

The UNEP Magazine for Youth



TUNZA



for young people • by young people • about young people

Asking searching questions • Green leap forward



Money on the move • Transforming markets • E-creation

TUNZA

the UNEP magazine
for youth. To view current
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Partners for Youth and the Environment



UNEP and Bayer, the German-based international enterprise involved in health care, crop science and materials science, are working together to strengthen young people's environmental awareness and engage children and youth in environmental issues worldwide.

The partnership agreement, renewed to run through 2010, lays down a basis for UNEP and Bayer to enlarge their longstanding collaboration to bring successful initiatives to countries

around the world and develop new youth programmes. Projects include: TUNZA Magazine, the International Children's Painting Competition on the Environment, the Bayer Young Environmental Envoy in Partnership with UNEP, the UNEP Tunza International Youth/Children's Conference, youth environmental networks in Africa, Asia Pacific, Europe, Latin America, North America and West Asia, the Asia-Pacific Eco-Minds forum, and a photo competition, 'Ecology in Focus', in Eastern Europe.

EDITORIAL

Much of the impetus behind the growth of environmentalism came from concern about resources, catalysed by the Club of Rome's famous 1972 report *Limits to Growth*, which predicted that many would run out before long. That perception proved a bit too simple, and greens also got it wrong by asserting that the main problem was with non-renewable resources, like minerals and fossil fuels – which can be irretrievably exhausted – rather than renewable ones which can be replenished. In fact, overuse of such renewable resources as forests, soils and water is plunging the world into a grave environmental crisis long before the non-renewable resources peter out, though of course it still makes sense to use these wisely and efficiently.

Resources can be used many times more efficiently without any loss of living standards or well-being, mainly by reducing waste. Key to this is observing the three Rs of the waste hierarchy – reduce, reuse and recycle – which are set out in order of priority. First the use of resources should be reduced as far as possible in producing goods and equipment without compromising standards. Then when the product's original work is done, it should be reused whenever practicable. And when that is no longer possible it should be broken up and the materials used to make it should be recycled, wherever they can, rather than thrown away. A fourth R is often added – 'rethink' – indicating that the world needs to re-examine the whole way in which it uses resources in the first place.

Nowhere is this rethinking more necessary than over the use of the most important resource of all: energy. The issue is not, by and large, that we have too little fossil energy on Earth. Overuse of oil may lead to demand outrunning supply before long, and with highly disruptive consequences, but the critical issue is that we cannot use what we do have without causing climate change to run out of control. We need urgently to reconsider and to change course, switching as rapidly as possible to the clean renewable energy provided by the sun, the wind, the waves, the tides and the heat of the Earth itself, to provide sustainable growth.



JOY TO THE WORLD

'Waste papers and plastics have become the world's most significant pollution ... trees has been severely damaged. That's why I used waste papers and plastic eggs in my design. The plastic eggs were used to make the lighting decorations for a big Christmas tree, to awaken people to care for the trees and enjoy and cherish the limited resources that we have on Earth.'

Yo Han Lam, 11, from Hong Kong, Province of China, won UNEP's recycled art competition on World Youth Day, 2010. 'We were asked to collect rubbish, and then create something. I chose a tree because they are so important for the whole world. They give us feelings of freshness, life and hope.'

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or on Facebook
www.facebook.com/TUNZAmagazine

Asking searching questions

Every two years, WWF, the global conservation organization, checks the effect that we as ordinary consumers are having on the natural world. The Ecological Footprint and the Living Planet Index show how many of the world's resources we are using, and what we are doing to the planet's biodiversity. **WWF Director General Jim Leape** talks about its latest findings.

The latest Ecological Footprint shows a doubling of our demands on the natural world since the 1960s, while the new Living Planet Index reports a fall of nearly a third in the health of all those species that underpin the ecosystem services on which all we humans depend.

The rapid economic growth that the industrialized world has enjoyed over the last few decades has fuelled a vast increase in our use of resources – for food and drink, energy, transport, electronic products, living space, and space to dispose of our wastes, particularly carbon dioxide from burning fossil fuels. These rich countries no longer have enough of these resources to meet their own needs, so they get them from other parts of the world. The negative effects are clearly visible in the tropical world and for the poorer countries, whose biodiversity, the

Living Planet Index tells us, has declined by 60 per cent since 1970.

The implications are clear. Rich nations must find ways to maintain their quality of life while treading much more lightly on the Earth. Rapidly growing emerging economies must find ways of improving the well-being of their citizens in a way that the Earth can actually sustain. It is alarming for all our futures that, as countries develop, their demands on the natural world increase, gradually introducing unsustainable habits.

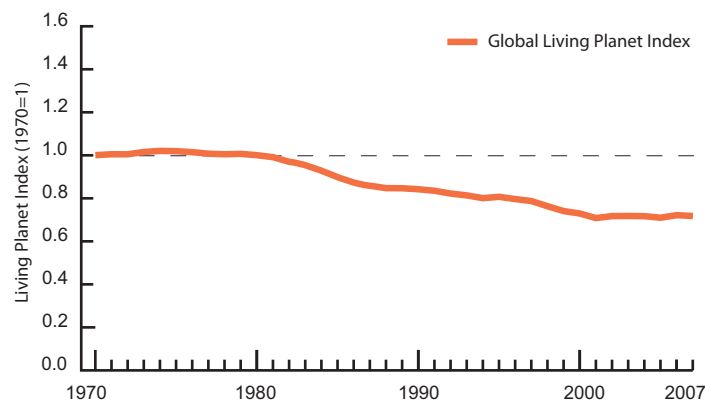
Out of the current economic crisis some green shoots have appeared. The Economics of Ecosystems and Biodiversity (TEEB) initiative has highlighted the economic cost of biodiversity loss and ecosystem degradation. UNEP and the Organisation for Economic Co-operation and Development (OECD) are working hard to promote the benefits

of a green economy. And in an increasing number of industries – fishing, timber, soy and palm oil, for example – producers and buyers are working to put their activities on to a sustainable footing.

The fundamental question is how we can adapt our ways of living and definitions of development to include nurturing the natural world that sustains us with clean air, clean water, fertile soils and so much more. Put simply, how can we create a future that offers a high quality of life to everyone, within the limits of this one planet? Consuming the Earth's resources faster than they renew themselves is no longer an option. We have to work out ways of getting as much, and more, from much less. And we all have a part to play in that – through innovation, through new ways of thinking and new ways of living. Challenging ... but also exciting.'

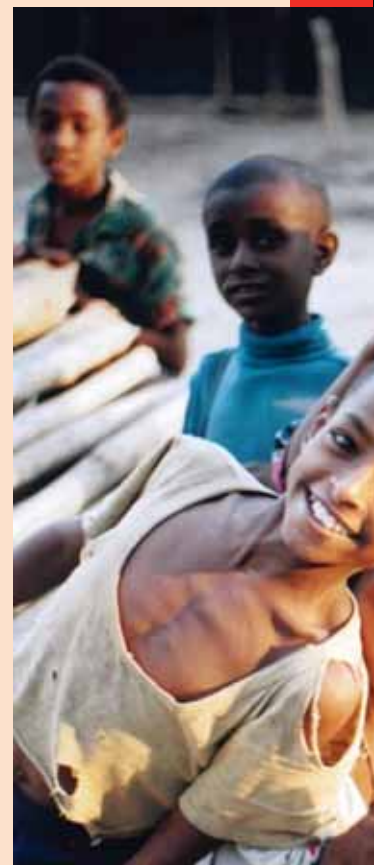
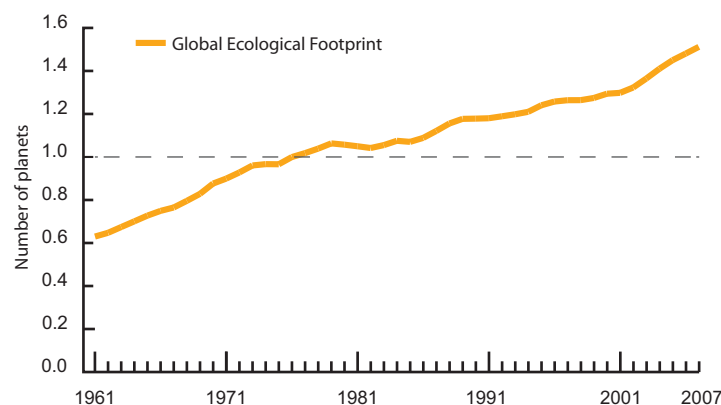
The Global Living Planet Index shows that vertebrate species populations declined by almost 30 per cent between 1970 and 2007.

ZSL/WWF, 2010



Human demand on the biosphere more than doubled between 1961 and 2007.

Global Footprint Network 2010



Changing f o c u s

What you do not count often does not count. Accounting systems determine goals, shape our way of life and profoundly affect the planet.

'Our national accounting systems are fixated on what we can produce,' says statistician Nic Marks, who has done pioneering research on human well-being. 'This is outdated, appeals to human greed, and has stripped Earth of its resources. Yet as Robert Kennedy Jnr. said, "The Gross National Product measures everything except that which makes life worthwhile." We need to redesign our systems to be based upon such things as sustainability, social justice and people's well-being.'

'Social scientists have already found that people overwhelmingly want happiness for themselves, their families and communities, no matter where they are. They want health, to live long and fully. They want love – a fundamental human need. These are universal human aspirations. So why not think of the progress of nations in these terms, rather than in numbers measuring production and consumption?'

So, as Marks says, a concrete goal of achieving well-being within environmental limits has to be set. And, to help establish the parameters of this goal, he developed the Happy Planet Index, which juxtaposes 143 countries' levels of well-being – measured in life satisfaction and expectancy – against how much of the planet's resources each country uses – its Ecological Footprint – to achieve them. 'It's an efficiency measure,' he says. 'How much well-being does each country get for its resource use?'

Predictably, the USA and the Gulf States were shown as having high rates of well-being but using a large number of resources, while countries in sub-Saharan Africa had low well-being and used the fewest resources. So neither scored well.

Costa Rica did best. Its people enjoy a higher life expectancy than North Americans, while using a quarter of the resources per person of a typical Western country. In all, Latin America turned out to be the champion continent, with nine of the top ten nations. 'While nations that score well aren't necessarily the happiest on the planet, they show that it's possible to achieve long, happy lives without overstretching the planet's resources,' says Marks.

Working towards human and environmental well-being – pulling the rest of the world closer to Costa Rica on the index – would require different approaches in developed and developing nations, he says. 'The first things Western countries spend their higher GDPs on are health and education. These public goods are key to generating public well-being. So achieving sustainability in the West means convincing people to shed a load of stuff we *don't* need, then shifting focus from individuals acquiring more to redistribution of resources.'

In developing countries, the first priorities are adequate water, food, infrastructure – and beyond that, convincing people that it is not worth losing culture and connectedness in the blind acquisition of material wealth. 'Such thinking really is a challenge to the Western model, which is what we've always tried to market to developing countries in the name of development, creating a race that no one wins.'

And on a personal level? 'We've done an evidence-based study on what generates well-being. It breaks down into "Five Ways": connect, be active, take notice, keep learning, and give. These are universal actions, none of which need a lot of resources. It's a question of being creative.'

The Happy Planet Index and Five Ways to Well-being
www.neweconomics.org/projects/happy-planet-index
www.neweconomics.org/projects/five-ways-well-being



K. Drakos/UNEP



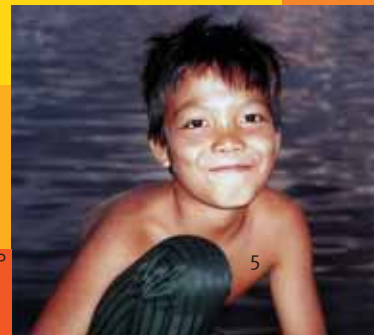
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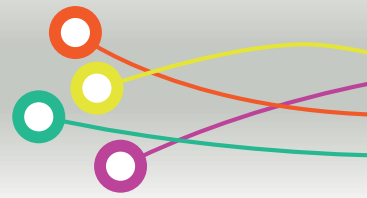


H. Hearing/UNEP



M.E. Widener/UNEP

e-creation



We love our electronics. As fashions change and innovation offers a constant stream of new apps and functions, we discard the old and embrace the new.

Take mobiles. In Europe alone, 794 million mobile phone users replace their handsets on average every 18 months. That's 500 million handsets a year! But each handset has an average lifespan of five to seven years. Many people send them for recycling but what does that mean?

Embedded in every electronic gadget are valuable resources, both in terms of materials – especially rare metals – and the energy used to manufacture them. Europe's electrical and electronic equipment output in 2005 contained around 450,000 tonnes of copper and 7 tonnes of gold. Lithium ion batteries contain cobalt, and coltan helps regulate voltage and store energy. The environmental costs of mining and refining these metals include biodiversity displacement, water use, massive

DOMINIC MUREN, 28, a designer based in Seattle, USA, thinks it's time to rethink the way we manufacture stuff. He explains his visionary approach, which avoids having to recycle energy-intensive materials and makes it easy to customize products around a reusable core.

'We've bought into the idea that we are meant to consume mass-produced objects as quickly as possible, then replace them with brand-new ones. In doing so, we don't just waste material resources, but also the energy it takes to make them.

'Electronics is a good example: production of 1 kilo of laptop consumes 10 times the energy required to make the equivalent of a plain aluminium object and 50 times more energy than a wooden chair. Yet we use a laptop for just three years, while a chair can survive a decade or more, and some for hundreds of years!

'Recycling the laptop takes energy too: most of the energy embodied in its electronics comes from processing the components into complex assemblies. So while recycling helps keep heavy metals out of landfills, melting down the metals wastes the energy used to create the components in the first place.

'This is one of the issues I'm trying to address at Humblefactory, where I'm researching ways to design beautiful, functional products that minimize waste, using small-scale, flexible, low-cost and low-energy machinery, methods and materials.

'One solution I'm pursuing is Skin, Skeleton and Guts (SSG, for short), a framework for designing electronics or mechanical tools so that their components can be easily taken apart and swapped to make new, updated items. 'Guts' are modules that are interchangeable between devices and can include things like reprogrammable electronics, motors, sensors, screens and so on. Components from a digital camera could easily be integrated into a phone or an e-reader, for example.

'Guts are given form with a 'Skeleton', which might be carved from wood or made from printed plastic, depending on what is easily available locally. To hold it all together without using

screws or glue, we add a 'Skin', made from fabric or leather in an almost infinite variety of colours and textures. Skins can be repaired locally, and fashion-conscious people can swap skins easily and cheaply.

'An SSG laptop, for example, could be upgraded and repaired, and you'd be able to easily upgrade its parts, reusing the outmoded ones in a new device. Every component that's reused means direct energy savings. I haven't managed to create a laptop yet, but I have made a prototype cellphone and I've also created a functioning SSG watch. It's not all electronics: my SSG furniture is constructed without glue or fasteners, using simple, locally available materials like fabric, bamboo, thread and cardboard.

'Ideally, SSG would bring manufacturing back into local communities, so that the economic benefits and environmental consequences stay close to those who consume the products.

'There are many related questions. How can better high-performance materials be made, or even grown locally? How can locally available materials be made beautiful and work well? How can designs for objects, and tools for making those objects, be shared globally and freely, and adapted for local markets? Most importantly, how can we create objects that prioritize clever design while minimizing energy use? The dialogue is wide open, and I would love to share ideas and designs with other young people around the world. Please join the conversation at www.humblefactory.com.'

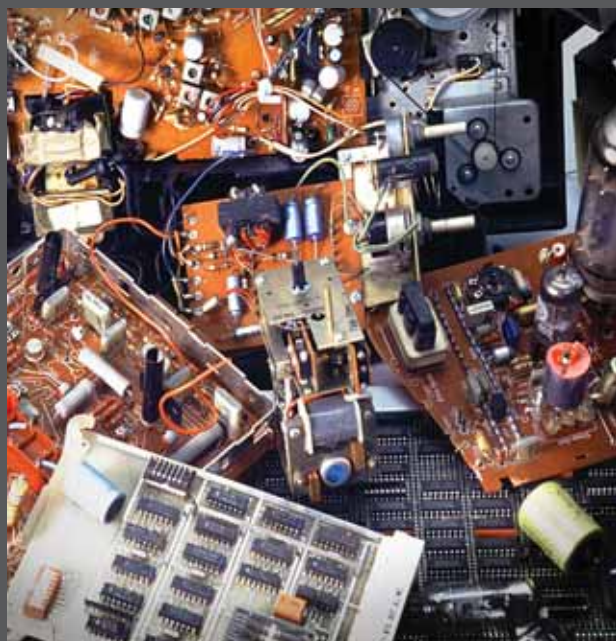


Dominic Muren

waste production and greenhouse gas emissions. Reclaiming these above-ground sources of metal alone could significantly reduce environmental impacts.

But to do so, electronics recycling and reuse need to happen properly, and at the moment, we don't have the infrastructure to make it happen. Lots of schemes collect and export phones saying they'll recycle and reuse them but, too often, they get sent to the developing world, where they are stripped of their precious metals and then dumped or burnt. Regulation helps, but can be ineffective. In 2002 the European Union set a collection target of 4 kilos of electrical and electronic waste per person, but only half its countries have hit that target. Meanwhile, the output of new electrical products grows apace.

It's a complex problem requiring a variety of solutions, from regulation to product design and consumer education. TUNZA talked to two young people who are exploring redesign and reuse.



H. Schmidbauer/Blickwinkel/Still Pictures

Collect recyclables and raise money for your school or chosen charity using links like:

UK

www.recycle4charity.co.uk
www.fonebank.com/oxfam

Australia

www.mazumamobile.com.au

Malaysia

www.crcbox.org/objective.html

Donate your old computer to an organization that will refurbish it and send it to someone who needs it.

Computer Aid International

www.computeraid.org

Computers for African Schools

www.cfes.org.uk

Cómo donar Argentina

www.equidad.org/como-donar

ALEX LIN, 16, from Westerly, Rhode Island, saw a need for more sustainable practices in his community, and kick-started a reuse project that has made a real difference in his home town and far beyond.

'In 2004, when I was 11, my community service team, the WIN Team, began our electronic waste project. We had already found in our research that reusing was seven times more efficient than recycling.

'Although electronics recycling was an integral part of our project, it was reuse that helped maximize matters. Instead of just buying new computers and recycling old ones, which would have enormous resource costs – water, energy, raw materials, and so on – we were able to give these electronics a second life.

'Working with a local tech company, we learned how to dismantle computers and install new hardware and software for students, such as word processing and educational games. Grants and fundraisers helped cover expenses. We wanted to prove that our ideas were practical by showing that it was easy enough for a group of 11- to 14-year-olds to do. In the last six years, we have refurbished more than 300 computers to give to students who couldn't afford home computers.

'We unexpectedly went international after the Christmas 2004 tsunami devastated a large portion of southern Asia. Our local doctor went to help through Médecins Sans Frontières. When she returned, she told us there was a need for computers in Sri Lanka. We contacted an English teacher that she had met and got to work, raising money to refurbish computers and send them to an elementary school. They named it after our group, and so the WIN Children's Learning Center was born!

'So far, we've created five similar centres in schools around the world, from Mexico to Cameroon. The Mama Na Dada culture centre in Kenya, for example, is being used for computer technology job training. Each centre has become an invaluable part of the surrounding community, helping students and adults alike get acquainted with the opportunities that come with information technology.'

Seeing cities as a resource



Notoriously resource-intensive, cities consume 75 per cent of the world's energy and produce 80 per cent of its greenhouse gas emissions, and are home to more than half of us all. Living densely has advantages: shops and services can be within walking distance; public transport systems, congestion charges and cycle infrastructure keep cars off the road; and shared walls and tightly packed buildings make the distribution of power, heat, water and food far more efficient than in sprawling suburbs.

New eco-cities, like Masdar in the United Arab Emirates and China's Tianjin, will incorporate the advantages of dense urban living with innovative green technologies such as renewable energy infrastructure. In older cities, it's worth looking at ways in which they can serve as a resource for humans and the natural world rather than a drain on them.

Green lungs, green pathways

Urban green spaces are vital. Vegetation absorbs carbon dioxide and delivers oxygen, keeps cities cool by offsetting the heat-absorbing properties of stone, concrete and asphalt, absorbs rainwater to prevent runoff and flooding, and provides space for recreation.

Urban green spaces are also a haven for wildlife, particularly when corridors connect habitats fragmented by buildings and roads. To create corridors, planners identify gaps between existing green spaces, then link them with hedges along main roads and streets lined with trees, or by reopening waterways. Green roofs – roofs planted with vegetation – provide green links while adding energy-saving insulation to buildings. And elevated green bridges allow animals to move across major roads. In the Netherlands, the 100-metre-wide Crailo Sand Quarry Nature Bridge, which spans 800 metres over a railway line, river and commercial estates, lets mammals, insects and amphibians move freely while providing recreation space for people.

Green networks, roofs and bridges are serious building projects, but city dwellers can help, too. Planting native flowers and trees in gardens, balcony pots or window-boxes, and creating community gardens help make it easier for insects and small animals to move between larger green spaces. 'Guerilla gardening' is a worldwide activist movement to plant useful trees, food and flowers in disused urban land – typically without the owner's permission – greening space that would otherwise be wasted. In Mexico, guerilla gardeners plant flower beds in potholes; their Australian counterparts run community vegetable gardens and plant native vegetation along railway lines.

Nothing goes to waste

The United Nations Development Programme estimates that 720 billion tonnes of urban wastes are produced annually, but even rubbish can be a resource. In Denmark and Germany, very little waste is now sent to landfill; instead, it is sorted for recycling, and anything left is incinerated to produce energy. In Copenhagen, nearly 60 per cent of collected waste is recycled, and almost all the rest is incinerated; in 2004, this provided enough power and heat for 70,000 homes.

But where there is landfill, there is methane, and this can be put to use, too. In Rio de Janeiro, the NovaGerar project captures methane emitted by decomposing landfill at two rubbish sites. A power plant at each site burns the methane, generating enough heat and electricity for 100,000 people. This, together with burning off unused methane, is projected to save 12 million tonnes of CO₂ emissions over 21 years – the equivalent of taking 150,000 cars off the road.

Methane produced from by-products of the meat industry is being used to power trains in Sweden, where the world's first biogas-powered passenger train runs between Linköping and Västervik. And in the USA, an intercity train run on biodiesel made from beef by-products is being trialled.

Water water everywhere

One problem with paved-over cities is that excess rain can't be absorbed into the ground, running instead into storm drains, sometimes overwhelming them and causing flooding, overflowing sewage systems and streams, and polluting rivers with runoff.

Green roofs can help solve this problem – the Vancouver Convention Centre's green roof, for example, captures excess rainwater for its landscaping – as can roof-top rainwater harvesting systems. In the 1990s, several hundred thousand ready-made roof-top rainwater-harvesting systems that also filter and treat the water were installed in Germany. The water is used for lavatories, laundry and irrigation, and can provide for more than half a household's typical water demand.

Some cities cope with runoff by installing rain gardens: native plants grown in shallow depressions near buildings, often with layers of mulch or pebbles, which capture excess water and release it slowly into the ground, stabilizing the flow and filtering out toxins. Studies show that rain gardens can reduce storm-water runoff by up to 80 per cent, remove 99 per cent of toxins from water and provide habitat for wildlife.

The 10,000 Rain Gardens initiative in Kansas City encourages residents and businesses to build rain gardens to reduce pollution pressure on its water infrastructure while Melbourne is encouraging citizens to build 10,000 rain gardens across the city by 2013.



M. Minderhoud/GNU/GFDL

CITY BEES

Cities are becoming a refuge for wild honeybees. As European and North American honeybees have declined in the last decade, probably due to changing climate, agriculture and insect diseases, wild bees are swarming to city parks and gardens, where fewer pesticides and greater diversity of plant life help them thrive. Urban citizens as far afield as Chicago, Paris, New York and Toronto have started to look after them, and even commercial bee-keepers have followed the bees to cities, where the insects are not only healthier, but are said to produce higher-quality honey.



Patrick Blanc

VERTICAL GARDENS

Why stop at green roofs? Why not green walls, too? Inspired by tropical plants that grow without soil on the surfaces of rocks, tree trunks, slopes and cliffs, botanist Patrick Blanc creates vertical gardens – large green façades of living plants that clean the air and provide shelter for biodiversity, as well as raising people’s spirits. Vertical gardens are made with a sheet of PVC riveted to a metal frame, with layers of felt over the PVC. The plants’ roots grow into the felt, which distributes water and nutrients, and the PVC prevents roots from damaging the wall. The gardens are lightweight – less than 30 kilos per square metre – so can be hung anywhere, and require little maintenance. Blanc’s work graces buildings in Paris, Tokyo, Kuala Lumpur, Dubai and more. Whenever he is commissioned, Blanc researches the species best-suited to the local environment and light levels. ‘Amongst plants, wherever natural resources are scarce, biodiversity is higher and the competition between individuals is lower,’ Blanc says. ‘We should keep that in mind when coping with the exploitation of Earth’s resources.’



Lasse Hejdenberg /Hejdlösabilder

CREATING NATURE

Zira Island is a desert island located in the crescent-shaped bay of Azerbaijan’s capital city, Baku, and plans are underway to make it Central Asia’s first carbon-neutral urban community. Recently, Azerbaijan asked Danish architect Bjarke Ingels – founder of design firm BIG-Bjarke Ingels Group – to design a zero-carbon leisure, cultural and residential complex on the island that would recreate the silhouette of the country’s most significant mountains. Currently, the island has no vegetation or water, so Ingels is having to design the entire island as a single ecosystem.



www.insideireland.ie

‘The buildings will operate like mountains, creating shelter from the wind, accumulating solar energy and gathering water,’ says Ingels. Baku is known as ‘the city of wind’, so an offshore wind farm built on disused oil platforms will power the island, including desalination plants. Buildings will be cooled and heated using thermal exchange, water will be heated by the sun, while photovoltaic panels will heat swimming pools. Wastewater and storm water will be recycled for irrigation, and solids from wastewater will be processed as compost to support vegetation. ‘Urban development normally happens at the expense of nature, says Ingels. ‘In this case, it’s actually creating it.’



BIG-Bjarke Ingels Group

TRANSFORMING MARKETS



We are using resources faster than natural processes can renew them. Our very survival depends on using less to produce more. But how can we make sustainable production happen, and make it happen more quickly?

One way is to harness the buying power of the world's corporations to make industries more sustainable. **Jason Clay** created WWF's Market Transformation Initiative, which is working to get the world's biggest corporations to commit to purchasing sustainably produced raw materials and making all their products with them.

He explains to TUNZA the theory and practice behind the Initiative, and how this approach is rapidly changing the way the world uses resources.



Ron Gilling/Linear/Still Pictures



What's the basic idea behind the Market Transformation Initiative?

The idea is to tap the large-scale purchasing power of the world's biggest companies to insist on the sustainable production of the raw materials they use, whether it's fish, cotton or sugar. Raw materials make up 50 to 80 per cent of any company's overall environmental impact, so getting their supply chain right is a big step in making final products more sustainable.

As consumers, many of us already make sustainable choices. Does it make a difference?

Yes, but it's difficult, even for the most informed consumer, to keep up with all the complex and ever-shifting information on sustainable production. With 6.9 billion consumers on the planet speaking more than 7,000 languages, the communication task is impossibly huge. The same is true of trying to regulate the world's 1.5 billion producers.

BUT, between 300 and 500 companies control 70 per cent or more of the trade in each of 15 commodities that we've identified as having the biggest

environmental impact. This is a much easier number to work with.

How did you get started?

The first step was to identify the world's most vulnerable ecosystems and the commodities that pose the biggest threats to them. It's like Noah's ark. To protect a representative sample of all the biodiversity on the planet, what do you focus on? WWF convened scientists to identify and advise us on priority places. Much as anyone would like to, one organization simply doesn't have the resources to do it all. So we had to ask which are the key savannahs, tropical rainforests, wetlands, marine areas and so on that most need protection. In the end we whittled it down to 35 ecosystems.

For every one of these we identified one key threat – human consumption – and 15 priority commodities: palm oil, cotton, biofuels, sugarcane, pulp and paper, sawn wood, dairy products, beef, soy, fish oil and meal, farmed salmon, farmed shrimp, tuna, tropical shrimp and whitefish. These 15 cross over a multitude of the places we care about. For example, agriculture is a threat to 70 per cent of the 35 vulnerable ecosystems. Livestock affects about 30 per cent.

Where do companies come in?

Well, remember the 300 to 500 companies we identified? We have found that 100 companies control 25 per cent of the trade of *all* 15 commodities. This is significant because 25 per cent of demand affects a much larger percentage of production – up to 50 per cent.

So we convene roundtables – meetings of all the members of a commodity's value chain – everyone from producers, traders and manufacturers to brands and retailers, as well as scientists and non-governmental organizations (NGOs). Together we agree on the key impacts of producing a commodity – deforestation, water use, and so on – then design standards to minimize these impacts, which are ultimately certified by an independent third party. The participants publicly commit to producing, buying and selling within these standards, to be part of the commodity roundtable, forming a chain of sustainability.

What about standards like those of the Marine Stewardship Council (MSC) and Forest Stewardship Council (FSC)? Are they still useful in this context?

Those were initiated by WWF, and are the prototypes for what we're doing



Photoshot/VISUM/Still Pictures

RTS
Roundtable on Responsible Soy



MARS
incorporated



RSPO
Roundtable on Sustainable Palm Oil



now. And we've learned a lot from their success. But whereas MSC and FSC focused more on sustainable practices, we now focus more on measurable standards. For example, in aquaculture, we're developing standards based on the actual quantity of specific effluents being produced by fish-farming operations, rather than evaluating the methods used to control effluents.

What motivates the relevant parties to participate?

It used to be about reputation: bad publicity around salmon farming and palm oil, for example. But companies are now realizing they might not always have raw materials to buy in the future. When commodity prices went up in 2006 and 2007 due to demand and shortages of resources, it became clear that if there are no raw materials, you can't make a product to sell. Companies are also motivated by the sustainability commitments their competitors are making.

And does this really make a significant difference in making industries more sustainable?

Certified palm oil has achieved a 6 per cent global market share in less than two years. Whereas in the last 40 years, organic produce, which is based on

consumer demand, still makes up less than 1 per cent of global food production. Consumer demand simply can't change markets as quickly as can corporate demand.

How long is it before there will be a majority of sustainable products on shelves?

Our goal is that by 2020, 25 per cent of the global trade in our top 15 commodities will be certified as sustainable. In our 35 priority places, the target is 75 per cent of production certified as sustainable. And we're on target.

Is government regulation the next step?

Yes, it's already happening. We've set up standards that governments are using in their regulations. Usually, governments' performance requirements are lower than those required by the private sector, but they can measure the same things and push in the same direction. Eventually they'll come closer and closer.

What can young people do to help?

It's still important for all of us to send signals that we want things produced sustainably. The Mars corporation has made a commitment to source all its chocolate sustainably by 2020, and consumers should ask all confectionery manufacturers to do the same thing. The planet depends on all such companies taking the same position. Consumers – that's you and me – can also ask governments to regulate industries using credible standards.

Do you foresee a day when consumers will have no choice between sustainable and unsustainable products?

Absolutely. The goal is that all products will be sustainable. At some point in the not-so-distant future, this needs to be regulated by governments, not just NGOs. If we continue at our current rate, there won't be a choice: scarcity will change people's minds. We need to manage this planet as if our life depended on it. Because it does.

RECREATION



The increasing use of synthetic materials has created a massive waste problem, but even in the wealthy world, people are beginning to realize what has always been true for nature and has long been known by the less well off: there is no such thing as waste. Here are some of the things that people are doing to make better use of what we've got, and some ways of getting creative at home.

GIVING NEW LIFE TO CORK

The use of synthetic stoppers for bottles has resulted in a steep decline in the demand for cork – the spongy bark of an oak tree native to southwest Europe and northwest Africa. The bark is harvested every nine years, allowing it to regenerate, which makes cork oaks extremely efficient at absorbing carbon dioxide, and the tree lives for around 200 years.

The good news is that there is increased interest in the use of cork for flooring, furniture and kitchen worktops. Petz Scholtus has created a series of cork boards depicting creatures that have already been affected by rising global temperatures (www.treehugger.com/files/2010/05/cute-animal-bulletin-boards-deliver-serious-reminder.php).



Or why not make your own cork message board? You will need:

1. Lots and lots of corks. Ask friends, family, cafes and restaurants to save them for you.
2. Wood glue and a small brush.
3. An old picture frame or tray with the backing still attached.

Spread the glue on the backing and fit the corks within the frame, ensuring that they are tightly packed. Leave to dry for a few hours with heavy weights on top. Simple!



Karen Eng

RECYCLED PLASTIC CLOTHES

Outdoor clothing company Patagonia was the first to use recycled plastic bottles to make fleeces. They have used more than 86 million bottles over the past 13 years, and their Common Threads Program reuses donated polyester (www.patagonia.com/international).



Just last summer, Nike provided football kit recycled from plastic bottles to World Cup teams, including finalists the Netherlands, the undefeated New Zealand team and Brazil. It is now possible to buy official home football kits made of recycled polyester (<http://store.nike.com>).



In Kenya, Naylee Nagda has come up with a way of reusing plastic bags rather than throwing them out. She straightens them, cuts them into strips and joins the strips together, and then knits with the strips creating useful and beautiful things.



Companies such as Mango Moon are looking at ways of recycling viscose, and are now producing yarn in vibrant colours made from recycled saris in viscose and silk. All the yarns are sold through www.mangomoonyarns.com. They encourage people to 'change the world one stitch at a time'. So get knitting! Either with Mango Moon yarn, an unravelled old jumper or a plastic bag.





THINGS FOR YOUR ROOM

It is not just clothing that can be made from plastic bottles. Furniture designers EMECO and Coca Cola have teamed up to create the Navy 111 chair which sparked interest at the Milan Furniture show. Made from 111 coke bottles, Coca Cola says that this is just the first of many projects to come from recycling the waste left after having a drink (www.emeco.net).

If you thought felt was a thing of the past, think again. Some felt is now made from plastic bottles recycled into polyester (www.simplysequins.co.uk/kunin-recycled-felt-285-c.asp).

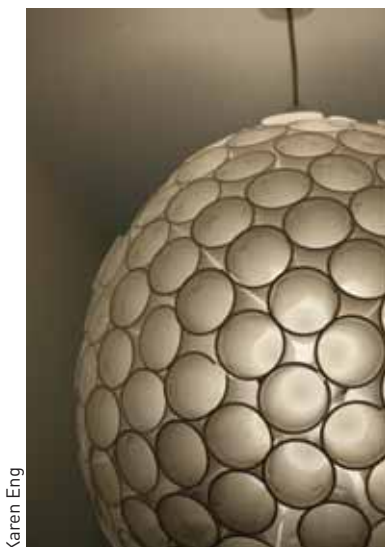
So why not follow up on designer Nahoka Koyama's simple lampshade made of felt, which buttons on over a long-life light bulb (www.mixko.co.uk).



Or are you fed up with seeing piles of dumped plastic cups? Rescue them to create your own lampshade. You'll need:

1. Around 200 clean plastic cups, either white or transparent.
2. A stapler.
3. Sticky tape.
4. A length of dowelling or a rigid plastic drinking straw.

Start with two cups side by side, insert the stapler as far into the cup as you can and staple together. Add more cups until you have created a globe shape. Complete the globe leaving a hole for the light fitting to go through (make sure you use a low-energy bulb that doesn't get hot). Insert the dowelling or straw, positioning it across the opening, and tape your light cable to the straw (tape several together for added strength if necessary). Then turn on the light and admire your handiwork.



Karen Eng

Or, if you are patient and just love lollies, make a lampshade out of the sticks.



FEELING LIKE A STUCK RECORD?

Here's a fun idea that gives a second life to unplayable vinyl discs that so many people have lying around.

1. Choose an appropriate record, checking first that it is not a collector's item or a prized possession.
2. Put it in the oven at 100°C until malleable.
3. Take it out of the oven and mould into a fluted bowl for fruit. It should be lukewarm when removed from the oven. Try and get it right first time, as reheating will stretch the record.

Your bowl will last for at least 500 years, but remember to wash it in cool water.



Karen Eng

Or create a sparkling curtain or room divider. You will need to work out the height and width you want and from that the number of old CDs and DVDs you need. You will also need:

1. Fishing line.
 2. A drill or a carefully heated bradawl.
 3. A curtain rod/bamboo pole or similar, long enough to hold your curtain or screen.
1. Make a small hole at the top and bottom of each CD.
 2. Feed the fishing line through the holes, knotting as you go, until your string of CDs is the required length. Attach one end to your curtain rod.
 3. Continue until you have made enough rows to cover your window.

You could include beads in your design to make it more colourful.



Karen Eng

Friend or foe?

Plastic is everywhere ... electronics, clothes, packaging, bags and bottles. We all use it because it's a wonderful material. Light, strong, neither resource- nor energy-intensive to make or ship, plastic can be recycled, or at least reused and down-cycled. And it's extremely durable.

There are five major gyres in the world's oceans. All of them have collected plastic debris, but the North Pacific Gyre holds by far the most. About 20 per cent of marine plastic comes from ships, and the rest comes from poor waste management on land. Around a million seabirds and 100,000 marine mammals and turtles die from ingesting plastic every year.



Most things made from plastic will only be used once then thrown away. So where does it all go? The world recovers just 5 per cent of the plastics we produce and buries another 50 per cent. The rest is litter. Bags that can take up to 1,000 years to degrade blow into habitats where they trap, suffocate or choke wildlife and clog waterways. Countless plastic bottles, packaging, bags, syringes and more make their way to the ocean via rivers and drains, where they are carried to and trapped in gyres – vast vortices of ocean currents. Some estimate that there are more than 600 billion tonnes of plastic debris currently in the ocean, augmented, according to UNEP, by more than 6 million items every day.

Plastic is accumulating in all five major oceanic gyres, but most is known about the plastic in the North Pacific Gyre. Known as the Great Pacific Garbage Patch, this contains about 3.5 million tonnes of rubbish, and may be twice the size of France. But it's just the tip of a plastic iceberg. Up to 70 per

cent has sunk below the surface and broken down into tiny, sometimes microscopic, pieces that get distributed around the oceans, eaten by marine life and washed up on beaches, indistinguishable from sand.

Unfortunately, there is currently no way of cleaning plastics from the oceans. The scale is too vast for clean-up boats, and the plastic particles are too widespread and too small to gather without killing plankton and other marine life. Scientists continue work to map and measure the problem; meanwhile, governments and activists are trying to curb plastic consumption by raising awareness and passing laws.

While many plastics can be reused, they can only be down-cycled into lower-grade forms, so eventually cannot be recycled any more and must be thrown away. So what you CAN do right now is apply the 3Rs: reduce your use of plastic, reuse items for as long as possible and – only when they really are broken and worn out – recycle them.



Individual action

'Unfortunately, the most notable thing about today was the amount of plastic trash I saw littering the ocean – the worst I have ever seen it. I saw about 30 plastic bottles, yoghurt pots and bits of packaging. There is something deeply upsetting about seeing a beautiful blue ocean glinting in the sunshine marred by a plastic bottle bobbing along on the surface.'

So blogged UNEP Climate Hero Roz Savage on her epic solo row across the Pacific, undertaken to spread the word about environmental sustainability. Savage rowed more than 18,000 kilometres, took 3.5 million oar strokes, and spent 352 days alone at sea in a 7-metre rowing boat.

She is now raising funds for her next row, across the Atlantic, Pacific and Indian Oceans. 'For me,' says Savage, 'the greater achievement is that people are getting the message that when it comes to taking care of our planet, just like my oar strokes, every individual action counts.'

Message in a bottle

Building a catamaran out of 12,000 plastic bottles and sailing it across the Pacific sounds pretty crazy. Explorer and UNEP Climate Hero David de Rothschild and his team did just that, setting sail in March 2010 on *Plastiki* from San Francisco for a 128-day, 15,000-kilometre journey to Sydney, passing through the North Pacific Gyre.

David's idea was to be a 'message in a bottle', calling the world's attention to the problem of plastic pollution in the oceans. The project was named after explorer Thor Heyerdahl's 1947 expedition across the Pacific on the *Kon-Tiki*, which proved that pre-Columbian people could have sailed from South America to Polynesia.

'Waste is a design flaw that doesn't occur in nature,' says de Rothschild. 'It's time to rethink the life cycles of the materials we create, and think about what happens to them once they outlive their usefulness.'

Turning the tide



Ellen MacArthur

DAME ELLEN MACARTHUR developed a passion for sailing as a child, and by the age of 20 became the fastest woman – and youngest person – to sail solo around the world. In February 2005 she broke the world record for the fastest solo journey circumnavigating the globe: 27,354 nautical miles in fewer than 72 days. Recently, Ellen MacArthur announced she would quit competitive sailing to launch the Ellen MacArthur Foundation, which aims to catalyse new ideas, open debate about sustainable design, and offer young people the tools and skills to carry ideas forward. Dame Ellen tells TUNZA how she decided to change course.

Q: How did you come to realize you wanted to commit your life to sustainability?

A: Having sailed around the Earth several times, I've had to manage everything I needed on board my boat. I knew that if I ran out of something – diesel, food or even kitchen roll – it would be impossible to replenish my stock. What I had on board was all I had, and there was no stopping off for more. Our world is no different: precious resources such as coal, oil, gas, copper, indium and lithium we have only once. We need to begin 'using things' rather than 'using things up!' I realized gradually that the majority of us are totally dependent on resources that won't be around forever. What sailing showed me was the meaning of the word 'finite'. This made me decide to leave competitive sailing behind.

Q: Please tell us more about the Ellen MacArthur Foundation.

A: The Foundation brings together education and business to help young people rethink, redesign and build a sustainable future. We're developing teachers' toolkits with materials like case studies, films, slides and more, covering the circular, or 'closed-loop', economy, one in which waste becomes an input for another cycle or process, rather than thrown away. We also offer hands-on workshops aimed at students aged between 16 and 18, which help them consider how we might live and work at the end of an era of cheap materials, and give them the opportunity to work with industry professionals from such fields as energy, transport and consumer products.

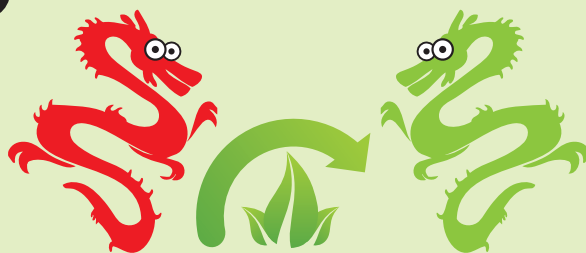
Q: The Ellen MacArthur Cancer Trust takes young people sailing to help their confidence while recovering from serious illness. Why the focus on young people?

A: In order for us to really begin the transition to sustainability, it will require a whole generation to think differently and acquire the necessary skills.

Q: Do you intend to keep sailing, or do you plan to devote your time to environmental work?

A: Yes, I do still sail, both with the Trust and also on *Iduna*, which I sailed round Britain when I was 18! And the environment? I prefer to call it working for our futures!

Is a green leap forward in China possible?



There's no denying that China's explosive economic growth has brought with it environmental issues. In 2008, for example, China became the world's largest emitter of carbon dioxide (CO₂), though its annual emissions per person are only 4 tonnes in contrast to the 19.6 tonnes of US citizens. But this and other issues – like rapid urbanization and the need for transport – present possibilities for green innovation. Depending on how you look at it, the scale and speed of China's growth creates problems or opportunities. China has already recognized that embracing greener development is important for its own prosperity and well-being.

Wind and sun

The bad news is that 70 per cent of China's power is supplied by coal, much of it still burned in outdated plants. The good news is that China leads the world in installed renewable electricity, with nearly twice as much as is installed in the USA, and that's excluding hydropower. In 2008, its investment in renewable energy as a percentage of GDP was almost that of Germany's. Now it is making a big push to produce a fifth of its energy from renewable resources by 2020, through big investments in wind and solar power.

The world's second-largest producer of wind power, China has already exceeded its 2010 targets for installed wind capacity by 100 per cent, and has doubled its wind capacity every year since 2005. Researchers say that at this rate, wind could replace coal by 2030, provided transmission infrastructure can be built. Currently, China is building the world's biggest wind farms in the Gobi desert, which are set to produce as much power as 16 coal-fired power stations.

China's solar capacity is far less than its wind capacity, but it's still a world leader, with 130 million square metres of solar heating arrays already installed, compared with the US goal of 200 million square metres by 2020. There are more than 10 solar farms under construction or planned in China. The biggest is a 2,000-megawatt project being built in the Mongolian desert, set to be the largest photovoltaic facility in the world when it's completed in 2019. Solar thermal power for heating water is already in wide use in homes.

In the meantime, China is helping the rest of the world go solar: it is the world's top manufacturer of photovoltaic panels, 95 per cent of which are exported.



L. Prossor/UNEP

High-speed transport



Sinopictures/viewchina/Still Pictures

China has started constructing 30,000 kilometres of high-speed rail links, which will become the largest network in the world, to connect all its major cities by 2015. There are even plans to expand through Russia into Europe, which could someday offer a competitive alternative to flying. Early in 2010, the first high-speed line, Harmony Express, was launched. Its trains travel at a breathtaking 354 kilometres an hour, faster than Japan's bullet trains and France's

TGVs. The Harmony Express speeds between the cities of Wuhan (central China's most populated city) and Guangzhou (the capital of southern Guangdong province), 1,068 kilometres apart, in three hours – a journey that used to take nearly four times as long.

Within cities, China is also rapidly building mass transit systems. Between 2001 and 2008, Beijing alone built five new subway lines, and is constructing more, reaching

Green building



sinopictures/viewchina/Still Pictures/Spec. Stock

China is building faster than any country in the world and urbanizing at an unprecedented rate: by 2030 its total urban population is expected to be more than a billion. To promote more efficient resource use while building factories, offices and homes, it has created its own green building standard, the Three Star system. This has separate standards for commercial and residential buildings, covering land savings and outdoor environments, indoor environmental quality, operations and management, and savings in energy, water and materials. An extra category called 'preference items' evaluates harder-to-implement innovative strategies such as renewable power and brown-field redevelopment.

Recognizing the need for a sustainable model of urban living, forward-thinking developers have also been trying to build prototype energy-efficient sustainable cities. There are several eco-cities and villages in process, such as Xiangji town in Xinjiang, and Huangbaiyu in Liaoning. The most high-profile of these projects, Dongtan, has slowed, but the eco-city

a total of 420 kilometres of track by 2012. By 2015, China's cities will have more urban rail than anywhere else in the world, with more than 2,000 kilometres of line in 11 cities.

China's car production and ownership are also burgeoning. In 2009, China sold more than 13.5 million vehicles, an increase of 43 per cent over the previous year, becoming the world's biggest car market. To cope with this and to minimize impact, its automobile fuel-efficiency

Cleaning up

In recent years, much has been made of electronic waste – computers, mobile phones, and so on – being shipped to China so that their valuable metals and components could be extracted. Joshua Goldstein, an associate professor at the University of Southern California, spoke to TUNZA to put the problem in perspective.

First of all, it's a myth that all the West's e-waste gets exported to China. There was a big market about 10 years ago, but today, most of China's e-waste is Chinese – everything from computers and mobile phones to televisions and refrigerators. Waste from the USA and Europe now goes to Vietnam, Pakistan, India, Egypt, Ghana, Nigeria and so on. That said, there's still a market for imported e-waste, especially in south China.

E-waste is valuable for two reasons. First, components, especially from computers, can be resold on the second-hand market. Particularly in developing countries, people buy used CD drives, circuit boards and so on. This is good in terms of reuse, and 80-85 per cent of the value of computer e-waste is generated this way.

The rest of the computer, which needs to be processed for its valuable metals, only makes up 15 per cent of the value at most. Metals like gold that are hard to mine are much more easily extracted from used stuff. The trouble is, it's expensive to extract them properly and safely, but highly profitable if done unsafely, such as burning the plastic wires to get copper or dumping circuit boards into acid baths and then disposing of the acid in a river.

The Chinese Government recognized the economic value of e-waste as well as its health and environmental hazards, recently passing an electronics disposal law to come into effect in 2011 and establishing centralized funding to subsidize safe electronic recycling facilities.

The other part of the solution lies with producers, who must set new standards for sustainable production, which could include simple things like using less toxic materials, and making things more easily disassembled for recovery. There could, for example, be a standard cell phone charger, rather than hundreds of different kinds that get thrown out and need to be taken apart. The best news is that the industry has already started making moves in this direction.

in Tianjin, a green urban community for 350,000 people being built in northeast China in partnership with the Government of Singapore, looks on track to be completed by 2015. It will use wind and geothermal power

and have more green space than any city in China; more than half its water will be harvested rainwater and recycled grey water; more than 60 per cent of its waste will be recycled; and a light railway will discourage car use.

standards are 40 per cent higher than those in the USA. Because China has to import most of its petroleum, it's looking for alternatives, particularly using non-food stocks such as waste oil, vegetable oil and jatropha. It's already the world's third-largest producer of ethanol, which it produces using marginal land. Plans were recently announced for a plant that can convert agricultural waste into ethanol, and is slated to produce more than 11 million litres of bioethanol a year.

It is hoped that agricultural waste might supply around a tenth of the country's fuel in the next decade.

While this is just a taste of the multitude of green initiatives under way in China, it's important to remember that they all have state support. As nations continue negotiating how to come to terms with global warming, it looks as though China may emerge as a leader in how to jumpstart a bright green economy.



BUG BURGERS?

Four out of every five people in the world already eat insects, and entomologist **MARCEL DICKE** thinks we should all consume a lot more of them. Indeed he thinks we will have to farm them if we want to go on eating animal proteins *and* protect the planet.

'Insects are far more abundant than humans. Why not exploit this resource?' he argues. 'More than 1,000 species of insects are regularly eaten, typically foraged in seasons when they're abundant. On the borders of Lake Victoria, for example, people harvest mosquito-like insects that arrive in huge clouds, and bake cakes with them. It's like berry season in Europe or America.'

Dicke – who won the NWO-Spinoza award, the top Dutch science prize, for research into how plants communicate with insects – believes that, given world population trends, growing wealth and diminishing resources, we will soon all be forced to resort to insects. 'The Food and Agriculture Organization (FAO) says we need to increase agricultural production by 70 per cent by 2050 to feed the rapidly growing world population,' he says. 'Seventy per cent of all agricultural land is used to produce livestock. We can increase this a bit at the expense of rainforests, but clearly we can't keep using resources this way and certainly will not be able to meet the growing demand for animal proteins in the classical way.'

Eating insects also benefits the environment. 'First there's the conversion factor: with 10 kilos of feed you get 1 kilo of beef, 3 of pork, 5 of chicken – but 9 kilos of locust. Then insects produce far fewer wastes than traditional livestock, and those they do produce emit far fewer greenhouse gases. Yet nutritionally – in terms of vitamins, proteins and calories – they are just as good for us. And,' he adds, 'insects are so different from humans that they are far less likely to carry viruses, such as flu, that can infect us.'

So what's the problem? 'Mindset,' says Dicke. 'Most of us in the West are put off by the idea, though we already eat an average of 500 grams of insects a year, mainly hidden in processed foods. (Tomatoes with insect damage go to the factory for soup rather than to the grocery.) And even people living in places with long-established traditions of insect-eating don't necessarily want the rest of the world to know, fearing they will be considered backward.'

Nevertheless, he and his colleague Arnold van Huis are challenging these taboos to promote insects as a sustainable food source to be reared for human consumption. He himself is researching and developing insect agriculture at Wageningen University with support from the Government of the Netherlands, and stresses that this is much better than hunting them. 'I wouldn't promote people going into the wild and collecting insects on a large scale. If you rear them, you know what the quality is, and you leave nature intact,' he says. 'We're looking into feeding insects on vegetable wastes from restaurants,' Meanwhile, van Huis is promoting the idea at the FAO, recently presenting a position paper on the state of insect-eating around the world.

Companies are already commercially breeding mealworms and locusts for human consumption and Dicke believes insects will be eaten in Europe within a year – not whole ones at first, but as a protein supplement in processed foods. He also hopes to bring insect farming to Africa, providing a year-round source of animal protein as meat prices increase.

A FEW OF THE INSECTS EATEN AROUND THE WORLD

- Mopane caterpillars in Southern Africa
- Termites and locusts throughout Africa
- Ants and grasshoppers in Mexico
- Dragonfly larvae and silkworm pupae in China
- True bugs and ant pupae in Thailand



Thai Guide to Thailand



C. Ruoso/Biosphoto/Still Pictures



Thai Guide to Thailand

M-PESA

money on the move

By Maurice Odera



Ron Giling/Lineair/Still Pictures

Mobiles are part of daily life. We make calls, send SMS, take pictures and even read TUNZA magazine on them (<http://tunza.mobi>). Now Kenya's Safaricom is pioneering a mobile money transfer system, important in a country with few bank branches and a population widely spread across remote areas.

M-PESA (M is for mobile and *pesa* is Swahili for money) was started to allow microfinance borrowers to receive and repay loans using the Safaricom airtime network. As there is a reduced cost in dealing in cash, this allowed microfinancers to offer more competitive loan rates, and users to track their money more easily. Using M-PESA, you can deposit and withdraw money, transfer it to others (even non-users), pay bills, buy phone airtime and even access M-PESA transfers through ATMs across Kenya.

'I'm based in Nairobi but own a public transport business in Kisumu, 400 kilometres away,' says John Onyango. 'With M-PESA I can get the daily takings, pay my staff, and pay for service and repairs without long-distance travel and exorbitant bank charges.'

M-PESA's launch has led to growth in the micro-finance sector of Kenya's economy, contributing to the overall GDP while greatly reducing the level of poverty, which affects 50 per cent of the country's people.

Now it's spreading. The M-PESA International Money Transfer service, launched in October 2009, allows money to be received almost instantly from the United Kingdom with no charge to the recipient. That really helps Kenyans in the United Kingdom send and receive money to or from their families.

M-PESA is expanding to other destination countries for Kenyans: Uganda, Tanzania, Rwanda, Dubai and the USA. Already independently active in Afghanistan, where it's used to pay the police across the country, there are also plans to take Kenya's innovation to India, Egypt and South Africa, helping the environment with less paper, less transport and fewer emissions.



A. Von Hagen/UNEP



Doing it nature's way

D. McClenaghan/UNEP

The recent Deepwater Horizon oil spill reminded us of the consequences of contaminating the natural world. But Kate de Mattos-Shiple, 25-year-old microbiologist at Bristol University, told TUNZA that it's not just the disasters we need to worry about. All around the world we are contaminating soil and water with wastes from our daily activities. Every year, for example, more than 37 billion kilos of toxic organo-pollutants are produced in the USA alone, and only 10 per cent of these are disposed of safely.

All substances eventually decay, but it takes time. The amount that degrades naturally in a day is insignificant when compared to the amount we continue to produce. What we need is a way to recycle potentially harmful substances more rapidly, and scientists have turned to nature.

Bioremediation is a combination of two words: biological (living) and remediation (to remedy or cure), and that is exactly what it is – a living cure, organisms converting matter in their environment into the things they need for their survival. They metabolize substances for energy and nutrients and sometimes accumulate disagreeable compounds in their tissues to make themselves less tasty to other organisms.

Bioremediation could theoretically utilize any organism capable of removing or breaking down unwanted contaminants. Microbes, such as bacteria, are a common choice. Many are already present in contaminated regions and sometimes all that is needed is to add nutrients to encourage their growth and speed up the process. It is also now possible to introduce blends of bacteria optimized to decompose a range of contaminants, including pesticides, oil and diesel. Fungi are particularly good at digesting complex organic compounds, and military organizations have been investigating the potential of using them to reclaim land contaminated by explosives.

And then there are plants. Poplar trees and Indian mustard have been used to remove lead from soil, the sunflower to remove arsenic. Water hyacinth and lesser duckweed both remove lead, arsenic and cyanide from water. There is even the potential to use plants to remove certain valuable minerals and metals from soil where they are harmful, then harvest the plants and extract the compounds as ores which can be sold and reused, covering some if not all the costs of the bioremediation.

Bioremediation's key benefit is its simplicity. Usually, it can be carried out on site, minimizing environmental disruption, and it is far cheaper than alternative methods. The fact that the cost of decontaminating waste sites in the USA using traditional methods is estimated to run to trillions of dollars shows just how important economical alternatives are.

A lack of knowledge about the needs of the organisms used for bioremediation has been one of the main factors holding it back. Whether using plants, fungi or microbes, bioremediation needs the right conditions, including the correct nutrients, the right temperature and acidity, sufficient light when using plants and – if using aerobic organisms – enough oxygen. Achieving the right balance can involve adding nutrients or tilling the soil to aerate it.

Then there's time. Depending on the type and level of contamination and the requirements of the bioremediation agent, it can be a relatively fast solution, taking just weeks – or it can take years. But when such important resources as water and soil are at risk, we should be thinking long term. An environmentally friendly solution must be worth the investment of time.

Bioremediation could have a very promising future. As research progresses and our knowledge about how to implement successful programmes improves, bioremediation should – and hopefully will – be considered not only by scientists but by land owners and regulators as a good alternative to expensive and disruptive traditional clean-up methods. Bioremediation is not a quick fix, nor is it a way of avoiding the need to waste less. Just as our own health requires a combination of preventative measures and treatment, the health of our planet requires us to prevent as much contamination as possible while developing safe and trusted methods for treating unavoidable ills.

1. Water hyacinth *Eichhornia crassipes*

This is a plant you don't want to let out by mistake. It's so fast-growing that it quickly blocks waterways, clogs drains and smothers native species. But in the right place, it's very effective at removing lead and arsenic from contaminated water.



2. Aspen *Populus tremens*

Poplars are fast-growing trees capable of degrading or deactivating a number of contaminants, including atrazine, 1,4-dioxane, TNT and trichloroethylene, as well as accumulating aluminium, zinc and cadmium in the above-ground parts of the plants, which can then be taken away for safe disposal.



Willow/ShareAlike 2.5

3. Sunflower *Helianthus annuus*

Sunflowers have been used to remove lead from contaminated soils in post-Katrina New Orleans, and home-owners suspicious of the soil in their own back yards use sunflowers prior to planting edible crops. Getting rid of the toxic sunflowers, however, requires access to specialist waste-disposal systems.



Bruce Fritz

4. Oyster mushroom *Pleurotus ostreatus*

This popular commercially grown culinary mushroom has many advantages. Not only delicious, it is also good for you, containing statins that reduce cholesterol; it is said to be a natural defence against stink bugs – an unpleasant-smelling insect that can invade homes; and produces enzymes that break down many pollutants, including dioxins.



Aaron Sherman/Wiki Commons

5. White rot *Phanerochaete chrysosporium*

Phanerochaete chrysosporium is one of the fungi that may hold potential for biofuel production, breaking down the structure of wood to release its energy-rich cellulose. Field studies show that it also breaks down contaminants in munitions waste, pesticides and synthetic dyes, amongst other toxic substances.



Regents of the Univ. of California

7

Eco-pioneers

Cassandra Lin, USA

Two years ago, my friend and I wanted to find a sustainable solution to two local problems: sewers were being clogged with grease and fat, and local families couldn't afford heat because of unemployment. We came up with Project TGIF – Turn Grease Into Fuel – to work with restaurants and residents to create a sustainable system to collect grease, refine it into biofuel, and distribute it to families in need. We asked local residents to deposit used grease in barrels at the town's transfer station, and gave restaurants collection barrels too. Grease Co., our partner, collects and delivers the grease to a biodiesel refiner. Since cooking fat is a commodity, all funding is generated from the waste. My volunteer group, Jr. WIN, keeps a fifth to buy Bioheat, a biofuel/diesel mix, for families who need it to heat their homes, and Grease Co. keeps the rest. Everyone wins: oil is recycled, companies profit, and families receive lower-emissions fuel. So far, we've donated more than 15,000 litres of Bioheat, heating 40 homes. At this rate, more than 120,000 litres of biodiesel will be generated each year, offsetting 250 tonnes of CO₂ emissions.

Cassandra Lin



Adital Ela, Israel

When I went on a 10-day silent walking retreat in the south of France, I came across places that had long been untouched by humans. I wondered whether humans could live with nature without disrupting it – and how I could design from a mindset of deep participation between people and the environment. I now explore these ideas at S-Sense Design, teach sustainable design at the Holon Academic Institute of Technology (HIT) in Israel, and lead design workshops for young people in Brazil, Mexico and Europe. Students at Universidad Iberoamericana, Mexico City, invented the Alive Bus Stop: climbing plants grow over its roof, which collects rainwater for the plants. The TWO GO, designed by Yael Livneh at HIT, is a do-it-yourself project that encourages the reuse of plastic milk crates to create bicycle seats and storage units. I designed Slow Water, an indoor water-recycling system that collects water from the basin and reuses it for lavatory-flushing and other needs, and WindyLight – outdoor lights whose LED bulbs are operated by wind energy – a direct link between renewable resources and basic human needs.

Yael Livneh



Nina Dudnik, USA

During a year working abroad in a West African rice research station, I was struck by how frugal my colleagues were with equipment, washing and drying disposable test tubes and reusing them for months. But at Harvard where I was doing my PhD, we regularly got new lab equipment. I wondered where the used gear went, and discovered that it was often stored and forgotten, sold for scrap or simply thrown out. My friends and I started a volunteer programme to collect equipment and identify labs that needed it. This grew into Seeding Labs, which I now run full-time. Our partner universities and research companies contribute surplus equipment and help us send it to scientists around the world. We've worked in 16 countries already, including Argentina, Chile, Ecuador, Venezuela, Paraguay, Haiti, the Dominican Republic, Congo, Nigeria, Ghana and Kenya. Seeding Labs is about human resources, too: it's a natural way to connect scientists to each other. We've started exchange programmes that enable scientists from different countries to share ideas and form links which I hope will benefit them throughout their careers.

Nina Dudnik



Milena Boniolo, Brazil

In Brazil, cleaning and filtering industrial pollutants from wastewater requires expensive technologies from foreign sources. Meanwhile, the Brazilian fast-food industry throws out vast quantities of banana peel – at least 4 tonnes a week in São Paulo alone. As an environmental chemistry student at Paulista State University, I found a way to solve these two waste problems sustainably. Could the structure and compounds on the banana peel's surface be used to clean heavy metals and other pollutants from wastewater? Most of the pollutants have a positive charge, and I discovered special molecules in the peel that have a negative charge. So when put together, the negatively charged molecules of the banana peel attract the positively charged heavy metals, removing at least 65 per cent of them from the water after 40 minutes. Afterwards, the heavy metals and banana peel can be separated, allowing both to be recycled.

M.S. Nolan/Still Pictures/SpecialistStock



Peter Thuo, Kenya

I started the Ruiru Youth Community Empowerment Program because I wanted to keep young people out of trouble. We've done road rehabilitation, cleaned up construction sites and planted trees. In 2005, we started promoting Jiko Kisasa, fuel-efficient stoves which also improve indoor air quality. We produce them with local clay and teach women's groups how to install them. In total, we've produced and installed more than 3,000 stoves, part of a UNEP-backed movement to improve health, reduce deforestation and help stem climate change. I also taught myself how to build household-scale biogas plants, and have built six. Most recently, I founded my own company that constructs greenhouses, and I train and employ many young people. I believe in the potential of youth to create value for themselves, their community and their environment.

Peter Thuo



Carlos Bartesaghi Koc, Peru

To address the need for truly sustainable tourist accommodation, I designed the Eco-tourist shelter, a hostel based on the 6Rs (Reduce, Reuse, Recycle, Rethink, Refuse, Repair) made completely of local, recycled materials – guinea pig fur and sheep's wool for insulation, and adobe-covered panels of woven straw for walls. The design features wastewater recycling through aluminium cans filled with sand and gravel for lavatory-flushing and irrigation; a biogas system to power electrical appliances; a radiator façade of plastic and glass bottles filled with water, which the sun heats, providing warmth. All systems for irrigation, construction, ventilation and heating are operated passively or manually, with no electricity. This is just the beginning: a local non-governmental organization has expressed interest in the concept and I plan to start a master's programme in architecture so that I can further develop and build the hostel.

Carlos Bartesaghi Koc



Olatunbosun Obayomi, Nigeria

In Lagos, sewage is typically collected in septic tanks, picked up in trucks, then dumped, untreated, into the Lagos lagoon. The wastes of more than 11 million Lagosians pollute the lagoon, from which we get our drinking water. Diseases like typhoid are, sadly, a normal part of daily life. I decided to try designing a solution that would convert septic tanks into biogas plants. With the support of mentors on the internet, I designed a system that modifies the tanks into biogas digesters. This means waste can be treated onsite. There is no need for transport, the system fits directly into an existing tank, provides free fuel, and the waste doesn't get dumped in the lagoon. Biogas can be used to run natural gas engines and for cooking. I'm developing an idea to link septic tanks along Lagos streets to run natural gas engines, which could power local boreholes to provide the neighbourhood with clean drinking water. If this works, we will have a centralized system treating wastes, producing energy and providing clean water, solving three problems in one go.

Frans Lemens/Linear/Still Pictures/SpecialistStock





Youth Olympic Games

CLEAN, **GREEN** AND KEEN

Jed Senthil tells TUNZA about volunteering at the Inaugural Youth Olympics.

In August 2010, Singapore was excited to host the first-ever Youth Olympic Games. The idea of International Olympic Committee President Jacques Rogge, the Games gave 3,531 athletes aged 14-18 from more than 200 countries a world-class platform in 26 sports, including swimming, rowing, archery and the triathlon.

But it wasn't just about competition; it was also about values. In addition to the Games, all athletes participated in a Culture and Education Programme focused on five themes: Olympism and Olympic values; Skills development; Well-being and healthy lifestyle; Social responsibility; and Expression through digital media.

Environmental awareness was part of the Social responsibility theme, with UNEP organizing some fun activities. A bicycle generator let the super-fit athletes see just how much effort is needed to produce enough electricity to run a CD player or heat a mug of water. An environmental-footprint calculator enabled participants and spectators alike to see how green their lifestyles are, and how things like taking a hot shower or watching television contribute to greenhouse gas emissions. Athletes were also able to test their environmental knowledge through a quiz, and to join the Tunza network.

One of the reasons Singapore was chosen as the host city was that it is clean and green, lauded for the quality of its air and water, lush street-side greenery, nature reserves and parks.

The Organizing Committee worked with the National Environment Agency to make the Games as green as possible and raise public awareness of environmental responsibility, encouraging people to adopt such practices as carrying their own water bottles, using energy and water wisely, taking public transport, and minimizing waste by practising the 3Rs: reduce, reuse and recycle.