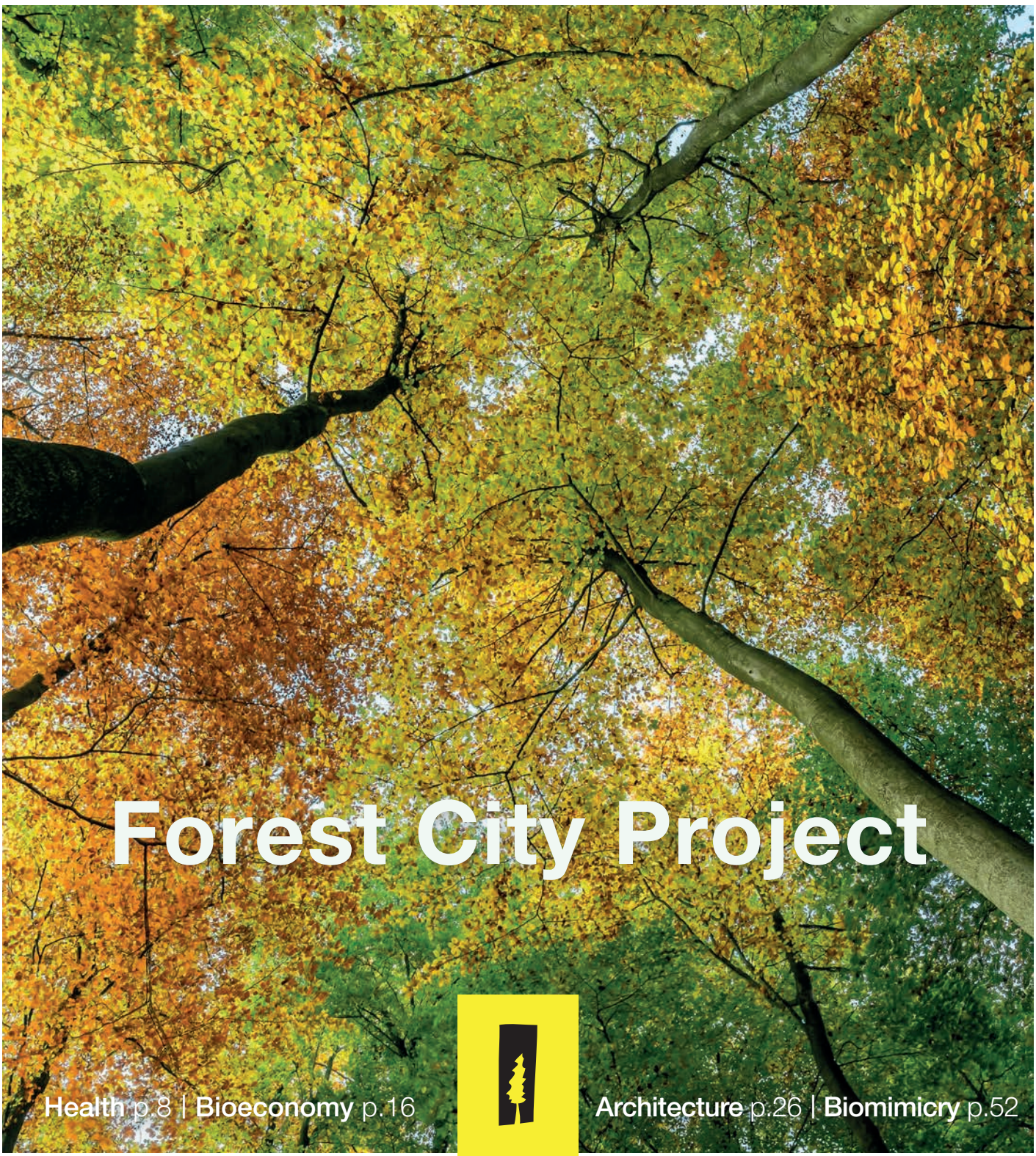
REVOLVE

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5TH EDITION

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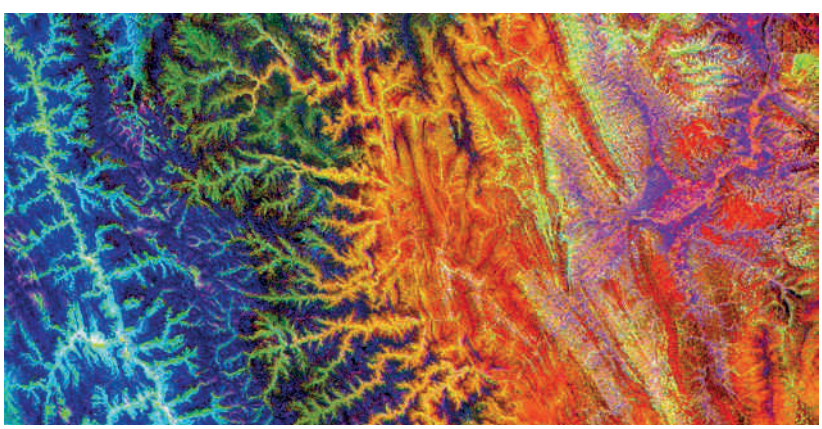
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Revolve Media is a limited liability partnership (LLP) registered in Belgium (BE 0463.843.607) at 63-67 rue d'Arlon, 1040 Brussels, and fully-owns its international publication on sustainability Revolve.

To view all our publications, visit: **issuu.com/revolve-magazine**

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Cover image: Sonian Forest, Brussels. **Source:** Michel Petillo



All We Need is Trees

As we are witnessing expanding drought conditions here in Kenya, where the Headquarters of the UN Environment Programme are located, and also in the Mediterranean, the Middle East, and elsewhere in Africa, we are starkly reminded that climate change is already affecting vulnerable regions and societies across the world. People, animals and plants are suffering from more unpredictable rains, higher temperatures, and more frequent and severe weather events. Not every storm, flood or drought is caused by climate change, but the general trend is undeniable.

Humanity has responded to the global challenge of climate change with the most ambitious international agreement ever concluded – the Paris Agreement. All countries in the world have agreed to do their part under the Agreement that entered into force on 4 November 2016. Forests play a special role: over 100 countries have chosen to reach part of their national climate actions through the conservation, restoration and sustainable management of forests because for these nations and their peoples forests are a priority. If all these forest-related pledges are realized, they would remove more greenhouse gases from the atmosphere than the combined emissions of all cars in the world. Of course, the benefits of having more and healthier forests do not stop there. Forests clean our air, filter and store our drinking water, regulate our local climate, and provide habitat for more than half of all terrestrial plants and animals. They are also simply beautiful places to visit, and they nourish our spirit and energize our minds after a hectic day.

One of the most promising global trends in climate action is that more and more local communities, regional and national governments recognize the potential of transforming lives and landscapes through planting trees and restoring forest landscapes. Under a global banner introduced by Germany seven years ago, the 'Bonn Challenge', more than 40 countries and regional governments have pledged to bring 148 million hectares of forest landscapes under active restoration by the year 2020. This is an area the size of France, the United Kingdom and Spain combined. In the United States, for example, the National Forest Service and partners are already restoring an area of 15 million hectares across many different landscapes. This has created thousands of jobs in rural areas. A similar effort in Europe could go a long way to stimulate green growth in more remote rural areas where landscape restoration investments would offer local economic gains while contributing to the national economy and offering significant environmental returns.

The next time you take a walk in a forest near you in Europe, remember that most of those forests, even when they appear old and majestic, are rather young – at least from the perspective of trees. In the 17th and 18th century, much of Central Europe was so degraded by deforestation and overgrazing that droughts and crop failures regularly resulted in famine and mass migration. Only concerted government interventions and investment in reforesta-



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tion and education on forest management could break that vicious cycle. Similar transformations have happened in other regions. Costa Rica's forests were down to 41 per cent in 1986 and now, through concerted national efforts cover over half the country. These restored forests harbor some of the world's richest biodiversity, and attract tourists from across the globe. South Korea has managed to turn itself from a nearly completely deforested and impoverished country with eroding soils in the 1950's into a flourishing economy with over 60 per cent forest cover. These changes were possible because of strong political will enabling and driving national and local efforts.

The world today needs a similar kind of emergency response to climate change for the benefit of people, especially for those fleeing from environmental degradation and decreasing soil fertility into ever-growing megacities. Re-creating resilient and productive landscapes by simply bringing back trees and forests can play this role. Forest landscape restoration can provide climate action and economic benefits. It does not replace other strong climate actions in energy, transport, agriculture and other sectors, but complements these. The 'decarbonization' of our economies is already happening, but we have little time because the impacts of climate change have already started. Conserving and restoring forests and planting more trees in agricultural landscapes, can bring us much-needed breathing space to win the race against time that we find ourselves in. Europe can play a key role in leading by example, and by inspiring and supporting its neighbors to establish resilient and productive forest landscapes.

This help is particularly important for Europe's neighbors to the South. In Africa, 65 per cent of all arable land is already degraded to some extent. The Sahara is advancing to the North and to the South. Helping countries such as Kenya or Ethiopia to achieve their ambitious commitments for restoring landscapes and forests would be an investment not only for Africans, but for Europeans as well. It would give millions of people economic opportunities near their homes. Forests are indeed more than the sum of their trees - they are essential for our health and well-being and they can be the basis for building a more resilient world.

Source: Anna Marie Kapunan



Restoring the Connection Between Forests and Human Health

Forests are among the most biologically rich areas on Earth, home to 80% of global terrestrial biodiversity. They provide us with oxygen, an array of natural resources, and a source of livelihood. They also play a crucial role in supporting our mental and physical health, yet this is often overlooked within health strategies, education programmes, and in everyday human lifestyles. Recognizing the extensive benefits and services provided by forests can help us to overcome many of the challenges linked to physical and mental well-being facing Europe today.

Writers: Chantal van Ham & Helen Klimmek



Grandfather and child
Source: Anna Danilkova, shutterstock



Forest biomass-derived energy could reduce global carbon dioxide emissions by between 400 million and 4.4 billion tons per year.

Source: FAO Report 2016

A growing body of evidence suggests that early childhood experiences with nature provide physical and mental health benefits, stimulate child development, and can help to generate a lifelong sense of connectivity and stewardship towards the environment, yet urbanization poses a growing challenge to these types of experiences. Today close to 75% of Europe's population and over 1 billion children worldwide live in cities.[1] While cities can be places of innovation, learning, and diversity, they can also pose a threat to healthy lifestyles by increasing exposure to pollution, limiting access to nature, and contributing to increasingly sedentary lifestyles. The current health challenges facing Europe require leadership in identifying the critical intersections between health and nature policies, as well as the creation of institutional conditions and partnerships that can support win-win solutions for the environment, human well-being, and the economy.

One-third of children spend under 30 minutes outside each day.



Health Challenges in the European Union

The European Union currently faces a number of health-care challenges. These include a changing demographic context, limited financial resources, growing health inequalities between and within Member States, and a growing prevalence of chronic diseases (also known as Non-Communicable Diseases)[2]. These types of illnesses, which include cardiovascular conditions (such as heart attacks and strokes), cancer, chronic respiratory ailments, and diabetes, are responsible for 63% of all deaths worldwide and are the leading cause of mortality in Europe. Approximately 50 million people in the EU suffer from chronic diseases, representing an annual cost of € 115 billion to the EU economy. Mental health problems present an additional challenge, as they result in wide-ranging and long-lasting effects and become a source of discrimination and inequality.

Fundamental to developing an effective European health system is the recognition that the presence of ecosystems such as forests can play a crucial role in helping us lead happier and healthier lives. Policies such as the EU Health



Children playing on a log
Source: Shutterstock

Forests for Healthier Lifestyles and Cleaner Air

Many behavioral and environmental factors have contributed to the rise of chronic illnesses. This includes less time spent being physically active[3] a trend particularly noticeable in children. Research conducted by the National Trust in the United Kingdom in 2012[4] found that children in the UK spend approximately 20 hours a week online and 17 hours a week watching television, with much less time devoted to playing outside in wild places compared to a generation ago.

Studies show that physical activity plays an important part in child and adolescent development, as well as in the prevention and treatment of health problems such as asthma.[5] Exercising in green spaces can lead to a reduced risk of stroke, cardiovascular disease, and obesity. It can also lessen symptoms of anxiety and depression. Natural areas such as forests are often deemed to be particularly attractive settings for outdoor recreation; ensuring accessibility to these types of spaces may therefore play an important role in encouraging more active lifestyles.

Forests also play a crucial role in reducing air pollution, the presence of which has a major impact on health. In France, according to a joint EU-OECD report on the state of health in the EU, approximately 48,000 premature deaths per year (9% of total mortality) are caused by high concentrations of fine particulate matter.[6] This problem is not unique to France: In 2013 nearly one fifth of the EU population lived in areas where the EU air quality limits for particulate matter were exceeded. Health care spending on

Strategy and the 7th Environmental Action Program will, once achieved, work towards this end. An integrated approach to health care could see governments promoting time in nature as part of public health policy, or providing information to physicians and patients alike about the health benefits of time spent in the forest. Physicians might then be able to prescribe visits to the forest as a means of boosting mental health, which would support more effective preventative health care. This would help to improve the health status of the population and help to create better employment and economic outcomes.

respiratory diseases in the EU represents approximately 6% of the total health care budgets of the Member States.

Although forests cannot provide a panacea to air pollution, they do have an important role to play. According to a US study of tree and forest effects on air quality and human health, trees remove substantial amounts of pollution, with pollution removal being greatest in areas with the highest amount of tree cover.[7] Interestingly, the study found that "most of the pollution removal occurred in rural areas, while most of the health impacts and values were within urban areas"[8], demonstrating the benefits forested areas provide even to people who do not live in close proximity to them.

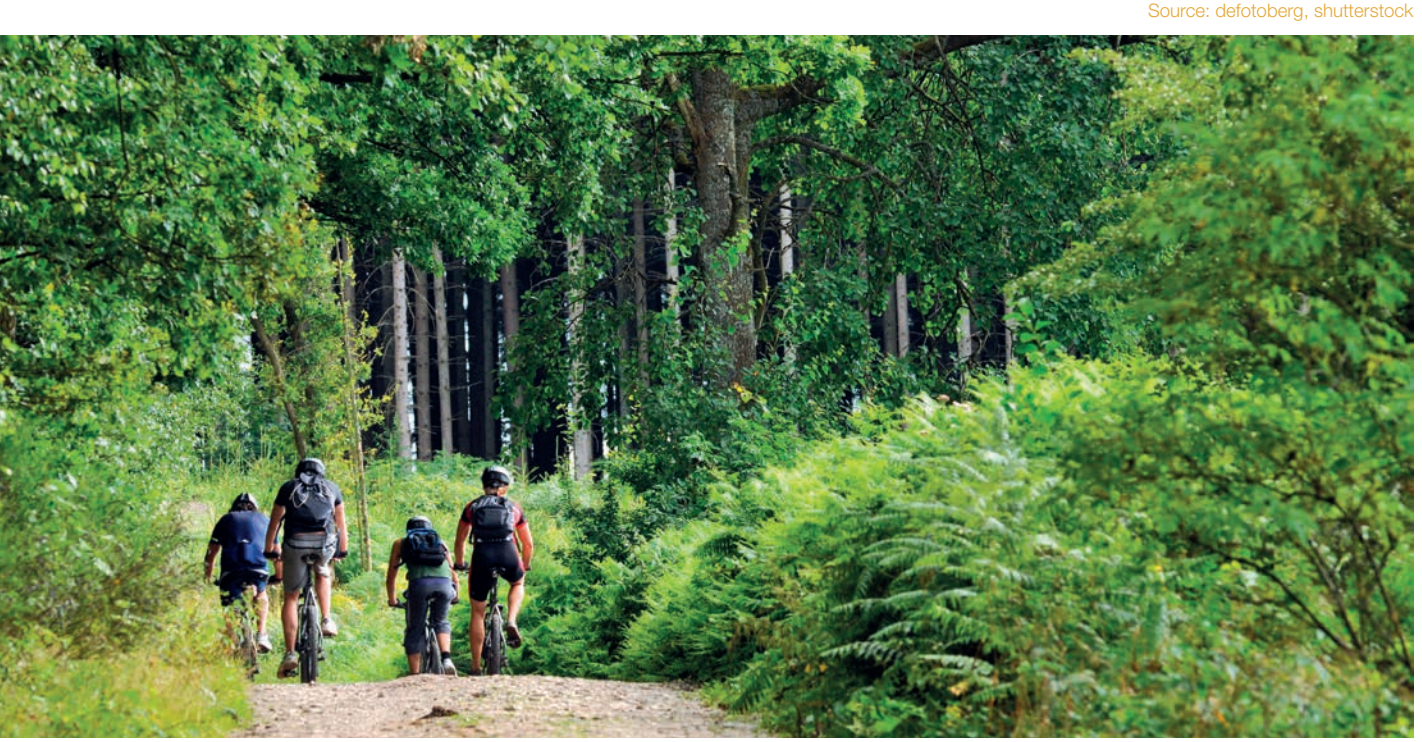
Spending time in forests can help to lower concentrations of cortisol, pulse rate and blood pressure.

The Physiological Effects of Spending Time in Forests

The benefits of outdoor physical activity for health and general well-being have been recognized in public health campaigns and initiatives. As part of the Unites States National Park Service's 'Healthy Parks Healthy People' program, doctors prescribe time in nature to help treat conditions such as diabetes, depression, and high blood pressure. In Japan the restorative benefits of forests were formally recognised in 1982 when the Ministry of Agriculture, Forestry, and Fisheries advocated Shinrin-yoku (forest bathing) as a form of stress management and relaxation. Though there is a need for more research into the physiological effects of Shinrin-Yoku, small-scale studies have shown its potential to contribute to preventative health care by lowering concentrations of cortisol, pulse rate, and blood pressure.

The potential of natural areas such as forests to provide an escape from our increasingly stressful, noisy, and polluted surroundings is also being acknowledged in other parts of the world. In the UK, a national project called NHS Forest is using forest and park areas near health care facilities to support rehabilitation and recuperation.[9] In Sweden, the Alnarp Rehabilitation Garden helps individuals to recover from stress-related mental disorders, stroke and war neuroses through nature-based rehabilitation.[10] In Scotland, the Forestry Commission is piloting projects that focus on bringing early-stage dementia patients into contact with woodland environments in order to expose them to stimulating environments and promote a sense of well-being and self-worth.

Cyclists in Ardennes, Belgium
Source: defotoberg, shutterstock





Mummelsee near Seebach, Black Forest, Baden Wurttemberg, Germany
Source: Juergen Wachenhut_shutterstock

Reconnecting People with Nature

Although there is ample evidence demonstrating the positive links between human health and outdoor activity, adults and children are in fact spending more and more time indoors. In his book Last Child in the Woods, Richard Louv coined the term 'nature-deficit disorder' to describe the range of behavioural problems, such as diminished use of the senses, attention difficulties, and higher rates of physical and emotional illnesses, that result from less time spent outdoors. Sedentary and indoor lifestyles have not only resulted in a growing disconnect between people and nature, manifested in a lack of knowledge about local wildlife and natural areas, but have also contributed to physical and mental health problems such as rising levels of obesity, vitamin D deficiency, and asthma.

Reconnecting people with nature by showcasing the wonder and beauty of the natural world as well as the many essential services and benefits entailed can play an important role in encouraging more active and healthy lifestyles. Initiatives such as IUCN's #NatureForAll campaign aim to do just that by inspiring a new generation of thinkers and doers across all sectors of society to connect with nature and take action to support its conservation. By fostering collaboration between initiatives from around the world that focus on restoring the connection between humans and nature, the #NatureForAll campaign seeks to promote a very simple idea: the more people experience, connect with, and share their love of nature, the more support there will be for its conservation. This, in turn, will have a positive impact on human health by ensuring that we continue to benefit from the vast array of valuable goods and services provided by nature, such as clean air, green spaces, and stress-free environments, which are so essential to our health and well-being.



Hikers at the Herrenwieser See, Westweg, Forbach, Black Forest, Baden-Wuerttemberg, Germany
Source: Juergen Wachenhut, shutterstock

Encouraging Dialogue to Facilitate a Healthier Future

More integrated policies and knowledge are needed to achieve our aim of living well within the limits of our planet. There is a lot to gain from bringing the nature conservation and health sectors closer together. Joint initiatives could identify the services that ecosystems provide for human well-being, facilitate their integration in EU policy objectives, and together develop solutions for health-related challenges.

> …forests can play a crucial role in helping us lead happier and healthier lives

Many health and nature related activities take place at the local and regional scale, but at the national level the positive links between public health and nature can also be promoted through policy and institutional frameworks. The EU has an important role to play in supporting the protection of nature, the implementation of the EU biodiversity policy, and in ensuring that policies and financial mechanisms take into account

the links between health, societal, and environmental concerns.

Supporting dialogue between policymakers, scientists, and communities is essential to developing more holistic approaches to human health-care and environmental protection. The Parks for the Planet Forum, launched in 2012 by IUCN and Salzburg Global Seminar, supports this process through a combination of annual high-level meetings with an evolving multi-year work programme to share pioneering approaches at local and international levels. Over the next decade, this forum aims to position nature at the very heart of human health and well-being, security, and prosperity across the planet. By fostering this type of dialogue and raising awareness of the multiple benefits of nature towards human well-being, IUCN will continue to re-establish the connection between humans and nature, and thereby support the achievement of a healthier and happier Europe for all.

Notes:

1. Unicef 2016
2. ec.europa.eu/health/sites/health/files/programme/docs/factsheet_healthprogramme2014_2020_en.pdf
3. ec.europa.eu/health/sites/health/files/state/docs/health_glance_2016_rep_en.pdf
4. www.nationaltrust.org.uk/documents/read-our-natural-childhood-report.pdf
5. ec.europa.eu/health/sites/health/files/state/docs/health_glance_2016_rep_en.pdf
6. ec.europa.eu/health/sites/health/files/state/docs/health_glance_2016_rep_en.pdf
7. Nowak, D.J. Hirabayashi, S., et al. (2014). Tree and forest effects on air quality and human health in the United States. Environmental Pollution 193:119–129 www.fs.fed.us/nrs/pubs/jrnl/2014/nrs_2014_nowak_001.pdf
8. www.cbd.int/health/SOK-biodiversity-en.pdf
9. ieep.eu/assets/2092/Health_and_Social_Benefits_of_Nature_-_Final_Report_Executive_Summary_sent.pdf
10. ieep.eu/assets/2092/Health_and_Social_Benefits_of_Nature_-_Final_Report_Executive_Summary_sent.pdf



The third session of the Parks for the Planet forum, entitled The Child in the City will take place in Salzburg from 18-21 March 2017. It will focus on setting a new change agenda to promote access to nature, health and development for vulnerable children and communities in growing urban centers and cities.

For more information please see: www.salzburgglobal.org/calendar/2010-2019/2017/session-574.html



The International Union for Conservation of Nature (IUCN) is a membership Union uniquely composed of both government and civil society organizations. It provides public, private and non-governmental organizations with the knowledge and tools that enable human progress, economic development and nature conservation to take place together.

Created in 1948, IUCN has evolved into the world's largest and most diverse environmental network. It harnesses the experience, resources and reach of its 1,300 Member organizations and the input of some 16,000 experts. IUCN is the global authority on the status of the natural world and the measures needed to safeguard it. Our experts are organized into six commissions dedicated to species survival, environmental law, protected areas, social and economic policy, ecosystem management, and education and communication.

The Climate Value of Forestry

The 2015 Paris Agreement on climate change is a worldwide commitment to control global warming by keeping the temperature rise well below 2°C above pre-industrial levels and implementing measures to adapt ecosystems to climate change. Sustainable forest management and wood use are playing a crucial role in reaching the goals of the climate deal: while forests remove CO2 from the atmosphere, acting as carbon sinks, wood can substitute for non-renewable materials and fuels.

Writer: Salvatore Martire

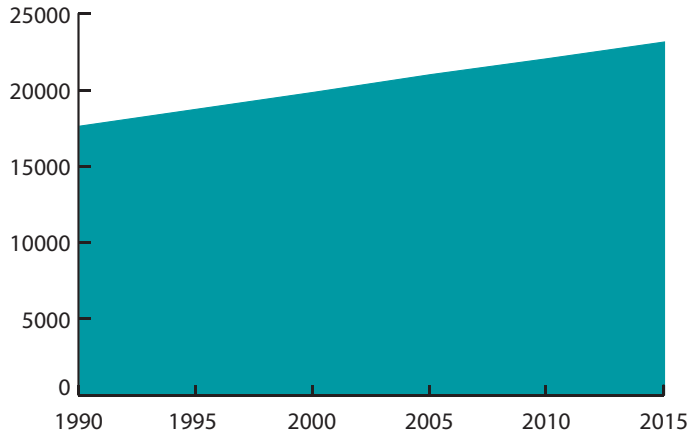


Sustainable managed forests by Statskog SF, the Norwegian state-owned land and forest enterprise, near Overhalla (Norway).
Source: Eustafor

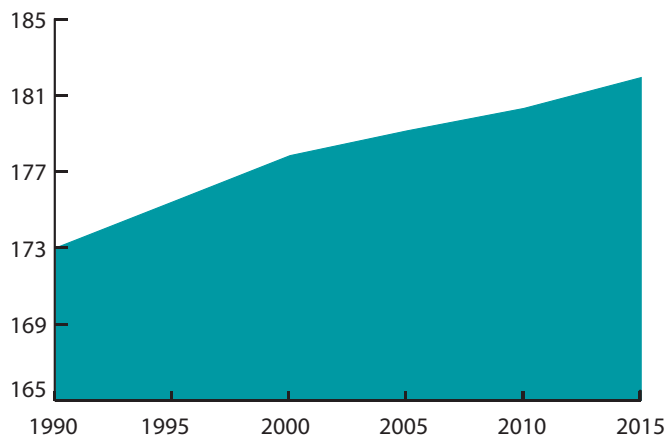


The 194 countries that signed the Paris Agreement committed to achieving a balance between emissions and removals of greenhouse gases by the second half of this twenty-first century. Greenhouse gas emissions globally have increased in the energy, industry, transport and building sectors. Forests and wood use are crucial for reaching the goals of the climate deal. Forests are carbon sink, they remove (CO_2), the principal greenhouse gas, from the atmosphere, and wood can substitute non-renewable materials and fuels.

To be effective for climate change mitigation and adaptation, forests need to function as carbon sink well into the long term.



Growing stock in forests available for wood supply (Mm^3)
Source: Eurostat, 2016



EU-28 Forest area (Mha)
Source: Eurostat, 2016

Growing Forests Absorb CO_2

Forests globally absorb about one trillion tons of carbon. Trees are carbon sinks thanks to the process of photosynthesis in which CO_2 from the atmosphere is processed. The carbon from CO_2 is integrated into the mass of the trees and the oxygen is released back into the atmosphere. In other words, forests absorb greenhouse gases if they grow.



Forest carbon sink

A carbon sink is a reservoir that accumulates and stores carbon. Forests function as carbon sinks when they increase in either volume or area.

It is good news that European forests are increasing both in volume and in area. Over the last 25 years (1990-2015), the forest area of the European Union grew by about 9 million hectares – equivalent to 3 times the surface of Belgium. Forests now cover near 40% of Europe's land surface area.

About 1 cubic meter of wood grows every 0.16 seconds in European forests. The carbon sink function of forests is dynamic and varies throughout the life cycle of the forest. One very important factor is the age of forests: young trees absorb more CO_2 than old trees. Since European forests are in general getting older, their capacity to absorb CO_2 is decreasing. Therefore, a vital European forest-based sector is the best answer to boost forest ecosystem resilience and to fully benefit from their climate mitigation potential. According to scientists,[1] EU-27 forests could absorb an additional 1,750 million tons of carbon by 2100 if biomass increment is maximized.

Forests now cover near 40% of Europe's land surface area.



Non-exhaustive List of Forest Ecosystem Services

- Provision of wood
- Provision of non-wood products (e.g. mushrooms and berries)
- Biodiversity
- Pollution control
- Nutrients cycling
- Water regulation
- Climate regulation
- Erosion control and soil protection
- Recreation and tourism

State Forest Management Organizations are committed to ensure the long-term life cycle of forests by balancing their many functions. Forests can have a prevalent function, for example productive or protective. However, forest functions are not mutually exclusive. On the contrary, forest managers constantly apply and improve sylvicultural techniques in order to maximize the multiple values of forests and the provision of ecosystem services.

One essential element of a sustainable and multifunctional forest management is the harvesting of wood which is crucial to maintaining a stable and positive forestry carbon balance. If left unmanaged, forests become sources of carbon because the CO_2 emissions from decaying wood exceed the uptake from growing trees. Harvesting in state forests is carried out according forest management plans which include most advanced knowledge available in terms of sustainable and multifunctional forestry, including the protection of natural habitats as well as wild flora and fauna in order to enhance biodiversity. The long-term production capacity is ensured by safeguarding soil quality and by advancing sylvicultural innovation to design resilient forest ecosystems.

"Serit arbores, quae alteri saeclo prosint" (plant trees for the benefit of future generations) wrote Cicero in 44 BC. Forest life cycles are relatively long. Some tree species have very long life spans (about 200 years in the case of oak). Others have shorter life times (about 40-50 years in the case of birch). For this reason, it is important to have a long time perspective when we consider the role of forestry for climate change mitigation.

Biodiversity enhancement in forest management near Křivoklát (Czech Republic). State-owned forests managed by Lesy České republiky, s.p.
Source: Eustafor





Q&A: Per-Olof Wedin

President of the European State Forest Association (EUSTAFOR) Chief Executive Officer of Sveaskog

What products can be made with wood?

Wood is a great material for making products of various forms and aesthetics that are of high quality and resistant to damage. Nowadays, innovation and technology allow us to make almost anything out of wood. We all know that paper, panels and furniture are made from wood. But not everyone is aware that wood fibers can be used in many other products such as cosmetics, textiles, bio-plastics and even medicines. In the future, we will be able to make things from wood that are unimaginable today.

Why should we use wood?

Why not? It is a feedstock that we have in Europe and it would make us less dependent on imports. Wood from sustainably-managed forests is a renewable and environmentally-friendly material. Forests grow by consuming atmospheric carbon, while wood products store carbon and together with bioenergy are a substitute for non-renewable materials and fossil fuels. Using wood instead of other materials and fuels is very good for the climate and actually by using more wood we contribute to mitigating climate change, allowing us to develop a low-carbon economy.

> Together, EUSTAFOR member organizations employ about 100,000 people.

Are there enough trees to do all this?

European forests are constantly growing both in size and in the volume of wood they can make available for use. As foresters, it is our duty to carry out long-term management planning in order to ensure the production capacity and resilience of forest ecosystems as a whole, including many other forest ecosystem services such as regulating the water cycle and climate and providing biodiversity as well as cultural and landscape services and values. Constant innovations in sustainable forest management and wood mobilization will continue to ensure a sufficient wood supply to support the development of the bioeconomy in Europe.

What are the specific contributions of state forest managers?

European state forests belong to all citizens and it is our mission and duty to manage these incredible and diverse resources on their behalf. State Forest Management Organizations manage over 49 million hectares of land, which represents around 30 percent of EU forested land. We are committed to responsible forest management, which will fulfill the various needs of society at large. Employing approximately 100,000 people, EUSTAFOR members together provide about 120 million m^3 of wood to downstream value chains.

What challenges lay ahead for the forestry sector?

Moving towards a low-carbon economy, we need to shift from non-renewable to renewable materials and energy. Therefore it is important to allow for the mobilization of our forest resources. In this regard, forest owners and managers are key actors of the economic transition because they provide raw materials for the bio-based industries.

EU policy should support the use of wood and foster innovation in the forest-based sector while EU forest owners and managers need to make their expertise and knowledge available, so that the full potential of European forests can be effectively acknowledged and unlocked. In addition, the European bioeconomy should be based on domestic resources in order to decrease our dependence on large-scale imports of non-sustainable resources and goods.

Forests are at the core of the transition towards a low-carbon economy. Let's make them part of the solution!

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MANAGING STATE FORESTS RESPONSIBLY



Pilke Science Centre and Metsähallitus premises in Rovaniemi (Finland). The carbon emissions of Pilke, which is made of wood, are only one-third of those of a steel or concrete building of the same size.
Source: Tiedekeskus Pilke / Jussi Tiainen

Climate Reasons to Use Wood

Wood has been a construction material for a long time and there are many ways it is used in construction, depending on local building practices and needs as well as technological developments.

Many Scandinavian cottages have walls, floors, roofs and finishings made of wood, while traditional stone Mediterranean houses depend on the mechanical features of wood for use as slabs and roofs, as well as window frames and doors. Over the past decades, steel and reinforced concrete have tended to replace wood. But innovations in architecture and the need to lower energy consumption are now bringing back the use of wood. The most developed construction techniques use wood because it is naturally elastic and can more easily tolerate a slight deformation. In fact, it is one of which make it one of the preferred materials for building in seismic areas. Its high heat storage capacity is appreciated as well as its lightness and mechanical features.



State Forest Management Organizations manage about 30% of European forests.

State forest annual increment is about 200 million cubic meters of wood, of which about 130 million are used to produce a wide range of wood products

Source: EUSTAFOR database, 2017

It is not only matters of engineering; tree species and wood grains make unique every piece of wood. Despite the high variability, the chemical components are quite similar and about half of the weight of wood is given by carbon. This means that one kg of wood is “holding” half kilo of carbon that without forestry would be in the atmosphere. The carbon storage time depends on for how long the product will be used and reused. Clearly, products with longer life cycles store carbon for longer time. Wood used in construction can be preserved for hundreds of years. At the same time recycling increases the carbon storage of wood products. For example, even when paper is used for some years it can be recycled numerous times.

Wood has great potential to displace carbon if it is used to substitute for non-renewable and high-energy intensive materials. The substitution effects vary widely and they depend on case specific features. For example, Canadian scientists[2] estimated that using sawed wood and wood panels instead of steel and concrete in their country has a carbon displacement factor of the 54%, taking into account all the emissions connected with the value chains. Using wood in construction instead of materials that require high-energy consumption along their value chains can have even higher impacts. A scientific review[3] of many studies reported that one cubic meter of wood in substitution of non-renewable materials can displace almost 2 tons of CO_2 emissions.

In essence, using as much wood as our forests can offer sustainably would help to rebalance the carbon cycle and to achieve the temperature target of the Paris Agreement.

Positive Bioenergies

Global emissions of CO_2 rose by about 10 giga tons in just 10 years (2000-2010),[4] and almost half of the increase comes from the energy supply. To reduce CO_2 emissions we need more energy efficiency and we must replace fossil fuels with renewables.

Forests provide raw materials and residues to produce renewable energy. Woody biomass is the most important renewable energy source in Europe. Currently, renewable energy sources cover approximately 16 % of the EU's energy consumption. Bioenergy represents 63 % of renewables' consumption and wood covers approximately 70 % of bioenergy consumption.[5] In Europe bioenergy consumption doubled from 2000 to 2014, reaching about 105 millions of toe (ton of oil equivalent), and it is expected to reach a consumption of about 140 millions of toe.

> Woody biomass is the most important renewable energy source in Europe.

Bioenergy from woody biomass is very important not only for climate but also for the development of rural areas and for strengthening rural value chains. Forest bioenergy is often made from low quality wood or harvesting residues that cannot be used for other products. And the development of local forest energy chains is the right way to activate and make economically feasible forest management in many areas in Europe. This can result in the enhancement of the management of abandoned forests often at high risk from wild fires.

Closing the Loop

The bioeconomy enables the shift towards a low-carbon society. In fact, the bioeconomy is based on the use of biological resources from both land and sea; hence it embraces many sectors and activities. In a circular economy recycling and reuse are maximized within sustainable limits and waste production minimized, by going beyond the linear 'exploit-transform-consume-throw away' model.

While promoting sustainable and resource efficient production and consumption patterns, we need to use renewable resources for materials, energy and food. In these regards, managed forests provide the input for the bioeconomy, as renewable materials as well as the other ecosystem services. Sustainable forestry merges the two concepts of circular and bio- economy, by providing renewable and bio-based resources for products, energy and services.

By making productions less dependent on fossil raw materials and fuels, a forest-based bioeconomy has a positive impact on climate change, since forests, wood products and energy can reach the compensation of about 20% of European greenhouse gas emissions.[6] There is great availability of forest biomass in Europe to develop a strong bioeconomy, which would be based on to use domestically available raw materials and it will then have a positive impact on the security of supply of energy and goods, as well as lower impacts from transportation and higher job opportunities along the value chains.

A vibrant European forestry sector can make the bioeconomy the next major economic development and it can bring real benefits to face climate change.



Sustainably harvested wood in Kelheim by the Bavarian State Forest Enterprise (Bayerische Staatsforsten)
Source: Eustafor

Notes:

1. G. E. Kindermann, S. Schörghuber, T. Linkosalo, A. Sanchez, W. Rammer, R. Seidl, and M. J. Lexer, Potential stocks and increments of woody biomass in the European Union under different management and climate scenarios. Carbon Balance Manag., vol. 8, no. 1, 2013.
2. C. Smyth, G. Rampley, T. C. Lempriére, O. Schwab, and W. A. Kurz, "Estimating product and energy substitution benefits in national-scale mitigation analyses for Canada," GCB Bioenergy, ,2016.
3. R. Sathre and J. O'Connor, A Synthesis of Research on Wood Products & Greenhouse Gas Impacts, 2010.
4. IPCC, Fifth Assessment Report (AR5), 2014.
5. Eurostat, Energy from Biomass, 2013. [Online]. Available: http://ec.europa.eu/eurostat/web/environmental-data-centre-on-natural-resources/natural-resources/energy-resources/energy-from-biomass.
6. G. Nabuurs, P. Delacote, D. Ellison, M. Hanewinkel, M. Lindner, M. Nesbit, M. Ollikainen, and A. Savaresi, A new role for forests and the forest sector in the EU post-2020 climate targets. From Science to Policy 2. European Forest Institute. 2015.



The European State Forest Association (EUSTAFOR) is based in Brussels and represents state forest companies, enterprises and agencies that have sustainable forest management and sustainable wood production as major concerns. The goal of EUSTAFOR is to promote the common interest and sustainable development of state forests. The association currently has 32 members in 22 European countries. They manage approximately 42 million hectares (i.e. ~30 % of EU forests) and deliver annually more than 130 million m^3 of wood to downstream industries (or value chain).

EUSTAFOR is recognized as a strong and well-coordinated voice of European state forest management organizations at EU and pan-European level. The association shares the pan-European definition and principles of sustainable forest management developed by FOREST EUROPE (www.foresteurope.org) as well as the objectives and guiding principles of the EU Forest Strategy.

EUSTAFOR member organizations provide valuable, professional and experience-based knowledge about the sustainable and multifunctional management of state-owned forests in order to support Europe's forestry-relevant policy objectives.

European State Forest Management Organizations (SFMOs), members of EUSTAFOR, perceive themselves as key enablers of the current and future bioeconomy, using their experience in sustainable and multifunctional forest management practices to provide a wide array of products and services. Through careful stewardship, European state forests contribute to safeguarding sustainability and serve as predictable partners in the long-term business strategies of forest-based value chains.

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Wood: A Natural Choice

Writer: Xavier Noyon, EU Affairs PEFC

Wood is a wonderful material, natural as well as renewable. Energy requirements during its 'production' period are minimal, especially when compared to alternative materials such as concrete, aluminium, or steel. Forests are essential. And so is taking care of them. They're fragile and prone to threats such as land conversion, unsustainable forestry practices, and illegal logging.

Certification systems such as PEFC offer assurance to the consumer that the timber and wood-based products they buy come from forests that are managed sustainably, balancing their ecological, economic and social functions and, so, can continue to deliver the full range of benefits that people and nature depend on. Now and for generations to come.

An increasing number of building projects are now opting for certified timber, and both public authorities and private companies are choosing to work with wood and paper with a sustainable origin, through their (Corporate) Social Responsibility policies.

Here are some innovative European projects using sustainably certified timber!



Germany

High Above the Treetops

The centrepiece of the Panarbora experience is the treetop walk: 1,635 meters long, 23 meters above the ground, and with a 40-meter high observation tower, it gives an unprecedented view onto the "Bergische Land". The treetop walk enables one to discover the natural landscapes of North-Rhine Westphalia from a totally new perspective. The path, built by Schaffitzel, a PEFC-certified company from Germany, is entirely made of certified wood.



Spain

First PEFC Certified Construction Project

The Lighthouse building (El Faro) at the Zaragoza 08 Expo was the first construction project anywhere in the world to be PEFC Project Certified. The developers, UTE Pavilion Initiatives, were awarded Chain of Custody certification for this remarkable project as all the structural timber elements of the building were sourced from PEFC-certified forests.



Italy

Rubner's Kindergarten

This PEFC-certified kindergarten built by Rubner Holzbau (Bozen district North-East Italy) replaces two communal kindergartens that were damaged by the earthquake that shook Reggio Emilia in May 2012. The new building has the shape of a whale and has been designed to stimulate the children's interactions with the surrounding space according to a pedagogical vision.



The Netherlands

Shakespeare in the Netherlands

The new Globe Theatre, located next to the open air theatre in Diever, has wood at its heart. The circular building was made and built by Assinkhout with PEFC-certified oak, and was designed by Willem van der Salm, based on the original Globe Theatre in London. The handcrafted building makes the atmosphere within the Globe Theatre a very special one indeed.



Finland

Innovation in Traditional Wood Construction

The first PEFC-certified multi-storey wooden block of flats in the Nordic countries has been built in Seinäjoki, a city in western Finland. Its name “Maïhä” originates from wood; it means cambium, which is the layer beneath the outer bark of woody plants. It is also a synonym for luck and fortune. Residents’ good fortune is guarded by a tree in the yard that in Finnish folklore was thought to be a gateway to the spiritual world.



United Kingdom

The Hurlingham Racquet Club

This is a green oasis of tradition in the heart of London, renowned as one of the largest private clubs in the world. The Racquet Centre, designed by David Morley Architects, has a sunken low-profile shape and a curved green sedum roof to minimize the environmental impact of the building. PEFC-certified wood was used to fill the large gaps of 12.9 meters between the beams that assured sound absorption, and so, reduces reverberation in the hall.





The **Programme for the Endorsement of Forest Certification (PEFC)** is an international non-profit, non-governmental organization dedicated to promoting sustainable forest management through independent third-party certification. It works throughout the forest supply chain to promote good practices in the forest and to ensure that timber and non-timber forest products are sourced with respect for the highest ecological, social and ethical standards. Today, PEFC has recognized certification systems in over 40 countries. Together, these account for over 300 million hectares of certified forest (which represents two third of all certified forest area worldwide), making it the world’s largest forest certification system.

Visit: www.pefc.org

Practical tips to build in PEFC-certified timber:

1. Analyse your timber supply

PEFC is the world’s largest forest certification system, which means that a lot of PEFC-certified timber is available on the market.

2. Choose the tree species according to the use you wish to make of the timber

By combining the natural sustainability class and the usage class of the various available species, while also taking into account the architectural requirements of your project, you will broaden your choice of species for your project.

3. Work with certified companies

Only companies with a PEFC Chain of Custody certification can supply PEFC timber. They are audited and checked by independent organisations.

4. Put your requirements on paper

Specify clearly that you want certified timber for your project. Your suppliers will therefore be aware of this from the start and the risk of misunderstanding or a surprise will be reduced.

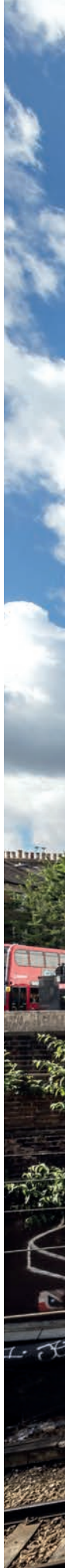
5. Check the invoices

Certified products must be identified in the appropriate manner as being PEFC-certified. A clear mention of the PEFC certification of the company, a distinct separation between certified and non-certified products, as well as the percentage of certified material for the PEFC-certified products (min. 70%) are required.

Building Cities from Timber

Mitigating climate change is high on most people's agenda but the results are not evident in every industry. In architecture, there is a shift towards using more timber offering many unexpected advantages.

Writer: Andrew Waugh



Dalston Lane: The world's largest CLT building, and a landmark project in our ambition to roll out the use of timber construction in high-density urban housing, across London and beyond.
Source: Daniel Shearing



Wood materials physically store carbon, extending the duration of carbon storage outside the forest.

Source: FAO Report 2016



Everything we do should be done with our planet in mind. “Touch the ground lightly” is the mantra of Australian Aboriginals. However, the international architectural community seems overall to believe that a little extra insulation and a couple of solar panels should do the trick. Keep calm and carry on the narcissism. This really is not a tenable attitude, humanity has to start thinking consciously and strategically about how we build, what we build in, and what effect our architecture is having on the planet.

Throughout the 1980’s and 1990’s engineers and scientists in Switzerland and Austria worked with sophisticated harmless new adhesives laminating timber planks in perpendicular layers to form large panels. The genius of these simple panels is to create a building material that is light, adaptable, and very strong. Commercial production began in Austria in the late 1990’s… then by 2008, 50,000 m^3 a year were produced in Austria, Germany and Switzerland; by 2017 more than a million m^3 will be produced across the world.

In 2003, my practice built the first cross-laminated timber (CLT) panel building in the UK that is a 45m^2, three floor extension for the classical musician Joji Hattori in South London. It was a small but perfect experience. Three car-



Global demand for wood and timber products is projected to increase as much as three times by 2050.

Source: The Prince's Charities, 2015

Murray Grove: Stadthaus, the first urban housing project to be constructed entirely from pre-fabricated solid timber, from the load bearing walls and floor slabs to the stair and lift cores.
Source: Will Pryce

penters built this accurate little building on a Saturday afternoon, craned directly off the delivery truck.

We took the notion of that modest building and extrapolated it. To face the two challenges for contemporary architecture: climate change and urban densification. How can we build up our cities without exacerbating climate change? Through our experience of the Hattori Building we contemplated a city built from timber, of a new timber age for architecture.

How can we build up our cities without exacerbating climate change?

We drew a lot of timber buildings over the next few years, but no one was interested. So we honed our argument.

We demonstrated that this is a very quick method of construction. We drew programs for our clients that showed how we could build buildings in half the time with half the people on site, also with less deliveries and less foundations. We got better and better at this argument…

Alongside this, we got better at politics. Politics with our clients and local politics. We were able to encourage local politicians that by using timber we could build truly sustainable buildings quietly and with half the construction traffic. We persuaded them to let us propose taller buildings if they were timber... We generated allies. It was a slow process.

In April 2007, we presented our ideas to a housing co-op for a building in Shoreditch, East London. We took the principle of the design to the local authority and were permitted two extra floors. We presented this at the feet of our client and other facts; it was faster, less expensive and cheaper... They liked it. By January 2008, we started construction and by January 2009 the first people were living there. That was a fast ride.

Proposing a 9 story timber building was a challenge in many ways and we had only weeks to demonstrate its feasibility. We have no written constitution in the UK, so if you can prove it – you can do it – a completely performance-based building code. We arrived at the code official's office with a large piece of timber and arms full of European test results, between us the Engineer Techniker, the manufacturer KLH, and finally our client.

> We know that timber has a completely different thermal dynamic to masonry: timber manages a temperature equilibrium, cooler in summer and warmer in winter.

Murray Grove
Source: Will Pryce





Exton Street: The first CLT panel building in the UK in 2003; a 45sqm, three story extension for classical musician Joji Hattori in South London.
Source: Waugh Thistleton

We raced around the UK persuading and encouraging, cajoling people not immediately sign off on the structure but into becoming part of the design team. We could not have built this building without the enthusiasm and passion of everyone involved. The completion of Stadthaus changed the perception of timber construction forever. Our vision that timber is a viable alternative to concrete and steel became real.

Every September, we give a public talk about timber architecture outside Stadthaus as part of the Open House weekend. Invariably, a resident of the building will come down and tell us what it is like to live there – that she cannot hear her neighbors… or that he's never used the heating… Because beyond the fact that we are using this wonderfully renewable carbon-based material is that timber is a beautiful material with which to build. Timber makes healthy breathing buildings – buildings fit for people to live in.

The completion of Stadthaus changed the perception of timber construction forever. Our vision that timber is a viable alternative to concrete and steel became real.

We are learning more about how the material works on each building we complete. To meet the energy-use code, the external envelope of the building must meet a certain thermal resistance. We know that timber has a completely different thermal dynamic to



Whitmore Road: Andrew Waugh formed a cooperative with friends to develop this project on a prime canal-side site in Hackney, to realize a shared dream of living and working in a CLT building.
Source: Will Pryce

masonry: timber manages a temperature equilibrium, cooler in summer and warmer in winter. In each of our timber buildings, the thermal performance outstrips expectation. We should not be surprised since timber is a natural material prone to the same climatic conditions that we are.

Since 2009, we have built seven more CLT buildings – and I now live in one! Our latest project, Dalston Lane, is 17,000 m^2, ten floors tall and built for a large UK house builder. Another piece of the puzzle was completed with this project: we could transfer the 3D design drawings from our computers directly to the engineer and then the same file migrated to the CLT factory where the timber panels were cut precisely to size with window and door openings cut out and recesses routed for services. Prefabrication this precise allowed the panels to be assembled on-site with accuracy unknown to 20th century construction methods. Prefabrication takes preparation. A little more time spent at the earlier stages of the job ensured that all the pieces were present and correct. Through this digital connection the architect is brought so much closer to the process of construction.

> We are seeing the emergence of a timber age in architecture.



We are learning at a faster rate than I thought possible in architecture. We are once again beginning to understand how the materials we build can influence the architecture we create. We are at the beginning of an evolutionary process – just as the first cars resembled carriages our buildings are very similar in conception to their concrete predecessors. The typology developed a hundred years ago (through the re-discovery of concrete) is deeply embedded in our creative psyche meaning that the visual references that we have for buildings are ones made of concrete. And the processes of construction are still steeped in concrete: all the disciplines, all the contracts and the building sites we see around us are those of an Industrial Age. Moving rapidly forward into a climate-sensitive culture, these processes must, by necessity, be completely re-configured.

We are seeing the emergence of a timber age in architecture. We are now working alongside architects such as Richard Rogers in the UK, SHOP in the USA, and with Shigeru Ban on a project in London. We have students and professors from around the world knocking on our door every week with bags full of questions… these are exciting times!

For now, we need to do two things: we need to learn quickly how to re-build our cities naturally, beautifully and efficiently. And we need to grow more trees: we need to fill our planet with trees, soak up the carbon and re-fuel the soil. We need to do this now, because although our timber buildings can go up quickly, trees really do grow very slowly.



WAUGH THISTLETON ARCHITECTS

Waugh Thistleton Architects have been at the forefront of sustainable construction for 15 years. Understanding the greater political role of architecture has meant for the practice that the materials and processes by which they build are no less important than the aesthetic considerations. Waugh Thistleton has led the field in designing buildings where energy reduction and an acknowledgement of the threat of Climate Change is inherent to the design, rather than an addition to meet regulations. They aim to maximize environmental sustainability through building materials. Notable in this activity is the instrumental role of cross-laminated timber (CLT), as an alternative structural technology to concrete and steel.

Contemporary
Art Fair

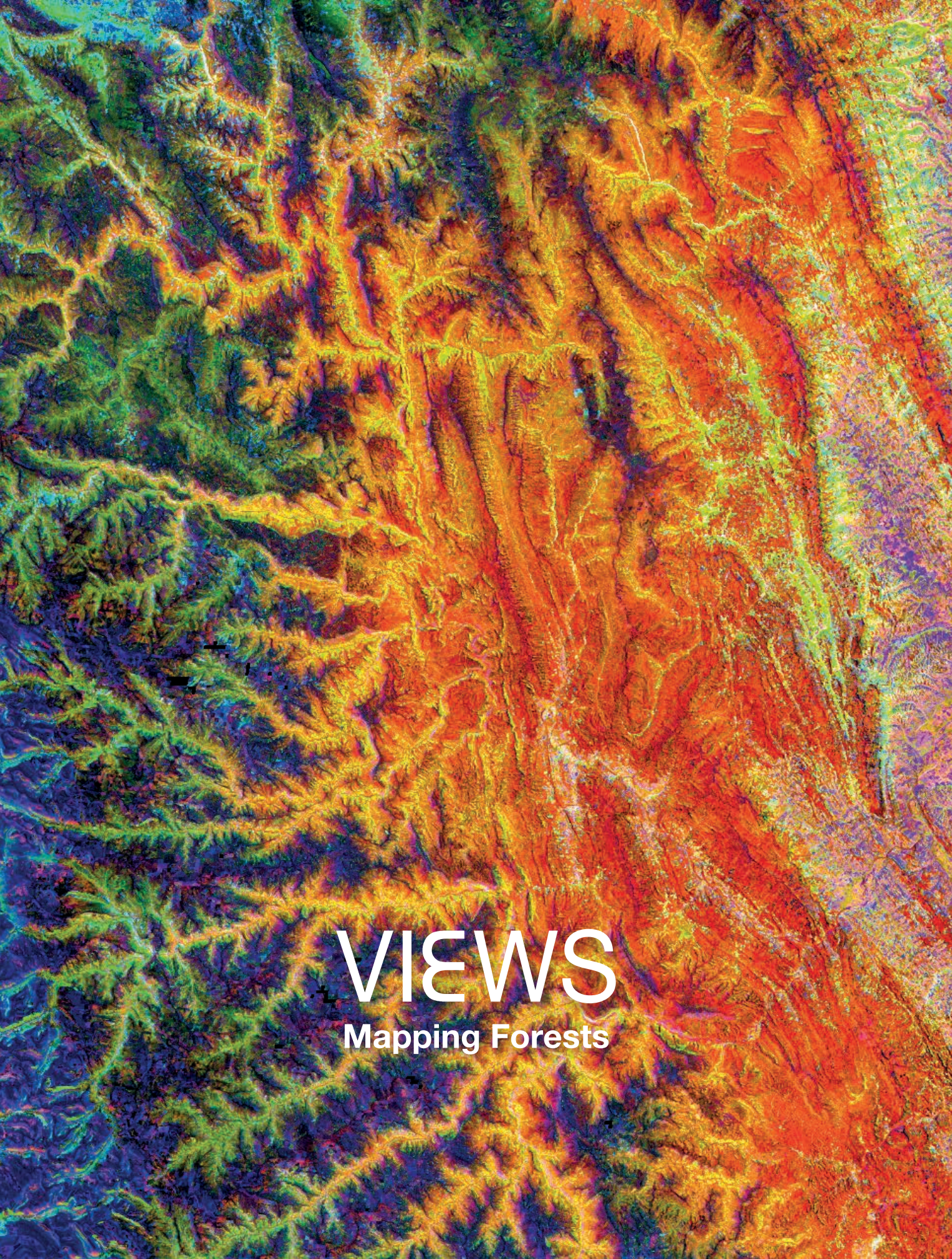
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VIEWS

Mapping Forests

CARNEGIE AIRBORNE OBSERVATORY

The Carnegie Airborne Observatory (CAO) is the most scientifically advanced, aircraft-based mapping and data analytics system operating in the civil sector today. First deployed in 2007, and greatly expanded in 2011 and 2015, the CAO has transformed our understanding of natural and managed ecosystems at large geographic scales, thereby supporting improved conservation, sustainable resource use, and environmental policy.

The CAO is equipped with the world's most advanced passive-active remote sensing package. Known as the Airborne Taxonomic Mapping System, or AToMS, this system integrates a high-fidelity Visible to Shortwave Infrared (VSWIR; 400-2500 nm) imaging spectrometer with a dual-laser, full waveform Light Detection and Ranging (LiDAR) sensor that is capable of collecting 3-dimensional ecosystem data at fine spatial resolution. A single overpass of AToMS generates thousands of layers of information on vegetation, soils, topography, and animal habitat.

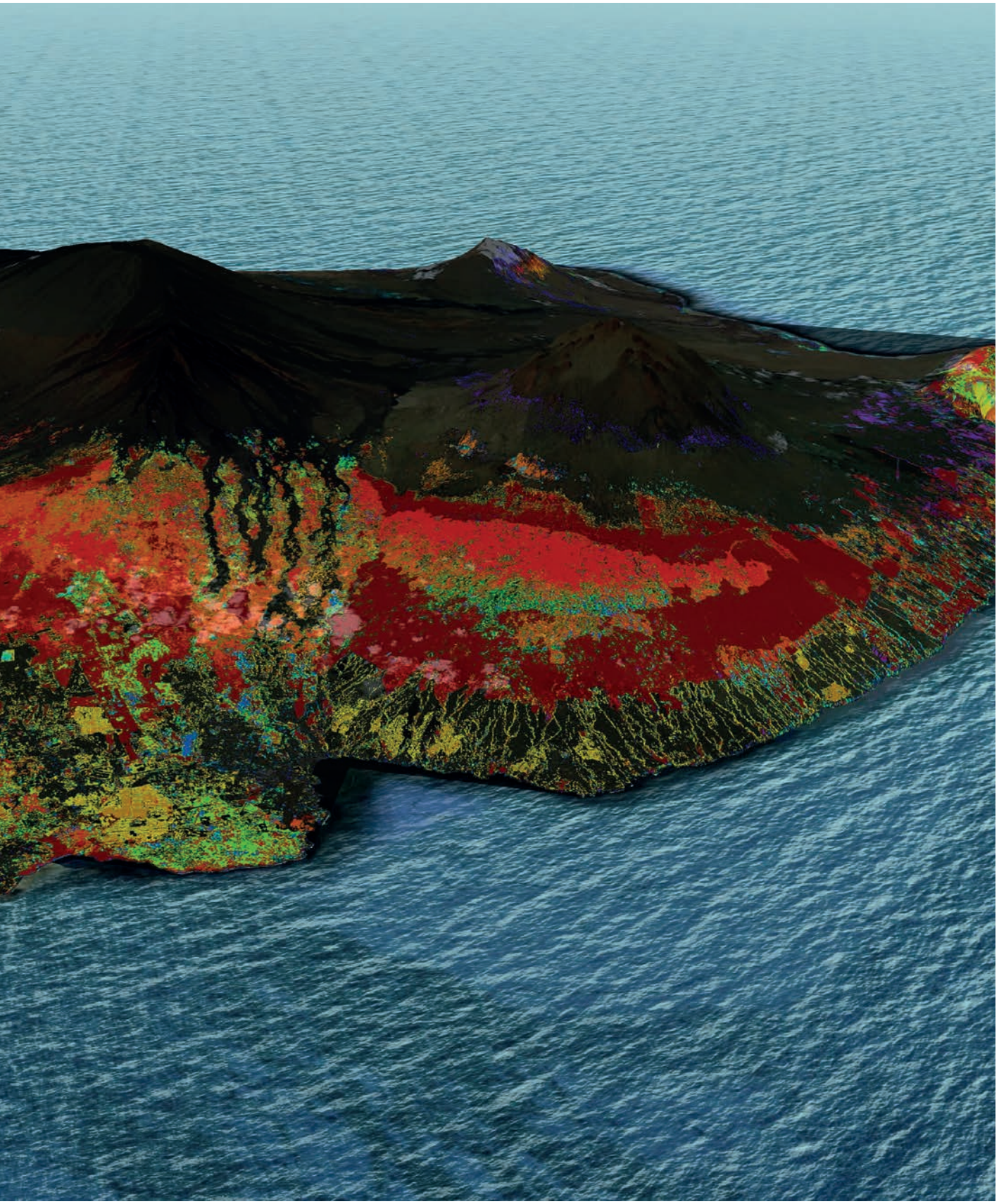
The CAO's 3-D imagery has served as an effective form of outreach to world leaders, conservationists, managers and everyday citizens. The CAO has demonstrated its powerful ability to deliver significant new discoveries in dozens of arenas, such as previously undetected illegal gold mining in the Amazon; animal hunting behavior in African savannas; ecological conditions promoting malaria and other diseases; undiscovered archeological sites in Hawaii; ecological imprints of prehistoric human activity in California, and much more. CAO data have been provided to thousands of organizations ranging from science to the arts, music to the fashion industry, and school children around the globe.

From 2008 to 2016, the CAO operated in Borneo, California, Colombia, Costa Rica, Ecuador, Hawaii, Madagascar, Panamá, Perú, and South Africa. The program has provided high-tech geospatial science support to private and public institutions working to conserve some of the most endangered, biodiverse ecosystems on Earth. CAO maps have played a central role in policy development at the highest levels in the host countries, and they have been center-stage in the United Nations climate change and biodiversity negotiations. The CAO program has produced more than 300 scientific publications, trained hundreds of scientists around the world, and been covered in more than 5,000 news stories.

The Carnegie Airborne Observatory is led by Dr Gregory Asner. Visit: cao.carnegiescience.edu



(previous page) A map of forest canopy chemical composition in a portion of the Amazon basin, taken in 201



3. Different colors indicate differences in the evolution of forest trees and their chemical properties. (above) Mapped forest biomass throughout Hawaii Island, also known as the Big Island, in 2011.



A collapsed volcanic cinder cone with vegetation, Hualalai Volcano, Hawaii Island, 2016.

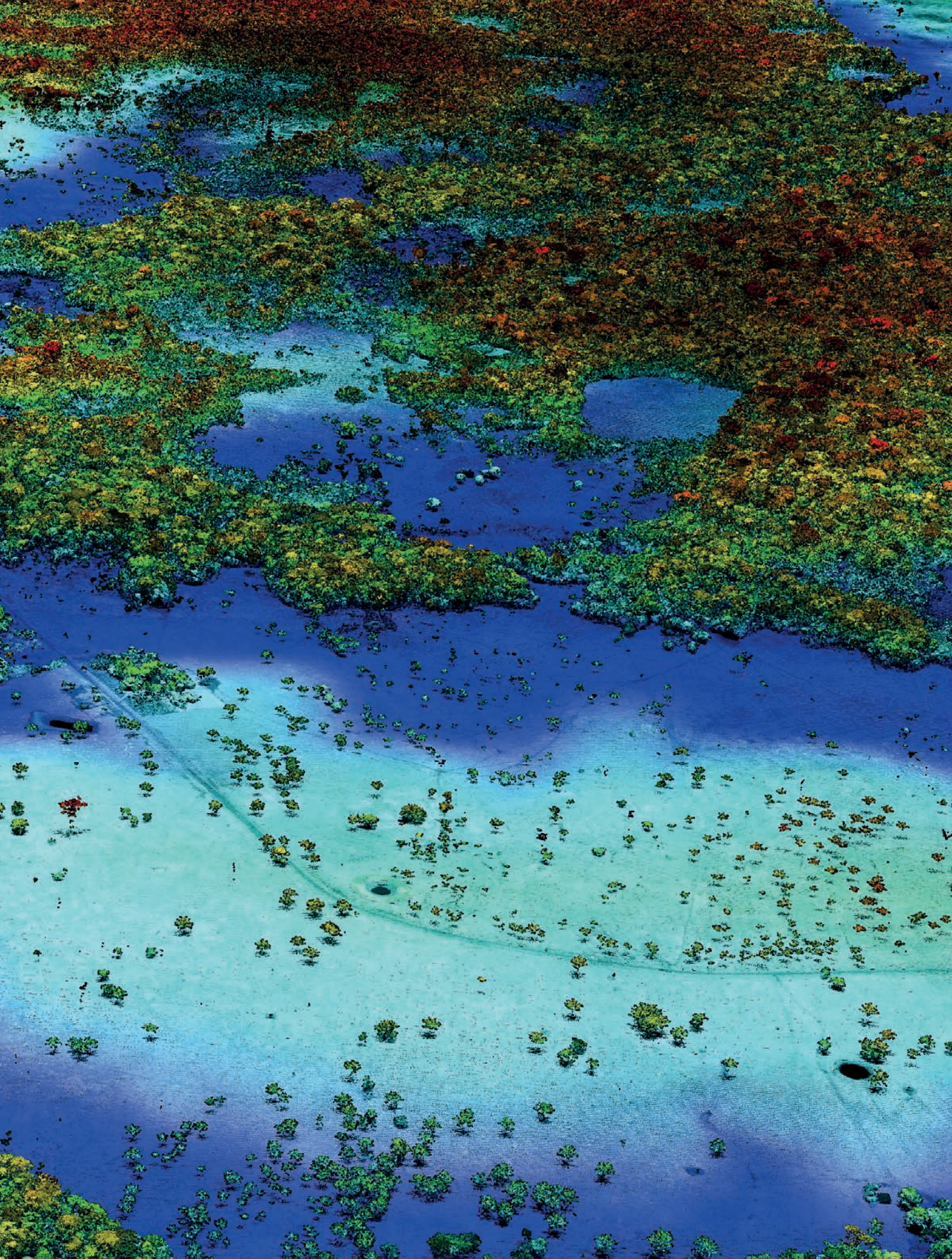


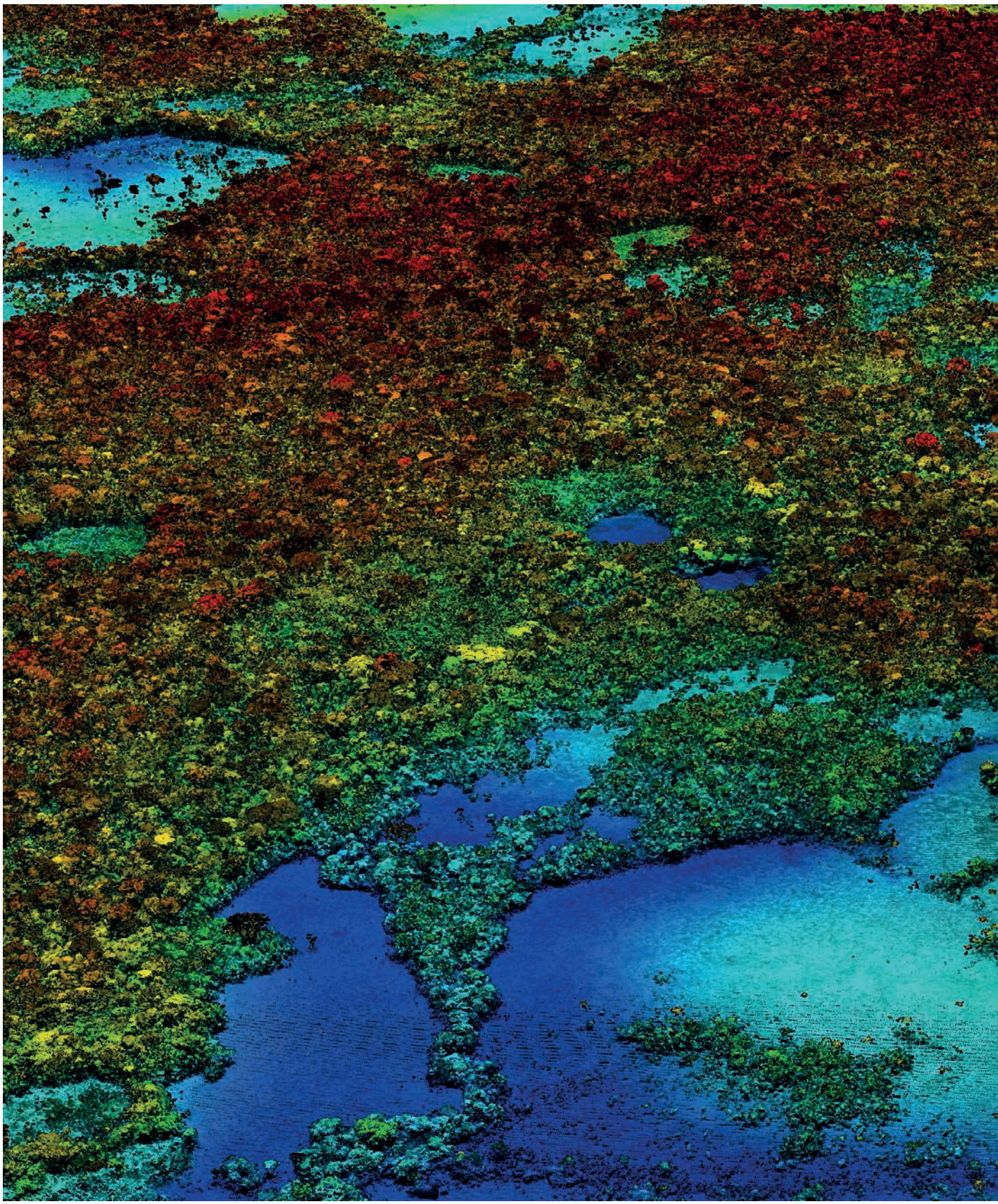


Coastline view of Kohala Mountain on Hawaii Island, mapping in 2016. Pololu Valley is visible to the left, and land clearings for sugar cane are visible to the right.

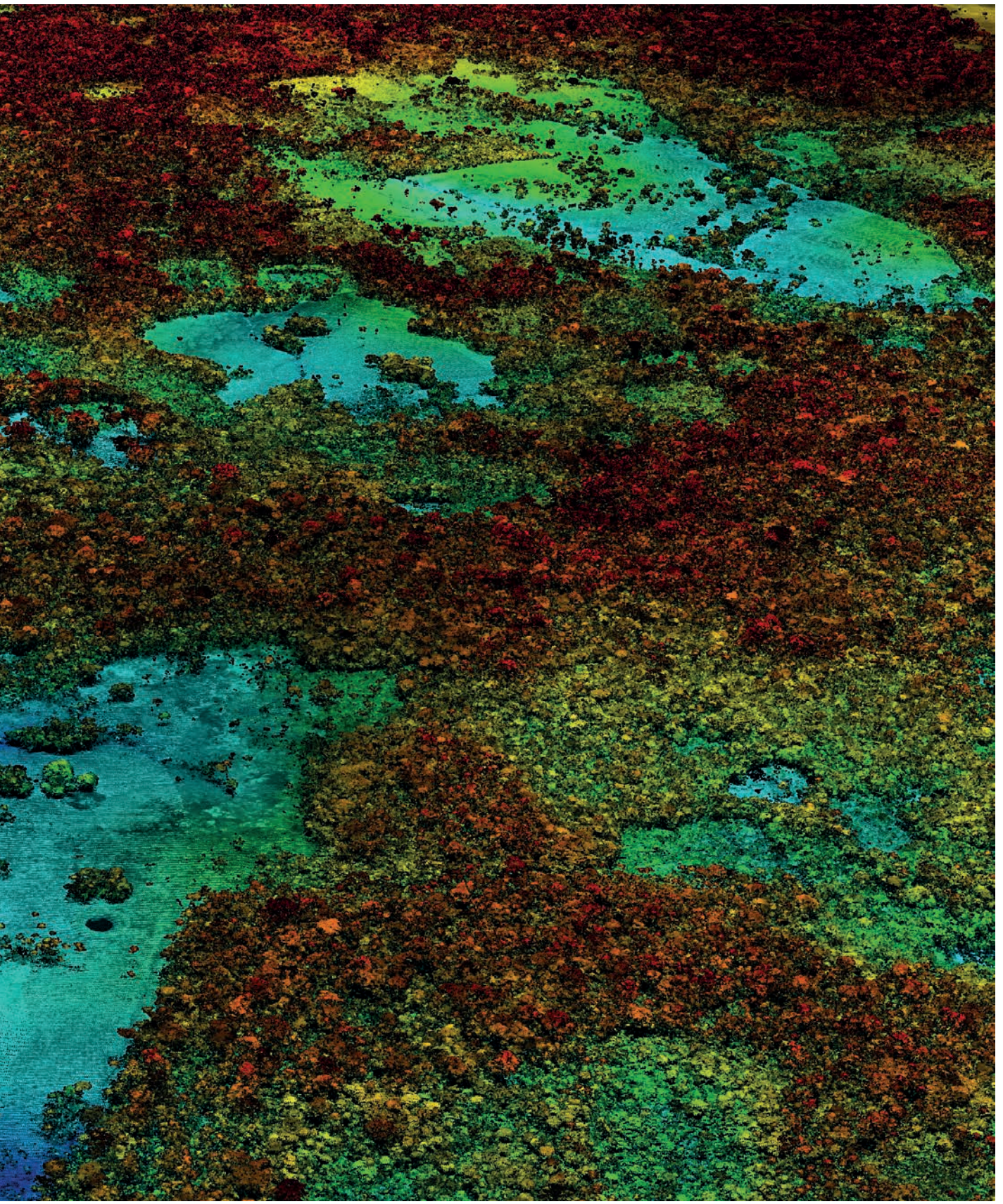








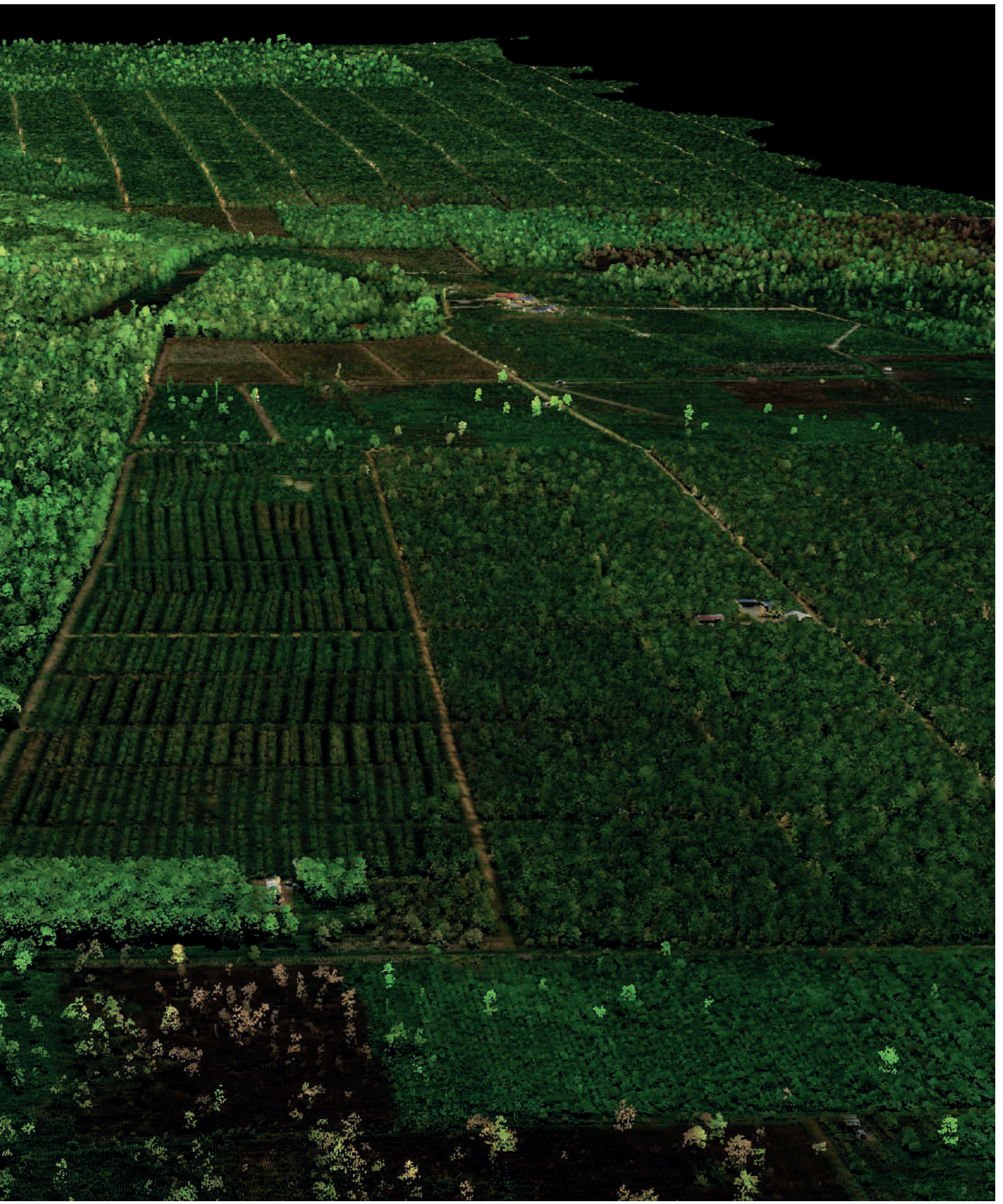
(previous page and above) CAO mapped the three-dimensional structure of the Colombian Amazon basin in 2010 and again in 2012. The mapping was done



at night using lasers. The resulting images show the 3D structure of the forest, and land clearings created for cattle ranching.

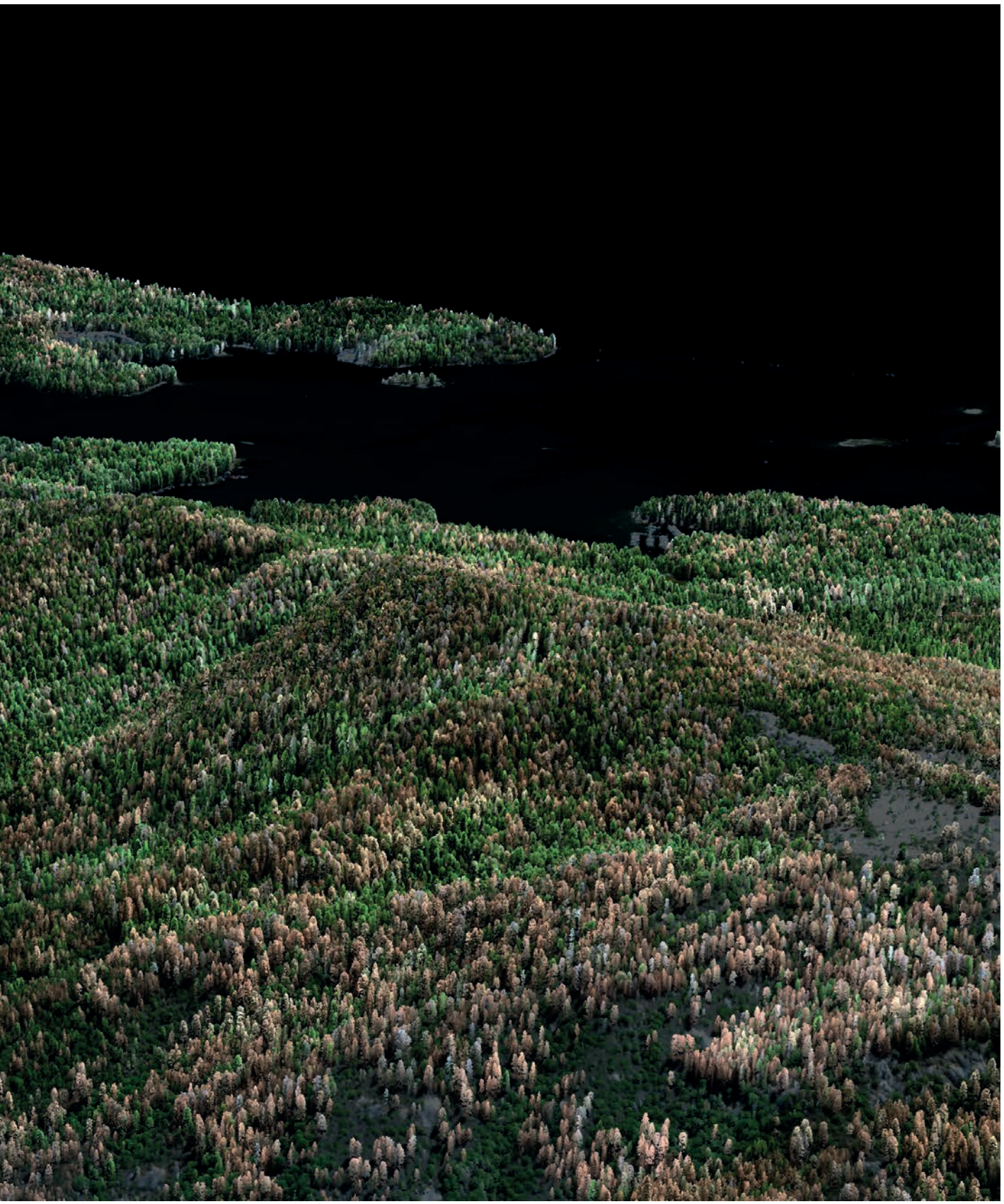


Natural forests line the Kinabatangan River in northern Borneo Island in 2016. To the right, the invasion of oil palm plantations that destroy natural rainforest.

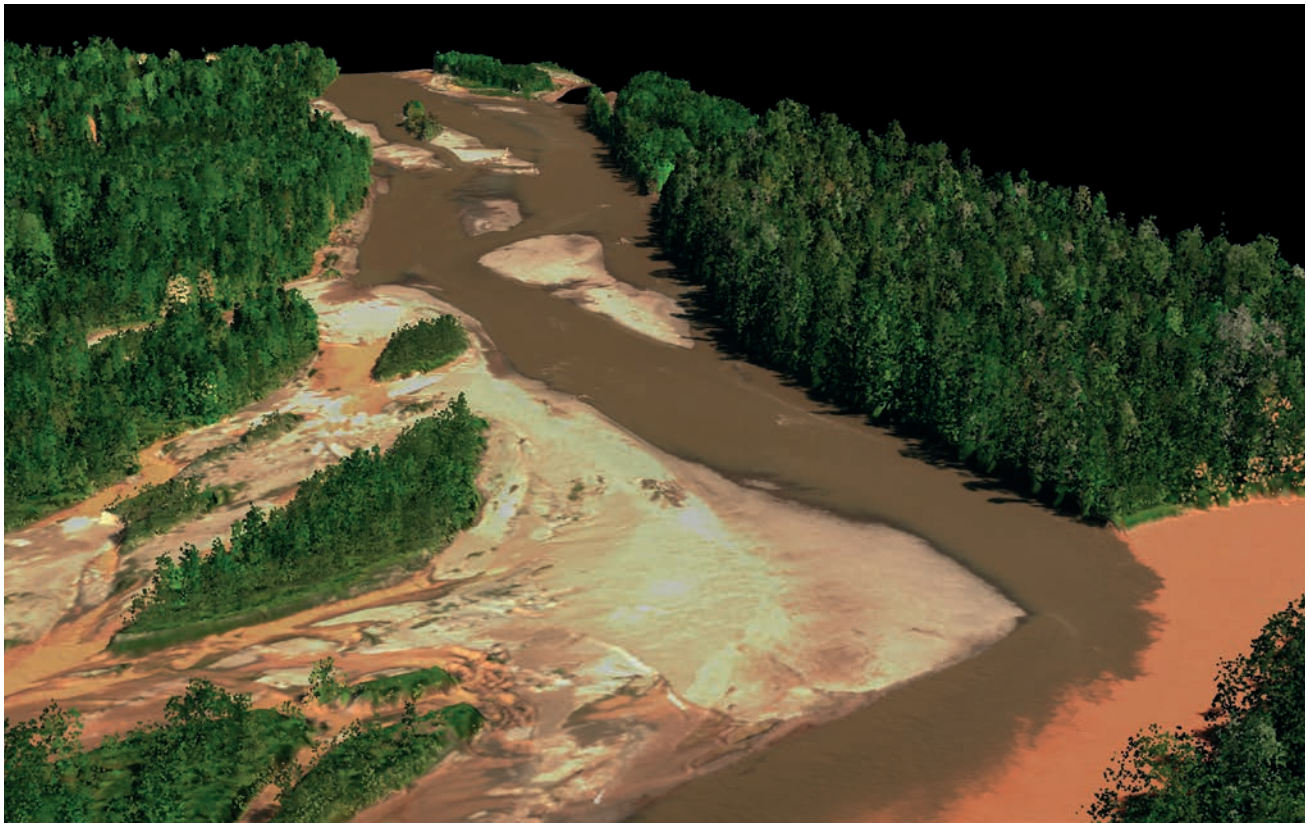




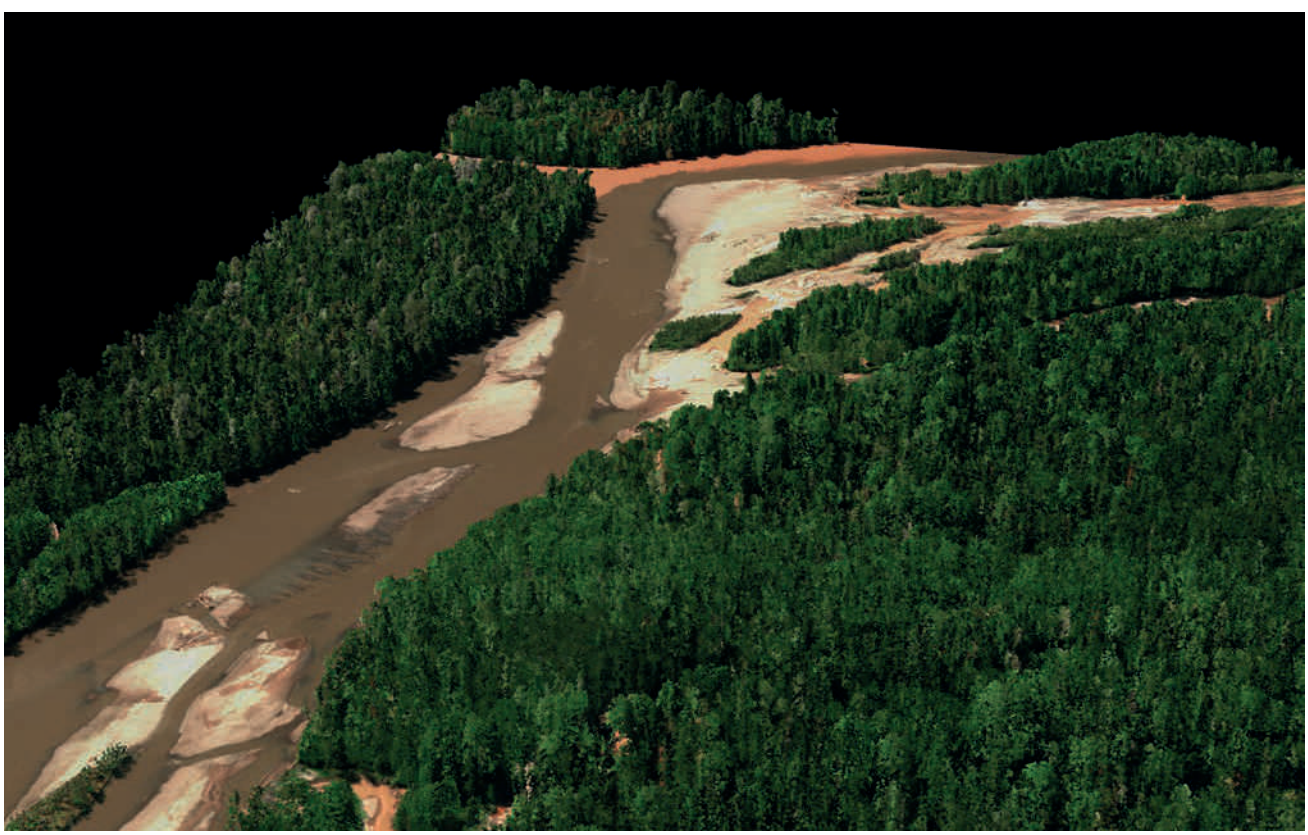
A portion of the Sierra Nevada Mountains in California during the 2012-2015 megadrought that left more than 100 million trees dead. This image shows an



area in the central Sierras with live trees in green, and dead trees in brown colors. The image was taken in 2016.



Confluence of two rivers in the Peruvian Amazon basin, taken in 2013. One river is naturally brown due to the decomposition of fallen leaves into the river water. The other river is artificially orange, caused by sediments generated by illegal gold mining upriver.



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Biomimicry & Sustainable Architecture /Design /Building

Biomimicry is a rapidly developing discipline in design that draws inspiration from the startling structures that natural organisms have evolved over the course of the last 3.6 billion years.

Writer: Michael Pawlyn



Biomimetic Office Building exterior cgi
Source: Exploration Architecture



Wood energy accounts for 7 % of total global carbon emissions.

Source: FAO Report 2016

Design Biomimicry

Proponents of biomimicry contend that many solutions exist within nature that we can employ to radically transform our construction techniques in order to build super-efficient structures, high strength bio-degradable composites, self-cleaning surfaces, zero waste systems, low energy means of creating fresh water and much more.

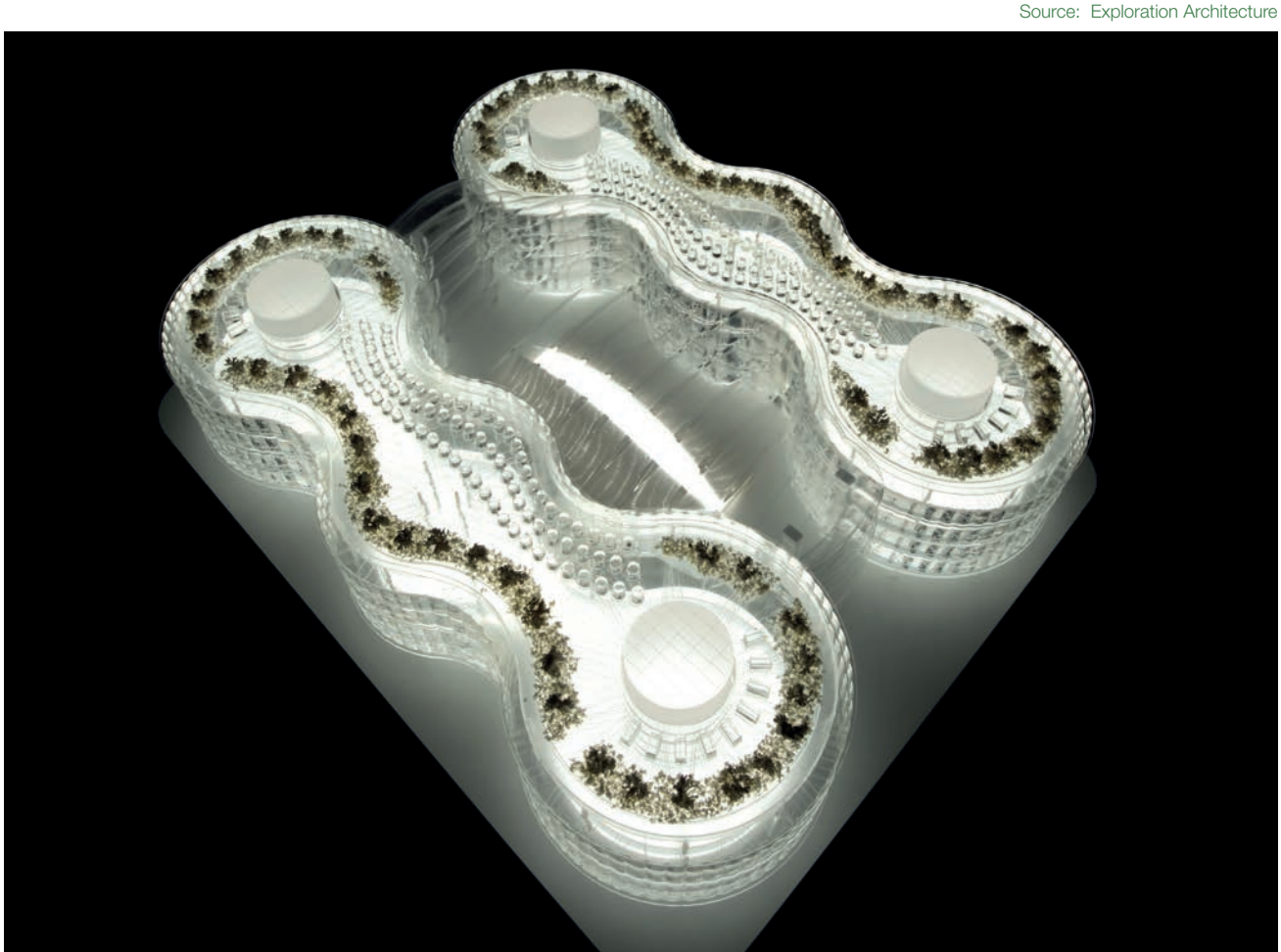
Biomimicry (also referred to as 'biomimetics') is distinct from biomorphic design, which essential seeks to copy or allude to natural forms and shapes for symbolic effect. Biomimicry is a functional discipline. It involves studying the way that forms deliver function in biology and then translating that understanding into design solutions that suit human needs.

Typically, human-made systems and products involve using resources in linear ways. Often the resources are derived in highly energy intensive ways, then used inefficiently and partially ending up as waste. While some benefits can be derived by looking at each of these stages separately, it is worth remembering Einstein's maxim: that problems are not solved by thinking within the same level of consciousness that created them. Biomimicry offers completely new ways of approaching design, such that the whole system can be optimized and radical increases in resource-efficiency can be achieved.

Biomimicry offers completely new ways of approaching design such that the whole system can be optimized and radical increases in resource-efficiency can be achieved.

If future generations are to enjoy a reasonable quality of life then we urgently need to redesign our buildings, products and systems to be completely 'closed loop' and to operate with current solar income. While no one suggests that these transformations will be easy, biomimicry offers a vast and largely untapped well of solutions to such problems. There are countless examples of plants and animals that have evolved in response to resource-constrained environments, and a lot can be gained by treating nature as mentor when addressing our own challenges.

Biomimetic Office Building high level three quarter view
Source: Exploration Architecture



The Biomimetic Office Building

The Biomimetic Office is an example of how biomimicry can be applied to the radical rethinking of a conventional building type. The client entrusted the architects to assemble a team of excellent consultants which included a globally renowned professor of biomimetics. The client also accepted the proposal that to achieve the best results a new approach would be required as follows:

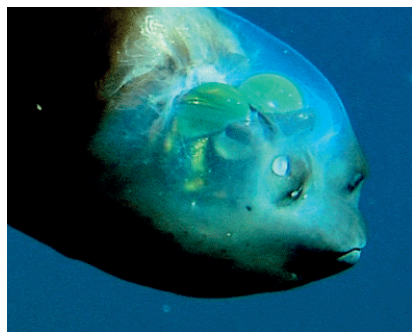
1. The team should do a concept study first with a minimum of constraints (no specific site or budget at the start)

2. The second stage should be a commercial feasibility study that refined the concept proposals to suit a target budget identified by market research as realistic for a high-performance building

3. A truly collaborative process which requires a certain amount of ego suppression on the part of the architect

The selection of polymaths as part of the team resulted in a very rich dialogue in which the boundaries between disciplines dissolved and several ideas emerged, some that the individuals had been nurturing for many years but had never had an opportunity to implement. The team set out to design an office that would be radically more resource efficient in terms of its energy and material usage, that aimed to achieve a minimum 10% improvement in the productivity of its occupants, to generate more energy than it consumes and for the air coming out to be cleaner than the air going in. It was clear that some of these objectives went beyond sustainable design to strive for restorative aims.

The first workshop concluded that daylight was likely to be the most important driver of strategic form for the building. Light is a pre-condition for most life on the planet so it's not surprising that there are numerous examples of organisms that gather light in intriguing ways:



Barreleye fish (spookfish)
Source: Greenanswers.com

The spookfish, for example, has amazing mirror structures within their eyes which point downwards to focus low-level bio-luminescence into an image on the retina.



Lithops salicola (stone plant)
Source: Dysmorodrepanis

The stone plant, a succulent native to desert climates, was another example. The majority of the plant structure grows below ground for reasons of thermal stabilization, and it has what could be called a 'skylight,' which brings the light down into the plant to where the photosynthetic matter is.



Brittle star *Ophiocoma Wendtii*
Source: John Miller

Brittle stars, such as Ophiocoma wendtii, are a type of starfish that have a covering of calcite crystals which function as effective armour, as well as near-optically-perfect lenses. These crystals focus light onto receptors below so that the whole body works like a compound eye. Additionally, brittle stars can control the amount of light coming in by means of chromatophores (pigment-filled cells) and adaptively tune the focusing of the lenses.



Anthurium warocqueanum
Source: Clivid

It is often organisms that live in the lowest light conditions that demonstrate some of the most interesting adaptations, which can provide inspiration for architecture. The rainforest plant *Anthurium warocqueanum* has evolved a covering of cells whose diameter, shape and spatial layout create lenses over its leaf surfaces. This surface appears to be able to concentrate diffuse light onto a group of chloroplasts aligned at the point of highest concentration. This strategy ameliorates the



Biomimetic Office Building interior cgi
Source: Exploration Architecture

basic disadvantage of its growth habit: receiving no direct light because it lives near the forest floor, under the shadow of dense canopy above.

With these examples, the team was encouraged to design more creatively with daylight in mind, and the building was designed to ensure that every inhabitable part of the office floor was within 6 meters of a window.

Anthurium, the forest floor dweller, sparked the idea of rooftop lenses that could concentrate diffuse light into fibre optic tubes so that daylight could be conducted around the building to where it was needed. There are some similar products on the market today, but they all depend on focusing on parallel rays of direct sunlight, which is less appealing when there is direct sunlight because general illuminance levels are higher, and getting light into the building is less of a problem. *Anthurium* inspired the interesting prospect of gathering light in diffuse conditions, and the idea is now progressing as an independent research project.

The idea of incorporating a symmetrical pair of large-scale mirrors in the atrium to reflect light into the ground and first floor levels was borrowed from the spookfish. Additionally, the space under the mirrors was well suited for the creation of a dramatic auditorium – a feature that would add value to the building.

Another added value of abundant daylight in a designed space is the a range of plants that can be grown in the office space. NASA has carried out extensive research into creating self-sustaining internal environments, and found that in sufficient quantities, three plants – the Areca palm, the Mother-in-law's

> Biomimicry offers enormous potential to transform our buildings, products and systems.

tongue and the Money plant – can process and neutralize all the contaminants in a normal internal environment.

Areca palms produce oxygen during the day; Mother-in-law's tongue produces oxygen at night; and the Money plant removes formaldehydes and Volatile Organic Compounds (VOCs). This was tested in a 5,000 sqm office building in Delhi and resulted in a 52% reduction in eye complaints, a 24% reduction in headaches, and more than a 20% increase in productivity. The team plans to do the same in the biomimetic office building which should help towards the aims of boosting human productivity and wellbeing.

The strategic design of the structure was led by optimization of daylight use and biomimetic techniques used to refine the structure that minimized the amount of material required. Professor Julian Vincent has characterized natural structures by saying, "In biology, materials are expensive and shape is cheap". To express this in another way, biological structures often achieve their resource efficiency through complexity of form, evolving to place the material exactly where it works most effectively. A bird skull demonstrates this principle in the way that very thin layers of bony material are laid down and connected with tiny struts, not dissimilar to dome or space-frame architecture. Another interesting example is the cuttlebone, which is also made up of thin layers of bone connected with undulating walls. Both the bird skull and the cuttlebone achieve strength through complexity and use a minimum of materials to their maximum effect.

The team analyzed a standard type of building construction – a floor and column structure – in terms of its structural efficiency and found that a lot of that material in the middle of the columns and the middle of the floors could be removed. Following the shapes dictated by the present forces suggested that the columns should be hollow, and the floors deeper in the middle. Excess mass from the floors could be removed with void formers of varying size. This could be achieved with relatively minor adaptations to established technologies such as 'bubble-deck' and fabric formwork. The resulting design approached the kind of efficiency present in the two biological examples.



Areca palms in the WuHe area in Ruisui, Wuhe, Taiwan
Source: Fred Hsu



Sansevieria trifasciata (Mother-in-law's tongue) flowers
Source: Meneerke bloem



Epipremnum aureum, common names: Money Plant.
Source: Mokkie

Developments in 3D printing offer the potential to get even closer to the efficiency seen in biology because there is no cost penalty to complexity in additive forms of manufacturing. This example of structural optimization captures how useful biomimicry can be as a tool. Through design we can pursue the most idealized form and from there compromise so that the project is achievable within the financial, programmatic and technological constraints that the team must work. The team took the view that you should never start with reality; you should always start by identifying the ideal and then compromise as little as necessary.

This idea of hollow columns led the team to discuss secondary purposes that hollow structures serve in biology. These 'conducting services', such as the exchange of fluids, gases or sensory information as in the case of nerve cells, led to an idea of constructing the building into the ground beneath to benefit from the steady temperatures that exist a few meters below the surface. Ground burrowing animals like rabbits and foxes use this to regulate the temperature within their burrows. Termites are the accomplished masters of this and can create thermos-regulating structures by using a combination of steady ground temperature and evaporative cooling. For the team, the ideal was to create a network of pipes that could utilize this stable ground



Biomimetic Office Building section cgi
Source: Exploration Architecture

temperature to be used as a source of free cooling in summer and free heating in winter.

When the team turned to the building's exterior skin, the design ideal emerged from a careful identification of functional requirements. The main desire was again to optimize the use of daylight – partly for human health, and partly to reduce energy usage. Daylight varies enormously in brightness from zero at night to 20,000 lux on a bright day, but inside, a reasonably steady level is required for working. The team also wanted to minimize heat loss that would otherwise demand an additional source of energy to warm the building during winter months. The ideal identified was a highly insulating and transparent skin with a layer of movable photovoltaic leaves that could allow in exactly the right amount of light, converting all surplus light into usable energy.

> Developments in 3D printing offer the potential to get even closer to the efficiency seen in biology because there is no cost penalty to complexity in additive forms of manufacturing.

The next stages of the project explored the use of complex genetic algorithms to further refine the optimizations between a wide range of criteria. These software tools essentially replicated the process of evolution at greatly accelerated speed, demonstrating the changes which organisms underwent to fit their respective ecological niches over aeons.

Biomimicry offers enormous potential to transform our buildings, products and systems. For every problem that we face - whether it is generating energy, finding clean water, reducing waste or manufacturing benign materials – there are precedents within nature that we can study. All those examples will run on current solar income, and there will be a closed loop in all their use of resources. As with any period of dramatic change, the early adopters of new ideas and new technologies are likely to be those that achieve the greatest success.



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The Untapped Potential of Biomass in the Western Balkans

The Western Balkans are endowed with great biomass resources that could massively improve energy efficiency and lower dependence on imported fossil fuels, but this form of indigenous energy remains only partially exploited.

Writer: Elisa Asmelash

Forested river valley
Source: UNECE/FAO

A Strained Energy Arena

Western Balkans are endowed with an enormous availability of natural resources, but remain significantly dependent on imported energy which are largely subsidized. Energy imports account for 44% of total energy use and costing over 3 billion euros. The electricity sector is largely dominated by coal, predominantly the highly polluting lignite, except for Albania which relies almost entirely on hydropower for electricity generation.

A report by the International Renewable Energy Agency (IRENA) shows that in contrast to the EU's long-term decarbonization strategy, Western Balkan countries are planning a significant expansion of new coal and lignite plants of up to 6 GW, which is considered the only means to guarantee energy security at reasonable costs.

Due to the lack of investments and maintenance in ageing infrastructure, the region is experiencing significant electricity shortages and cuts, especially during peak times in winter. In fact, during these months, the load on the already strained electricity networks is further increased by the use of electricity also for heating purposes.

biomass supplies 4-9% of total primary energy in the Western Balkans

Bombastic Biomass Potential

Forests are one of the most important natural resources in the Western Balkans. The Food and Agriculture Organization's 'Global Forest Resource Assessment 2015' shows that forests in the region are well-stocked and growing (both in volume and in area) and are efficiently and professionally managed. Forest coverage is very similar in the region: Bosnia and Herzegovina (BiH), Croatia, FYRM and Serbia having comparable levels of forests, while Montenegro is far much richer in forests, despite being far smaller than the other countries (Figure 1). State forests are mainly Forest Stewardship Council (FSC) certified, such as in Croatia and Serbia where 80% and 45% of the respective total forest area is certified. Reported annual wood use runs between 40-60% of annual growth.

Forest Coverage		
Country	1000 ha	% of Land Area
Albania	722.00	28.2
Bosnia and Herzegovina	2,185.00	42.8
Croatia	1,922.00	34.3
Montenegro	827.00	61.5
Serbia	2,720.00	31.1
FYR of Macedonia	998.00	39.6

Figure 1: Forest area in the Western Balkans- 2015
Source: Data extrapolated from the 'Global Forests Resource Assessment 2015- Desk Reference' FAO

Forests play an important environmental role that is crucial for the wellbeing of populations in the region, such as fighting climate change, conserving biological diversity, protecting soils or preserving water resources. And forests provide great opportunities for the sustainable development of the energy sector. The biomass sector now supplies 4-9% of total primary energy in the Western Balkans, offering significant amounts of raw wood materials suitable and available for energy production, such as wood residues, wood waste and bark. However, despite the availability of large biomass resources, biomass production in the region remains unexploited due to 3 key factors:

1. Biomass is not embedded into sector policy and national market structures. The market-based support scheme of feed-in-tariffs (FITs) is largely implemented in the region for renewables, including biomass in theory, but due to limited competition in the energy markets and to the low level of support, investments in biomass do not appear economically viable and attractive, especially when compared to the low prices of oil and natural gas. Similarly, national market structures are generally not designed to include the consumption of biomass energy. This is because of a lack of supportive initiatives and overall awareness about using of biomass for heating. For example: processed wood-based fuels (pellets, briquettes, chips) from countries such as Serbia and Croatia are mainly exported to neighbouring European markets, such as Italy and Switzerland, instead of being consumed locally, where oil-run boilers are still preferred.

2. Most of the energy utilities and forest resources are state-owned. Western Balkan states, like others, are generally reluctant to invest in the development of biomass production-based projects. Similarly, the few private forest owners are unwilling to cooperate among themselves even if a collaboration would be beneficial given the very small-sized plots they possess (usually < 1 hectare). This is particularly evident in the Former Yugoslav Republic of Macedonia (FYRM), where 90% of forest area is publicly and centrally managed (Figure 2) and not run with a long-term perspective of economic growth and sector innovation. As a result, improvements in forest management and especially in its derived energy services are not implemented with required efficiency, or not implemented at all due to insufficient financial allocations from state budgets and no participation from the private sector.

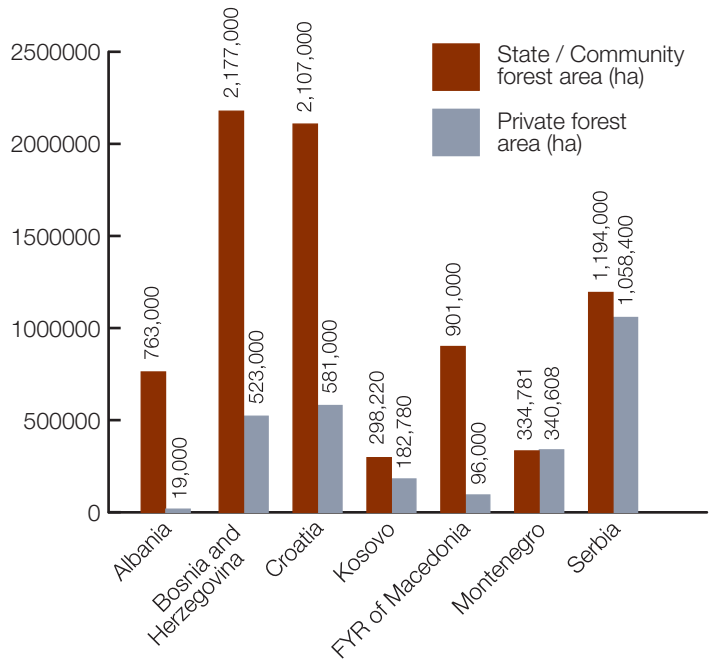


Figure 2: Share of state/private forests in the Western Balkans, 2015
Source: 'Biomass in the Western Balkans: Why don't we use our wood biomass potential?' V. Milijic, April 29, 2015

3. Most of the power and heat generation facilities are old, inefficient and highly polluting. While low-quality wood has been traditionally treated as waste, 84% of wood energy in the Western Balkans is used as firewood. This now represents the main source of energy in households, where it is used inefficiently and far from being integrated into modern energy systems. The use of traditional biomass in the heating sector and inefficient district heating systems are still predominant and a key barrier to the improvement of energy use in buildings and households.

84% of wood energy in the Western Balkans is used as firewood



Wood residues at sawmill, Sawmill Vektra Jakic , Pljevlja, Montenegro source: UNECE/FAO

5 Key Elements to Develop Biomass in the Western Balkans

1. Reliable financial mechanisms

The development of local demand requires reliable finance models. The most common support for renewable power (including biomass) in the region is feed-in tariffs (FITs). However, the absence of clear, enforceable secondary legislation – resulting in complicated permitting, licensing procedures and rules for grid connection – has hampered any investment. In this context, Power Purchase Agreements (PPAs) are an important tool for financing renewable power projects. As highlighted by IRENA, this is particularly evident for biomass, as they can help to secure both the biomass supply chain and power offtake.

2. A bottom-up approach

Similarly, there is a strong need to create local project ownership. There are numerous international initiatives providing external support to the development of biomass projects, but a bottom-up approach would be much more beneficial, as it would entail the creation of a critical mass among municipalities and local authorities. This type of direct participation approach creates sustainability effects by focusing on the local target groups and driving improvements at all levels for the environment, society and business.

3. More training and awareness

The potential of biomass energy is not politically recognized despite its significant importance in the region. As a result, countries are not in the position to offer adequate training to develop the required skills and knowledge in the biomass sector at national levels. Expertise is often missing at all levels of the biomass chain. Biomass logistics and trade centres based on wood represent an innovative business model aiming at developing domestic woody biomass value chains as a renewable source of energy. A successful example in the region is the EU-funded Horizon 2020 BioRES Project that includes Serbia, Croatia and Bulgaria. These centres aim at boosting investments in biomass production by demonstrating modern technologies for wood biomass production to forestry and energy stakeholders. This is being promoted and achieved through trainings, study tours and workshops, building up a network of qualified wood biomass laboratories among the participating countries and especially encouraging research and development with a strong collaboration among research institutions and other stakeholders and key actors in the field.

4. Improved forest management

Centralised forest management is making the energy and forestry sectors' stagnating and hindering any potential improvement. Privatisation of forests and rural forest communities could be effectively used as a vehicle to relieve state-owned management organisations which are sometimes not well equipped to perform all functions.

5. Greater regional cooperation

There is a clear need for regional cooperation and networking exchanges for biomass energy to gain traction in the Western Balkans. Countries share a long legacy of widespread environmental neglect and wasteful use of energy derived from a shared past with inherited practices and experiences from ex-Yugoslavia. Similarly, in their transition they also share the common development paths and dynamics of the region, especially in the context of the Energy Community Secretariat and EU membership processes.

To maximise the forest sector's contribution to climate change mitigation, the best strategy is to combine sustainable forest management with a steady flow of wood for energy. Among other renewables, biomass is the most promising for the majority of Western Balkans countries. Its mobilization can provide large employment generation schemes and can be linked to ecosystem conservation, improved industrial competitiveness, regional development and the growth of a strong export industry.

To read the full article, visit: **revolve.media**

revelle GROUP

Q&A Sampsa J. Auvinen, EOS President



CEO of Norvik Timber Industries and President of the European Organization of the Sawmill Industry (EOS)

How do sawmills contribute to rural development?

The European sawmill industries play a key role in the development of a green and sustainable society. With over 56% of the EU population living in rural areas, the effective implementation of rural development policies is a key component for lowering unemployment levels and returning growth to Europe. Often located in remote and less industrialized areas, the European woodworking and sawmill industry have long been a central player in rural communities supporting stable employment while encouraging investment. Indeed, the processing of timber constitutes the main source of economic revenues for forests owners. The continued development of this sector will help to avoid delocalization across the EU and enhance the competitiveness of rural areas. In Nordic countries, the forest sector plays a particularly vital role in general economic and social development.

How do wood-based products contribute to the circular economy?

In the Circular Economy, the materials used in products should not be seen as inputs but as assets. All businesses need to step away from unsustainable models such as 'creating – using - disposing' and think about ways to maximize the value of products over product lifecycles. Optimizing the entire lifecycle of materials and avoiding the production of waste are two main elements of the European Circular Economy Strategy. The Circular Economy should encourage the use of naturally and renewable raw materials, products and designs for structures and interior applications which are more environmentally-responsible and cost-efficient to operate.

Wood products are an excellent environmental choice. They are naturally renewable, recyclable and they store significant amounts of carbon from the atmosphere. Wood products also require considerably less energy for processing compared to other materials and at the end of the products' life, these can be recycled and burned for the bio-energy production. Comparative studies reveal that there is virtually no waste during the manufacture of wood product.

By way of example, wood and sawmill residues can be converted into a broad range of wood-based products including pulp and paper, bio-composite materials, bio-plastics, textiles and carbon-neutral biofuels. Moreover, most wood-working manufacturing facilities use wood residues as a source of energy to run a significant portion of their operations and sometimes use it for the cogeneration of electricity avoiding the use of fossil fuels.

What efforts are being made along your supply/production chain to be environmentally sustainable?

The European Sawmill Industries are fully committed to respecting the principle and criteria defined by FOREST EUROPE on the sustainable forests management. I believe that forest resources should be used in a way that minimizes impact on the environment with clear priority given to the forest outputs that have higher added-value, such as the sawmill products that create more jobs and contribute to a better carbon balance. It is important to highlight that when sourced from sustainably-managed forests, wood represents the optimal choice as it is an environmentally-friendly material. Europe can drastically reduce CO2 emissions by increasing the carbon sink created by its forests (by optimizing their management) and by enhancing the use of sustainably produced wood products. European sawmill companies are continuously evaluating solutions and instruments to have a trusted wood sourcing supply chain.

Comparative studies reveal that there is virtually no waste during the manufacture of wood product.

To read the full interview, visit: **revolve.media**

WOOD: AN ENVIRONMENTAL CHOICE!

Choosing the right building materials makes a big difference for the environment: by choosing wood, you opt for the most environmentally-friendly material

Wood represents a traditional building material that has been used for centuries when humans began building shelters, houses and boats. Timber is now recognized as being a natural and environmentally-friendly product and indeed offers many environmental benefits. Compared to other products, wood helps to increase a building's energy efficiency and minimizes the energy consumption. Using wood also helps to keep carbon out of the atmosphere, thus mitigating climate change.

Trees and wood products have the unique ability to store carbon. Forests store carbon in biomass, that is, in trunks, branches, leaves, roots and in dead wood. As trees grow, they 'inhale' carbon from the atmosphere. When trees are harvested and used as wood products, the carbon remains stored in the wood for the whole product lifetime. Studies estimated that 50% of the dry weight of wood is carbon. Wood-based products are considered an integral part of the carbon cycle of managed forest ecosystems. In sustainably-managed forests, removing wood is in balance with forest growth in the long-term, and wood removed from forests through harvesting, constitutes a replacement for the natural trees mortality that would otherwise occur eventually.

Timber in buildings and wood-based structural components, wooden furniture, or any other wood-based products continue to sequester carbon from the atmosphere for at least as long as the building stands or the wooden item is used. Moreover, when wood is used to replace energy-intensive materials, which contain non-renewable raw materials, and which generate carbon emissions during their production phase, the carbon dioxide emission reduction effect is often even greater than the carbon storage effect of the wood.

To top it off, in most cases the energy necessary for processing and transporting wood is less than the energy stored by photosynthesis in the wood. Every cubic meter of wood used as a substitute for other building materials reduces CO_2 emissions to the atmosphere by an average estimate of 1.1t (tons) CO_2. If this is added to the 0.9t of CO_2 stored in wood, each cubic meter of wood saves a total of 2t CO_2.



Less CO2? Use Wood!

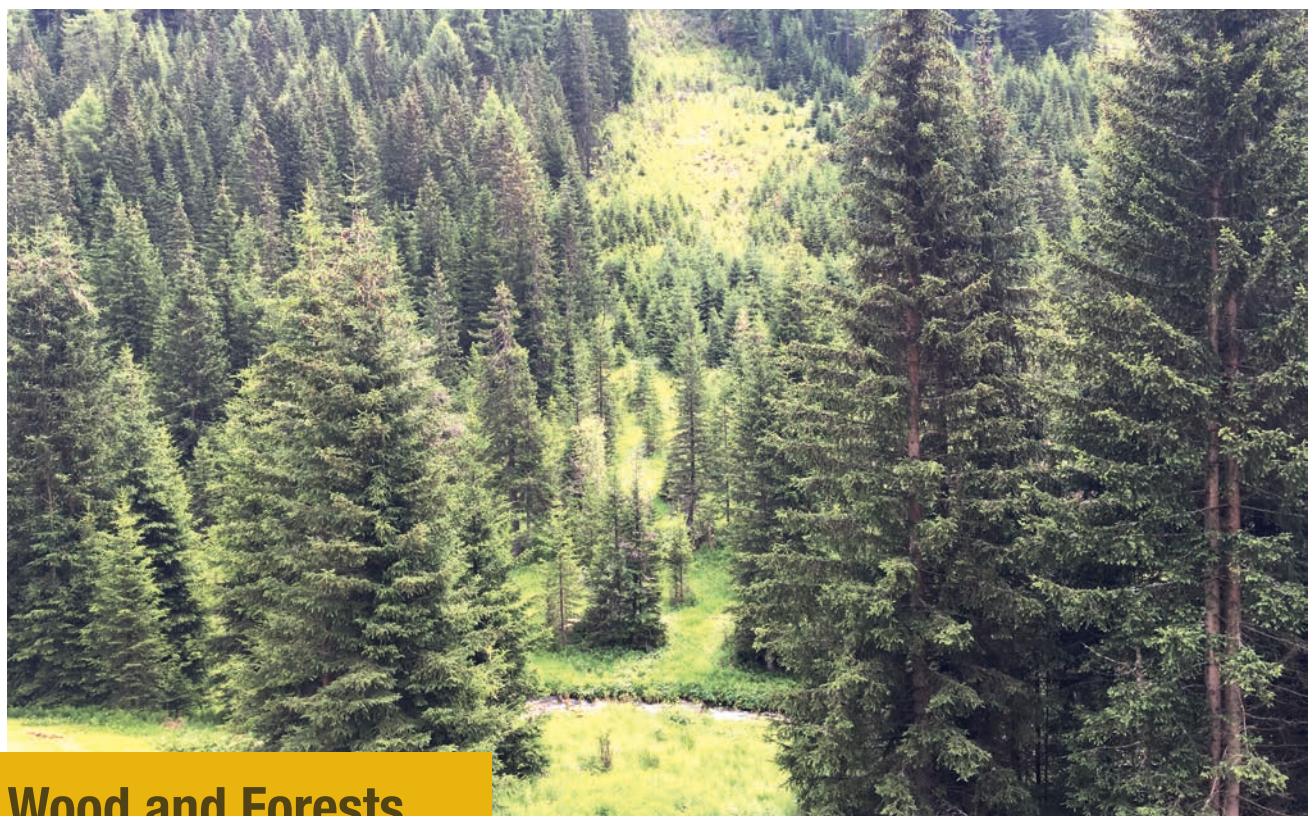
The enhanced use of wood products can help Member States reduce overall carbon dioxide emissions and achieve their climate targets. Timber in construction and wood products can represent an important solution to some of the challenges of the 21st century such as sustainable urban development, "zero emissions" buildings and more sustainable consumption. In this sense, the expansion of green architecture using timber and engineered wood products can play a key role.

According to the European Commission, buildings are responsible for 40% of energy consumption and 36% of CO_2 emissions in the EU. Currently, about 35% of the EU's buildings are over 50 years old. By improving the energy efficiency of buildings, the total EU energy consumption could be reduced by 5-6% and could lower CO_2 emissions by about 5%. **Using renewable materials with low-carbon footprints and improvements of energy performance of buildings to reduce emissions provides low-cost and short-term opportunities.** The main opportunities are the storage of carbon in wood products and the potential offered by the substitution of other (energy- or carbon-intensive) materials.

buildings are responsible for 40% of energy consumption and 36% of CO_2 emissions in the EU

One of the most important developments in modern construction practices is the use of thermal insulation in all types of buildings. Wood and wood-based materials are by nature good insulators, as timber's cellular structure provides it with natural thermal insulation qualities that are superior to any other building material, keeping out the cold in winter and the heat in summer, and reducing energy consumption and thus lowering energy bills. Without a doubt, wooden houses easily meet thermal insulation expectations.

Wood means as well less energy 'leakage' from a home. If you want the warmth (or coolness) to remain in your home, and you want to spend less money on heating (or cooling), wood is a tremendous alternative to other materials. Compared to any other construction material, **wood is economically a super star for insulation.**



Wood and Forests

To guarantee that the use of wooden products does not negatively affect the high value of forests in terms of ecosystems, timber should always be produced according the criteria and indicators developed by **Forest Europe**: an important forum in which 46 participating countries and the European Union discuss how to protect and manage forests more sustainably. Indeed, managing forests can result in more climate benefits than just leaving forests alone. Forest management activities contribute to maximizing biomass production and forest health, in addition to minimizing soil disturbance and increasing the forest carbon storage.

Left entirely to nature, forests will achieve a climax stage at which point the forest only grows as trees fall due to age,

> One of the best ways to address climate change is to use more wood, not less. Every wood substitute – including steel, plastic and cement – requires far more energy to produce than lumber.
>
> Dr. Patrick Moore,
> co-founder of Greenpeace

wind, landslip, disease or fire. European forests and the forest-based sectors are already contributing significantly to climate change mitigation. This mitigating effect reduces EU emissions by 13%. Nevertheless, there is a potential to contribute up to an additional 9%, according to the European Forest Institute.

The competitiveness of the European forest-based industry is inextricably linked with the sustainable management and expansion of forests. All European countries have policies and practices requiring reforestation and imposing that more trees are planted than are harvested. Currently, only 65-70% of the annual increment of European forests is harvested and the forest area is constantly increasing.

Using wood products and timber means making a smart choice for tackling climate change. Using more wood from sustainable managed forests implies less fossil fuels and ensure that the carbon storage potential of forests continues to grow. **To effectively tackle climate change we must remove carbon from the atmosphere and reduce new carbon emissions into the atmosphere. Responsibly sourced wood can do both.**



European saw mills have an annual turnover of 37 billion euros and provide over 259.000 job opportunities



EOS
EUROPEAN ORGANISATION OF THE SAWMILL INDUSTRY

www.eos-oes.eu

Created in 1958, the European Organization of the Sawmill Industry (EOS) is a Brussels-based non-profit association representing the interests of the European sawmilling sector on European and International levels. Through its member federations and associated members, EOS represents some 35,000 sawmills in 13 countries across Europe (Austria, Belgium, Croatia, Denmark, Finland, France, Germany, Latvia, Norway, Romania, Sweden, Switzerland and the United Kingdom) manufacturing sawn boards, timber frames, glulam, decking, flooring, joinery, fencing and several other wood products. Together, they represent 77% of the total European sawn wood output and a turnover of almost 37 billion euros, creating over 259,000 job opportunities annually in the EU.

Tree Huggers Were Right all Along

As you read these words, we should be celebrating a fantastic achievement: tonight, 137,000 fewer people will go to bed being "extremely poor" than yesterday. Yesterday, too, 137,000 people escaped extreme poverty, defined as living on less than $1.9/day. And tomorrow, another 137,000 people will emerge from extreme poverty.[1]

Writer: Patrick Worms



Faidherbia Albida parkland in Niger. Those trees help farmers through nitrogen, other nutrients, moisture, and shade. Without them, growing crops is almost impossible in those landscapes owing to the 10-month long dry season. With them, farmers can grow a surplus even in drought years. Source: ICRAF



The Population Paradox

This has been going on for at least 25 years. As the world's population has grown from 4.5 to 7.5 billion souls, the number of people under that extreme limit has dropped from 2 billion, or 44% of the global population, to 0.7 billion, or under 10% of the total. Just imagine that. 6.5 billion people alive right now are not extremely poor anymore. They have food now. They have better housing. Their children go to school for longer. They have more leisure. Their consumption of everything from food to energy to manufactured products is growing.

That is a good thing. More and more people are leaving the evils of hunger and despair behind. But that wonderful progress generates a rapidly growing demand. Not only are there more people, but each is on average richer. In the aggregate, demand for everything is growing, often almost exponentially. Even for flint knives, as more kids and more collectors can afford them.

Almost everything that people want – from food to building materials to the raw materials for everything from bedsheets to smartphones – comes, in part, from the land. The landscapes of the world are consequently changing at an extraordinary pace. Two thirds of the Earth's land surface and 70% of its fresh water are devoted to growing food and wood. Vast tracts of savannah, prairie and forests have been yoked to human needs. And in that process, a slow-moving disaster is unfolding.

Already, land-based activities are the second-biggest source of greenhouse gas emissions. The speed at which species are disappearing – or the speed at which our oceans are acidifying – exceed any known for the past 60 million years. The climate is changing at speeds that exceed any forecast even a few years ago. And the very levels of oxygen in our atmosphere are, slowly but relentlessly, dropping.[2]

Humans populations will keep growing to around 11 billion by 2100 - and they will

These coppiced trees intercropped with the coco fix nitrogen, reducing fertilizer needs, and the long poles they produce are bought by the local biomass to electricity plant. Source: ICRAF



keep getting richer. All the problems of the Anthropocene (of which climate change is but one) will accelerate. As we are pushing the planet way beyond safe boundaries, drastic solutions are being mooted.

Some would plant an area of land equivalent to the size of two Indias with fast-growing trees, whose sole purpose would be to be burned for energy, and for the CO2 this emits to be captured and stored deep underground. Imagine this: tens of millions of hectares of acacias or eucalypts forming country-sized landscapes almost as devoid of diversity as the Sahara, without any of the resilience that diversity brings, offering no room for anything except fuelwood.

But even without such extremes, demand for wood – from roundwood to panels and paper – will keep growing relentlessly. Where will it come from?

Industrial forestry plantations are comparatively easy to manage and to mechanize, and are becoming the dominant source for wood products as natural forests are logged out. But that model, too, is reaching its limits.

Monocrops – whether agricultural or perennial – may be profitable in the short-term, but they have downsides: they are fragile, in that any disease can easily spread, and so they require a lot of expensive phytosanitation, much of it for prevention. They exhaust soils, since the millions of individuals they are comprised of are genetically identical and consume exactly the same kind of nutrients. They thus require a lot of fertilizer input. They are financially risky, since they leave their owners at the mercy of the price swings of a single commodity. And, perhaps worst of all, they leave no room for biodiversity.

> "mining": extract what you can from the soil, and when it's turned to desert, move on.

It's not just the visible kind of biodiversity – the birds, the mammals, the reptiles – that disappears in large-scale plantations. Worse, perhaps, is the slow death of the diverse microbiome that ultimately give soils their fertility and resilience. That's why, among soil scientists, this form of farming is often called "mining": extract what you can from the soil, and when it's turned to desert, move on.

With so much of the Earth's surface already devoted to growing the stuff we all need, and so little left for the millions of other species we share this planet with, expanding plantations to any significant degree is not really a long-term option. The paradox of growth is that the more people we are, the less resources we will have.

But all that wood will have to come from somewhere (unlike iron or platinum, we can't even dream of mining it from asteroids). If the downsides of plantations make them unattractive over the long-term, what is left?

Agriculture + Forestry = Agroforestry

What is left is putting the trees everywhere in our agricultural landscapes.

It's called agroforestry, and its slowly revolutionizing farming. Agroforestry comprises a vast range of production systems that have one thing in common: they combine trees with crops or livestock on the same unit of productive land.

Agroforestry is all around us, from the hedges of Britain's West Country to the poplar lines of the Pajottenland west of Europe's capital. When you gaze upon the severe checkerboards of southern Russia on your flight to Asia, you see agroforestry (windbreaks, in this case). When you walk through the multi-layered damar and rubber gardens of Sumatra, you may think you are in pristine rainforest, but you are in fact in highly productive farmland. And the vast faidherbia parklands of Niger's Zinder districts are not forests, but the most productive farmlands in the country.

To the unwary, such landscape uses appears to be nonsensical. Surely, the trees crowd out the crops by hogging all the sunlight, using all the rainwater and stealing all the nutrients? Aren't forests floors often bare for exactly those reasons?

No. Not in a well-tended agroforestry system. There, the trees and the crops complement each other. Trees offer shelter from wind, storm and excessive



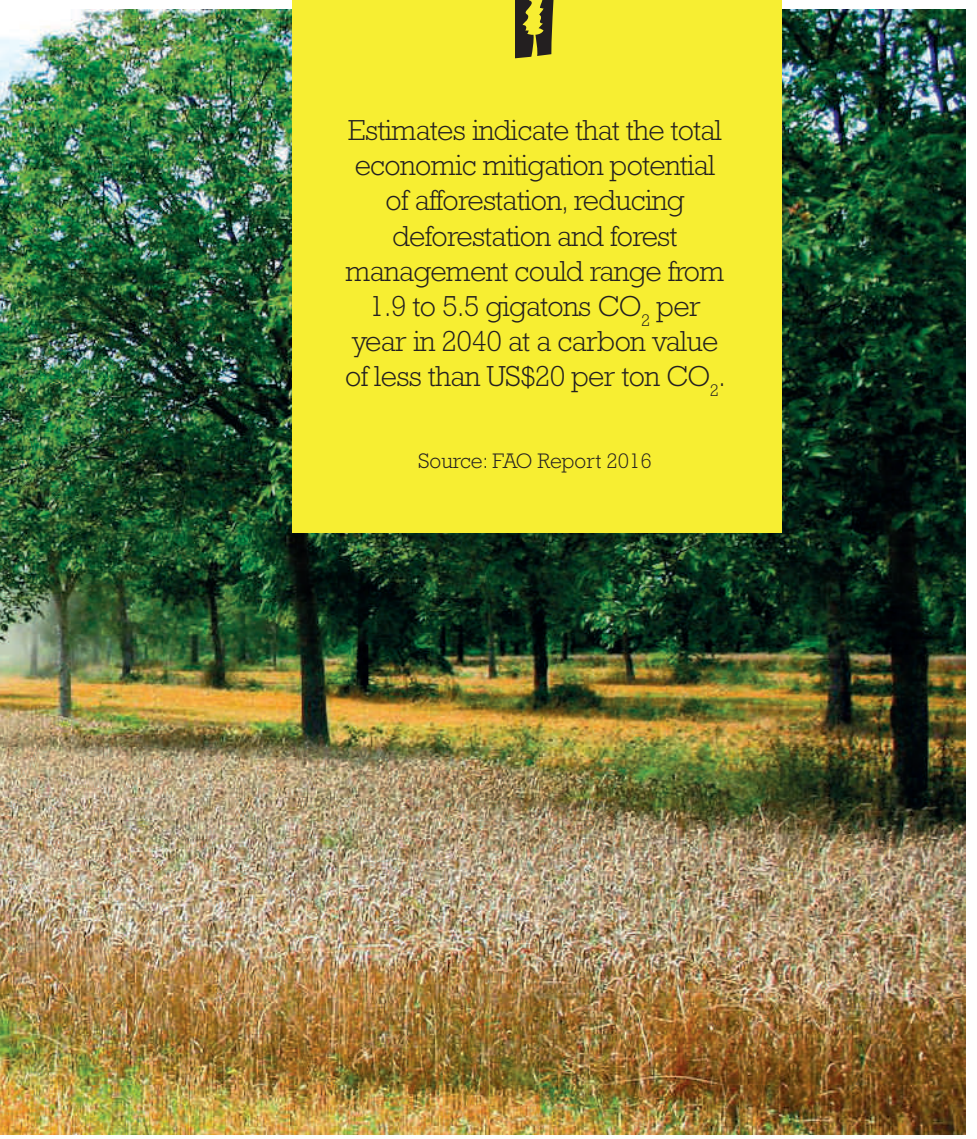
sunlight. Their roots reach deep into the soil, accessing nutrients that crops or grassroots cannot reach and bringing them to the surface to make their leaves and branches. As these fall upon the soil and rot away, the nutrients they are comprised of become available to the crops.

It's like having a free fertilizer factory on your plot.

Tree branches host many small animals, including precious auxiliaries like pollinators and pest predators. They act as huge rain-catchers, channelling rainwater deep into the soil and reducing erosion from runoff. And they offer subtler services, too, such as reducing nitrogen runoff (their deep roots catch a lot of leached fertilizer) or dampening local climatic swings – as anyone taking a walk on a hot summer day may have noticed, livestock, like humans, like a bit of shade. That's worth up to 10% of production for European dairy cows.

Even more surprisingly, crops and animals provide useful services to trees, too. The most obvious is fertility: livestock manure fertilizes trees. More intriguing still is the

introducing agroforestry across Europe could capture 1/3 of its total greenhouse gas emissions



This French farmer intercropped his wheat with timber walnut 38 years ago. This timber is now worth ca. 2 million€.
Source: ICRAF

Estimates indicate that the total economic mitigation potential of afforestation, reducing deforestation and forest management could range from 1.9 to 5.5 gigatons CO_2 per year in 2040 at a carbon value of less than US$20 per ton CO_2.

Source: FAO Report 2016

phenomenon by which trees in agroforestry systems grow faster than in forests. In a crop field, tree roots must go much deeper than in a forest before they can spread unimpeded. In a wheat field, that's about a meter down. That means not only that the tree has access to more nutrients but also that it is protected from most droughts and floods, since the mass of its rootlets is too deep to be affected.

The result is amazing: on some farms, the woody biomass in the agroforestry system is as high as it is in a pure forest. That means the farmer is getting the same income as the forester from her trees – while still getting her usual yearly income from farming.

Finally, the mix of trees and crops guarantees a much better use of sunlight and rainwater: the trees keep growing after the crop has been harvested.

All of these phenomena, combined, mean that the overall productivity of an agroforestry system almost always exceeds that of an equivalent area of segregated crop field and forest. In the temperate zones of Europe, that typically means 30-40% more biomass. In the tropical zones, that figure can rise to astronomical heights – in Niger's parklands, for example, nothing at all would grow without the shelter of the trees.

No wonder farmers around the world historically added trees to their farms. In the days before inorganic fertilizers or tractors, trees were the surest, easiest way of ensuring your land stayed productive. Indeed, research has shown that the very first plant to be domesticated, over 11,000 years ago, was the Middle East's ultimate agroforestry tree: the fig.[3]

Tree-less Farmland

Today, as the limits of the Green Revolution technologies of hybrid seeds, irrigation and fertilizer become obvious, farmers are again adding trees to their fields. As they do so, they are doing wonders for climate change: a study estimated that thanks to trees, the world's agricultural soils are holding double the amount of carbon than estimated.[4] Another one estimated that in the EU alone, the large-scale introduction of agroforestry could capture a full third of its total greenhouse gas emissions.[5]

But despite these manifold advantages, most farmland remains resolutely free of trees. On rainy days, ditches and rivers fill with the brown waters of erosion; on dry, windy days, the bare soils of freshly laboured lands whip up enough dust to lead to epic pile-ups.[6] While our soils are slowly but surely turning to desert in this manner, fresh forest plantations march on to feed the world's hunger for timber, fuelwood and

fiber. This dangerous nonsense has to stop: it's not as if it benefitted anyone. So why is it still so prevalent?

Much of the answer has to do with the sheer difficulty farmers face wanting to embrace agroforestry. In Europe, they are largely on their own. Farmers have had no training in forestry and they do not know how to prune or otherwise care for their trees. Agricultural colleges churn out agronomists who have had hundreds of hours of training about crops, chemicals, irrigation or rooting systems, but hardly any on soil science or agroecology. Advisory services know little to nothing about agroforestry. Commercial farm suppliers – who, in several European countries, are the main income source for farmer associations – cannot find a way of making money from it, and so they don't advertise it.

And the Common Agricultural Policy bristles with fearsome penalties for any farmer making a mistake, for example by having too many trees in her field: stopping the subsidy payments on account of these "ineligible features".

In the face of such headwinds, it is a miracle that the use of agroforestry is growing at all on our continent. That growth is fragile, and could all too easily be reversed. That would be a catastrophe. Agroforestry is not only an extremely useful addition to the toolkit of a modern farmer; it is also the only major unexploited source of fuelwood, timber and fiber that can be deployed without major environmental downsides.

As we celebrate a world that keeps growing, and keeps growing richer, we should do what we can to encourage the stewards of our lands to adopt a management system that is not only good for the planet their children will grow up on, but good for their bottom line as well.



French Agriculture minister Stéphane Le Foll explains the benefits of agroforestry to President Hollande.
Source: ICRAF

Notes:

1. ourworldindata.org/world-poverty
2. scrippso2.ucsd.edu
3. news.harvard.edu/gazette/story/2006/06/figs-likely-first-domesticated-crop
4. Carbon on Agricultural Land: The contribution of agroforestry to global and national carbon budgets Robert J. Zomer, Henry Neufeldt, Jianchu Xu, Antje Ahrends, Deborah Bossio, Antonio Trabucco, Meine van Noordwijk & Mingcheng Wang Scientific Reports 6, 29987 (2016)
5. Valuing the carbon sequestration potential for European agriculture. Joris Aertsens, Leo De Nocker, Anne Gobin, Land Use Policy 31 (2013) 584–594
6. www.youtube.com/watch?v=C5zs0dU85q4



World Agroforestry Centre

The World Agroforestry Centre seeks a rural transformation as farmers increase their use of trees in agricultural landscapes to improve their food and nutrition security, income, health, shelter, social cohesion, energy resources and environmental sustainability. The Centre generates science about the direct and indirect benefits of agroforestry and disseminates this knowledge to promote policies and practices that improve livelihoods and benefit the environment.

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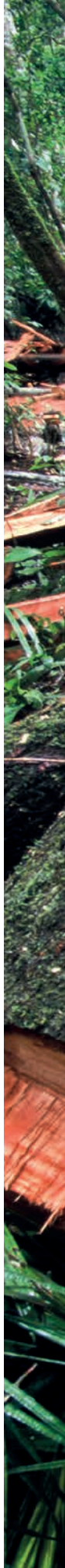
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Sitting on Illegal Wood

Illegal logging is a real problem threatening some of Europe's oldest forests, as well as forests across the world, putting at risk unique wildlife and habitats, causing greenhouse gas emissions and depleting natural resources. And yet, despite progressive EU legislation, products containing illegal wood continue to appear in our everyday life, from wooden chairs to our favourite books. What can be done?

Writers: Stephania Campogianni and Anke Schulmeister



Illegal logging is happening in the lowland rainforest along the Rio Las Piedras, near the Alto Purus Reserved Zone in Peru.
Source: © André Bärtschi / WWF





The current EU legislation on illegal timber trade has some strange exemptions/gaps: while wooden tables sold in the EU need to be fully legal, the same does not apply to wooden chairs.
Source: Charles Schug

In 2013, the European Union's first legislation against illegal logging entered into force, stirring great enthusiasm and setting high expectations for the global fight against deforestation. The EU Timber Regulation aims to ensure that all timber and timber-based products on the EU market are fully legal. As wood is present in many everyday products – from the newspaper we read to the carton packaging of the milk we drink and from the furniture we buy to the frame of our favourite picture – it is important to ensure that all this wood does not fuel illegal or criminal activities destroying pristine forests.

Unfortunately, four years on, illegal wood is still reaching shelves across all EU countries. Besides the usual delays and shortcomings by EU national governments to implement effectively the pan-European legislation, there is also an important gap in the legislation: it does not cover all wood products! For no clear reason, the law requires, for example, wooden tables sold in the EU to be fully legal, but the same does not apply to wooden chairs…

This situation is entirely illogical and must be fixed urgently. One opportunity to fill this gap will be this year's review of the product scope of the legislation – this legislation must ensure that all wood products (without exception) traded and sold within the EU borders are ALL legally-sourced.

up to 30% of the current global forest production is illegal with a turnover valued at $30-100 billion

Europe's Illegal Wood Products

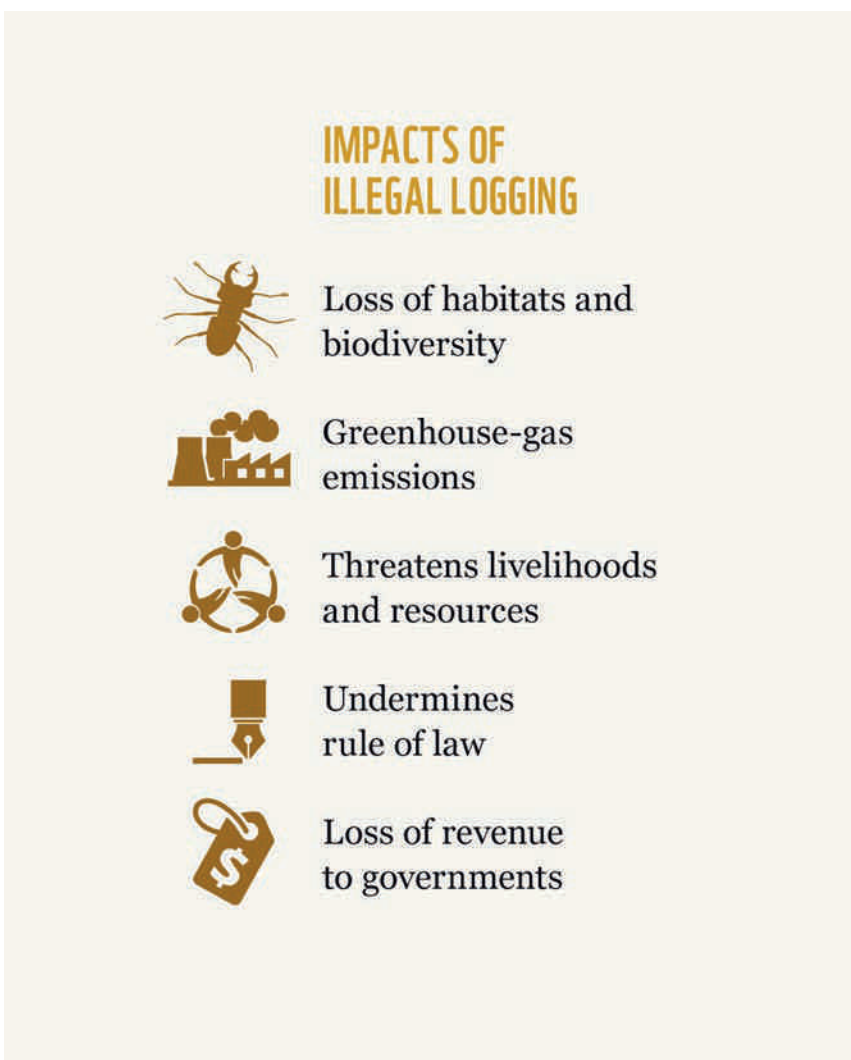
According to a poll commissioned by WWF in 2015, 73% of polled Europeans were unaware of the risk of wooden products sold in the EU containing illegally logged timber, but 85% of them supported stronger measures to avoid this (so let's avoid it!). 77% of respondents estimated that the European Commission should take action to ensure that the regulation covers all wood-based products and 82% thought that it should make sure that the regulation is applied fully and consistently across all EU countries. Source: WWF-EU.

References: WWF EU work on forests: www.wwf.eu/what_we_do/eu_forests/our_work_eu_forests

How Much Wood is Illegal?

Up to 30% of the current global forest production is illegal, with a turnover valued at $30-100 billion. In key tropical countries in the Amazon Basin, Central Africa and Southeast Asia, the rate is even higher with an estimated 50-90% of forest products sourced illegally. The European Union is one of the world's largest consumers of wood, importing wood and wood products worth about €54 billion.

Illegal logging destroys some of the most unspoiled forests in the world such as the Amazon, the Congo Basin, the Greater Mekong, and some of Europe's last remaining old-growth forests, especially in Romania and Bulgaria. It threatens wildlife like tigers, rhinos and elephants, and depletes their habitats and the natural resources upon which more than a billion of the world's poorest people depend. And, what is more, illegal logging increases global greenhouse gas emissions.

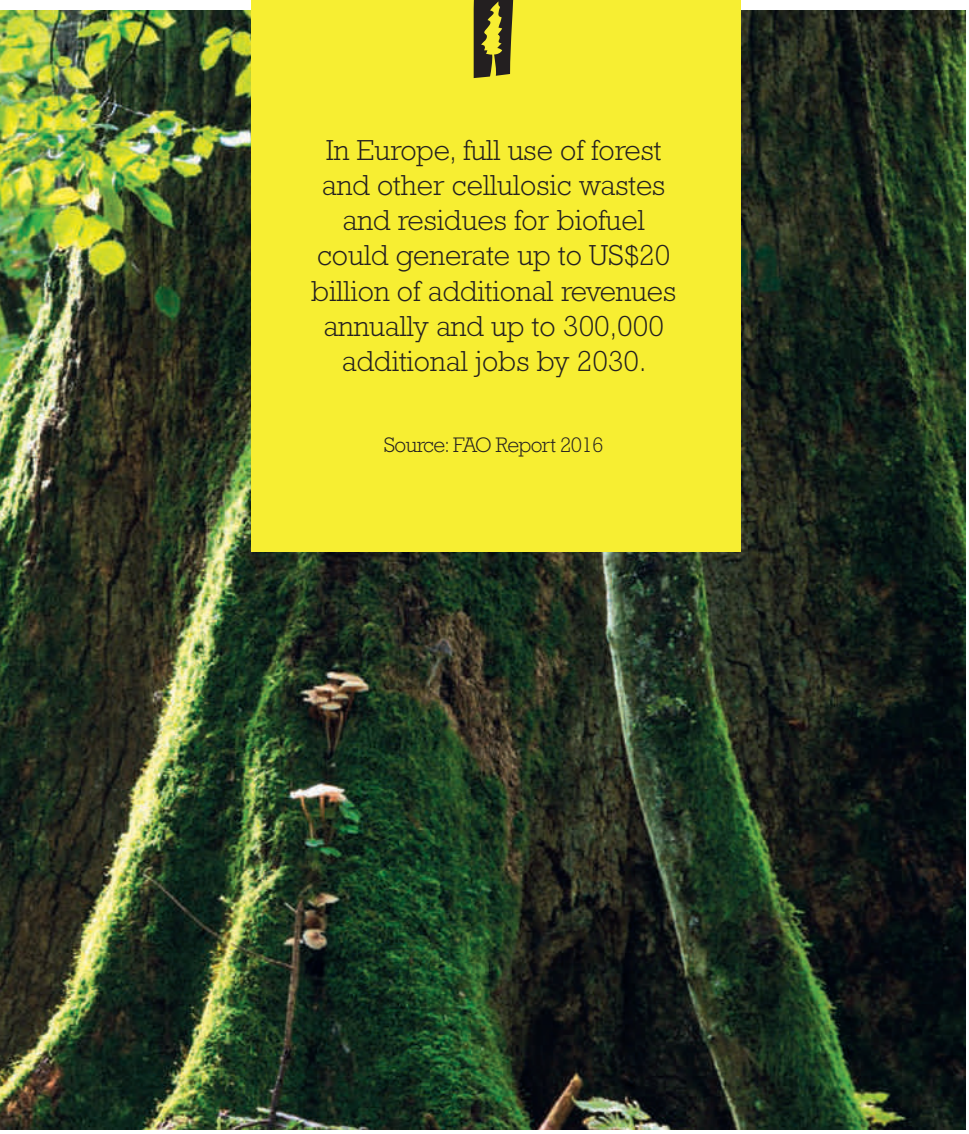




Out-of-Scope Products

The list of the so-called "out-of- scope" products that do not require any due diligence to prove their legality is very diverse. There are some curious surprises and many inconsistencies: for example, products like wooden boats, ships, toys, frames, and even some furniture are currently excluded. It is also strange that paper itself is covered, while printed publications, like books, magazines, newspapers or greeting cards are out of the scope of the legislation. Musicians may be worried about the precious, but possibly illegal, wood of their musical instrument, and (in Brussels) we should be aware that our best umbrella may well be waterproof, but not "illegal-wood-proof"… Reading a book on a wooden chair can now be a highly threatening or destructive activity (from the perspective of forests) but most of us do not know.

In 2015, WWF commissioned an in-depth analysis to understand the extent and impact of this legal loophole. This study showed that the EU Timber Regulation covers 86% of wood-related items by volume, but only 33% by value. This means that 2/3 of EU imports by value could contain timber of illegal sources. Musical instruments are a good example of a problematic exemption because even if they do not use large quantity of timber, they are often made of precious wood from tropical countries. Testing of garden furniture and other wood products on sale in Germany found a high risk of tropical wood and wrongly declared wood types in 8 out of 13 randomly selected products, including endangered tropical timber from Africa and South East Asia. The total value of all EU "out-of-scope" imports rose from €43.1 billion in 2013 to €46.6 billion in 2014.



In Europe, full use of forest and other cellulosic wastes and residues for biofuel could generate up to US$20 billion of additional revenues annually and up to 300,000 additional jobs by 2030.

Source: FAO Report 2016

Illegal logging is threatening the Bialowieza Forest, Europe's best preserved old-growth forest and home to the largest bison population.
Source: © Adam Lawnik

Zero Illegal Wood?

The exclusion of certain products from the regulation has proven to make the fight against illegal logging much less effective so WWF's position is simple, we advocate an "all-in" approach for all products that are, or may be, made of wood and that contain, or may contain, wood. We believe this is the simplest and most effective way to ensure that no wood from illegal sources is sold in the EU. Bringing more products into the scope of the legislation will mean that more sectors will have to carry out due diligence exercises on their supply chains, but they will benefit from a level playing field and provide a better service to their customers.

1. The EU Commission is currently doing an impact assessment of the product scope of the legislation. On the basis of this, the Commission will decide on the products to be included under the legislation.
2. INTERPOL/World Bank. 2009. CHAINSAW PROJECT: An INTERPOL perspective on law enforcement in illegal logging. INTERPOL General Secretariat, Lyon



WWF

WWF is one of the largest conservation organisations with a presence in over 100 countries in the world. WWF works to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature. The European Policy Office helps shape EU policies that impact on the European and global environment. www.wwf.eu

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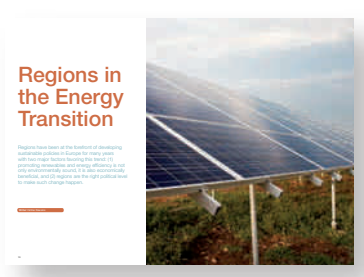
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Founded in 2010, Revolve Magazine (ISSN 2033-2912).
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