight, but we've really kicked the tyres and we're very convinced it's plausible', says Professor Brennan. 'It could be a game changer'.

Maybe so, but there could be stiff competition for that title from superconductors and hydraulic transmission - and a rash of other developments. Clipper is developing the Britannia, a prototype 10MW machine with an improved gearbox that reduces loads by a factor of four; EDP of Portugal will test turbines on floating platforms this year; and Gamesa is leading a Spanish industry study to research the technologies needed to build a 15MW machine. While the challenges of offshore wind remain formidable, the industry is not short of ideas.

Drought, food insecurity and desertification blight Niger

Photo special by Matilde Gattoni



While the frequency of drought in the region is thought to have increased from the end of the 19th century, three long droughts have had dramatic

environmental and societal effects upon the Sahel nations. The Sahel forms the southern edge of the Saharan desert, passing at least 4,500km from Senegal through Mauritania, Mali, Burkina Faso, Niger, and Chad,

Famine followed severe droughts in the 1910s, the 1940s, and the 1960s, 70s and 80s, although a partial recovery occurred from 1975-80. While at least one particularly severe drought has been confirmed each century



since the 1600s, the frequency and severity of recent Sahelian droughts stands out. Famine and dislocation on a massive scale—from 1968 to 1974 and again in the early and mid 1980s—was blamed on two spikes

in the severity of the 1960-1980s drought period. From the late 1960s to early 1980s famine killed a 100,000 people, left 750,000 dependent on food aid, and affected most of the Sahel's 50 million people. The economies,

agriculture, livestock and human populations of much of Mauritania, Mali, Chad, Niger and Burkina Faso. The vast landlocked West African country of Niger faces an increasing demand upon its scarce water resources, the lack of which - when added to poor sanitation and hygiene - results in high levels of death and disease among its 13 million inhabitants. Many of them subsist on less than a dollar a day following traditional farming and livestock rearing in this harsh and uncompromising climate. Niger is one of the countries that form the Sahel Region which has seen recurring drought, food insecurity, and increased desertification over the last 30 years, a result - at least partly - of global climate change and overuse of scant natural resources. During the last two years, food insecurity and drought reached abnormally high levels, prompting a response from the international community and an intensive food security operation undertaken by the International Federation of Red Cross and Red Crescent Societies.

Matilde Gattoni is a French/Italian photojournalist based in the Middle East. She has travelled 9 countries (Eritrea, Niger, Indonesia, India, Tajikistan, Uzbekistan, China, Jordan, Yemen) to testimony about the water issues around the world covering topics like desertification, war, natural and ecological disasters, drought... Matilde started to work on this with the United Nations first and later with MSF (Medecins Sans Frontieres) and has decided to dedicate her career to this project.

In the coming weeks The Ecologist will be featuring more of Matilde's dramatic photo-essays online at www.theecologist.org



Many Niger inhabitants subsist on less than a dollar per day.

WATER

Recent droughts and food shortages have led to major operations from international aid outfits.



WATER

Daily life in Niger is frequently marred by poverty and hardship.







Climate change and exploitation of natural resources contribute to desertification .



Niger is just one of the Sahel nations facing serious problems over water resources





London 2012 Olympics:

Planning for the London 2012 Olympic Games is seeing a vast amount of construction work taking place.



Already hit by rows over radioactive waste and airport expansion, the London 2012 Olympic Games are accused of degrading green land vital to local communities and wildlife. **Tom Antebi** reports

When London won the bid to host the 2012 Olympic and Paralympic games it was, according to its advocates, intended to set a bench-mark in large-scale environmentally-friendly and sustainable sporting events, as well as acting as a significant hub for regeneration in North East London. The development of sports facilities, the influx of money during the Games themselves, as well as significant investment in the five Olympic boroughs: Hackney, Waltham Forest, Newham, Tower Hamlets and Greenwich; were all put forward as examples of this underlying commitment to a 'greener' Games.

In a statement on sustainability, the Olympic Delivery Authority (ODA) maintains that 'London is the first summer host city to embed sustainability in its planning from the start...we want to use the Games as a catalyst for change, for the regeneration of and improvement of quality of life in East London.' But already blighted by rows over radioactive waste and concerns over airport expansion, a number of further allegations surrounding the nature of the construction of the Olympic infrastructure - and its impact on local wildlife and green land - have been made, raising questions about the overall ramifications of the Olympics and whether they are in fact being 'green-washed'.

Green hotspots

In stark contrast to the rotting, disused industrial landscape where the stadium itself has been built, much of the wider area in which the Olympic Park is situated and the boroughs in general, are awash with marshes, allotments, meadows, floodplains, nature reserves and open green space.

Each of the five boroughs affected by the Olympics produced, during the last five years, a Biodiversity Action Plan (BAP). These BAPs provide detailed analysis of local wildlife bases with key habitats and species identified for particular attention. They also, with the exception of Waltham Forest, outline the number of Sites of Importance for Nature

what's the hidden cost to green spaces and wildlife habitats?



Conservation, or SINC, within the boroughs.

There are more than 111 identified SINC within the other four boroughs. Newham and Hackney have identified 56 and 30 priority or protected species respectively. Hackney Council told the Ecologist the borough consists of 42 per cent green space, including '24 hectares of woodland, 34 hectares of standing water more than 20 hectares of grassland and two hectares of reed bed.'

The BAP for Waltham Forest details, among other things, details 8-9 hectares of flood plain grassland, an estimated 16.5 hectares of marshland and 7 hectares of reedbed, almost all of which is located in the Walthamstow Marshes, a nature reserve and a Site of Specific Scientific Interest. Species earmarked in Greenwich include bats, black redstarts, hedgehogs, stag beetles, water voles and black poplar.

One area particularly affected by the Olympics development is the Lower Lea Valley, widely known as a green 'lung' for London, with the vein of the river Lea (or Lee) running through the middle. The importance of the valley for local wildlife cannot be underestimated, according to campaigners.

Mark Pearson, of the Hackney Wildlife Group, which collates environmental and biodiversity data in Hackney, said that not only is the valley home to many species, including kingfishers (who also breed along it), it is 'one of the top three or four migratory routes in London.'

In fact the valley forms a corridor for a number of migratory birds such as ducks, geese, warbles and thrushes. Kestrels and herons are also known to make use of this oasis. Pearson said the valley was a 'traditional route' and had been for 'hundreds of thousands of years.'

The valley constitutes a rest and

refueling space for these various migratory species, who would otherwise be forced to fly further afield. Yet despite its natural importance, this green lung, along with other areas with huge importance for local residents and critical to wildlife, is seeing degradation and disruption as a result of the games.

The Bully Point Nature Reserve, bought in 1972 by the Lea Valley Regional Park Authority, who landscaped it into its nature reserve form, is amongst the victims. 'Bully Point nature reserve, a secluded and very much loved area ... was bulldozed out of existence. It was... a haven for wildlife, but sadly no more' the Lea Valley Federation told the Ecologist. As well as being a reserve, the land was integral to a major community woodland scheme.

The reserve was removed in order to build the Velodrome arena, a permanent structure that will host

the track-cycling events. The legacy of the Velodrome will, according to its supporters, mean 'a new mountain bike course and road-cycle circuit will be added to create a VeloPark for the local community, sports clubs and elite athletes', as well as providing 'outreach' and 'community development programmes'.

In an official statement in relation to Bully Point however, the ODA claimed that 'extensive works were needed to remediate the land and eradicate the invasive species in the area. The redesign of the parklands in this area incorporates new wet woodland habitat, [and] will encourage biodiversity as well as foster greater recreation access.'

Broken promises?

Arguably the most publicised loss of community land due to the London Olympic development is the Manor Garden Society (MGS) allotments. The allotment collective found themselves in the middle of the planned Olympic Park, and consequently felt the sharp end of a Compulsory Purchase Order (CPO) driven through their 100 year-old plots.

At the time, the 1981 Acquisition of Land Act required that replacement land must be found for common land acquired by the ODA.

However, the MGS, which saw their plots destroyed in 2007, claim that their 'old site will be replaced by something far inferior in the future Olympic Park', and argue that the displacement of a plot 'so naturalised into the surroundings is a betrayal of the thousands of people on allotment waiting lists in the local area, who were hoping for a genuine example of sustainability and a response to local needs in the Olympic legacy.'

Although there is no suggestion of illegality or wrongdoing, opposition groups claim that the obligation to replace land swallowed up for Olympic purposes was later quietly dropped, meaning developers are effectively free to default on the

requirement in other cases arising from Olympic developments.

The Hackney Environment Forum (HEF), a network of local environmental groups in Hackney, including Hackney Marshes User Group (HMUG), claims that in the summer of 2003 the bidding company, London 2012, and the then Mayor of London Ken Livingstone, made commitments that 'no permanent or temporary structures would be built on Hackney Marshes.'

However, these commitments appear to have been broken, with one SINC – known as Arena Fields – destroyed to make way for a press and media centre and multi-storey car park, plus an arena for handball and food halls. Another, known as East Marsh, it has now emerged, will be used as a coach drop-off point during the games.

The ODA responded that 'After the Games, [East Marsh] will be reinstated with improved football pitches. There are no plans to undertake works on the Hackney Marshes other than East Marsh.' Hackney Council told the Ecologist that 'biodiversity enhancements have been designated for Hackney Marshes, including tree planting and habitat creation along the eastern fringe. The new Olympic Park is due to include areas of habitat creation to mitigate any loss, including Arena Field.' The authority acknowledged that although biodiversity enhancements have been drawn up in the ODA's own BAP 'it is not yet entirely clear exactly what and how [they] will [sic] be delivered'.

Disputed perceptions

The public body with jurisdiction over the Lower Lea Valley is The Lea Valley Regional Park Authority (LVRPA). In a statement on the loss of common green space within the Lower Lea Valley, the Ecologist was told: 'It has been estimated that a total of 42.47 hectares of SINC sites will be lost due to the development of the Olympic Park', but the ODA's

BAP has planned to replace this with '45 hectares of SINC standard land'. The legacy of the Olympic Park is designed to be beneficial for the area: 'The Parklands will comprise 102ha of open space... which will extend the area of open parkland into the Lower Lee Valley. This will support the regeneration of the Lower Lee Valley,' the LVRPA stated.

This view was echoed by the ODA, which said: 'Habitat proposals outlined in the [ODA] BAP were discussed with the other key biodiversity partners including Natural England, Environment Agency, London Wildlife Trust, British Waterways, Lee Valley Regional Park Authority.'

When asked how this work will support the Lower Lea Valley, the ODA said: 'Much of the former open space was fragmented, of relatively poor quality, had poor access, or was not publicly accessible.'

Annie Chipchase of the HMUG responded to this by saying: 'It is far from the reality. There was a large amount of publicly accessible open space on what is now the Olympic site, much of which was not 'fragmented'...the Bow Back Rivers provided a network of towpaths, which had been opened up in the 1990s.'

Although the jury may still be out in relation to the overall, long term, impacts of the London Olympics, these claims do little to encourage confidence in the Games' eco-credentials, say campaigners, who also point out the less-than-shining environmental and social legacy of other Olympic events globally.

Useful links

www.gamesmonitor.org.uk
www.london2012.com