ECOLOGIST
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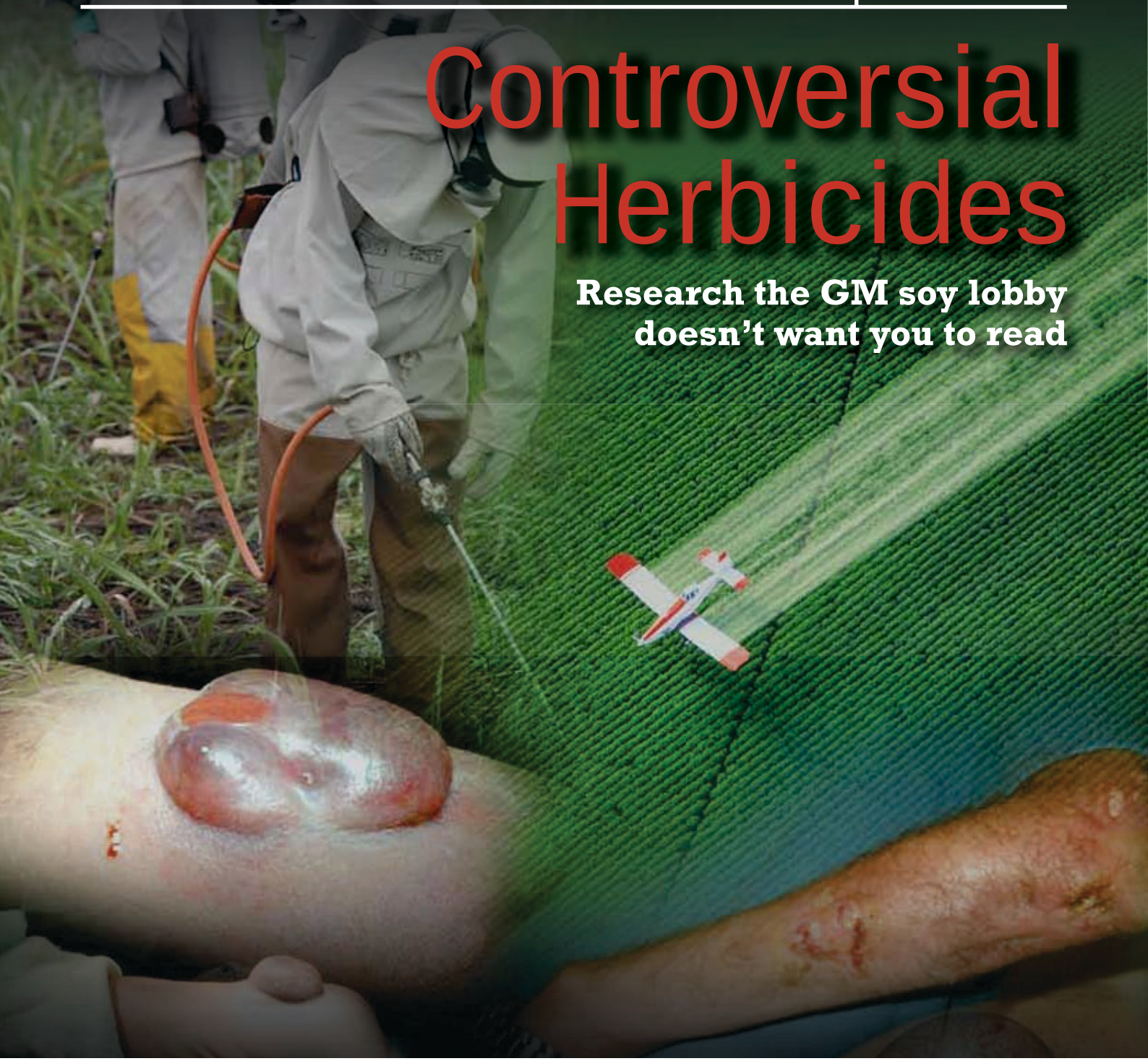
Controversial Herbicides

Research the GM soy lobby doesn't want you to read



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Energy intensive...

At the time of writing the Cancun COP 16 climate talks are still underway in Mexico, with the now familiar merry-go-round of never-ending discussions, arguments, empty pledges and broken promises. After the spectacular failure of last year's Copenhagen summit – widely agreed to have achieved virtually nothing and at times bordering on high farce – the Ecologist took an editorial decision to largely leave day to day coverage of its much-hyped follow up to others.

Whilst the world's attention is focussed on Mexico, we've drilled into another developing catastrophe – the rapid advance of hydraulic fracturing (or 'fracking' as it has come to be known) in the scramble for natural gas reserves. The process is currently used in many natural gas wells in the US, and involves millions of gallons of water, sand and chemicals being pumped underground to break apart rock formations and release gas reserves. As our ground-breaking investigation and film show, the technology is now being linked to serious ecological and social impacts in regions bordering fracking sites.

Experts and ordinary people alike have mobilised in their droves to oppose this fracking that is sweeping across the US at an unprecedented rate. In response, the gas industry has ploughed huge resources into convincing the American public – and politicians – that the technology is clean and safe. Despite this growing controversy brewing on the other side of the Atlantic, we have established – alarmingly – that energy companies are scrambling to secure licenses to roll out fracking projects across Europe.

Exploratory drilling or other preparatory work is now underway in Poland, Sweden, Denmark, Spain, Germany and the UK, among others. Here, a little known company called Cuadrilla Resources has completed a test well in the 'Bowland Shale' formation between Pendle Hill and Blackpool in Lancashire. Other similar developments are in the pipeline.

The timing of our release of their report and film couldn't be more crucial – the influential House of Commons Energy and Climate Change Committee have recently announced they are to launch an inquiry into the UK's shale gas potential. Their recommendations will hold much sway in influencing future decisions about hydraulic fracturing in the UK – we hope they watch our film.

Sticking with energy matters, we also carry an in-depth report this month examining claims that uranium mining in the US is linked to serious illnesses amongst indigenous communities living nearby. We also investigate the growth of factory farming in Egypt; probe the disturbing but little-researched links between deforestation and disease spread; and – closer to home – report on how some of our leading food retailers are grappling with the sticky issue of food packaging and how to avoid excess waste... I hope you enjoy our unique reportage.

Andrew Wasley, editor

Front Cover: Crop spraying from the air is blamed for some of the health impacts of glyphosate use.

US natural gas drilling boom linked to pollution and social strife

The gas stored in the Marcellus Shale formation is the subject of desperate drilling to secure US domestic energy supplies. But the process involved - hydraulic fracturing - is the focus of a bitter dispute over environmental damage and community rights. Jim Wickens reports

It is a timeless patchwork of small dairy farms and endless hills, emblazoned with the blood-red tints of an autumnal Pennsylvania forest. Set against this sleepy backdrop, however, the constant convoys of water trucks rumbling along the deserted country roads suggest something profound is taking place. This is 'fracking' country, the latest frontier in America's desperate search for fossil fuels.

Pioneered by companies such as Halliburton, high-volume horizontal slickwater fracturing – otherwise known as hydraulic fracturing, or simply fracking – involves the drilling of horizontal wells that are then injected with large volumes of water, sand and chemicals at high pressure to open up rock fractures and help propel rock-trapped gas back to the surface. For landowners, those in the gas industry and governments of cash-strapped US states that find themselves sitting on the gas-rich lines of the Marcellus Shale rock formation, this new technique has opened up lucrative opportunities and created a rush unseen for decades. Vast reserves of previously untappable natural gas, perhaps in excess of 50 trillion cubic feet of gas, can now be extracted on US soil, and the arguments used by advocates of fracking seem impressive.

'It's almost divine intervention. Right at the time oil prices are skyrocketing, we're struggling with the economy, we're concerned about global warming, and national security threats remain intense, we wake up and we've got this abundance of natural gas around us,' said Aubrey McClendon in 2008, CEO of Chesapeake Energy Corporation, one of the leading gas companies drilling today.

Fracking is currently taking America by storm. In Pennsylvania alone, government estimates predict that 3,000-4,000 new wells will be drilled each year for the next 30 years. And America is not alone: test sites have already been set up over gas-holding shale formations in Poland, France, England and Germany. So

where is the catch, and what can these European countries expect? The Ecologist visited Pennsylvania to find out.

Little Texas

'They call us little Texas,' says Norma Fiorentino, speaking in her low-rise bungalow in the sleepy community of Dimock in northeast Pennsylvania. Dimock has become notorious in fracking circles because more than a dozen households here lost their drinking water – in Mrs Fiorentina's case, her well exploded in the middle of the night – as a result of a methane buildup in 2009. 'When they came in and drilled, there was so much more truck traffic, dust, noise, lights,' she says.

Like others in the community we spoke with, she now relies on bottled water to drink, unable to touch the water that comes from her artesean well. 'Mine was never black, it was like an orange colour and it smelt of dirty socks. It would smell of diesel fuel.' Pressured into selling her mineral rights by aggressive landsmen several year ago, today she mourns the loss of the water that she once took for granted. 'A geologist told us it would be 200-300 years before we got our water back. It makes me very mad because my life is over without my water.' Hers is not an isolated case.

In Bradford County, Truman Barnett's home has all the trapping of a rural hideaway. Deer antlers adorn the side of the house and a US flag flies gingerly over the carefully tended doorstep. But the serenity is broken by a low vibration, a nagging hum that churns the stomach. It is a disorientating experience. The source of the disturbance is a gas well constructed a couple of hundred metres from his home, and the unpleasant vibration is a 24-hour reminder of the compressor that whirrs away on the site.
'The only thing you heard at night-time was your heartbeat. Now it's just totally devastated here. Inside my home you can hear and see the pictures vibrate on the walls,' he says. There have been two spills on the site above him to date, plant life and pond animals on his land have reportedly died, and the impact on his family has been profound. 'Our drinking water and our house has high concentrations of lead, they've told us not to drink it and don't bathe in it… from our heaven it's turned into our hell.'

Halliburton loophole

Fracking involves the use of huge volumes of water and a potent cocktail of chemical ingredients that are pumped underground to assist with the process. What isn't known, however, is exactly which chemical combinations are actually being used, a confidentiality that is enshrined in national law. Referred to affectionately as the 'Halliburton loophole', in 2005 the Bush administration effectively exempted the gas industry from a number of federal acts that would have enabled critics to clamp down, regulate and scrutinise the gas industry; and specifically, understand the precise nature of the chemicals being used in fracking processes.

It is a situation that exasperates healthcare professionals and local citizens alike. 'Am I comfortable with an industry that won't disclose and tell me, as an American citizen, what they're putting underneath my feet?' asks John Lykens, an engineer from Bradford county. 'Absolutely not. They're exempt from the Superfund Act, the Safe Drinking Act, the Clean Air Act, the Clean Water Act… environmental acts that were put down to protect everyday citizens.'

When the Ecologist spoke with the Marcellus Shale Coalition, a group representing the gas industry, it stated that only a tiny percentage of the liquids going into the ground – less than 1 per cent overall – is 'chemicals', and that although some biocides are used, others are the same as those found in everyday ingredients such as peanut butter.

But for industry professionals such as Jim Northrup, this kind of PR statement is simply misleading. 'Do the math on that. That means that there's 5,000 gallons… of toxic chemicals that goes into each well. Some of the fracking fluid is more toxic than others, but the fact is that none of these chemicals is potable. You know methanol, hydrocholoric acid, athalyne, glycol. I mean, when someone tells you that it's like peanut butter then you just shake it up in some milk and you ask them to drink it.'

For Northrup, a major worry is not just the chemicals that go into the ground but the potential disposal of them when the frack-water resurfaces. He claims that 'in addition to the fracking fluid, which we know is toxic… the frack flowback leaches radium out of the shale. The level of radium in the Marcellus is about 276 times the safe disposal limit. Meaning it'll kill you… you are looking at as much as four million gallons of flowback that comes out of one pad site and you got to have a place to get rid of it.'

Pollution fears

Research has calculated that in Pennsylvania each fracked well requires an average of 592 one-way truck trips, with each truck commonly weighing more than 80 tonnes. As Northrup observes, there are more than 11,000 disposal wells in Texas, but in the temperate geology of a state such as Pennsylvania, only a few disposal wells exist, so much greater distances must be driven over trickier terrain. 'This is like taking

that rough and tumble, highly industrialised activity and plopping it right down in the Cotswolds. Maybe not such a good idea… the amount of fluid running around out there, literally, in tanker trucks, you know thousands of tanker trucks, is such that one doozy going off the road, with fracking chemicals in it, into a river, would pretty much wipe it out.'

In Pennsylvania, that river is the Delaware, water source for 16 million people, including much of the population of New Jersey and New York. For this reason alone, New York State currently has a moratorium in place on fracking until further research is carried out. Up the river in Pennsylvania, however, a cash-strapped state with rural pockets of chronic unemployment, the seductive lure of fracking rigs is currently too big an opportunity to turn down. And it is clear that the dollars, like the trucks, are starting to roll in. Hotels are fully booked, cafés have higher takings and some of the landowners that the Ecologist spoke to expressed excitement about the potential gains from mineral-leasing on their land, explaining how it might offer a way out of debt-ridden dairy farming.

But for organic farmers like Carolyn Knapp, close to the town of Towanda, the opposite is true. 'As an organic farmer I don't feel that they should be allowed to put chemicals into my ground. Chemicals that I feel can do harm to my family, to the people around me, and I feel violated.' Stories of misleading landmen trying to lure mineral rights from unsuspecting farmers are commonplace. What has really shocked Carolyn isn't just what she has given up in selling mineral leases on her land, but who she has effectively sold them too.

As she explained, from the topsoil downwards, every portion of the rock strata on her organic farm has now been divided and repeatedly resold by the company she originally leased it to, so that individual investors in Australia now have financial interests in one particular subsurface rock formation, while a Chinese company now owns the rights to mine for coal. 'The way I look at it now is that I didn't lease my property, I sold my property. I sold the subsurface… we're talking about years of people extracting whatever minerals they want from our land whenever they want.' Even if Carolyn had refused to lease her mineral rights, a law on the statute books ominously known as 'forced pooling' looks set to compel landowners to allow gas extraction from under their land where the majority of surrounding landowners are in favour of fracking.

Threats and intimidation

But in some cases, a law may not be needed at all. With million-dollar mineral leases at stake, and the much-heralded prospect of economic regeneration, voices that

speak out against the dangers of fracking are frequently met with hostility or worse. The Ecologist met with John Trallo, an outspoken opponent of fracking, outside his home in Sonestown, deep in the hills of Sullivan County, northern Pennsylvania. During the interview an industry gas truck drove slowly past John's home and the passenger used his hand to imitate a gun against the window as it rolled on by. 'I refused this guy access to my land,' John says, 'and since then he has repeatedly threatened me, even showing me his gun and saying how he will shoot and bury me down a well with all the gas.' John was clearly distressed by the threat that had been made to us during the interview, but not defeated. 'I mean this is what is happening to our community; frankly this kind of behaviour says it all.'

After a week investigating the impacts of fracking on rural Pennsylvania, it's clear that it's not just the land that is being fractured but perhaps the communities as well. What were once sleepy towns are now clogged bumper-to-bumper with water trucks carrying water containers and fracking chemicals to and from the thousands of well-sites that increasingly dot the landscape. As one diner owner dryly observed to the Ecologist: 'If these trucks were all painted green, you would think we were being invaded.'

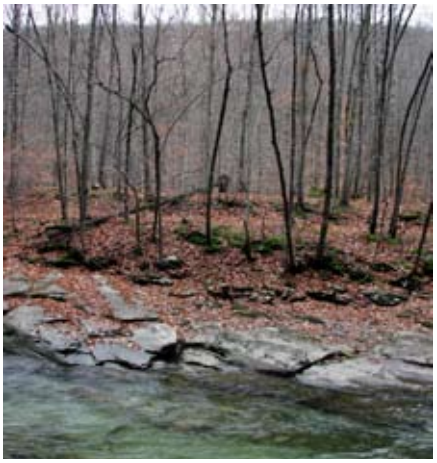
Stories of group fights and tension in towns caused by the so-called 'gashole' employees are told bitterly by town residents, shocked at how quickly their rural idyll has changed. The impacts stretch beyond bar brawls, though. In 2010 alone, it was reported that more than a dozen children around the small town of Towanda had been put into foster care, their families turfed out of low-rent accommodation by unscrupulous landlords to make way for gas-industry employees who are able to offer higher rents. 'The feel of the place has just changed,' remarked Tom and Amy, a couple from Towanda, lifelong local residents who have recently put their house on the market and are looking to move away. 'Greed is ugly and greed is rampant in Bradford county today.'

Beyond the conflicts raging inside Pennsylvania's border, however, advocates of shale-gas extraction point to the benefits that fracking will bring to the whole country, helping to wean the most energy-hungry population in the world away from a reliance on both foreign energy supplies and unsustainable sources of energy, such as oil and coal.

Economic benefits

Research has found that 1.52 full and part-time jobs are created for every oil and gas industry job that is established in the state. And in the midst of the worst economic downturn for 75 years, where as many as 70 per cent of people in some areas of Bradford county may be on state assistance, statistics such as this are very persuasive indeed.

Like many young men in Bradford Conty, Dustin was lured by the high wages on offer to work on drill pads but has since had a change of heart: 'I was getting paid $16 an hour... so it's all about the money I guess... Money talks. The way I feel about the gas industry is, I mean, yeah, they're giving people jobs, but look what they're doing. They're destroying somewhere I've lived for 21 years of my life and will probably live for the rest of my life. I don't want to see it turn into a wasteland.'



Professor Anthony Ingrafea, one of the world's leading experts on fracture mechanics, based at Cornell University, told the Ecologist: 'Oil and gas are not interchangeable. We are not going to decrease oil imports by increasing gas production. Whereas the national energy plan that says over some period of time, 20 years maybe, at most, we are going to downplay and downsize the use of coal and increase the use of natural gas in what are coal-fired power plants. That would be a great thing to do, except 20 years from now we're now out of natural gas... then what are we going to use for electricity? Natural gas burns cleaner than any other fossil fuel, but it is not cleaner in its lifecycle. The lifecycle cost, in terms of carbon dioxide emission, and methane emission, from the development of gas from unconventional sources like shale is at least as dirty as coal.'

For Ingrafea, there is an overriding urgency to slow down the fracking rush. 'I'm not anti-oil and gas. What I'm against is an industry that is so out of control in using a new technology that does not have proper regulation, and enforcement of regulation, that they're riding roughshod over a large segment of the population.'

As drilling rigs begin shale exploration across Europe the conflicting experiences of Pennsylvania offer a stark warning to communities and governments this side of the Atlantic. As Norma Fiorentino predicts: 'Your beautiful countryside will never be the same. Your peace and serenity will be gone. For a few bucks, and basically,

Shocking legacy of 'uranium poisonings' haunts Obama's looming mining decision

Despite disturbing claims about the impact of uranium, ten-thousand proposals for exploration in the Grand Canyon area have been submitted. A key fuel for nuclear power, the US must now decide between full scale uranium mining, partial mining or a twenty year moratorium. Leana Hosia investigates

Standing on the rim of the Grand Canyon it's easy to see why it's is called the crown jewels of the United States and a wonder of the world. Millions visit each year, generating some $600 million in tourism revenue. But a new wealth has been discovered here: America's largest concentrations of high grade uranium - the fuel for nuclear power. In his energy policy President Barack Obama said 'it is unlikely that we can meet our aggressive climate goals if we eliminate nuclear power as an option.'

Last year ten-thousand claims for exploration in the Grand Canyon area were submitted and the government decides next year between full scale mining, partial mining or a twenty year moratorium.

Mineral interest is not new to Arizona. The Spanish came in the 1500s looking for the legendary cities of gold, but found only the mud-walled homes of the indigenous people. Then in the 1800s rush Jake Snively struck gold in Arizona. Geologist Jim Rasmussen works for the uranium industry: 'I fill the niche of the old prospector with the mule, the gold pan and the hammer wandering around the desert. The difference is I drive a pick up and have more technical tools.'

On the plateau The Ecologist followed the cow tracks to the

site of the old Hermit mine, which was exploited in the 1980s. Jim explained how the uranium deposits are searched for by air. The uranium in Arizona is found in breccia pipes - long vertical deposits underground which form a circular depression on the surface. Not all breccia pipes will contain uranium, but when they do the deposits are rich. At the site you couldn't tell there had ever been a mine there. But it's the invisible levels of radiation that causes concern. At some reclaimed mines, such as Kanab North, levels ten times higher than normal were found by government scientists. The central issue is this: in the process of mining could uranium contaminate the area and ground water? The Colorado River supplies drinking water to about 30 million people and uranium is a known toxin. The US Geological Survey (USGS) has been investigating the risks. Geologist Jim Otton says 'there is no question that when you start mining the levels of contamination rise.'

Exposure

When uranium comes into contact with oxygen it oxidises and becomes soluble in water, which increases the chance of contamination. Radioactive dust can also be blown away by the wind or washed away by rain. USGS adviser, Andrea Alpine, sums up the dilemma: 'The problem the government is facing is to try and protect the Grand Canyon, but from our estimates about 40 percent of the nation's uranium is in this area. If mining goes ahead water sources should be monitored. In the past uranium was left on the surface. Now if you went over and picked that up that's not a danger, but if you were exposed to it day in and day out, or if it leeched into nearby ponds of water that would be bad.'

That bad outcome occurred on the nearby Navajo reservation. From 1944 to 1986 nearly 4 million tons of uranium ore was blasted from the canyons and plains to fuel the Cold War arms race. The Navajo were told it would provide jobs and they would be serving their country. They were not told about the dangers, it is claimed, despite apparantly known links between radioactive radon gas emitted from uranium and lung cancer. The US government launched a Public Health Study in 1951 into radon levels and miners' health, but according to criminologist Linda Robyn from Arizona University, 'mounting evidence of the dangers of uranium and warnings from public health service physicians were ignored by mining companies and the government.'

Many of those miners have now succumbed to cancer or other illnesses and died. Factors other than uranium could account for at least some of these illnesses but the finger of suspicion has been repeatedly pointed at uranium mining.

According to David Michaels, Head of Occupational Health and Safety in the Obama administration, the Atomic Energy Commission knew that miners on the Colorado Plateau received some of the highest doses of radon ever recorded. Linda Robyn says that 'what happened on the Navajo reservation amounts to a state-corporate crime.'

All the companies that were operating there at the time have now ceased to exist.

But the miners were not the only ones to suffer. In the 1950s cancer rates were so low on the reservation that a medical journal published an article titled 'Cancer immunity in the Navajo'. That so called immunity no longer exists. The US Environmental Protection Agency (EPA) says 'the legacy of uranium remains, including over 500 abandoned uranium mines as well as homes and drinking water sources with elevated levels of radiation. Potential health effects include lung cancer, as well as bone cancer and impaired kidney function.' Piles of radioactive waste have been dumped on the reservation.

Cancer

The open pits and shafts filled with rain water, which resident Milton Yazzie remembers swimming in with his friends. At the age of 50 he's been told he's not got long to live. 'It's something to do with my pancreas. The doctor said it's not something that can be cured, so I just call him doctor doom.' Milton lost his sister seven years ago to kidney cancer: 'she would have been 51 at the time and it was really painful for her. Then a month later my dad died of kidney complications. He had been a uranium miner, but he was never able to complete the medical tests to prove his illness so we never got compensation. His lungs were so bad that he couldn't breathe into the ventilator - he'd just pass out. One night he died in my arms. My older brother knew he didn't have long to go and followed him soon after. That was a real wake-up call for us that something is really wrong here.'

Assistant professor of biology, Dr Lee Greer, from Sierra Nevada University, explained to The Ecologist how uranium poisoning occurs. 'People ingest it, breathe it into their lungs or it gets absorbed through the skin from bathing. Then it starts bombarding tissues and causes wild uncontrolled cell growth like cancer, gets into the bone marrow and leads to leukaemia. If it penetrates the reproductive tissue, like the ovaries or testicular tissue, then children can have birth defects. With ongoing chronic exposure this can be passed on from generation to generation.'

We spent the whole day driving through desert scrub land, taking geiger counter readings that measured hot spots by the sides of the road, old mine sites and in people's homes. Because of poverty people used material from the abandoned mines to make home improvements. The EPA have started to assess uranium levels in 500 homes and schools through a five-year plan set to end in 2012. But they say the problem is so widespread it will take years to address.

State of emergency

Water is life, but to the Navajo it's begun to be associated with death. 'I would never have fed that to my children if I had known,' says Rolanda Tohannie. According to scientific studies done by the Southwest Research Information Center many of the underground springs that the Navajo have always depended on have some levels of uranium contamination caused by uranium mining and milling. The situation has reportedly become so bad that the Navajo government recently declared a public health state of emergency.

According to the EPA 30 per cent of people here have no access to safe piped water so families like Larry and Rolanda Tohannie's still use springs suspected of being contaminated. Larry was not informed by the authorities that the water may be contaminated and only found out when he attended a meeting held by a local grassroots group called The Forgotten People. 'My wife has had thyroid cancer. She's recently had a ten pound growth coiled around her intestines taken out. Our children have cysts on their bodies. They're big enough that the doctors don't want to remove them because they say it's going to damage the nerves around it. But the cysts are still growing.' Larry told me about other neighbours who are also suffering from cancer, including 41 year old Pauline Lefthand who I had arranged to meet. But she died the morning of our interview - from cancer.

Photo: Leana Hosia

Rolanda and Larry Tohannie outside their home on the Navajo Reservation. They are forced to rely on spring water as there's no safe piped water available for them. Photo: Leana Hosea

Because people didn't know the causes of their illnesses they came to feel as if they were cursed. 'I always wondered what was wrong with the sheep. They were born without sex organs and they couldn't walk on their hooves, but hobbled on their ankles', says David Neztsosie. But the real horror started when his two younger sisters started to loose the feeling in their legs and their feet and hands started to curl inwards. 'They would crawl around on their knees. In the end they were bed ridden.' Doctors couldn't find a reason for these birth defects which only afflicted Navajo children. So in the 1960s, without considering any environmental factors, they declared it was a genetic disorder and named it Navajo Neuropathy.

The cause of Navajo Neuropathy is still unknown, but evidence now suggests it may be caused by pregnant women drinking uranium contaminated water.

Compensation

David's mother had used an abandoned open pit mine that had filled with rain when she was pregnant with her girls. Navajo Neuropathy is not a compensable disease under the federal Radiation Exposure Compensation Act. 'It's so hard to get compensation. The authorities knew the water was contaminated, but we are just Indians - we're like perishable food to them.'

The question now is could contamination occur again in a new mining phase? The Ecologist visited the sole currently active uranium mine in Arizona run by Canadian company Denison Mines Corporation, near the Northern rim of the Grand Canyon.

There is no suggestion that the company is responsible for any wrongdoing or involved in, or linked to, any current or previous contamination.

Harold Roberts, Vice President of the mine, is adamant the risk are minimal for what the benefits are worth and the industry has learnt a lot over the past fifty years: 'we go to great lengths to ensure the safety of our employees.'

Large fans pump clean air into the mine and suck out most of the poisonous radon gas. However, when I went down into the mine, none of the miners appeared to be wearing masks and had uranium ore all over their hands and faces. 'It washes off,' said 28 year old Cody Behuden, licking his ore caked lips. When I put it to Harold Roberts that miners may be ingesting uranium, he insisted there was no danger in that and pointed out that the mine was watered to minimise dust and prevent it being breathed into the lungs. The miners didn't seem too worried about the toxicity of uranium.

Mining foreman Dustin Nielson took a radiological reading of the ore, which told him the uranium concentration was high. 'When it's like this and it probes 2 per cent, it makes you want to take your clothes off and wallow around it in!'

Safety net

Back on the surface Harold Roberts assured me that when accidents have happened in the past they are cleaned up swiftly and effectively. Once the ore is mined it's trucked to the milling site in Utah, where the uranium is extracted with acid. The product is yellow cake and this is what is used in nuclear fuel rods. The by-product, called tailings, is 80 per cent more radioactive than yellow cake. Thousands of tons are buried in containers lined with 60mm of plastic with drainage layers. Regulations dictate the company must design the facility to last not less than two-hundred years. If Denison Mines doesn't last that long Mr Roberts says the company is bonded, so the government has some money as a safety net.

Employment in the depressed US economy is a hot topic and Roberts is keen to point out that the mine employs 30 miners with a further ten employed in ore transportation. The life of a mine is about five to eight years and he hopes to have several mines operating in sequential development. The previous uranium boom ended when the bottom fell out of the uranium market in the early 1980s, partly due to American public opinion turning against nuclear power because of a major accident at Three Mile Island nuclear plant. Mining towns were left depressed and some locals are keen for the work.

But the mine is not welcomed by all locals. Carletta Toulousi and Dianna Uqualla are members of the Havasupai tribe, who have always lived in the and around the Grand Canyon. 'The Havasupai and other Native American tribes consider the Grand Canyon a sacred area and we are trying to protect it,' Dianna Uqualla says. 'We need to slow down our industrial development if we are going to survive, not furiously try to maintain our current way of life ignoring all the costs.'

The current mines are on federal lands and not on the reservation. But Carletta Tilousi argues: 'my people live on the bottom of the Grand Canyon and our water source comes from the rim. Mining companies are pursuing uranium for their own profit, but the only benefit that we are going to get is a source of contamination that will not be possible to clean up. We are concerned about the future of our children, that's why we fight this.'

ASDA and Marks & Spencer lead assault on packaging waste crisis - but will it work?

As UK supermarkets scramble to reduce packaging in the face of growing legislation and consumer demand, **Aimee Steen** talks exclusively to those tackling the problem at high street stores and asks what role customers have to play

Some of the UK's largest retailers are taking steps to reduce waste from product packaging - but is it enough?

There's not much a joint of beef can do to be offensive. Unless you're vegetarian, in which case steering clear of the meat aisle in the supermarket is probably the best option. Lincolnshire trading standards, however, did have a problem with a Sainsbury's Taste the Difference joint. It wasn't too big, it wasn't too small, it wasn't claiming it was delicious when it actually didn't have much on a bog-standard burger. It simply had too much packaging.

It was a landmark case, believed to be the first packaging prosecution brought against a major supermarket, but it was dropped just before it was due to be heard in October 2010. Lincolnshire council decided that the offending product had, in fact, had its packaging sufficiently reduced. Sainsbury's claimed that the product's packaging had already been reduced by 53 per cent and would be reduced by a further 10 per cent. All in all, we will never know whether the case would have been successful.

These days, packaging is everywhere. Whether it's a simple foil wrapper for your crisps, a plastic bottle for your fabric softener or an elaborate construction for your beef joint, it's difficult to buy much these days without wading your way through layers of plastic and cardboard. Packaging for food and household goods is clearly a huge contributor to waste worldwide, and legislation exists to try and reduce that waste – though it has had very few challenges in court. But what is actually being done to reduce packaging? What does it take to make what protects products that little bit greener?

In a world where large companies face increasing pressure to green up their business practices, it's little wonder that supermarkets and brands alike appear to be making an effort to reduce the packaging on their shelves. Given that customers question the need for plastic bags, the environmentally savvy consumer naturally queries whether large amounts of packaging are needed too.

Reduced packaging

Some companies have visibly stepped up their game, with high profile advertising campaigns to boot: Persil and Kenco have both shouted from the rooftops about their reduced packaging options, and the supermarkets say they're working away behind the scenes. Still, the day where we all keep one jar for coffee and buy refills doesn't - at the moment - look likely to be in the near future.

Supermarkets, suppliers and packaging companies all have a role to play in reducing packaging. The issue divides broadly into two parts: reducing the amount of packaging used in the first place, and ensuring that the packaging which is used is recyclable.
The problem, according to one industry expert, is streamlining that process through the whole supply chain. Jane Bickerstaffe, director of the Industry Council for Packaging and the Environment (Incpen), says that unless everybody in the chain knows what's going on, it's very difficult to meet environmental objectives.

'Unless you get everybody from that chain in one room, nobody knows exactly why packaging is the way it is,' she told The Ecologist. Incpen argues that everybody has different needs and requirements: the manufacturer may need a certain strength of raw material to be able to safely hold the product, the delivery team needs to get a certain amount into a lorry, and the warehouse has to store the items within its physical constraints. It is these real world issues that make reducing packaging a much more complex problem.

From a store's perspective, it would seem to make economical sense as well as environmental: less packaging means less weight, leading to lower transportation costs and increased profitability. There is obviously some outlay in redesigning packaging, and that decision will be weighed up by each individual company.

Intelligent approach

One company which designs environmentally friendly packaging is A.M. Associates and, according to creative director Laurel Miller, the cost of introducing such packaging doesn't have to be high. 'Using less material in an intelligent way can reduce the cost of packaging as well as protecting the environment,' she says. Having designed low impact packaging using only recycled or recyclable materials for Tesco, John Lewis and Mothercare, the company views the issue of reducing packaging in a slightly more holistic manner as well.

'Using sustainable materials

protects against deforestation, and using only recycled or recyclable materials makes the most of the materials that are already in existence, thus reducing the demand for more materials to be produced,' explains Miller.

Dr Helene Roberts, head of food packaging at Marks & Spencer, agrees that considering the bigger picture can actually lead to a reduction in costs. In launching Plan A, their aim to become the world's most sustainable retailer, M&S estimated an initial outlay of £200m. 'Actually, what we found was that when you really do make sustainable decisions, you can actually save money through various activities,' she says. An annual saving of around £50m, in fact.

There has to be some driving force behind big companies changing the way they operate, and one of those forces is strictly political. The government has been legislating on packaging for over 30 years and membership of the EU has created another environmental agenda to comply with.

Legislation

UK legislation in the area states general aims, but is certainly open to interpretation. Firstly, the Packaging (Essential Requirements) Regulations 2003 requires that all packaging is minimised, and that it can be recycled and recovered. It is up to each producer or supplier to apply this as appropriate to their operations, and is subject to the safe packaging of items.

The Producer Responsibility Obligations (Packaging Waste) 2007 then hits the big players: all UK companies with a turnover of over £2m, or those who handle over 50 tonnes of packaging a year, must reduce packaging.

Overarching both of these is the European legislation, the European Packaging and Packaging Waste Directive (2004). This sets targets for the reduction of packaging waste, reviewable every five years, in relation to both recycling and recovery. According to the Department for Environment, Food and Rural Affairs (Defra), the UK met the last target in 2008 with the recovery of around 65 per cent of packaging waste. In contrast to the 1998 level of 27 per cent, this is a positive move; however, more can still be done, and targets for the years up to 2020 are due to be set following consultation.

Bodies such as Defra and the Waste and Resources Action Programme (WRAP) work with the industry to improve packaging sustainability, and voluntary agreements such as the Courtauld Commitment compel retailers to act within set targets. Laws and agreements are laid down, but prosecutions are few and far between.

Consumer power?

Criminalisation is not necessarily the way forward, but packaging laws weigh heavily on the views of the consumer. The minimum packaging must be used 'to maintain the necessary level of safety, hygiene and acceptance for the packed product and for the consumer'; does this place too much emphasis on what the consumer thinks, rather than what manufacturers should actually be doing?

Putting the onus on the consumer isn't necessarily the best idea, according to Incpen's director. 'Consumers have been told that packaging's a big environmental issue and therefore they are responding to that by saying, "what are you doing about your packaging, retailers?"' says Bickerstaffe. 'I'm not sure that they are right to think it's such a big problem, and I don't think they're in a good position to say, well, that's too much and that's enough. I think as an industry, across the board, we need to do a much better job of explaining what the packaging's doing there.'

Bickerstaffe points out that the potential wastage of food is actually a bigger problem than the waste packaging produced. 'If you're buying a cucumber and you're going to eat it tonight, you don't need any wrapping on it,' she points out.

'But if the shop's cucumber doesn't sell for three days, then they are quite sure that the one that's not been wrapped will not sell because it will have lost so much of its water content, it just looks dull and it doesn't crisp anymore. So a little tiny bit of plastic on it extends that shelf life for 14 days. When you think of all the resources that you've invested growing a cucumber, and the energy in moving it around the place, it's a good use of resources.'

It's a sentiment echoed across the industry. Asda's head of corporate sustainability, Julian Walker-Palin, says that in its parent company Walmart's Indian operations, 40 to 60 per cent of product can end up as waste before it even reaches the

consumer as supply chains are less efficient. So, he points out, it's a question of optimisation. 'There's a lot of inefficiency and a lot of waste of resources in packaging,' he says.

Each supermarket is approaching the issue of packaging in different ways, and Asda, in association with WRAP, has recently run a trial on in-store vending machines for fabric conditioner. Customers at five stores could get a reusable container for the product, which they would then bring back to the store next time to refill.

Measuring waste

The supermarket is currently analysing feedback, but Walker-Palin says the response has been largely positive. 'Most of the customers we've spoken to bought into the trial for environmental reasons rather than purely the economic reasons, and I must admit, I expected the opposite,' he says, alluding to the fact that they ensured it was the cheaper option to go green. He acknowledges, though, that such a scheme could not be rolled out en masse: 'We can't ask our customers to come back with 50 different types of packaging to refill.'

The way that waste is measured could be set to change, however. Past targets have generally been based on weight of the packaging, whereas a general consensus now suggests that this is not the best option. 'If you solely focus on weight, then you can reach a bit of a glass ceiling,' explains Walker-Palin. Initial consultation for future guidance from the government outlines aims related to total carbon emissions rather than waste by mass, which could change how the whole idea of reducing packaging is viewed.

Reducing packaging and providing alternative options is an important area, but equally important is the need to recycle. M&S emphasises the need to not only make products recyclable, but to also create a demand for recycled materials. Their plastic packaging is made up of around 80 per cent of recycled plastic, something they see as very important.

'We can create an end of market for those materials when they are being recycled,' says Helene Roberts. 'So when you do put your PET bottles outside of your home and the council comes to collect it there needs to be somewhere for that to go, there needs to be a high value market in order to re-use that as a material, and that's what we've created. Literally, it's about closing that loop.'

Positive signs

Supermarkets all set themselves various targets, and their attempts to achieve them can viewed as positive. Tesco set an aim to reduce packaging weight by 25 per cent by 2010, though has adjusted this target to 15 per cent in light of new views on weight as a measure. The supermarket aims to reduce packaging across both its own products and branded products that it carries.

Asda had a target to reduce packaging by 25 per cent by the end of 2009, and has since surpassed that target by two per cent. M&S aims to reduce packaging by 25 per cent by 2012, and has so far achieved around 20 per cent. In addition, 91 per cent of its current customer facing packaging is recyclable or compostable. The company acknowledges a desire to get that up to 100 per cent, but points out that there are some products – like a joint of beef – which need investment in its packaging to be able to extend its shelf life.

The packaging industry is a complex area and it is clear that there is some way to go. It is also clear that more consumer education is needed, along with a holistic approach. The public may be faced with a larger packet and wonder why there is so much waste; but if that packaging is optimised to make the product last longer, it has less environmental impact in the long run than saving a few grams of plastic.

Revealed: the glyphosate research the GM soy lobby doesn't want you to read

Andres Carrasco's research linking a controversial herbicide with birth defects highlighted the potential health dangers posed by GM crop-spraying in Argentina – and led to violence and intimidation for those behind the study. Claire Robinson reports

In August 2010, community activists and residents gathered in La Leonesa, an agricultural town in Argentina, to hear a talk by Professor Andres Carrasco, lead embryologist at the University of Buenos Aires Medical School and the Argentinean national research council.

Carrasco was due to speak about his research, which found that glyphosate, an agrochemical used on genetically modified soy and rice in Argentina, causes birth defects in animal embryos at levels far below those frequently used in agricultural spraying. A delegation of public officials and residents from the nearby community of Resistencia also came to La Leonesa to hear the talk.

But the talk never took place. As the delegation headed for the school where it was to be held, it was attacked by a violent mob of approximately 100 people. Three people were seriously injured. Carrasco and a colleague shut themselves in a car and were surrounded by people beating the vehicle for two hours. Witnesses believe that a local rice producer and officials had organised the attack to protect agribusiness interests. As the police seemed reluctant to intervene, Amnesty

Previous page: Glyphosate has been linked with escalating rates of birth defects and other health impacts in Argentina.

International subsequently called for an independent investigation.

A political hot potato

Carrasco's research was never destined to gather dust on a library shelf. It has become a political hot potato: scientific confirmation of a human rights tragedy that is unfolding on a massive scale in Argentina. Over the past decade, doctors and residents have reported escalating rates of birth defects, as well as infertility, stillbirths, miscarriages and cancers in areas where glyphosate is sprayed on genetically modified (GM) soy. Because GM soy is engineered to tolerate glyphosate, the herbicide can be sprayed liberally, killing weeds but allowing the crop to survive. Spraying is often carried out from the air, causing problems of drift.

Carrasco and his team discovered that Roundup and its active ingredient glyphosate caused malformations in frog and chicken embryos that were similar to human birth defects found in GM soy-producing areas. In particular, the researchers found malformations of the head and cyclopia (where a single eye is present in the centre of the forehead). Carrasco said people should be worried by these findings as humans share with the experimental animals the same mechanisms of development. The researchers also pointed out that women living in soy-producing areas of South America have high rates of repeated miscarriage – often the result of a malformed foetus.

After Carrasco announced his findings ahead of publication – the study was later published in the journal Chemical Research in Toxicology – a group of environmental lawyers petitioned the supreme court of Argentina to implement a national ban on the use of glyphosate. But such is Argentina's dependence on GM soy that Guillermo Cal, executive director of the crop-protection trade association CASAFE, said a ban would mean 'we couldn't do agriculture in Argentina'. Much of Argentina's GM soy is imported into Europe as livestock feed.

Unprecedented ruling

No national ban on glyphosate has yet been implemented, but in a revolutionary ruling in March 2010, a regional court in Santa Fe province banned the spraying of glyphosate and other agrochemicals near populated areas. While the ruling is limited to the area around San Jorge, other courts are expected to follow suit.

Just a month after the court ruling, another bombshell dropped in Argentina's GM soy republic. The provincial government of Chaco province issued a report on health statistics from La Leonesa, the town where Carrasco was due to give his talk. The report said that from 2000 to 2009 the childhood cancer rate tripled in La Leonesa and the rate of birth defects increased nearly fourfold over the entire province. The report said that these staggering increases in disease coincided with the expansion of GM soy and rice crops in the region and the corresponding rise in agrochemical use.

Argentina is a unique experiment in the GM soy-farming model. In the 1990s the country rebuilt its collapsed economy around growing GM soy for export, becoming the world's largest exporter of soybean meal and oil. In 2009 the crop covered 19 million hectares – more than half the country's cultivated land area – which were sprayed with more than 200 million litres of glyphosate.

The Argentine government has come to depend on tariffs of more than 30 per cent levied on soy exports and is protective of the industry. Critics of the soy model have complained of harassment and persecution. Carrasco said after he went public with his findings, four people from CASAFE were sent to try to search his laboratory, and he was 'seriously told-off' by Argentina's science and technology minister.

Rates of birth defects have escalated in areas where glyphosate is sprayed

Serious health impacts

Carrasco's study was not the first to show that glyphosate is not as safe as is made out. A report released in September 2010 and co-authored by nine international scientists, including Carrasco, called GM Soy: Sustainable? Responsible? gathered a series of studies showing links between exposure to glyphosate and premature births, miscarriages, cancer and damage to DNA and reproductive organ cells. The roster more than justifies Carrasco's verdict: 'I suspect the toxicity classification of glyphosate is too low … in some cases this can be a powerful poison.'

Resistance against the GM soy with glyphosate model is growing. On 9th November, forest engineer and activist Claudio Lowy began a hunger strike in the doorway of the Ombudsman's office in Buenos Aires. In Argentina, the Ombudsman is called la Defensoria del Pueblo de la Nación – the Defender of the Nation's People.

In Lowy's view, the Ombudsman wasn't living up to his romantic title. Almost a year earlier, Lowy had signed a 2,700-strong petition to the Ombudsman requesting him to ask the government to change the way it classifies the toxicity of agrochemicals. When Lowy arrived on the Ombudsman's doorstep, the new GM soy-planting season was beginning, once again putting 12 million people in the path of the spray planes – and the petitioners still hadn't received a reply.

Long-term effects

Three days later, Lowy called off his hunger strike when the Ombudsman put in a formal request to the ministry of agriculture to reassess the toxicity of agrochemicals according to their entire range of health effects. The Ombudsman asked the ministry to consider sublethal and chronic effects involving low doses over long periods, as happens with people exposed to spraying of fields, rather than just short-term (acute) and lethal effects, as is the case now.

The toxicity classification of glyphosate is too low

The Ombudsman also advised that the toxicity of agrochemicals should be assessed based on independent scientific studies, not data provided by agribusiness companies. The Ombudsman's request will be sent to the ministry with a dossier of scientific research on the ill-health effects of agrochemicals, reports on sprayed residents and submissions from civil society organisations, scientists and health professionals.

Real science takes longer and costs more than rubber-stamping a company's data on its own chemicals. Often, the time and money needed to carry out proper studies becomes an excuse for inaction on the part of regulators. But that escape route has been closed off by the Ombudsman's final recommendation – that any chemicals that have not yet been evaluated for chronic and sublethal effects should be placed in the highest category of toxicity until they are proven safer. That would mean that they could not be sprayed near schools and residential neighbourhoods. Glyphosate is expected to be among them.

If the Ombudsman's recommendations are written into law, they will set an important precedent for science-based regulation of agrochemicals worldwide. Will it happen? A reply from an activist sounded familiar. Variations on it have been voiced by several Argentine people caught up in the fight against agrochemical poisoning – from the anonymous authors of the Chaco report to Carrasco himself: 'We don't know. There are powerful interests at stake.'

Claire Robinson is an editor at GMWatch

Deforestation could fuel deadly spread of malaria, yellow fever and Lyme disease

The economic and climate-related impacts of forest destruction are well known, but continued logging could unleash devastating new pandemics and spread fatal diseases into the human population, scientists tell **David Hawkins**

Previous page: Mother and her child sick of malaria in local pediatric ward in Kano State, Nigeria. Until recently, possible links between deforestation and disease spread were not widely researched

Photo: International Federation of Red Cross and Red Crescent Societies

The costs of deforestation in terms of climate change, biodiversity and economics are well known. Rainforests are also reservoirs for possible drugs, many of which have not yet been explored. But alarming new scientific research is presenting another compelling case for the urgent need to stop destruction of the world's forests.

In a series of exclusive interviews, scientists have told the Ecologist that if we don't keep remaining forests intact there is a danger that some of the planet's most life-threatening diseases could spread on a dangerous and unmanageable scale. The experts also warn that there is a serious risk of unleashing pandemics of new viruses into the world's human population.

Ravinder Sehgal, associate professor of biology at San Francisco State University, specialises in studying the effects of deforestation on African rainforest birds by mapping and modelling their diseases and blood parasites. But his research has huge potential relevance to human health.

'Non-migratory birds are a more natural system than humans, who move around a lot, so in looking at them we can determine how ecology affects the spread of disease a bit more easily,' he says. His work in Africa on species including the olive sunbird has revealed the effects of deforestation: 'We found different types of malaria in the same species of bird in deforested versus intact areas.'

The implications of this are clear, according to Sehgal: deforestation upsets the ecological balance, allowing diseases to move in unpredictable ways.

Spreading malaria

Africa has already witnessed an expansion of malaria's range. Dr Steve Lindsay, professor of public health entomology at the London School of Hygiene & Tropical Medicine, has nearly three decades of experience looking at vector-borne diseases throughout African and Asia.

'Deforestation raises ground temperature, increasing the rate at which mosquitoes develop into adults, frequency of blood feeding, the rate at which parasites are acquired, and the development of the parasite within mosquitoes,' he says. These increased surface temperatures due to forest clearing have allowed malaria parasites to spread their range to higher elevations, with the disease now commonly encountered in the previously malaria-free highlands of East Africa. 'For every 1 per cent of reduction in forest cover there is an 8 per cent rise in malaria mosquito population.'

With disease, however, nothing is straightforward. Lindsay acknowledges that in much of southeast Asia malaria is passed on by a forest-dwelling mosquito, so deforestation there could actually reduce cases.

In the Amazon, the primary vector for malaria is a species of mosquito named Anopheles darlingi. Recorded at very low levels a few decades ago, and even absent

from many areas, this mosquito has made a massive comeback in recent years, according to scientists. Jonathan Patz, professor of global environmental health at the University of Madison, Wisconsin, is a widely published member of the Intergovernmental Panel on Climate Change, with a special interest in ecology, land-use change and human health. He sees this upsurge as a direct result of deforestation: 'We don't yet know the mechanism, but the partially sunlit pools in deforested areas yield more mosquito larvae.' Logging and clearance are seen as creating an ideal habitat for malaria incubation.

Things don't necessarily get better over time. Patz says that 'the mosaic effect' of secondary, regrowth forest and abandoned land can be 'even worse' for malaria than recently deforested locations. Additionally, once malaria has been allowed to arise it is difficult to contain. 'Places that historically had been logged had a much higher incidence of malaria among people,' he says. When an area has been cleared of forest it can remain contagious for a long time.

Logging dangers

Yellow fever is another deadly disease whose complex ecology can be sent spiralling by deforestation. Usually, it is passed from monkey to monkey by mosquitoes in the high canopy. Logging can bring the monkeys closer to human habitation, and foresters into direct contact with the disease. Infected individuals from these fringe populations may then visit cities where the pathogens are picked up by the urban mosquito, Aedes aegypti, which also carries dengue fever. In this way new outbreaks can occur.

Along with deforestation, climate change and population movement, land-use change is capable of bringing diseases to new areas. In recent times the disease leishmaniasis (vectored by sandflies) has shifted its reservoir from wild animals to domestic dogs. Rice paddies in the Amazon have led to an increase in rodents, and so greater incidence of leptospirosis (Weil's disease). Professor Patz notes that large numbers of A. darlingi larvae are found in commercial fishponds. He claims that foregrounding strategies such as farming fish species that feed on mosquito larvae could be crucial methods of combating disease in these high-risk zones.

Lafcadio Cortesi, forests campaign director for Rainforest Action Network, recognises all this as a serious threat, and states that 'in terms of human productivity and quality of life, malaria is already having a huge effect'. This is an issue underexploited by environmental campaigners so far, and one that may become increasingly central. He brings in an ethical angle: 'The few elites mostly benefiting from logging activity aren't [yet] affected by the diseases they're helping to spread.' New science of this type will be another powerful ally for those fighting for protection of the world's forests. We've heard of 'avoided deforestation', when forests are preserved on economic grounds, but what about the unreckonable savings of potentially 'avoided disease' made by keeping them intact?

HIV viruses

Regarding these multifarious costs, Matthew Lebreton, director of the Central Africa Ecology Program for the Global Viral Forecasting Initiative (GVFI), wonders of HIV/AIDS: 'If we were doing the same work we are today in these African villages, 50, 80 or 100 years ago, what could have been done to prevent the disease or reduce its impact?' He warns: 'We are seeing new viruses in the same family as HIV crossing over into populations now.'
Headed by the dynamic scientist Nathan Wolfe, GVFI places itself 'at the interface of potentially dangerous diseases and human populations'. Monitoring diseases in places such as forest edges and regularly testing the blood of people there, while looking out for new illnesses, Matthew Lebreton and his team have a wealth of on-the-ground experience. Populations in these areas have a higher risk of contracting zoonoses (diseases that can pass from animals to humans – swine flu, avian flu and SARS being famous examples) that could then escalate. This kind of cutting-edge research is crucial for future health worldwide.

'The only way to really prevent pandemics is through education, addressing how to change behaviour and avoid risks,' Lebreton explains. Putting a name and a place to a virus – where it was discovered and in what animal or person – helps people in rural communities visualise these pathogens as real threats. 'Globally, vital to the process of prevention will be finding out new ways of making

very targeted interventions related to particular species or particular behaviours to stop transmission,' he says. He cites ebola outbreaks after people have retrieved dead animals from the forest, or blood contact following hunting, as examples.

Pointing out something else easily forgotten, Lebreton says: 'Animals are just as much victims of disease as we are, and finding starting points of those viruses is extremely important. It's really significant for conservation to figure out what risks those animals have in the long term.'

Chimpanzees and (already-endangered) gorillas have suffered tremendously from ebola in Central Africa. GVFI is keen to dovetail the interests of human health with conservation. Bushmeat-hunting is already illegal in many places, and when people are aware of the risks of diseases such as ebola they are less likely to target primates.

Wildlife

Lebreton adds: 'There is an enormous number of viruses in wild animals already that we know very little about.' Understanding this diversity is a significant part of forest ecology, as deforestation can have complex and subtle effects. 'There are a few species, such as bats, that tend to be more susceptible to disease when their habitat it threatened or when they're put under stress. Then they are more likely to become infectious,' he says. At the same time, forest fragmentation can cause population bottlenecks, with the resulting inbreeding making animals weaker and in more danger of contracting and carrying diseases.

There is a human correlation to this, too, as Ravinder Sehgal suggests: 'People living with HIV/AIDS in these deforested areas might be more likely to get some of these new pathogens. It is tremendously complicated what's going to happen in Africa with the interactions between different diseases and deforestation. I imagine that immuno-compromised populations are breeding-grounds for new pathogens, because if a virus gets into a person with HIV/AIDS it's more likely and more able to mutate and survive in that person. So a person with HIV/AIDS is like a mixing ground, where these pathogens can potentially evolve and become more pathogenic and spread to other people.'

Sehgal also points to new research into something known as the 'dilution effect': 'Species-rich communities can potentially snuff out transmission of pathogens, such as parasites, by "wasted" transmissions to hosts who are unable to pass the parasite on to the next life stage.' This is another way in which biodiversity offers us a hidden and vital service. The enormous harmful effect of deforestation only hastens the demise of such natural systems, increasing the chance of diseases leaking out.

Lack of understanding

It might sound as though these threats are particular to the tropics, but deforestation in temperate zones can have serious consequences as well. In North America the prevalence of Lyme disease has risen following forest fragmentation. The ensuing reduction in mammal diversity has enabled the white-footed mouse – a prime carrier of the pathogen – to proliferate over new territories due to having fewer predators and competitors. Ticks feeding on the mice can pass the disease to humans. A similar situation exists in much of Asia with tick-borne encephalitis.

It's clear that the expansion and emergence of infectious diseases due to global deforestation is of pressing concern. Scientists agree on the urgency of the case and acknowledge that the issue is not sufficiently understood.

Patz complains: 'These studies have not been well funded; the value of intact forest to protect public health is certainly underappreciated, and policymakers need to take this into account. Links between ecosystem changes and disease-spread are currently unrecognised, and this is insidious to the extent that by the time we have an epidemic we often don't look far back enough to see the causal factors, we just look at the proximal issues such as changes in mosquito-control or human population migration. In many cases it really goes back to the ecosystems and what we're doing to them – new risk factors that may cause the emergence or resurgence in diseases. Many of the irreversible changes we're doing to our landscape could lead to serious public-health threats. We must manage land-use more conscientiously and in a way that minimises the unintended consequences.'

Egypt's factory farming boom threatens stability of a hungry country

Increasing demand for meat in the land of the Pyramids is leading to more intensive farming, with serious consequences for food prices, the environment and animal welfare, reports **Joseph Mayton** in Cairo

Egyptians like their meat. They eat a lot of it. In order to maintain their daily, often multiple-times-per-day hunger for it, factory farming has entered the country. Often, these factory

farms have been marketed to the population as 'organic', but their tactics, with closed walls and no sunlight, are part of the game of feeding the Arab world's largest country.

The impacts from this growing industry have been felt by the population, and – in a now all too familiar cycle – as hunger grows, food prices continue to soar and the environment suffers from little to no regulation.

In April of 2009, anger at soaring meat-prices in the country boiled over, with two separate groups calling for a nationwide boycott of meat. The Egyptian Chamber of Tourist Establishments (ECTE) even called on all food outlets and companies to boycott red meat on 26th April.

'Egyptians love their meat,' café owner Waguih Samaan said at the time. He advocates purchasing from baladi – local farmers – in order to 'not get involved with the factory farmers who are destroying too much of what it means to eat meat'. But it is proving ever harder.

Poor husbandry

One top 'organic' food production company in Egypt that specialises in rearing chicken refused the Ecologist a tour of its facilities, but a former employee was willing to discuss the situation inside the factory on condition of anonymity. He says his family would be in danger if his name were revealed.

'Ahmed', as he refers to himself, admits that the poor husbandry practices seen online and in investigative reports in the United States and Europe are 'more common here in Egypt'. Ahmed says that when he was at the company 'chickens were stepped on, kicked around and dealt with without any questions asked because we had to cram in as many chickens into the barn as possible to produce more and more meat for Egypt'.

According to the Central Bank of Egypt, some 2.2 million chickens are slaughtered daily as part of efforts to increase production. The only way of meeting these production needs is via factory farms. Ahmed says that he had no problem with how the animals were treated: 'That's what they are for.'

The greater problem, according to Algerian economist Jalil Barghouin, who is researching farming practices in Egypt, is not the treatment per se, 'but how these new methods actually cost more for the average Egyptian on a daily basis'.

Growing costs

He cites a number of reports from Egypt's Central Agency for Public Mobilization and Statistics over the past four years. What he has discerned is staggering. According to the numbers, the costs of meat – whether chicken or lamb, eggs, dairy and other animal products such as yoghurt – has risen a staggering 50 per cent for eggs and dairy, and almost doubled for meat products.

'This is largely due to the rise of the factory farm in the country,' he says. 'It is because Egyptians want more meat that the price is rising, because even one decade ago meat-eating on a daily basis was not prominent in the country, but today many segments of society want their meat, and they want it quickly and easily. The result is the factory farm.'

According to Barghouin, factory farms run on the principle that they can keep meat cheap, and this ideology functions extremely well in the Western world, where the cost of meat has remained largely constant. But in the developing world it actually means price-hikes.

'The cost of establishing and running a factory farm on a similar level in the developing world, from Egypt to Algeria, is massive. I have spoken to a number of individuals who say one piece of land to rear chickens costs in the US$300,000 range or higher,' he reveals.

As a result, in order to keep chicken on the plate, companies such as those identified by the Ecologist above have been forced into factory farming. The result is higher prices to cover costs. 'It's a cycle that most Egyptians don't understand and that is why you have anger and frustration.'

Increased consumption

A poll published earlier this year by the Information & Decision Support Center of the Egyptian Cabinet revealed that the consumption of red meat is increasing in dramatic fashion.

The study showed that only 11 per cent of Egypt's 80-million-strong population eat less than 2kg of meat per month on average throughout the year. It gave stark statistics on meat consumption in the country, reporting that 32 per cent of the population consume an average of 2-4kg of meat per month, 30 per cent eat 4-6kg; 8 per cent consume 6-8kg; 6 per cent consume 8-10kg, while 7 per cent of Egypt eats more than 10kg of meat per month.

This desire to eat meat has led to the growth of the factory farm, but hunger in the country is still on the rise. In order to feed all the animals being prepared for slaughter across the country, acre after acre of arable land is being used for the production of feed that goes to sheep, chicken and the country's few dairy cows.

'People here believe that meat is the only source for many nutrients and that vegetarian diets will make

one malnourished and sick,' says Salua Tarak, a Cairo-based dietitian for upper-class Egyptians and foreigners. 'We know this is not the truth, but convincing people otherwise is hard.'

Unsustainable feed

The Egyptian ministry of agriculture told the Ecologist that nearly one-fifth of all farmland is currently being used for food for animals. At the same time the United Nations has warned that hunger in the country is increasing, with food shortages expected to hit the country in the coming few years, with what could be devastating effects.

Gian Pietro Bordignon, the World Food Programme (WFP) country director, says that Egypt must come to terms with the need to feed a growing population. Although he argues that meat-eating is vital to the health of the country, he does admit that 'the government must see whether developing agricultural land is vital to animal production or could go better towards self-sufficiency'.

Barghouin says that it is difficult to combine sustainable efforts to combat hunger with the rise in industrial food farming. He points to the need to look hard at eating practices, and the belief that meat is a necessity, if Egypt is to overcome its burgeoning population issues and hunger.

'If we look at how animals were reared, locally and in small farms or in backyards, this was more sustainable because it kept production minimal, costs lower and it was a catalyst toward environmental protection, but now we see that factory farms are doing all the things they do elsewhere and maybe even worse. It is not surprising to see hunger on the rise,' he adds.

Lack of resources

Yussif Badr, an agriculture ministry official in charge of regulations in the northern Nile delta region, says that regulating companies on private land has proven difficult. He argues that in order to deal with the massive rise in industrial food production the ministry would need to double or triple the manpower that is already in place. This won't happen, he admits.

'We have a very small team and what we are forced to do is inform the companies when we are coming,' he begins. 'This means that cleaning up the area is being done before we arrive, so we rarely see any negligence or bad practices taking place.'

On top of this, he says that Egypt has no real enforced legal standard for food production. In his 12 years at the ministry, Badr admits he has seen animal carcasses thrown 'one on top of another right next to irrigation that [is] being used for drinking water. I have also seen remains from chickens and waste thrown directly into the river system in the delta'.

He admits that it is an uphill battle, with millions of dollars spent annually by his department in an attempt to clean up the water systems for local villages, and a lack of power to do anything about it.

Dangerous impacts

According to Badr and others within the food industry, waste from factories and farms is continually tossed aside and left to rot close to where people live. This leaves both land and people in danger, according to environmental conservation consultant Richard Edwards, an American researcher at the US Department of Agriculture.

Walking through an abandoned farm, he points to what he terms 'scorched earth'. It is a result of waste from animal production being thrown into ditches and left to decompose. While it does, for the most part, eventually do so, 'the chemicals and drugs used to make the animals grow faster and larger has detrimental effects on the soil and surrounding crops'.

Edwards is not opposed to factory farming, but warns there must be a renewed sense of environmental protection if it is going to be sustainable. He argues that in countries such as Egypt, where government oversight is limited, 'the companies must begin to see that their actions will not be helpful in the long run. If the land, water and other ecosystems cannot handle the levels of pollution, the land will die and along with it the ability to sustain animal-rearing in these conditions'.

In his research in Egypt, Edwards says that nearly 10 per cent of land used for animal production has made future farming 'nearly impossible'. What is needed, experts argue, is a change of mindset across the country, one that provides for the population, is sustainable and that works with – not against – the environment.