

The UNEP Magazine for Youth

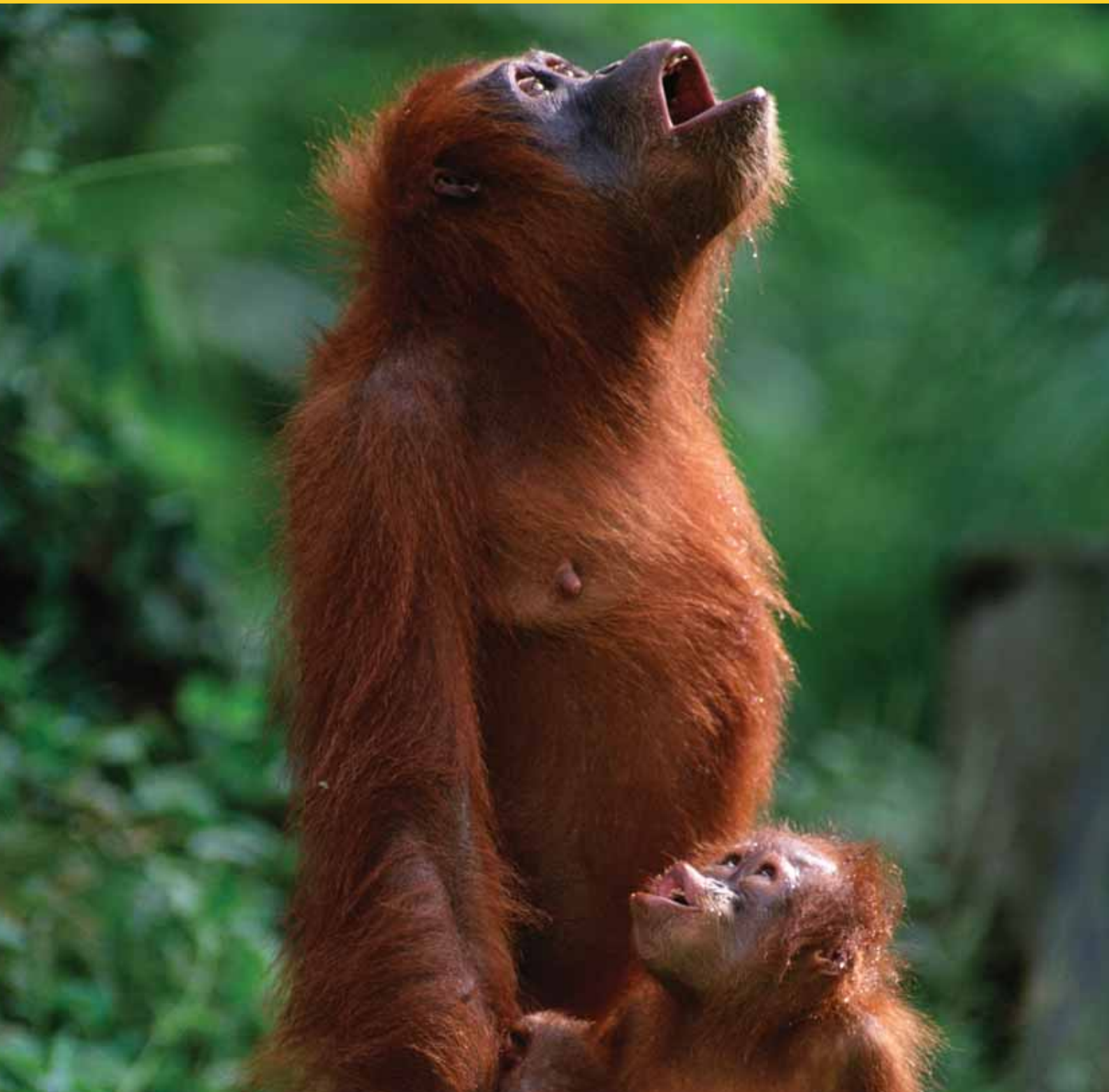


TUNZA



for young people • by young people • about young people

Forests and trees



A portrait of home • Sacred forests

Urban jungle • Chemical cornucopia • It's up to us

TUNZA

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

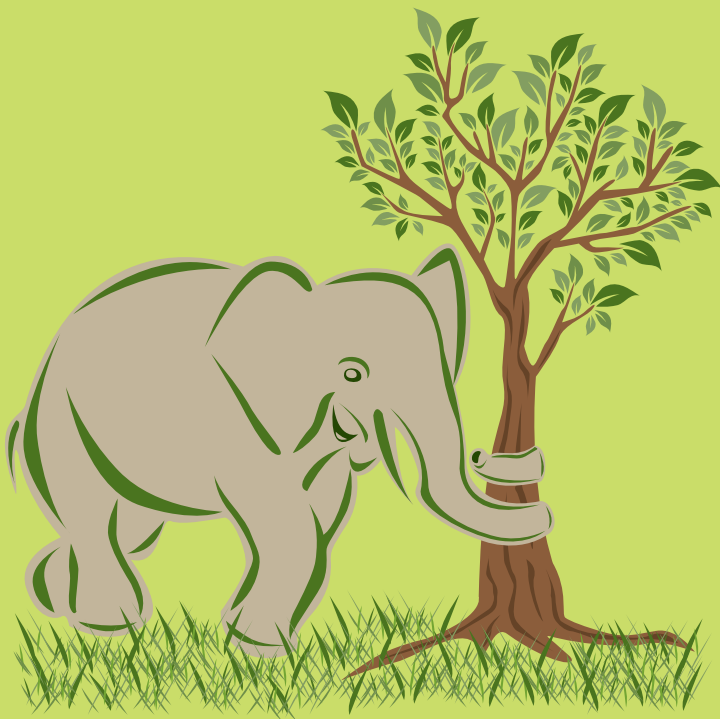


UNEP and Bayer, the German-based multinational involved in health care, crop protection and high-tech materials, are working together to strengthen young people's environmental awareness and engage children and youth in environmental issues worldwide.

A partnership agreement, originally signed in 2004 and renewed in 2007 and 2010, runs through 2013. It lays down the basis for UNEP and Bayer to implement the projects under the partnership. These include: TUNZA Magazine, the

International Children's Painting Competition on the Environment, the UNEP Tunza International Youth and Children's Conferences, youth environmental networks in Africa, Asia Pacific, Europe, Latin America and the Caribbean, North America and West Asia, the Bayer Young Environmental Envoy Program and a photo competition, 'Ecology in Focus', in Eastern Europe.

The long-standing partnership between UNEP and Bayer has become a public-private partnership that serves as a model for both organizations.



What ecosystem services are worth (per hectare per year)



Cameroon's forest services

Climate regulation \$842–2,265

Non-timber forest products: \$41–70

Flood regulation \$24

Hawaii, USA

Groundwater recharging services of the forested Ko'olau watershed: \$35,500–\$65,750

Costa Rica

The pollination value of forests next to coffee plantations: \$395

Reducing Emissions from Deforestation and Forest Degradation



The UN's initiative on Reducing Emissions from Deforestation and Forest Degradation (REDD, www.un-redd.org) is a mechanism that facilitates the flow of funds from the developed to the developing world to conserve forests. To date the REDD Policy Board has approved \$55.4 million to support the development of national REDD strategies in Bolivia, Cambodia, Democratic Republic of the Congo, Ecuador, Indonesia, Panama, Papua New Guinea, Paraguay, the Philippines, Solomon Islands, Tanzania, Viet Nam and Zambia. In the longer run, as partnerships between nations are established, REDD could raise as much as \$30 billion a year.

EDITORIAL:

A different way of thinking

We all know that timber, fibres, foods and medicines from forests have a price. But the services forests provide – often referred to as ecosystem services, such as regulating water and controlling floods, storing carbon and preventing erosion – go undervalued despite being far more significant. The current rate of forest felling contributes 20 per cent of our carbon emissions, but what is the true worth of keeping that carbon locked up? Expressing such values in economic terms makes it possible to compare the value of conserving forests with the cost of destroying them.

Putting a dollar value to ecosystem services, however, is a contentious issue. Some say we should appreciate our natural environment for its intrinsic worth, and that putting a monetary value to it devalues it. Others believe that we should really pay for what we consume – not just the face value of a cheap plastic toy or that affordable mobile phone, but the cost to our environment of making, transporting, using and discarding such things.

The trouble is that nature's harvests, using traditional economic measures, do not seem to contribute much, especially at the global level: forestry, agriculture and fisheries account for less than a fifth of the world's gross domestic product. At the local level, however, they are of huge importance, representing up to 90 per cent of poor people's livelihoods. So putting a price on ecosystem services more truly reflects the fundamental needs of people on the planet, rich and poor alike.

Payment for ecosystem services is a different way of thinking. Instead of letting the markets push people to clear forests for timber, building materials and fuel or turn them into agricultural land or grazing for cattle, it rewards communities who preserve and even restore their forests – and helps fight poverty. The money comes from those who benefit from the forests' wider services – regulating climate, storing carbon and controlling flows of water. On a practical level, it can be raised through general taxation or by adding a charge to existing tariffs such as for water use, or from greenhouse gas emitters through the carbon markets. And there are also moves to redirect some overseas development aid to payment for ecosystem services.

If these services are lost because of deforestation and forest degradation, money won't restore them. But expressing their value in the language of commerce may persuade politicians, producers and consumers alike to rethink exactly what goes into that plastic toy or mobile phone.



Yann Arthus-Bertrand

Yann Arthus-Bertrand has made documenting the grandeur and beauty of Earth his life's work. Born in 1946, the French photographer, film maker, environmentalist and UNEP Goodwill Ambassador started photographing wildlife on a trip to Kenya in the late 1970s, when he spent some time with a pride of lions. Since then, he has worked for *Life* and *National Geographic*, and along the way photographed naturalist Dian Fossey and the mountain gorillas in Rwanda.

Arthus-Bertrand is best known for his aerial photography – images shot from helicopters and hot-air balloons. With the support of UNESCO, he provided a perspective of our planet that we wouldn't otherwise see in *The Earth*

from Above, and in 2009, released *Home*, a documentary showing the glories of the planet from the air and how humanity's relationship with it is rapidly disrupting its ecological balance.

The UN commissioned Arthus-Bertrand to produce the official film for the launch of the International Year of Forests, *Of Forests and Men* – a seven-minute montage of the world's forests from above. The footage shows not only the beauty of forests, but also what we are doing to them.

TUNZA asked Arthus-Bertrand about his relationship with forests and how he feels photography can help preserve the Earth.

TUNZA: Do you spend much time in forests?

Y A-B: My house stands on the edge of a forest where I walk every morning. It is a world of sensations, where all human things seem to disappear. Forests' tranquillity and beauty, freshness and fertility express something that contributes to my physical and mental well-being. I don't think I am alone in this. We come from the forest. Humans developed their binocular vision and opposable thumbs in the trees. Perhaps that's why I feel the need to return to them from time to time, to reconnect. Yet I am aware that the forests around Paris all bear the mark of humanity.

TUNZA: From your perspective, what is the key problem, and solution?

Y A-B: I stopped once near a field in Borneo, where a farmer was cutting a patch of forest. I spoke to him about deforestation, ecosystems and climate change. He said: 'You come here in your helicopter to teach me a lesson? Me, I'm just working to feed my family.' Then he invited me on to his wooden boat where his wife was feeding a baby and watching a US television show.

We have created a dream of comfort and consumption, we profited from that dream, we showed it to others, but now we tell them: 'Sorry, not for you. The planet is in danger.' So the question is:

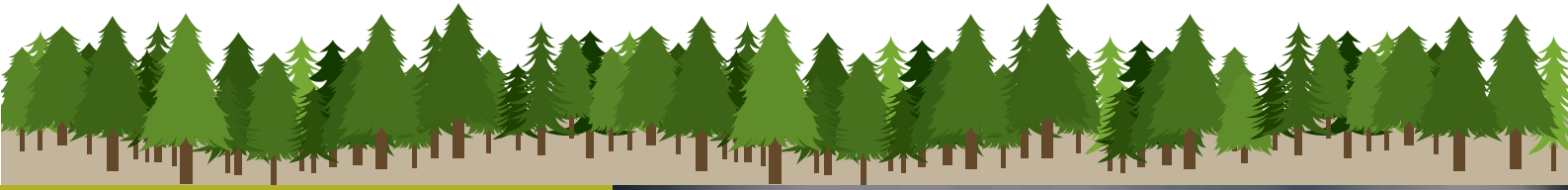
are we, from the developed countries, going to share? For others to have more, we need to accept having less. And that's not easy.

We have to change the way we think, so that people ask: 'Do I have the right to do this? May I live without considering my impact on the environment, on a planet that I share with others?'

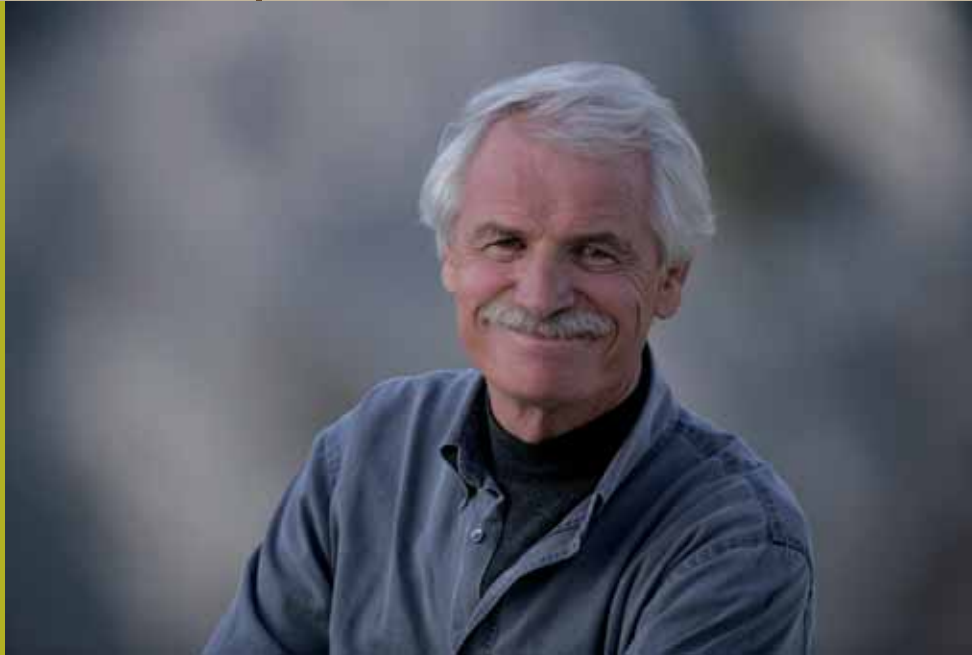
TUNZA: What can photography and film do to help efforts to conserve forests?

Y A-B: The beauty of the Earth creates enormous emotion, and through this, one can raise consciousness and pass





A portrait of home



Yann Arthus-Bertrand

on knowledge. Each picture of the Earth or its inhabitants aims to show the best in order to appeal to what is best in us. The will to protect is strongest towards what one understands and loves.

TUNZA: What would you say to the world's young people?

Y A-B: Commitment gives meaning to life. I show it through photography, an architect can demonstrate it by designing a 'green' house or an engineer by developing a clean car. Every person

can act in his or her own way. What is fundamental is to act.

Visit **Yann Arthus-Bertrand's GoodPlanet.org** for photographs, a competition, educational resources on forests, and much more.

See his films online:
Of Forests and Men

www.desforetsetdeshommes.org

Home

<http://www.youtube.com/watch?v=jqxENMKaeCU>



Yann Arthus-Bertrand



A chemical cornucopia

By Luke Roberts, who is studying molecular and cellular biology at Imperial College, London

The Earth's surface was once held tightly in the grasp of forests. An estimated 14 per cent of the 150 million square kilometres that make up our terrestrial ecosystems was rainforest, for example. Today, only 6 per cent of that remains, and some believe that it, too, will disappear within a mere 40 years. The reason? Deforestation. More than 130,000 square kilometres per year (an area the size of Greece) is lost each year, driven by the human desire to turn ever-greater quantities of land over to agriculture, to monoculture plantations for food crops or timber or palm oil, to build roads or dams and to extract minerals – all to supply the demands of an ever-growing human population.

In the race to become ever more economically 'successful', have we forgotten, or do we still not recognize, the fantastic wealth that already exists in the chemical storehouses that are forests? In the stems, flowers, vines, leaves, shoots, twigs, bark, roots, seeds, fungi and fauna lies the potential for medicines, pesticides, cosmetics and other compounds of massive industrial relevance.

Consumable products are not the only offerings. Incredibly, the release of volatile terpenes from trees produces a

Invaluable forest chemicals – a glimpse

- Taxol (Paclitaxel) originally from the Pacific yew (*Taxus brevifolia*), used to treat ovarian, breast and lung cancer.
- Quinine from the cinchona tree, once used to treat and guard against malaria.
- Tannins (polyphenols) from plants, used to treat parasitic diseases of livestock.
- Diosgenin from the Mexican yam (*Dioscorea* sp.), first used to produce the contraceptive pill.
- Salicylic acid from the white willow (*Salix alba*), the active compound of our most popular painkiller – aspirin.
- Terpenes (terpenoids) from coniferous species, vital in producing commodities ranging from food colouring, chewing gum and soap to paint, varnish, polish, ink, resin and adhesives.

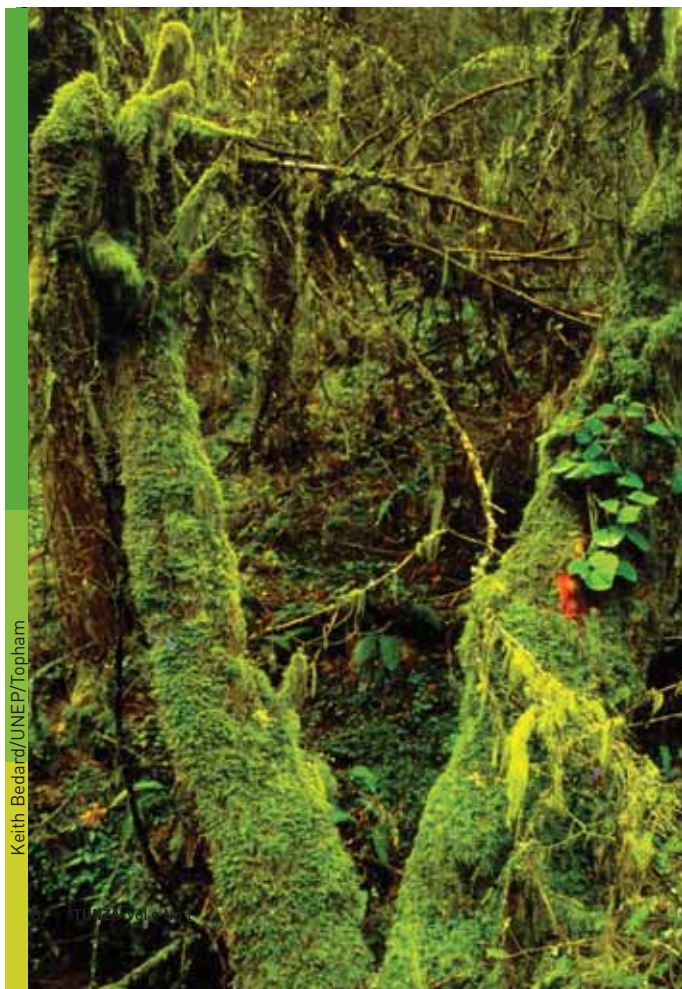
chemical 'cloud layer' that reflects sunlight back into the atmosphere – a forest's self-cooling system. In warmer weather more terpenes are released, perhaps providing some protection against increasing global warming.

With the advancement of new technologies, many naturally occurring chemicals are being replaced entirely or partially by chemicals synthesized to do a certain job: quinine, for example, has been replaced by synthetic drugs designed to be more efficient in the treatment of malaria.

It is easy to see why natural chemicals may become surplus to requirements: concentrations of such chemicals are often low and vary with seasonal and environmental factors, so lengthy purification processes are often needed. Does this mean our reliance on forest chemicals will soon be obsolete too?

Not so. For example, natural rubber – or caoutchouc, a hydrocarbon polymer from the latex of the tree *Hevea brasiliensis* – is still used extensively owing to certain physical advantages over synthetics: it is better at withstanding tearing when hot and it resists the build-up of heat during flexing.

It is critical to realize that out of the 300,000 to 400,000 plant species described, more than two thirds of these are in forests, particularly rainforests. But only 5 per cent of rainforest species have had their chemical composition explored. A poignant reason to strive for the protection of forest biodiversity – other than the inherent beauty of forest ecosystems – is the fear of losing unidentified potential. After all, you can't look for answers to questions that you haven't yet formulated. Letting undiscovered chemical assets slip through our fingers without us recognizing that they were ever there at all is not just a criminal waste – it could jeopardize the health and well-being of our lives, and of generations to come.



Norway leads on REDD



Bjørn H Stuedal

Nigel Dickinson/Still Pictures

Reducing Emissions from Deforestation and Forest Degradation (REDD; also see page 20) is a mechanism being negotiated under the United Nations climate change convention. It is intended to offer developing countries financial incentives to keep their forests standing and conserve the carbon stored in them, thereby fighting climate change. REDD+ goes further, encouraging sustainable forest management – helping preserve biodiversity, and providing livelihoods for millions. One of several multilateral initiatives offering REDD support is the UN-REDD Programme, to which Norway is the largest donor. TUNZA spoke to Norway's Minister of the Environment and UNEP Champion of the Earth **ERIK SOLHEIM** about why his country is leading the way, what has been achieved to date and his hopes for the future.

TUNZA: Could you tell us why and how Norway is supporting REDD/REDD+?

ES: Rainforests are disappearing at an alarming rate – an area the size of England every year. Most of the world's standing rainforests are in countries in great need of economic growth. An easy way to quick money is through deforestation, even though the consequences of forest destruction are huge. Globally, deforestation causes almost a sixth of all global greenhouse gas emissions and has severe effects on the regional and local climate and environment. Equally important: millions of the world's poorest people depend on tropical forests for their survival. And rainforests contain half of the world's plant and animal species. Unless conservation can contribute to higher income than other, destructive uses of the forests, the destruction will continue. The most important thing Norway has done is to put money on the table. We have decided to use up to \$500 million per year on activities that reduce climate gas emissions from forest destruction.

TUNZA: What progress has there been? With which countries are you working?

ES: Brazil has done an amazing job in reducing deforestation in the Amazon by almost 70 per cent in the past seven years.

The contributions from Norway are channelled through the Amazon Fund, and go to projects that should reduce deforestation further. Indonesia, the Democratic Republic of Congo and Guyana are also making progress. And more than 30 countries are working on rainforest protection with support from the UN and the World Bank.

TUNZA: What have been the biggest obstacles in implementing REDD?

ES: The biggest obstacle we are facing is MONEY. Norway has put a significant sum on the table, but this is far from enough. That is why we want this to become part of the international climate change agreement, with a requirement that all countries contribute. The challenge is threefold: developing countries must have the political courage to start this work before the international mechanism is in place; donor countries must have the courage to put money on the table before the mechanism is in place; and developing and developed countries must have trust in each other, and believe that we can achieve this together.

Another challenge is being able to check that forests are really being saved. To do this we need to monitor the forests closely in the years to come. Luckily, humanity now has satellites that make it possible to watch the forests from the sky, almost in 'real time'. In the Brazilian Amazon, the police use satellite images to find and apprehend people that destroy forests illegally.

TUNZA: How do you see the future of REDD+, and are you encouraged by what is happening?

ES: I am very optimistic. The prospects of saving the world's rainforests have never looked better, although there are huge challenges ahead. The ultimate goal is that protection of forests be part of a future global deal on climate change, but I sincerely hope that the rainforest countries will succeed in reducing emissions from deforestation and forest degradation even before a global deal has been negotiated.

ACTION on FORESTS

UNEP



Saving forests from destruction prevents carbon dioxide from entering the atmosphere, promotes natural biodiversity and forest cultures, and protects soil from erosion and water from pollution. All over the world, young people are working on ways to help conserve forests. Here's how.

Mandarina Wambui Njoroge, 24, Bayer Young

Environmental Envoy 2010, Kenya

The Mau forest, located in Kenya's Rift Valley province, is the country's largest water catchment area. It has been severely degraded through extensive logging and farming: 37 per cent of the forest cover has been lost since 1963, causing rivers that once ran year-round to become seasonal, and resulting in soil erosion and floods.

Recently, the government has taken the positive step of deciding to reforest it. Unfortunately, this means that the Ogiek, a tribe of people who have always lived in the forest and traditionally depend on it for their livelihood, must be resettled. The Ogiek are not the only people here: many have illegally settled, logged and grabbed land for agriculture, doing the majority of damage to the forest. The Ogiek do log from the forest, selling timber for profit, but not on an excessive scale.

The government plans to resettle the community of 80 extended families around the forest perimeter. They'll be given land, but will have to leave their home without being offered an alternative means of survival. Along with members of the Chiromo Environmental Awareness Club, which I chaired, I developed a project that seeks to allow the Ogiek to make a living through honey production.

The Ogiek have always produced honey for themselves, hanging beehives in the forest's trees. Our plan is to provide training on commercial-level beekeeping, harvesting, refining and bottling, while providing beehives and modern equipment. The honey would be packaged as an eco-friendly product supporting reforestation. The Ogiek would still benefit from the forest without having to log, and would also serve as guardians against illegal harvesting. Beekeeping is also a way of protecting the trees.

Fellow environmentalists and I are now working on the project independently from the Club. We must enlist a donor to fund equipment and training, and the community's cooperation. If all goes well, my colleagues and I will oversee the project on site.

Diana Friedrich, 19, Bayer Young

Environmental Envoy 2010, Argentina

In Argentina, forests are destroyed for industry and agriculture, while poachers kill animals illegally. My project, Banco de Bosques (Forest Bank), aims to save the provincial park Urugua-I in Misiones, Argentina, part of the Upper Paraná Atlantic Forest, one of the world's most endangered rainforests, where more than 90 per cent of all amphibians and half of all plants are endemic. Within the park's 84,000 hectares are four private properties with cattle, small plantations and an access road. Unfortunately, this road leads poachers into the heart of the park, one of the last areas where the endangered great jaguar still lives.

We can only close it by purchasing the properties, so in 2008 my colleagues and I launched the Forest Bank, a website that collects donations to buy the threatened forests, giving people everywhere a chance to help save Urugua-I's forests. It's simple. On www.theforestbank.org, we show a satellite image of the forest. Donors click on a parcel, pledge at least \$3, and receive the parcel's coordinates. A map shows how much land has been saved. As we receive money, we'll purchase the properties one at a time and donate them to the province, adding them to the park and closing the access road.

We've raised enough money for one hectare so far. One hectare equals 10,000 square metres, and most people are pledging to save 10 square metres per month. We have quite a few donors, but not enough, so please donate and help us spread the word.

Our website: www.theforestbank.org

On Facebook: www.facebook.com/#!/pages/Banco-de-Bosques/126872527377361



Emiliano Ezcurra



**Andrea Tobar, 21, Bayer Young
Environmental Envoy 2010, Colombia**

In the Putumayo region south of Colombia, the Amazon rainforest has long been logged and burned in order to grow illicit crops, particularly coca, causing environmental and social problems. In order to provide local people an alternative to growing coca for a living, I am developing a business to produce and market an oil made from sacha inchi (*Plukenetia volubilis*), a perennial plant native to the rainforest.

The plant is cultivated by indigenous peoples for its nutritious seeds, which are typically pressed into oil. In Colombia, communities harvest it wild for themselves, but I plan to standardize production on land that has already been deforested, with standards and techniques overseen by government. The second step is to develop a market of consumers in Bogota. Sacha inchi is not normally consumed outside indigenous communities in Colombia, but is cultivated commercially in Peru and exported to Europe, the United States and Japan, where it's appreciated for its peanut-like flavour and nutritional value – it is high in protein and Omega 3 fatty acids.

The product is environmentally beneficial. The deforested parts of the Amazon are empty: it's not jungle, and never will be again; the animals that lived there are already gone. Planting sacha inchi crops would re-green the land, making productive use of the space, and discourage deforestation for coca plantations. Sacha inchi also revives soil poisoned by herbicides the government sprayed on coca crops in an effort to stop illegal drug production, and avoids the pesticides needed to produce coca, which pollute soil and water. The plant is resistant to poisons in the soil, and returns nutrients to degraded soil.

The project has been given special recognition by my university, and has been accepted as my thesis. With implementation underway in mid-2011, I hope to market a product before long.

**Madhushree BN, graduate in environmental
management at Teri University, Delhi**

Shola forests are evergreen forests found at higher elevations in southern India, comprising dense growths of trees interspersed with stretches of grasslands. Sholas are broad-leaved stunted trees with large canopies; some are endemic and provide an ecosystem for other endemic flora and fauna. They used to cover the Palani Hills in the Western Ghats, but when the British took over, the forests were converted to eucalyptus plantations. Eucalyptus consumes a good deal of water, depleting groundwater levels, while the sholas' high water-holding capacity helps to recharge aquifers.

That's why non-governmental organizations (NGOs) are working to regenerate the original forest by planting shola trees within the eucalyptus plantations. Newly planted sholas actually need the eucalyptus because they require a lot of shade, but they grow quickly, ultimately overshadowing and killing the eucalyptus. Some shola forests have already been successfully replanted, and together the forest department and NGOs are also pushing for the Palani Hills to acquire sanctuary status.

As researchers, I and 32 classmates interviewed the NGOs, forest rangers and villagers to see how well the community understands the region's biodiversity, and found they do recognize that theirs is a unique ecosystem needing protection.

It was thrilling to see concepts we'd discussed in class come to life in the field, such as that of regeneration. Long ago, when the sholas were cut down, some seeds were left among the eucalyptus as *in situ* seed banks. We spotted a couple of shola trees growing in unreplanted areas – the seed banks had survived, and some had grown into trees.

Making the local community aware of shola regeneration is extremely important because they already profit from eucalyptus. But when educated about sustainable development, they become directly involved in the replanting process, and actively adapt their economy in new directions. I'm looking forward to returning soon to carry out more studies, and to advise on how to manage development and tourists while maintaining the environment.



Karunakar Rayker/CC-2.0

Tan Sijie, 28, Rover Scout, Singapore

Mangroves grow in coastal conditions where most other plants would not survive the poorly oxygenated mud, the heat and the salt. To adapt, they developed some of nature's most complex systems, such as above-ground roots, and leaves that keep water in and salt out. Mangroves provide important nurseries for fish and a food source for many animals, maintaining rich biodiversity. They even protect property and lives against natural hazards such as storms and tsunamis. But mangrove forests are one of the world's most threatened tropical ecosystems: more than 35 per cent of Earth's mangrove cover has been lost due to development, pollution, unsustainable timber harvesting and climate change.

On the shores of Terengganu, Malaysia, mangroves are part of the Setiu Wetlands, home to the critically endangered river terrapin and painted terrapin, and a landing site for marine turtles, particularly green turtles. I help organize a campaign called Project Orion to restore mangrove forests and conserve sea turtles in this area. Initiated by Rover Scouts from the Singapore Scout Association, in collaboration with WWF-Malaysia, the annual programme takes a team comprising about 10 Venture and Rover Scouts (aged 17



to 26), mainly from Singapore, to the village of Kampung Mangkok in Terengganu. As part of our work, we join with the villagers to plant mangroves on the banks of the Setiu River. When the project started in 2009, the village was just starting to reach out to tourists and visiting groups to enlist their help in replanting mangroves. We always have a wonderful time, and look forward to visiting every year.

Back in Singapore, we partnered with the National Parks Board to plant mangroves in our own wetland reserves. We've planted about 1,500 mangrove trees in Malaysia and Singapore since the project began. Now into our third year, Project Orion is here to stay, just like the mangroves!

Children plant 3.9 million trees!

by Yugratna Srivasvata, India, Asia-Pacific UNEP/
TUNZA Junior-Board representative 2008-2010

Plant for the Planet, UNEP's tree-planting campaign popularly known as the Billion Tree Campaign, was launched in November 2006. Backed by Prince Albert of Monaco, Wangari Maathai and the World Agroforestry Centre (ICRAF), the project encouraged individuals, communities, organizations and governments to get out and plant. The 1 billion target was easily exceeded in 2007; indeed by 2009, 7.4 billion trees were planted and now more than 11 billion trees have been planted across 170 countries. So UNEP raised the bar and set us all the challenge of planting 13 billion trees as soon as possible.

Young people have been key in this success. In 2007, Felix Finkbeiner, from Germany, who was then only nine, made a pledge to plant 1 million trees in Germany, the first spark of a children's initiative. I got involved in September 2009, when I presented a letter to UNEP Executive Director Achim Steiner in New York committing my organization, Tarumitra, to participate by motivating and helping our 1,600-school youth network to plant trees.

But the big turning point for the children's initiative came at the 2009 TUNZA International Children's Conference when Felix shared his vision of harnessing student networks. After the conference, children from 107 countries joined our network, and many also joined our Stop Talking, Start Planting campaign, where we get our photos taken holding our hands over the mouths of politicians and celebrities.

Reaching out to so many young people with so many different languages and cultures has been a challenge, but we've had

the support of our teachers, parents, UNEP and other adults. The internet, especially social networking sites, plays a crucial role, too. We have fan pages on Facebook and Twitter, and online platforms like UniteForClimate are really helpful. The student Plant for the Planet website, where you can register how many trees you've planted, has been translated into many languages, and more are in the pipeline, so we can reach out to as many people as possible.

So far, the children's initiative has planted more than 3.9 million trees. We've set ourselves a new and ambitious goal of 131,000,000 trees – 1 million for each country represented in our network. We also hope to present our views at the upcoming Conferences of the Parties to the Convention on Biodiversity and United Nations Framework Convention on Climate Change.

When it comes to working for the Earth, the only goal is a healthier planet for future generations. Each tree we plant is a symbol of climate justice. We aim to motivate and involve as many people as possible, especially the young ones. Environmental problems do not recognize political or geographical boundaries – blaming any one nation for environmental problems is of no use. We all have just one Mother Earth to care for and share.

Children's initiative, Plant for the Planet –
www.plant-for-the-planet.org
UNEP's Billion Tree Campaign –
www.unep.org/billiontreecampaign



Campaigning for cork

By Lea Keiper, 17, TUNZA magazine intern, 2011

Cork has been the main material of wine stoppers since 1700. But in recent years, plastic stoppers and screw caps have gained a stake in the global market. TUNZA looked into the issues.

Natural cork stoppers

Some 2.2 million hectares of cork oak forest – mainly in Mediterranean Spain and Portugal – produce an annual global harvest of about 300,000 tonnes of cork. The cork oak must be 25–30 years old before its bark can be collected and the first two harvests are usually of minor quality. But a mature tree can produce 40–60 kilos of cork every 10–12 years for the remainder of its 200-year life. The harvesting is done by hand and does no harm to the tree. In fact it is good for the environment as a whole: it triggers the tree to absorb more carbon dioxide as it re-generates its bark; it offers a sustainable livelihood to local people; cork products are easily recycled; and the cork oak forests are prime habitat for endangered species including the Iberian lynx.

But real cork now accounts for only 60–70 per cent of wine stoppers, with synthetic stoppers and screw caps gaining in popularity. This is partly because they are a quarter of the price of natural corks, but also because there is less risk of the wine becoming tainted – or ‘corked’ – even though the risk is, in any case, quite low and the taint often minor.

Synthetic stoppers

Available since 1993 and accounting for 5–10 per cent of the global market, synthetic stoppers are made from plastic compounds that are designed to look and ‘pop’ like a natural cork. However, while they carry no risk of tainting the wine, they offer less protection against oxidation. Although not biodegradable, they are generally recyclable, but the plastic is usually only accepted by recyclers in areas where demand justifies the recycling of this kind of plastic.

Screw caps

These are made of aluminium and have a 15 per cent share of the world’s bottle stopper market. They form a tighter seal and therefore keep oxygen out of the wine for longer than either synthetic or natural corks, maintaining the wine’s quality and ageing capacity – but only for about 10 years, according to one study. They also contain a plastic seal in the top of the screw cap, and recycling is difficult.

Environmental impacts

Studies on the environmental impact of the various stoppers find that the benefits of cork outweigh the advantages of its aluminium and plastic alternatives in almost all areas (see table below). Regrettably, despite the efforts of manufacturers and recyclers, plastic stoppers and aluminium screw caps often end up in the sea, endangering marine life and contributing to the ever-growing islands of ocean garbage. In addition, synthetic stoppers threaten the conservation of cork oak forests: without the cork market, the forests are likely to degrade or even disappear.

The environmental cost of cork relative to aluminium and plastic wine stoppers

Environmental indicator	Cork	Aluminium	Plastic
Non-renewable energy consumption	1.00	4.33	4.87
Water consumption	1.90	1.00	3.06
Greenhouse gas emissions	1.00	24.24	9.67
Contribution to atmospheric acidification	1.00	6.15	1.54
Formation of photochemical oxidants	1.00	4.04	1.48
Eutrophication of surface water	1.00	1.10	1.52
Production of solid waste	1.00	1.99	1.57

Source: Amorim/PricewaterhouseCoopers

TUNZA concluded that it is time to take a stand. It is usually impossible to tell whether a bottle seal hides a synthetic or natural cork, and not always obvious whether it is a screw top, so companies should be asked to give this information on the label of each bottle. This would enable consumers to make an informed decision before buying, and give them the chance to actively support the environment instead of harming it.

Go to www.tunza/corks and sign up to our campaign!



Photos: Clive Muir/www.grazalemaguide.com



What makes a forest a forest?

We all know forests are hugely important places. But why exactly should we care about them? And what, in fact, are they? Oddly, the second question is rather harder to answer than the first. Forests are home to a large proportion of the world's biodiversity. They play a major role in regulating climate, both globally and locally; they contain huge quantities of carbon, stored in the wood and below ground, which might otherwise enter the atmosphere as greenhouse gas. They stabilize soils and help prevent erosion, and have a major influence on the water cycle, affecting the supply and flow of freshwater. They provide a wealth of material resources: timber, of course, but also other products including wild foods, rattan from palms, medicines, fuelwood and charcoal. And they create some of the most beautiful and



Erin McKittrick/CC-2.5



Jason Hollinger/CC-2.0

Temperate rainforests are a source of the cancer drug taxol, made from extracts of yew trees, including the Pacific yew *Taxus brevifolia*.



Carsten Niehaus/GNU-FDL



www.lynxesitu.es/CC-2.5

Cork oak forests, the basis of a traditional cork-harvesting industry, are home to the world's most endangered cat, the Iberian lynx *Lynx pardinus*.



Dirk van der Made/CC-1.0

Cloud forests are believed to be particularly vulnerable to the impacts of climate change.

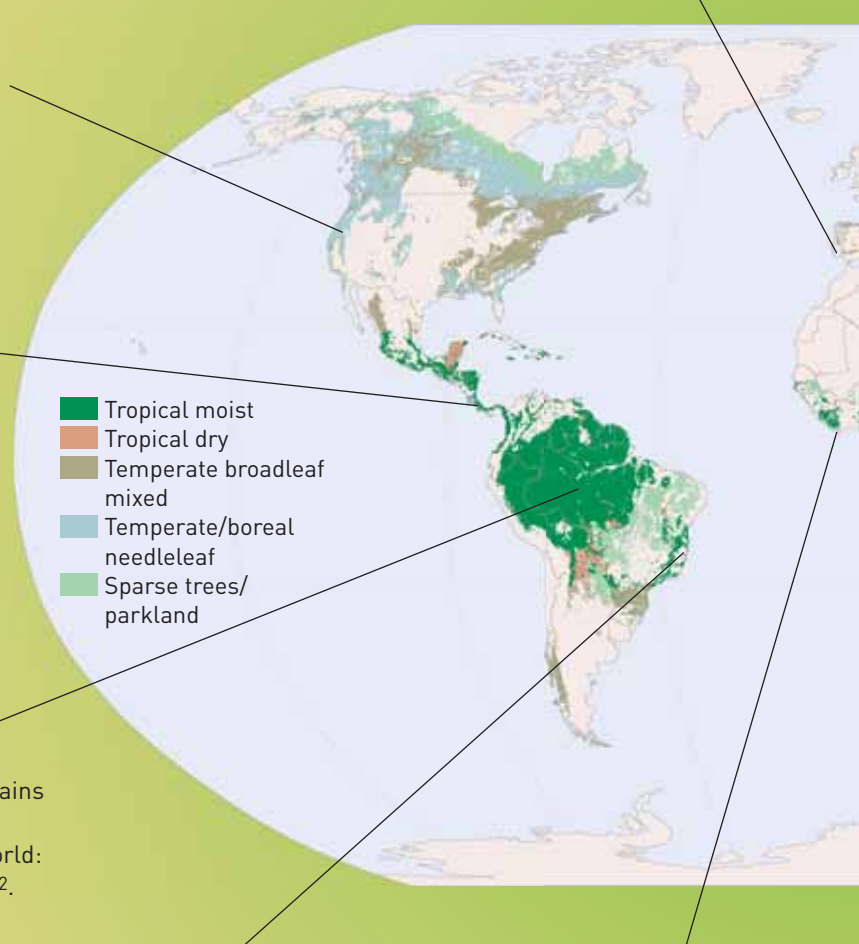


Francisco Chaves/CC-2.0



M Watts/CC-2.0

The Amazon Basin contains the largest expanse of primary forest in the world: more than 6 million km².



Specialist Stock

Tiny remnants of Atlantic coastal forest persist in southern Brazil, in close proximity to some of the largest conurbations on Earth.

Mangroves are the only forests that grow in salt water, providing vital coastal defences and nursery areas for many fish species.



UNEP/Topham

inspiring landscapes on Earth. But what is a forest? It's a place with trees, of course. But it's never as simple as that. How many trees exactly? And what exactly is a tree? Do plantations count? Parkland? Bamboo groves? It's hard to get agreement on this so it's not surprising that people may have very different ideas on what constitutes a forest. This in turn means that there are many different estimates of how much forest there is, both globally and in particular places, and how fast the area of forest is changing. The Food and Agriculture Organization of the UN (FAO) considers forests to be anywhere with more than 10 per cent tree cover, but that's not very much at all. On this basis, there are just over 40 million km² of forest in the world – or about 30 per cent of the Earth's land area, and it's probably about half the area that would be forested without the impact of people. Only about 14 million km² of forest remains largely unaffected by humans, and existing forests are very unevenly distributed. Over half of the total forest area is found in just five countries, and more than 60 countries have less than one tenth of their area forested, with 10 of these having no forest at all.



Scevenels/UNEP

Virtually all Europe's forests are actively managed, with a high proportion certified for sustainable timber production.

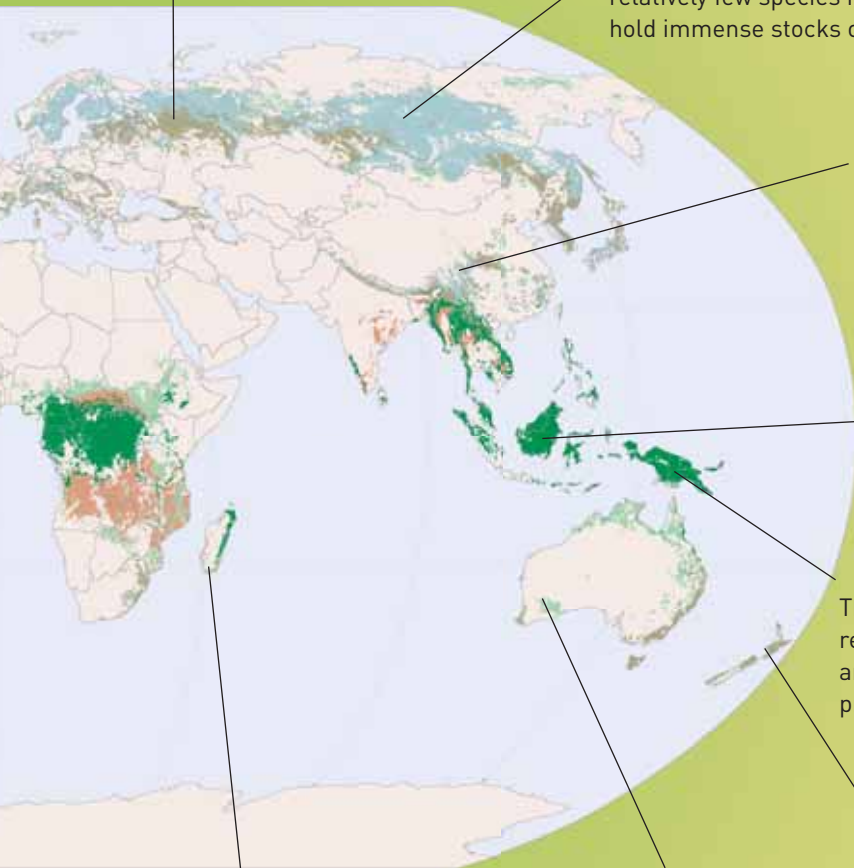


LB Brubaker/NOAA

The vast boreal forests of the northern hemisphere have relatively few species in them but hold immense stocks of carbon.



Ariel Steiner/GNU-FDL



In China nearly 300,000 km² of forest has been created since 2000, much of this by planting trees in previously unforested areas.

Southeast Asian rainforests may be the most diverse ecosystems on Earth. Huge areas are being cleared for cultivation of palm oil and other crops.



Marco Schmidt/CC-2.5

The rainforests of New Guinea remain relatively little explored and yield a constant stream of previously unknown species.



Lipton Sale/GNU-FDL

UNEP-WCMC

Around 90 per cent of Madagascar's unique and often highly threatened species depend on forest, which now covers only around 20 per cent of the land area.

Australia is the world's driest continent. Many of its eucalyptus forests are adapted to fire and frequent drought.

Protected areas such as Egmont National Park in New Zealand provide crucial refuges for forest ecosystems.



Jiali Gao/GNU-FDL



Arnaud Gaillard/CC-1.0



NASA

Sacred forests



How faith has helped conserve nature for millennia

Bjørn Christian Tørrissen/CC-3.0

All around the world there are sacred forests, woods or groves that have survived because of their association with the holy. In almost any country, and in almost any city, you will find the sacred has protected trees and has done so for centuries. Churchyards, mosques, shrines, temple compounds – all have within them landscapes which have been protected because they are sacred. And it is here that many of the trees that have survived in urban contexts are still to be found.

However, many others have been destroyed, perceived as the superstitious remains of outmoded belief systems standing in the way of progress. In pursuit of development, such sites have been bulldozed to make way for roads, railways, offices, factories and houses. The views of the local people have been ignored and the belief systems that helped preserve these beautiful and environmentally important places dismissed as old fashioned.

Today, we have become much more aware in the environmental movement of how precious and, indeed, ecologically vital these sacred forests and groves are. Often they protect key water sources or vital habitats for endangered species, or provide basic raw materials for health and healing.

But there is a new danger – that these sacred places merely become classified conservation areas or ‘sites of special scientific interest’. Such well-meaning attempts to protect them can be misguided, brushing aside or simply patronising the spiritual, historical and cultural meaning that has survived all this time. But by ignoring the religious and cultural reasons why these forests and groves have survived, we run the risk of killing off the very reason they are still there – and thus make it more likely that they will be destroyed.

Alongside this is the risk that REDD (Reducing Emissions from Deforestation and Forest Degradation) will not even really bother about the biodiversity issue of conservation areas, and simply values forests as carbon sinks – as if the Amazon rainforest

were created just so that we could drive cars. If we reduce the forests to nothing more than economic units, we will kill them.

Instead, we need to honour, work with, perhaps even join, the religious and spiritual beliefs and forces that for many hundreds of years have protected vital areas of forestry. It is stories, legends and faith that have conserved these forests, so let’s continue to work with these – because they clearly succeed.

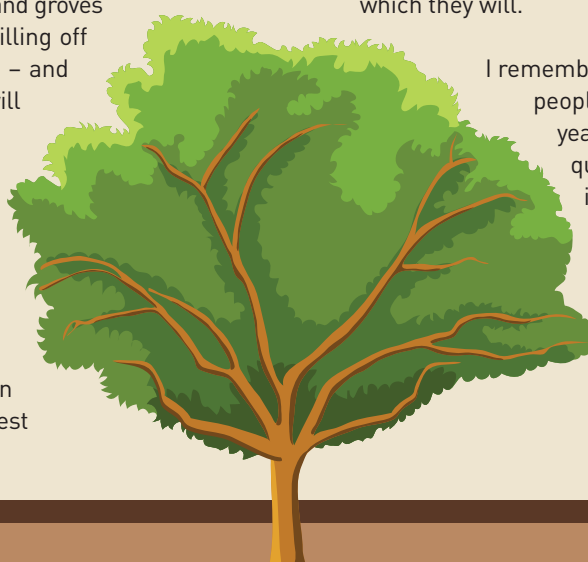
We need to be humble enough to recognize that long after the United Nations or conservation groups such as WWF are chapters in history books, and the current concerns of the environmental movement have become curiosities, the great faiths will still be protecting their sacred forests and groves, simply because they are holy, and will still be ensuring that the faith values that teach respect for nature are passed from generation to generation.

One of the core beliefs of the environmental movement is sustainability, and the oldest, most sustainable organizations in the world are the faiths. They have outlived every empire, every dynasty, every ideology and every fashion. They will still be here hundreds of years from now and, if we work with them, so will the forests and groves that they protect.

What we must not do is take them over, wrap them up in semi-scientific conservation-speak and cut off the roots of their faith, which have enabled the forests to flourish. If we do, then the forests will die when our civil organizations die, which they will.

I remember at a World Bank meeting at which people spoke of three-, five- and even 10-year plans, a monk from Tanzania saying quietly: ‘But we think in generations.’ It is this that has preserved the sacred forests of the world. And it is this view that will ensure they are here in hundreds of years’ time.

Martin Palmer
Director of the Alliance of Religions
and Conservation



For more than 1,600 years Istanbul, Turkey was the centre of the Roman, then Byzantine, then Ottoman Empires. In the old city centre, temples, churches and mosques are piled layer upon layer. Nature has little space here, but there is one place where it survives. On the edge of the Golden Horn a beautiful ancient woodland, which is also a major breeding place for birds, has survived.

The trees still stand because they grow in one of the holiest of Muslim cemeteries. In the mosque the cloak of the Prophet Muhammad is preserved and because of this, the site is considered special. As a result, for hundreds of years, people have wanted to be buried in this beautiful spot. If there were no mosque, no tombs, no sense of the sacred, there would be no trees either.

A van Zandbergen/OSF/Specialist Stock



Did you know?

Faiths own about 5 per cent of commercial forestry.

The Northern Diocese of the Evangelical Lutheran Church of Tanzania plans to plant 8.5 million trees over seven years to restore Mount Kilimanjaro's degraded slopes.

Faiths print around 15 million Qur'ans and 75 million Bibles every year – an opportunity for faiths to use paper from sustainably managed woodlands.



In Kenya, dozens of sacred groves survive, remains of ancient traditional sacred forests respected for centuries, if not millennia, by local peoples.



ARC

Travel into Tokyo and if you spot any trees, you can be certain that there too is a shrine – usually Shinto, the traditional religion of Japan, but sometimes Buddhist. The trees have survived or have been planted precisely because this is a sacred place where nature is honoured.



Tom Velandi

Almost every morning since 2001 Venerable Bun Saluth and his fellow monks have set out from their pagoda soon after dawn to patrol the Monks Community Forest and protect it from illegal logging and land incursion.

Seeing the extent of Cambodia's forest destruction, Ven Saluth sought official approval to protect 18,261 hectares of rare local lowland evergreen forest. This forest is now one of the largest and best-protected community-managed forests in Cambodia.

Armed with belief, but little else, in the face of often-dangerous forces, the monks have become powerful conservationists. They sometimes ordain the trees of the forest to confer protection on them. Venerable Bun Saluth says: 'The Buddha was born under the tree, attained enlightenment under the tree, and died under the tree. So a tree is a symbol of life, and sacred to Buddhists.'

IT'S UP TO US



S Turner/OSF/Specialist Stock



YoG2009.org

Great ape populations are declining at an alarming rate worldwide. The surviving great apes – gorillas, chimpanzees, bonobos and orangutans – all live in the forests of Africa and Southeast Asia. But the continuing destruction of their habitat by logging and conversion to oil-palm plantations – as well as the growth in the commercial bushmeat and pet trades – suggest that the majority of great ape populations will become extinct in our lifetime. The Great Apes Survival Partnership (GRASP) is an innovative and ambitious project led by UNEP and UNESCO to lift this threat. TUNZA spoke to biologist and GRASP Chief Consultant **IAN REDMOND** about the great apes, our nearest relatives in the animal world.

TUNZA: As someone who spent time with great apes and formed relationships with them, can you tell us why it is so important to save great apes from extinction?

IR: When I first studied gorillas with Dian Fossey in the 1970s, the gorillas came to regard us almost as honorary members of their group, and would choose to sit near us during rest periods. This allowed us close observation of their family behaviour, but cross-species friendships also developed. When poachers then killed members of our study group to sell their hands and skulls as gruesome souvenirs, and captured infants for the illegal wildlife trade, our natural response was to step up anti-poaching to defend gorillas we regarded as friends. In the wider picture, though, apes are keystone species in their habitat and many other species therefore depend on their survival.

TUNZA: Your work also concerns the people who live alongside great apes. What are some of the most pressing issues around human/ape interaction, and how can human needs be met while protecting great apes?

IR: If you have only known apes as frightening animals that sometimes destroy your crops, why would you care about their survival? Every family that farms near ape habitat is likely to see apes as a threat, or possibly if they can sell their meat or babies, as a source of income. Our work to conserve mountain gorillas tells us that if you engage local communities, address their needs, and create employment dependent on the apes being in the forest, many of the traditional threats will be reduced and the apes survive.

TUNZA: GRASP was founded in 2002, but great ape conservation had been a concern for a long while, and there are many organizations working on it. Could you comment on the role of this international initiative?

IR: At the turn of the millennium, it became clear that ape populations were declining all across Africa and Southeast Asia, with the one exception of the mountain gorillas. This was despite years of heroic efforts by individuals and organizations operating independently. GRASP was formed to develop a global strategy

so that everyone's efforts would be pushing in the same direction – the whole would then be greater than the sum of the parts, and every part would be strengthened by being part of the global effort. There is still a long way to go, but we have had some notable successes and created a more cooperative framework for governments and non-governmental organizations such as the Ape Alliance or WWF to work together.

TUNZA: Conserving great apes is not just about the animals but also conserving habitat, isn't it? Is this one of GRASP's main goals?

IR: People usually understand that apes need natural forests to survive, but most people don't realize the converse also applies – forests need apes, and other primates as well as elephants, toucans, tapirs – all the animals that eat fruit and disperse seeds. Most species of tropical trees have their seeds dispersed by animals – the gardeners of the forest. Lose the animals and you lose the next generation of trees and the health of the forest declines. Since GRASP was formed, a number of governments have



Michael Huffmann/GRASP Atlas



Daniel T O'Brien/UNEP/Topham



Tan Yik Yee/UNEP/Topham

created new national parks for apes, which is good, but we also need better management of forests that are not in protected areas. Tropical forests in Africa and Southeast Asia – and in Latin America, where other species play the ecological role of apes – are essential for global climate stability. They absorb carbon dioxide, releasing oxygen and storing the carbon; they generate rain through evapo-transpiration; they stabilize soil with their roots, and purify water flowing through them. In a nutshell, the health of the planet depends on tropical forests, and the health of the forests depends on apes and the other gardeners. This is now recognized by governments working to find ways to better manage forests – such as REDD+, the UN scheme to reduce emissions from deforestation and forest degradation while reducing poverty and protecting biodiversity.

TUNZA: What are the biggest challenges that GRASP – and the great ape conservation movement in general – faces?

IR: The biggest challenge to apes and all species that live in tropical forests is from logging, the commercial bushmeat trade and the conversion of forests to agriculture. As Prince Charles has said: 'If we lose the battle against tropical deforestation, we lose the battle against climate change.' But the fear of dangerous climate change is, paradoxically, one of the greatest spurs to change the way we manage forests. If we get it right, we'll save

the forests and all the species that form a part of the forest ecosystem, and stabilize the climate. If we don't, all the indications are that things will go badly wrong... so we HAVE to get it right.

TUNZA: What are your hopes for the great apes, and is there anything that young people, or readers, can do to help?

IR: My hope is that apes are valued as fascinating intelligent beings, and as an integral part of the ecology of our world. Every person on the planet benefits from tropical forests, whether they know it or not. The air we breathe, the rain that waters our crops and fills our aquifers, many of the products we buy in supermarkets and DIY stores – all come from or have links to tropical forests or the crops that replace them. And every person is also a decision-maker. Thus, as shoppers we can insist that our money is not used to destroy forests, and demand certified timber and sustainable palm oil, soy, beef, etc. And we can put pressure on our political leaders to make better laws to achieve this goal. There are also hundreds of organizations working on these issues that would welcome volunteers and/or donations – so get involved. We are all implicated in the problems facing apes and tropical forests, so we can all play a part in solving the problem.

To find out more, visit www.4apes.com and www.unep.org/grasp.



D.W. Liggett/GRASP Atlas



Ian Singleton/SOCP/GRASP Atlas

The urban jungle



Allan Mertner

'The measure of any great civilization is its cities; and the measure of a city's greatness is to be found in the quality of its public spaces — its parkland and squares.' *John Ruskin*

The 5,000-hectare Reserva Estadual da Cantareira in São Paulo – which includes remnants of the Atlantic forest – is not only the world's largest tropical forest within a metropolitan area, but provides the city with space for recreation, important wildlife habitat and 4 per cent of its drinking water.



C Ruoso/BIOS/Still Pictures



F Lemarchand/BIOS/Still Pictures

Dakar, Senegal, has a range of well-managed forests serving various purposes. The Hann Forest Park was established to drain the surrounding marshlands, protecting the aquifer and providing an important source of drinking water. Trees were also planted in the 1940s to stabilize the city's coasts. Outside city limits, the Bandia Forest was developed to provide fuelwood for Dakar and two neighbouring cities, M'Bour and Thiès, while the Mbaou Forest, 15 kilometres from Dakar, provides species used for medicines. Dakar's city trees include baobab, whose leaves and fruit are eaten, and palms, from which palm wine is made.



Joi Ito/CC-2.0

The 3,540-hectare Sayama Forest just outside Tokyo is a *satoyama*: mixed forest, grassland, agricultural land, streams and reservoirs traditionally managed to yield sustainable food, fuel and water, while respecting native biodiversity. This popular forest, which is under constant threat from encroaching development, was the inspiration for the famous animated film *My Neighbour Totoro* by director Hayao Miyazaki, who created a fund for its protection in the 1990s.



Andre Seale/Specialist Stock

Rio de Janeiro's 3,300-hectare Tijuca National Park, famous for its massive sculpture of Christ overlooking the city, is so dense it looks as if it's been there forever. In fact, the original Atlantic forest was destroyed by coffee plantations and had to be replanted with native species in the 1850s to protect the city's springs. Now it is home once again to many endemic and endangered species.

Wooded areas and cities have always coexisted. Some 2,500 years ago, 'hanging' gardens were planted on Babylon's terraced walls, creating one of the wonders of the ancient world. Greeks and Romans built their temples around sacred groves within their cities. From medieval to Renaissance times and beyond, royal and powerful families in Europe set aside tracts of countryside for their own purposes. London's 1,000-hectare Richmond Park, where deer and other species still roam, is an old hunting ground connected to England's royal families since the 1200s.

The 19th century saw a movement to create public parks for the newly emerging urban working classes of the Industrial Revolution. When it was recognized that harsh conditions were affecting workers' lives, public green spaces were opened in industrial areas, and sport and recreation were encouraged by private philanthropists.

Impressed by the public parks of Europe, Frederick Law Olmsted and Calvert Vaux designed New York City's Central Park – 341 hectares of lush greenery in the centre of Manhattan – not just to promote the health and happiness of city dwellers, but also their morals. Central Park inspired similar developments in many more cities, including San Francisco and Seattle, and Olmsted also went on to pioneer a linked system of parks and green spaces in several places, most famously Boston, where it forms a green belt called the Emerald Necklace.

Urban forests are now gaining recognition as a way to make cities – where up to 70 per cent of the world's greenhouse gases are emitted – more ecologically sustainable. They perform many crucial services: sequestering carbon, filtering dust and exhaust particles from the air, and absorbing carbon dioxide, sulphur dioxide and carbon monoxide. Trees also absorb noise, protect streets from wind and help keep buildings cool. Chains of greenery provide corridors, connecting plant and animal habitats that are otherwise fragmented by buildings, roads and parking lots. Unpaved green areas are important for absorbing rain, helping to recharge groundwater and preventing flooding of streets and sewers when weather is extreme.

Urban forests can also function as water purifiers: in Lima, Peru, for example, they are watered with the city's wastewater, which cleans the water and replenishes the aquifers.

As cities grow, well-managed urban forests not only provide the social spaces and ecosystem services every city needs, but help provide building materials, food and fuel. In cities in Asia, Africa and Latin America, for example, the planting of fruit and fodder trees, and trees to provide fuelwood or raw craft materials, is already common. But the next evolution for urban forestry everywhere will be to apply its principles systematically to help make all cities as green, comfortable and sustainable as possible.

While Beijing has lost most of its deciduous broad-leaved forest, the city still has more than 40,000 trees that are more than a century old. In order to expand green cover, China initiated a tree-planting campaign in 1979, and an estimated 500 million trees and shrubs have since been planted in and around the city. About a quarter of Beijing is covered in green, and species include maples, elms, pines, ginkgo, and fruit trees such as apples, dates and persimmons.



Transit/T Roetting/Still Pictures

What sorts of trees do best in cities?

This depends on the city, of course, but generally they must be resistant to toxins and able to live for a long time in severe environments. Popular city species include the prehistoric ginkgo, which is highly tolerant of pollution, and London plane trees, which trap pollution in their bark and regularly shed it. Small flowering trees, such as cherry trees, provide spectacular seasonal displays, as do maples, which cope well with limited root space.



G Martin/BIOS/Still Pictures

Stepping into the tiny but tranquil Bukit Lagong Forest Reserve, you wouldn't believe you're within Kuala Lumpur city limits. The 11-hectare reserve is packed with wildlife, including butterflies, macaques, white-throated kingfishers, rare orchids and ferns, as well as pythons and monitor lizards.



Mark Edwards/Still Pictures

In Burkina Faso, natural forests near Ouagadougou began to be managed for fuelwood in 1981, helping to meet the energy needs of the city's population while promoting community participation.

Urban forestry

A specialized branch of forestry developed in the late 1960s in the United States, urban forestry encompasses more than planning and care for the health of large forested areas. It includes care of all the green spaces in and around cities: the trees and other vegetation planted in smaller parks, along streets and even in private gardens. Managing trees in the context of urban planning poses a unique set of challenges, such as limited and fragmented space for growing trees, soil compacted by human traffic or polluted with toxins, challenging conditions such as dust, heavy metals and toxins in the air, and illegal timber harvesting. And as more and more people move into cities, planners must also keep in mind urban forests' role in protecting urban watersheds and wildlife habitats.

REDD+: a natural progression

Forests cover a third of the Earth's surface and play an essential role in absorbing carbon dioxide from the atmosphere. But deforestation and forest degradation – including through agriculture, subsistence farming and wood extraction – release up to a fifth of all greenhouse gases.

The UN-led initiative on Reducing Emissions from Deforestation and Forest Degradation (REDD) is trying to keep forests standing by offering financial rewards to forest owners in developing countries – where most of the world's forests remain – and is now developing a broader approach to how best to manage them (REDD+).

SARA OLDFIELD, director of Botanic Gardens Conservation International (BGCI), thinks that the world's botanic gardens are particularly well placed to help REDD+ achieve its goals. To encourage its global network of 700 botanic gardens in 118 countries to get involved in the global effort to reduce emissions, BGCI recently published a manual outlining some of the skills and resources botanic gardens can offer REDD+. Sara tells TUNZA about this initiative as well as some of the exciting forest conservation developments already happening in botanic gardens around the world.

Peter Hollingsworth/RBGE

TUNZA: What's the difference between REDD and REDD+?

SO: It's the difference between preservation and conservation. Rather than just remunerating countries for halting any deforestation or forest degradation that is already happening, REDD+ looks at conservation in the broader sense of rewarding those who look after their forests. This includes replanting and restoring degraded forests, and encourages local people to participate – enabling them to use their forests sustainably while enhancing them. In other words, local communities are being empowered to manage their forests and get what they need from them, while making sure that forest cover is maintained and improved.

TUNZA: How did cooperation between botanic gardens and REDD+ come about?

SO: Botanic gardens have been extremely concerned about climate change and forest issues for many years,

so it was simply a natural progression. At this stage, the cooperation between BGCI and the United Nations Framework Convention on Climate Change processes is still informal, because REDD+ is still being established. Meanwhile, BGCI is developing ideas about how botanic gardens can contribute, sharing them within our network and with REDD+. In 2010, for example, we asked botanic gardens around the world how they were already involved in forest conservation, specifically activities aligned with REDD+'s aims. We got some very interesting ideas and thoughts that should benefit other botanic gardens in forest countries and inspire them to get involved.

TUNZA: What can botanic gardens contribute to REDD+?

SO: Botanic gardens are a major source of expertise on what grows in forests. Species identification is very important both in terms of maintaining biodiversity and for carbon calculations, which means getting an initial idea of a forest's carbon stocks.

By their nature, botanic gardens know about the various uses of plants. This means they understand which trees are more likely to provide forest communities with important medicines, fruits and other produce that people need to make a sustainable living from their environment. People's investment in living forests gives them a much better chance of survival. Planting the right trees also contributes to forest enhancement, making them more biodiverse and productive.

Botanic gardens also play a very important role in training people in the key skills needed for REDD+, whether species identification, biodiversity surveying, GIS mapping, project planning, horticultural techniques or other conservation skills. BGCI runs training courses for botanic gardens – recent ones have taken place in Southeast Asia and Africa – and the gardens in turn provide training for local communities and non-governmental organizations.

Botanic gardens also possess the actual materials needed for forest restoration,

BGCI



The pulp of the achiota seed (*Bixa orellana*) from tropical America is used as a dye and food colourant.

Sarah Dixon



The ceiba tree is at the heart of Mayan mythology, and produces kapok, an excellent material for flotation cushions.

BGCI



Rhododendrons are an important part of the ecosystems of northern China, where many species are under threat.

such as supplies of seed, young trees and tools for community nurseries.

TUNZA: To what degree do conservation efforts vary from country to country? You must deal with a wide range of issues.

SO: Yes, and conservation solutions must be locally relevant, so the focus varies enormously, from biodiversity to sustainable livelihoods to carbon sequestration. All around the world, botanic gardens are helping to conserve forests in all sorts of different ways and, of course, all the projects consider carbon cycling to determine how well the forests serve as carbon sinks.

For example, the Tooro Botanical Gardens in Uganda is helping to conserve the trees of the Kibale Forest, where the chimpanzees and other primates live, and helping farmers and traditional healers grow native trees in their own gardens as a source of medicinal plants. Meanwhile, the South China Botanic Garden manages the Dinghushan Nature Reserve, an area of primary forest in south China where most of the forest has been destroyed. And the Xishuangbanna Tropical Botanic Garden is working to protect what remains of a natural forest degraded and destroyed by rubber production. It is also looking at potential carbon trading to help conserve the forest and to reduce poverty in that region.

TUNZA: Will BGCI take the lead in gathering and sharing data on activities aligned to REDD+?

SO: We'll do our best to share our information with different botanic gardens. As a small organization, BGCI can't keep track of everything, but we

do have various databases that collect and pool information. As the REDD+ initiative takes off, we will likely highlight case studies to show what certain botanic gardens are doing.

TUNZA: As botanic gardens become more involved with REDD+, have they benefited from more discoveries?

SO: Absolutely. In forest biodiversity survey work, we discover new species all the time. But we're also just discovering that many more endangered tree species than we realized have been growing in African botanic gardens. We did a survey in 2010 of trees on the IUCN Red List of Threatened Species that are being grown in these gardens, starting with Uganda and the Democratic Republic of the Congo, and there were more than 30 endangered tree species recorded. And there are very many more that are locally threatened but not yet on the List.

We're finding that all these species, which are very, very important for forest restoration, are probably not grown anywhere else. But we can now put back a whole range of different species when restoring a forest or planting trees for carbon sequestration. We can recreate natural biodiversity. Until BGCI had done the survey, this information just wasn't readily available.

It just goes to show that the conservation potential of botanic gardens hasn't always been fully appreciated – people tend just to think of them as a pretty place to go for picnic. Getting botanic gardens involved in REDD+ will really give global relevance to their work, highlight the skills, expertise and plant materials that are in botanic gardens, and give them a very exciting, vital new role.

Paul Mathew/FI



The pau brasil tree (*Caesalpinia echinata*), the national tree of Brazil, is prized for its high-quality wood.

Annie Lane



Baobabs, iconic African trees.

Harvesting wild walnuts in Krygyzstan.

Chris Loades/FI



7 forest wonders



Fastily/GNU-FDL

Silk worms

It all began, Confucius tells us, when a Chinese empress accidentally dropped a silkworm moth cocoon into her cup of tea in 2640 BC and discovered that a fine fibre could be unreeled from it. And China monopolized the trade in silk by keeping its method of production – from caterpillars fed on mulberry leaves – a secret from the rest of the world. Anyone caught smuggling eggs, worms or cocoons faced the death penalty, and the crucial knowledge only reached Europe in around 550 AD. Silk from mulberry trees still dominates the market, but many other species of silkworm are gathered from forests. In Madagascar, for example, the Malagasy silkworm feeds on the primary tapia forests (*Uapaca bojeri*) of the Amoron'i Mani highland region; only 50,000 hectares remain, however, and even this is under threat from logging, bush fires and invading pine trees.



USDA Agricultural Research Service

Shellac

Transparent but tough, shellac has long been used to varnish violins, glaze fruit, protect furniture, make gramophone records, and for a host of other things. Its binding, adhesive, fire- and water-resistant and electrical insulating properties are invaluable. A residue secreted by the Indian lac insect (*Laccifer lacca*) that feeds on the sap of more than 160 species of host trees, it also produces a scarlet pigment – used in cosmetics and to dye wool and silk – which is extracted to leave a transparent resin. The origins of the modern polymer and plastics industry can be traced back to attempts to make synthetic shellac in the late 1800s, and manufactured substitutes have greatly reduced demand for the natural product, but the quest was never totally successful, and shellac's unique properties have allowed a small lac-based industry to continue to thrive.



MPF/GNU-FDL

White willow

It's probably the best known pharmaceutical in the world – and it's certainly one of the most useful. Aspirin comes from the bark of the deciduous white willow tree (*Salix alba*), which was used to relieve fever and pain in ancient Greek, Chinese and Egyptian medicine. The active ingredient salicin, a natural anti-inflammatory, was isolated and refined by European chemists in the 1800s, and in 1897 Felix Hoffmann, at Bayer in Germany, chemically synthesized a stable form of it. Patented in 1900, it has recently been found to help prevent heart attack and strokes when taken regularly in small doses, and new research indicates this may also help prevent cancer. Willow bark itself is still taken as a herbal remedy and is thought to promote wellness with its antioxidant, antiseptic, and immune-system-boosting properties.

Sugar maple

Yes, it's delicious... but maple syrup is also more nutritious than other refined sugars, containing manganese, riboflavin, magnesium, potassium, calcium and zinc. Long before the arrival of European settlers, indigenous peoples in the northeastern United States and southeastern Canada collected the sap from sugar maple trees, drank it, cooked with it and boiled it down into syrup. The Europeans learned the process from them, and built log-cabin shacks in the sugar bush – wild stands of maple groves within mixed forests – where they could make the syrup. This is a time- and fuel-intensive process requiring many hands, as the sap is 97.5 per cent water. It takes about 40 years for a tree to mature enough to be tapped, but then it will yield up to 50 litres of sap every year for a century.



Dave Pape



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Bird's nests

It takes 45 days for southeast Asian swiftlets (*Collocalia* spp.) to build their nests, using their own saliva, on the walls of tropical forest caves, but they can be consumed in minutes in the famous bird's nest soup, whose unique, gelatinous texture has been enjoyed for more than a millennium. In Hong Kong alone, more than 100 tonnes of the nests – which are thought to encourage tissue repair and to boost the immune system – are eaten every year. They mostly come from Indonesian forests, and harvested correctly the process could be sustainable. But increasing demand is leading to abuse: unscrupulous harvesters remove the nests before the eggs hatch and the fledgelings mature, or take them so frequently that the birds don't have time to recover. Illegal logging and forest fires are also destroying the swiftlets' habitat.

Bamboo

You wouldn't think it, but it's a kind of grass. Bamboo is also one of the most rapidly growing plants on the planet, with some species growing an extraordinary 1.2 metres a day. It fixes carbon 7 to 30 per cent faster than the fastest-growing trees and, as it is particularly durable, it sequesters the carbon for longer. Growing in vast and beautiful forests – covering 22 million hectares mainly in the tropics and subtropics – it performs ecosystem services such as cleaning and retaining water in the ground and protecting soil from erosion. Used for building, flooring, furniture, paper, dishes and other kitchen implements, sleeping mats, charcoal, textiles, musical instruments, food, and even bicycle frames, bamboo is easy to cultivate in different climates and conditions, on marginal land and without the need for fertilizers.

Frankincense

The wise men seem to have lived up to their name, for frankincense – one of the three gifts they brought to the infant Jesus, along with gold and myrrh – is proving to be even more useful and valuable than ever. An aromatic resin from the deciduous *Boswellia sacra* tree of the desert woodlands of Ethiopia, northern Somalia, southern Yemen, and the foggy mountainous regions of southern Oman, it has been harvested for thousands of years. It has long been known to rejuvenate skin, aid digestion and relieve muscle pain and arthritis, and scientists have recently discovered that it contains an agent that causes cancer cells to shut down. But the *Boswellia sacra* is declining due to overgrazing and changes in land use, and now features on the IUCN Red List as a near-threatened species.

A step at a time

With soles cut from recycled rubber tyres and tops crafted from soft, hand-spun and woven organic cotton, soleRebels shoes are sustainable and stylish (<http://solerebelsfootwear.weebly.com>). No wonder the World Economic Forum named BETHLEHEM TILAHUN ALEMU, founder and managing director of soleRebels, a Young Global Leader of 2011. TUNZA speaks to her to find out the secrets to her success.



What was the spark for soleRebels?

soleRebels was born as an idea to bring jobs to our community. In Zenabwork, Ethiopia, where I was born and raised, there were literally no jobs. I hit upon the idea that the creation of footwear and apparel could be a platform for inspiration and hope in our community and elsewhere in Ethiopia. We'd use indigenous materials and crafts fused with modern design and teach those without work how to create things that would give the wearer immense comfort and joy.

What resources did you see around you that you could use?

We grew up watching our relatives spin cotton with hand spindles and weave gorgeous fabrics with simple wooden handlooms, as our ancestors had for centuries. These craftspeople had skills that simply needed to be channelled.

Ethiopia is also thought to be one of the birthplaces of cotton and is one of the last authentically organic environments in which cotton is grown. Most small-scale cotton farmers never use anything more complex than animal dung as fertilizer. We support their ability to grow their birthright crop in this manner, which has a meaningful impact on the local and global ecosystem.

We saw that by combining all these local resources, we could create footwear that would showcase many of Ethiopia's indigenous eco-sensible craft heritages and craft talents, while creating an export product made entirely from local resources.

Tell us about your 'selate' and 'barabasso' shoes. They have an interesting history.

These are shoes made from recycled rubber tyres, worn in the countryside as a work shoe as well as by the rebels who fought off invading forces in Ethiopia in 1991 – the original 'sole rebels'.

We also use recycled rubber for our other shoes, ensuring comfort and durability, while saving waste from landfill and preventing the harmful emissions from burning tyres. In Ethiopia, we've been recycling for years without ever calling it recycling. When you have limited resources, everything is valued and valuable; everything has a purpose.

You call your company 'historically eco-sensible' and 'green by heritage'. What does this mean?

We embrace deeply sustainable and traditionally zero-carbon methods of production not because it's the in-thing, but because these production methodologies and ideas are integral parts of Ethiopia's cultural fabric.

What advice do you have for young eco-friendly entrepreneurs who are just starting out?

Have a clear vision of your goal and the path to get there. Then work extra hard. Seek counsel from diverse places – don't just stick to one source. And never be deterred: setbacks and obstacles are part of life. It is how you overcome them that makes you a great person.

