

#MYPLANET

by The Navigator Company

Biodiversity
Knowledge is
our best defence



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A magazine for changing times

With this new edition, The Navigator Company's in-house magazine is now #MYPLANET. What we have done is to merge two of our publications - #MYPLANET and The Newsletter - with the best features of each. Combined, we are confident they will be more than just the sum of their parts.

Both The Newsletter and #MYPLANET established themselves as prime channels for communicating with our stakeholders, both inside and outside the company. But in a changing world, we felt it now made more sense to combine corporate topics with others of general interest. The new #MYPLANET magazine will now function as part of wider array of contents in multiple channels, bringing you the best stories about Navigator's world, its values and aspirations. And in our quest to inspire others, we are also offering a space for all our stakeholders. We want to showcase the best of our Company and of our community. #MYPLANET focuses on the subjects of public interest where Navigator has special expertise. Stories that we will bring to life on our different platforms and channels, looking at sustainable forestry management, rural development, good industrial and technological practices, and sustainability in general, for the environment, society and the economy.

The Navigator Company believes that this is a key route to realising one of its aspirational values - sharing knowledge with society and educating our stakeholders.

PICTURING WILDLIFE

Nature has inspired men and women ever since they first felt the impulse to draw pictures of their world. And like the real world, it is biodiversity that brings colour, light and variety to the visual arts. This is the lifeline that The Navigator Company has sought to evoke with an exclusive collection of engravings.



In Portugal, more than 60% of the plants assessed are at risk of extinction and 42% of all identified vertebrates are endangered. These are warning signs that point to the urgency of adopting ground rules to promote biodiversity conservation.

As a forest-based venture, The Navigator Company has identified 740 plant species and 235 animal species in the woodlands under its management, and these species benefit from regular efforts to preserve and conserve wildlife. These endeavours in defence of biodiversity are now celebrated in exclusive engravings that document the story of Portugal's wildlife. Mafalda Paiva was the illustrator chosen to create the engravings evoking the biodiversity in Navigator's woodlands. We talked to her to find out what this challenge was like.

Creative but true to life

It was as a child, in Santo André, Melides, that Mafalda Paiva started to draw animals. Her talent brought her to Lisbon, at the age of fifteen, to study at the António Arroio Secondary School for the visual arts. She went on to a degree in design and worked for several years before she discovered a course in scientific illustration. "I did the course, and then an MA, and today it's all that I do," she told us. Illustration is the area that best weds Mafalda Paiva's different interests: art, nature and an innate talent for observation. The lack of scientific training has never been an obstacle. "One of the essential features of scientific illustration is the collaboration with with an academic, who commissions the work. In my case, if it is in the field of biology, I work with a biologist. Scientific illustration is strictly descriptive, there's no room for invention," she explains.

Research and reconstruction

In her engravings for Navigator, she supplemented the information provided by Nuno Rico, the company's biodiversity conservation manager, with other materials

concerning the species selected. "The only species I wasn't familiar with was the carnivorous plant [sundew]. Actually, I had seen it before, but I had no idea it was carnivorous, so I had to learn more, because there are very tiny details and you can't always see everything in the photographs," she went on.

"I collect a large number of photographs, in different positions and from different perspectives, and then I select those which show the most detail and I do a reconstruction. Then it is almost like life drawing from several different sources," Mafalda Paiva explained. The work is done step by step, first the outline, then the colours, and the details can be a challenge. "I have the most trouble getting the right greens, because in nature they are very different from the palettes we have, we often have to mix a series of colours." She identifies snakes and fish as the most difficult animals to illustrate, because of the scales. "There's a pattern you have to get right. We must count the scales on the animals. Because there are species that are differentiated by a tiny detail, which might be on the flank, as in salamanders, or in their scales, in the case of fish," she told us.

More scope for artistry

Each commission adds to her expertise. "There are animals that turn out to be extraordinary, because we have to read about their behaviour. And there are also several types of scientific illustration. The ones I'm doing for Navigator are a little more artistic, because they're for the general public. I try to have the species in the most natural positions possible, as well as making them appealing and showing the beauty in each of them," she said. Mafalda Paiva believes that scientific illustration can help the cause of biodiversity preservation. "Photography is interesting, but there's a lot of noise. And it shows a given individual, which has its defects, whilst scientific illustration will show the most perfect specimen of the species. This makes it an excellent tool for promoting biodiversity within the group itself," she explained.



"I have the most trouble getting the right greens, because in nature they are very different from the palettes we have."

Mafalda Paiva's work has been exhibited in the United States (New York State Museum, and the Art. Science Gallery, in Austin), Italy (Venice Biennale), Slovenia (Maribor, during the European Capital of Culture, in 2012) and Spain (Catalan Association for Science Communication, in Barcelona). In 2012 she won the Il·lustraciència prize, from the ACCC, and in 2013 she won the second prize from the Calouste Gulbenkian Foundation, for her illustration of *Nucella lapillus*, at Casa das Ciências.



KNOWLEDGE IS THE BEST DEFENCE

Caring for biodiversity conservation is a way of securing our environmental, social and economic sustainability. After a century in which several species have all but vanished, Portugal is now investing in restoring its natural heritage.

The buzz of insects, a soaring vulture, the silent tread of a wolf, the trees and vegetation that shelter them, and the fertile soil that sustains it all. All these play their role in the life of the wild, and the biodiversity to which it is home. But over the past century, many have seen their existence threatened, and so recent years have seen efforts that have allowed populations and territories to recover, resulting in a healthier relationship with humankind. A lot of this work has involved raising public awareness, as you can only protect what you know and respect.

According to the red list of threatened species published by the International Union for the Conservation of Nature (IUCN), more than 28 thousand species were under threat of extinction in 2019. Habitat loss, overexploitation of resources and climate change are among the main threats. In Portugal, shrinking habitats and human disruption have also endangered the survival of species such as the Iberian imperial eagle

(*Aquila adalberti*), the Iberian lynx (*Lynx pardinus*), the black vulture (*Aegypius monachus*) and the Iberian wolf (*Canis lupus signatus*). Despite a recovery in recent years, there is still cause for concern, with the first three classified as "critically endangered" and the wolf as "endangered".

Learn about some of the species that are at risk of vanishing and the efforts that have been made to avoid this, which include the work done by The Navigator Company, organiser of the #MYPLANET project, in its forestry holdings.



The Cattle/Sheep Dog project, organised by Grupo Lobo, provides cattle dogs to livestock farmers and shepherds, providing food and veterinary services.



Iberian Wolf
Canis lupus signatus

The lynx is extremely specialised in its habitat and diet, and that has caused it problems.



Iberian lynx
Lynx pardinus

NOT AFRAID OF THE BIG BAD WOLF

With an estimated population of 350 animals, divided between 60 packs, the Iberian wolf, once common throughout Portugal, is today found in only 20% of its original territory. The species has been making a come-back in Europe, but Francisco Petrucci-Fonseca, chairman of Grupo Lobo, is cautious. "In frontier areas, wolves are returning, but they appear, they die, then reappear; in the area from Arada to Trancoso, the density is extremely low, but there are packs that persist. In Montesinho and Gerês, the density is good, and the population is stable. In the Vila Real region, it is more complicated, because of the lack of territorial planning," he explained, bemoaning the destruction of habitat,

especially in quieter areas, essential for breeding. This is the only species of Portuguese fauna protected by a law prohibiting their being killed or taken captive, and the destruction of their habitat. But this has not been enough to put an end to the persecution of wolves.

Their main source of food was traditionally deer and wild boar. But as this wildlife has vanished, they have turned their attention to livestock. Therefore, in areas where there is less wild prey, there are still attacks on flocks and herds. The recovery in populations of wild boar, deer and other species has allowed the wolf to return to some of

its traditional diet, and in areas such as Montesinho, these account for more than half of their food.

The Cattle/Sheep Dog project, organised by Grupo Lobo, provides cattle dogs to livestock farmers and shepherds, providing food and veterinary services. "We manage to create trust, and then attitudes can often change," explained Petrucci-Fonseca. "In order to protect the wolf, the general public needs to be educated," he told us.

In Mafra, the Centre for Recovery of the Iberian Wolf takes in animals which can no longer live in the wild, and runs educational projects.

THE WORLD'S MOST THREATENED FELINE

For the Iberian lynx, reintroduction of animals into the wild has been crucial in the recovery of what is still regarded as the world's most threatened feline, and the most endangered carnivore in Europe.

Profound changes in their habitat and the declining population of wild rabbits brought the species to verge of extinction, with the recorded numbers in the wild reaching their lowest point in 2002,

"The lynx is extremely specialised in its habitat and diet, and that has caused it problems," explained Eduardo Santos, coordinator of the Lynx Programme run by the Liga de Proteção da Natureza (LPN).

The global population of the Iberian lynx is numbered at 475, a hundred of which live wild in Portugal, along the Guadiana valley. "With continued efforts to reintroduce the species

and support breeding, it is hoped that the lynx can gradually move into surrounding areas," Eduardo Santos told us.

The Lynx Programme, set up in 2004, consists of re-establishing populations of wild rabbits (for food) and of conserving and restoring the habitat of the Iberian lynx in the Alentejo and Algarve uplands, working hand in hand with landowners, farmers and hunters.



The species benefited from the Lynx and Vulture LIFE Habitat project, which ran until 2014.

Black vulture
Aegypius monachus

FLYING GIANT

The same region, encompassing parts of the Alentejo and Algarve uplands, is the habitat of another species that is highly threatened in Portugal: the black vulture. This giant bird, with a wingspan in some cases of close to three metres, vanished from the Portuguese landscape, as a breeding species, in the nineteen seventies, and only started to nest again in 2010. There are currently 30 pairs, meaning that it is classified as "critically endangered".

The main threats it faces are poisoning (it feeds exclusively on dead carcasses, making it the victim of the poisoning of other animals), loss of territory and the scarcity of food. In addition, the species has characteristics that make recovery and territorial expansion difficult: it only reaches breeding age at 5/6 years, the female lays only one

egg, so at most each pair can only raise one young bird a year, and they tend to breed in the areas in which they are born.

The black vulture nests in the crown of large trees that can support a nest which, when occupied, weighs between 100 and 200 kilos, on sloping terrain, in areas of dense vegetation with little or no human disturbance - an increasingly rare scenario in Portugal.

The species benefited from the Lynx and Vulture LIFE Habitat project, which ran until 2014, and is currently included in the work done under the Lynx programme. Since 2017, this has included participation in the cross-border bird-watching tourism project, under which the Liga de Protecção da Natureza has pressed ahead with conservation work.



The LIFE Imperial project started up in 2014, when there were only eleven breeding pairs in Portugal, and has worked to reduce or eliminate the threats to the species.

Iberian imperial eagle
Aquila adalberti

PORTUGAL'S RAREST BIRD OF PREY

With just seventeen breeding pairs in Portugal, the Iberian imperial eagle is another species on the "critically endangered" list. "This is a large bird of prey that differs from others in that rabbits are an important part of its diet. There are studies that point to the relationship between the abundance of rabbits and successful breeding," explained Paulo Marques, coordinator of the LIFE Imperial project.

In the early twentieth century, the species was found throughout the Iberian Peninsula, but hunting and habitat loss have brought it to the verge of extinction. It was thanks to conservation efforts in Spain that the Iberian imperial eagle has managed to make a comeback. "The population has started to return to its historical territories,

and expanded into Portugal," the leader of the LIFE Imperial project told us. However, the population currently in Portugal consists of young birds, who have not enjoyed such great success in breeding. The LIFE Imperial project started up in 2014, when there were only eleven breeding pairs in Portugal, and has worked to reduce or eliminate the threats to the species: shooting, electrocution, disturbance and destruction of habitat, and scarcity of food.

"A close watch has been kept on areas where historically people have shot the eagles. There has also been survey of the use of poison in Portugal and the police have helped to detect new cases and the source of poisons," explained Paulo Marques.

PROTECTING BIODIVERSITY ON THE NAVIGATOR COMPANY'S ESTATES

The crowns of large trees are the preferred nesting sites for the Iberian imperial eagle. "They're mostly eucalyptus trees, which sway a lot in the wind. We've had a lot of cases where nests have fallen, and wherever possible we reinforce nests at risk or build new platforms," we heard from Paulo Marques, from the LIFE Imperial project.

There have been sightings of the Iberian imperial eagle on properties managed by Navigator, which are home to around 740 species of plants and 235 species of animals, including several protected and endemic species. Biodiversity conservation has been built into the company's forestry management model. Its estates include 4 100 hectares classified by Rede Natura 2000 as protected habitats.

Bonelli's eagle (*Aquila fasciata*), an endangered species, nests on several Navigator properties in the south-west Alentejo and in the Algarve, and has been monitored by the company since 2006. As part of the LIFE project (Conservation of Arboreal Populations of the Bonelli's eagle in Portugal), The Navigator Company has

worked with CEAI (Iberian Birdlife Research Centre) to draw up a conservation plan establishing buffer zones around nests. A critical period has been identified, during which certain operations are subject to restrictions. "We have to manage the plantation in a way compatible with the Bonelli's eagle's breeding season. We monitor the nests each year and restrict some disruptive activities, such as felling or planting trees, between December and May," explained Nuno Rico, Navigator's biodiversity conservation manager.

There are buffer zones on 32 Navigator units, corresponding to 16 territories for Bonelli's eagles, i.e. 16 breeding pairs. As well as this, there are four nests, or stable nesting sites, on our estates, around which protection areas of between 3 and 4.5 hectares have been established. These are called "high conservation value areas".

There is also a concern to create alternative nesting sites, by setting up or maintaining small clusters of large trees around existing nests and building artificial nests. "The nests are built in trees that sometimes dry up or fall, and it's good to have alternatives,"

Endemic species

Animal and plant species that occur in a limited area. Their intrinsic vulnerability means they must be given special consideration when making plans for biodiversity conservation.

From December to May, Navigator restricts disruptive operations in areas around nesting sites used by Bonelli's eagles, so as not to interfere with the breeding season.



Bonelli's eagle
Aquila fasciata

explained Nuno Rico. “The population has remained stable, and whenever the birds succeed in breeding, we’re hopeful that the juveniles will nest elsewhere,” said Nuno Rico with satisfaction.

The goshawk (*Accipiter gentilis*) is another bird of prey that nests in Navigator’s woodlands. Hunting by day, the goshawk is considered “vulnerable” in Portugal, and chooses woodlands and forests for nesting and finding food. On the company’s estates, it benefits from measures like those adopted for the Bonelli’s eagle. “We plan our operations to avoid disrupting its nesting and breeding season,” explained Nuno Rico.

The diverse woodlands on Navigator’s estates are also home to the booted eagle (*Aquila pennata*) and prairie species, such as the buzzard (*Otis tarda*), the heaviest bird in Europe, classified worldwide as an “endangered species”. As well as to several mammals, including the Iberian wolf. “There have been sightings on properties in the Arouca region, although it is not a breeding area,” Nuno Rico told us. Otters (*Lutra lutra*) can be found along riverside gallery forests, and benefit from specific conservation measures. “No eucalyptus is planted in the area and there are 30-metre protection strips. We seek to preserve the natural plant cover or, where this is in a poor state, we also do work to restore it,” explained the biodiversity manager, pointing out that, as well as the mammals, this also benefits other groups of animals, such as fish, amphibians and micro-invertebrates such as insects (e.g. dragonflies).

Protection and conservation measures are also extended to a number plant species, such as the Monchique oak (*Quercus canariensis*), an extremely rare and endangered species, with only 300 trees in the entire territory. In late 2019, a habitat restoration project on Navigator’s estate at Águas Alves, in Monchique, involved planting 50 young oaks, grown from locally gathered acorns. Care is also taken with cork oak woodlands, where no harrowing of the soil is permitted under the crowns of the trees, so as not to damage the roots, which spread out horizontally.

“These measures also benefit ecosystem services. By preserving riverside gallery forests we are improving water quality, protecting areas against erosion, and improving the carbon and nutrients cycle. And by maintaining a diversity of plant species, we create food for bees and other insects that then do the work of pollination,” concluded Nuno Rico.



Blue tit
Cyanistes caeruleus

Navigator's woodlands protection and conservation work also extends to plant species, of which the rare Monchique oak is an example.



Monchique oak
Quercus canariensis



Otter
Lutra lutra

THE "INVISIBLE" FOREST

Invertebrates and micro-organisms form a less visible part of the forest, but they play an essential role.

Bees, butterflies and other insects play an essential role in pollination, as everyone knows. But that is not all. For example, when a leaf falls from a plant or tree onto the ground or into the river, "it is gradually decomposed by bacteria and fungi, marking the start of a nutrients chain," we were reminded by Nuno Rico, The Navigator Company's biodiversity conservation manager, who stressed the importance of this type of natural "recycling". "These bacteria and fungi do a clean-up job that is a service for us, which we often overlook," he told us.

A eucalyptus plantation is also an excellent habitat for several creatures belonging to this "invisible forest". For instance, in Portugal, the diversity of ants found in eucalyptus forests is greater than that

documented for any other forest biotype.

"These small animals are extremely important to the overall balance of the ecosystem. For example, worms are an indicator of soil quality, butterflies or dragonflies are often associated with the existence of water courses. Preserving this type of biodiversity means preserving the richness of the soil and the quality of the water, and we have every interest in that," explained Paula Guimarães, Navigator's sustainability manager.

At Raiz, the Company's forestry and paper research institute, we analyse the soil and climate at all Navigator's properties, in order to define regions in terms of yields and the type of operations that can be carried on on each. Because, Nuno Rico tell us, "we want to maintain the soil and avoid measures that cause erosion".

The importance of bees to pollination is just the best-known face of the "invisible forest".



Want to get involved?

Field work, donations or even consumer choices can help protect species at risk.

Join the pack

Grupo Lobo runs a volunteering programme, which ranges from help at the Centre for the Recovery of the Iberian Wolf, in Mafra, to taking part in awareness raising activities or projects to monitor wolves in Portugal. You can even adopt wolves at the centre. Find out more at www.grupolobo.pt/programa-de-voluntariado or send an email to crloboiberico@ciencias.ulisboa.pt.

Help wildlife in need

The Lisbon Centre for Wildlife Recovery (LxCRAS) has a volunteering programme for biology and veterinary students. To learn more, send an email to lxcras@cm-lisboa.pt.

LPN and Transumância e Natureza

These are two NGOs with volunteering programmes for people with specialist skills and also the general public. Find out more at www.lpn.pt/pt/como-apoiar/voluntariado or send an email to geral@atnatureza.org.

Help preserve Mediterranean scrublands

By choosing natural and sustainable products from the Mediterranean habitat (honey, cork, *medronho* and carob), you contribute to developing local communities and preserving the habitat of the Iberian lynx.

A COMMUNITY-INTEGRATED APPROACH

Portucel Moçambique has built biodiversity conservation into its operations since the start of its venture in the country, working together with local communities to promote inclusive socio-economic solutions, that help mitigate the effects of climate change.

Portucel has signed an investment agreement with the Mozambican government for an integrated forestry project in the country with an industrial component. This involves planting up to 160 thousand hectares in Manica and Zambézia provinces.

In addition to creating wealth and jobs, the approach taken by the company (which is majority owned by The Navigator Company) includes protecting biodiversity. This was a concern demonstrated at the outset, in the terms of reference for the Environmental and Social Impact Assessment conducted between 2010 and 2014, in a process that involved talking to more than seven thousand individuals, in 130 communities. The approach is also based on the UN Sustainable Development Goals (SDGs), in particular Goal 15: protection of life on earth. In view of the situation on the ground in Mozambique, where forests have been severely degraded, largely as a result of the great demand for forest products for the subsistence of communities, it has been fundamental to design strategies for protection, restoration and sustainable use of terrestrial ecosystems, to combat desertification, to reduce erosion and reverse biodiversity loss. Measures to achieve this have been included in Portucel's Environmental Management Plan and its Strategic Plan.

Direct and indirect support

Although plantation work is still at an early stage, these strategies have already been applied in concrete measures, some of them directly geared to conserving biodiversity, and others taking a more indirect approach, by supporting communities, so that they can switch to more biodiversity-friendly practices. For example, Portucel's Social Development Programme involves training 6 500 families in conservation farming techniques, resulting in increased yields and a reducing the need to farm new areas of indigenous forest. Taking a more direct approach, a methodology has been developed for identifying and managing Areas of High Conservation Value. Experts in the fields of ecology and socio-economic issues were consulted in this process.

These areas are identified before forestry operations get started, and are designed to safeguard biological, socio-economic and/or cultural assets, by including them in the mosaic and seeking to ensure that local communities understand their importance and develop ways of managing the areas.

In partnership with MozFip, a project managed

by the Mozambican government and supported by the World Bank, Portucel has also developed a forestry development programme of incentives and support for forestry smallholders. The aim is to renew planted and native forests, helping to create livelihoods for these producers and to relieve the pressure on natural forests.

Joint efforts

Partnerships a key element in Portucel Moçambique's strategy. In the area of biodiversity conservation, Portucel signed a memorandum of understanding in 2017 with the Wildlife Conservation Society, Forest Trends and Biotope, to join the Combo project (Conservation, impact Mitigation and Biodiversity Offsets in Africa). This project sets out to conciliate economic development in Africa with conservation of biodiversity and ecosystem services.

For its part, Portucel has established its own Environmental Management Plan, which includes programmes and directives designed specifically to conserve habitats for flora and fauna. But it also deals with other key topics for the preservation of biodiversity, such as land use management (restoration of degraded areas, identification and conservation of historical and cultural heritage), changes in environmental conditions (monitoring of water and soils, waste management), as well as the human dimension (environmental education, communication, improvement of agricultural systems). The company takes awareness raising campaigns into the communities.

Portucel believes that support for the Natural Resources Management Committees is essential for the future management and protection by communities of their environmental, social and cultural assets. These committees are community bodies set up by local government for debate, decision making and monitoring of these assets. The company has run a pilot scheme in Namarrói district, in Zambézia province, where it sought to assess the real degree of empowerment brought by these structures, and the constraints they face. Similar schemes are soon due to be launched.

Portucel Moçambique is also a member of the New Generation Plantations platform, with which it shares a vision of how social prosperity can flourish hand in hand with sustainable management of the rural landscape in Africa, using innovative approaches, collaborative processes, and social support tools that make businesses more sustainable and bring greater value for everyone.



The Navigator Company's nurseries – Viveiros Aliança – produce more than 150 different species of trees and plants.



MOTHER NATURE IN A FOREST NURSERY

The woodlands of the future are growing in our forest nurseries. This is where trees are born.

Reforestation is a small gesture, or a great helping hand from human society to compensate the environmental imbalances and damage that add every year to the worsening climate crisis or emergency. The aim is to restore forests destroyed by either natural or man-made causes. This destruction contributes to climate change, which in turn makes spontaneous regeneration of woodlands impossible or exceedingly difficult.

The goals set for 2030 in the UN's first Strategic Plan for Forests include a significant increase, all round the world, not only in protected forests, but also in the area of sustainably managed forests. This is then planned to increase the proportion of forestry products sourced from these sustainably operated woodlands. Because we urgently need to combat the degradation of woodlands and deforestation.

In all projects, large and small, whether State run or undertaken by companies or individuals, reforestation must seek to preserve biodiversity and the balance of ecosystems.

And all these schemes need new trees, new plants. These are born in nurseries. And so the woodlands of the future are growing in our forest nurseries.

How trees are born

The Navigator Company's nurseries – Viveiros Aliança – produce more than 150 different species of trees and plants. The company is the world's largest producer of *Eucalyptus globulus* clones, which make up the bulk of its output, supplying Navigator's own needs for replanting, as well as external clients (approximately half the plants produced are sold outside the group). But the nurseries also produce many other species of trees, as their manager, Miguel Ferrinho, explained: "We produce other species, not just for Navigator's plantations, where we include strips of indigenous trees between areas of eucalyptus, but also for external clients."

Viveiros Aliança has three facilities, located in Espirra (municipality of Palmela), Caniceira (near Abrantes) and further north, in Ferreiras (Penamacor). "Combined, they produce 13 million plants each year," Miguel Ferrinho



The output of Eucalyptus globulus meets the company's own needs for renewing its plantations, as well as supplying other growers.

told us. Of these, nine million are produced at Espirra, which is the largest of the three nurseries.

The forestry species grown in Espirra include exotics and indigenous trees (a range of more than thirty), as well as ornamental trees and shrubs for parks and gardens (around 130), as well as five kinds of olive tree, including the Galega variety, for agricultural use.

"Most of the eucalyptus plants are produced from cuttings, taken from a mother plant," explained Miguel Ferrinho. This means they are clones, i.e. plants which are genetically identical to the one being replicated. The quality of these clones is the result of thirty years' research by RAIZ, the forestry and paper research institute, which has been selecting trees that offer the best growth in a forest setting and the best yields for industrial use. RAIZ also belongs to the Navigator Group, and works closely with the nurseries.

The Viveiros Aliança manager took us through the process: "At Espirra we have a park with

170 thousand mother plants. Each of these mother plants produces an average of 80 to 90 shoots, that we harvest from May to August and send to the biofactory. This is where the cuttings are taken, by selecting a small part of the stem and leaves, which is then planted individually in substrate. The cuttings are then sent to the shade houses, but are like incubators, where they go through three different stages with different conditions of light and humidity, over the course of 60 days. They are then put in an outdoor area to harden them off, so that they are strong and robust. These trees are then planted in their final location in the autumn or the next spring.

The Viveiros Aliança nurseries are open to the public, and so anyone can buy the forestry or ornamental species produced there.

From the mother plants section, through the biofactory and shade houses, and eventually in the hardening off area, the future trees pass through many hands, and are closely watched daily. This ensures they grow to be strong and healthy and can follow their natural course.

A nursery in Africa

Since 2015, The Navigator Company has had another nursery facility in its portfolio, through its subsidiary Portucel Moçambique. The Luá Nurseries are located in Zambézia province, in Mozambique and, like Viveiros Aliança, the bulk of their output consists of eucalyptus. But in Africa, a different species is used: these nurseries cultivate clones of *urograndis*, a hybrid of *Eucalyptus urophylla* and *Eucalyptus grandis*. The aim "is to supply the company's new plantations in the country, without having to import plants, which we did in the first place, at very high costs," explained António Canaño, the manager of the nurseries. "By late

2016, we no longer needed the imports." The eucalyptus is no stranger to Mozambique. "It was already grown in Zambézia, above all because of the tea and tobacco industries. The trees grow faster here than in Portugal, because of the greater humidity," António Canaño pointed out. "In Portugal, eucalyptus is felled in cycles of 10 to 12 years, but here it's 7 or 8, with the trees in the same conditions," he added. The Luá nurseries also produce some plants for external clients, in particular for the MozFipn forestry development programme. Native and fruit trees are also produced for distribution to local communities. "We

have a social aid project, under which we produce around eight thousand plants a year. Our aim in future is to increase that number," the manager explained. The indigenous forestry species produced include Umbila, Umbaua, Chanfuta and Panga-panga. But there are also fruit trees, such as orange, lemon, avocado, lychee, tangerine, mango and guava trees. The company's efforts to support the community include providing land on the nursery site for "machambas", where employees grow their own corn, nhemba beans, cabbages, cucumber, sweet potato, lettuce, peppers, carrots, papaya, banana and pineapple.





All plants need light, even indoor plants. Choose somewhere bright, but preferably not where they get direct sunlight all the time.

TALK TO THEM, BUT DON'T SUFFOCATE THEM!

No special skill or great expense is needed to enjoy attractive house plants.

They make any home feel more welcoming and their benefits go well beyond just their decorative value. **Carmen Correia**, one of the technical experts at the Espirra nurseries, shares some practical advice, tips and suggestions on the art of caring for house plants. Or at least, on how to keep them alive! So never say you do not have green fingers.

What plants are best?

Whether you've got a balcony, a terrace or just a sunny window ledge, aromatics are a really good choice. And they're right on trend. Rosemary, lavender, mint, parsley, coriander, oregano, basil... there's plenty to choose from! As well as their visual appeal and scent, they're useful in the kitchen. And they're very easy to look after.

Careful with water!

People often let their plants die from being over-zealous. They water the too much and the roots rot. So, rule number one is: water only when necessary, and not to any set calendar. How do you know they need watering? Touch the soil with your fingertips. If you feel it's cool, and slightly damp, don't water. If it's completely dry, then water the plant. The ideal time to water is early morning, or in the evening.

A tip to help the plant get rid of excess water: put some pebbles at the bottom of the pot before you put in the soil. This will improve drainage and bring air into the lower part of the pot. It will not save your plants from severe over-watering, but it can help in less serious cases. Carmen Correia explains that under-watering is better than over-watering: "A plant that has gone thirsty will revive faster than one that has been drowning in water."

Where should I put my plants?

All plants need light, even indoor plants. Choose somewhere bright, but preferably not where they get direct sunlight all the time. Flowering plants are especially sensitive to this, and will only bloom if there's enough light.

Prickly plants

With some plants, we need to be careful. *Dieffenbachia*, for example, although tricky in some respects, is a robust, easy-to-maintain

plants that does well away from bright sunlight. For this reason, it is often to be seen in offices and shops. But if you have children or animals, it is not the best choice for your home. This is because its sap is toxic when ingested or in contact with the mouth or eyes. If you have a child- and pet-free home, and are careful about this, it can be a good choice, not least because it is also known for its ability to purify the air in the room where it grows. Another plant that is toxic if ingested is oleander, but it is more commonly seen in gardens. Cacti and succulents are a good choice, in that they are hardy and do not need much attention - they just need a lot of sunlight. But be careful with the spines: if you get pricked, it can be painful or cause an allergy.

Should we use fertilisers?

You should use a fertiliser once a year, preferably in the spring, to enrich the soil and strengthen the plant.

What should I do about pests?

If you notice small flies, parasites, or other pests, visible or otherwise, which are affecting the health of a plant, dilute a spoon of washing up liquid in a litre of water and spray the plant. Another option is to use bicarbonate of soda, also dilutes.

Does talking to plants have any effect?

Carmen Correia spends her days nurturing plants. In her opinion, "speaking means you're giving them attention. And any living being will be healthier if it has someone looking after it. Plants are living beings, so I believe that if we look at them with affection and treat them with love, and if we talk to them (why not?), they will feel our attention". So, don't be shy. But don't suffocate them with your problems, and above all, don't drown them!

FOR THE HEALTH OF PLANTS (AND OUR OWN)

2020 is the International Year of Plant Health. This United Nations initiative is intended to highlight an issue that sometimes goes unnoticed: plant health is essential for mankind's sustainable development.

Plants are the foundation of life on earth. They produce the oxygen we breathe and supply more than 80% of our food. They also provide us with shelter and are used to produce clothes, medicines, and many other essential goods for humans. According to the United Nations Food and Agriculture Organisation (FAO), the plant world is a primary source of income for around half the world's population. For all these reasons, a threat to the health of plants is also a threat to the health and welfare of everyone in the world.

By declaring 2020 the Year of Plant Health, the United Nations has recognised the importance of protecting the health of plants to the fight against hunger and poverty, to protection of the environment and to economic development. Pests and plant diseases have the potential to devastate terrestrial ecosystems and their biodiversity, and can cause severe harm to crops, forests and other natural resources on which people depend.

The FAO estimates that, each year, as much as around 40% of plantations on the planet are lost to pests and diseases, leaving millions of people without food, and damaging the economy, especially in rural communities. This is further exacerbated by climate change, which is transforming habitats and life on Earth, causing pests to arrive earlier and in places where they were never seen before.

Threatened forest ecosystems

The State of the World's Forests 2020 is the title of an FAO report that shows that more than 100 million hectares of the world's forests are affected by pests, diseases and adverse climate events. In Europe, damage to forests caused by pests and diseases is estimated at around one third. In Portugal, measures to control and study harmful biotic agents have been recorded since 1886, and compulsory phytosanitary inspections of pine woods were also first

instituted in the late nineteenth century. Over the course of the twentieth century a number of threats to different forest ecosystems were identified, and these have been aggravated by the increased frequency of forest fires and years with hot and dry weather, as well as by the population shift away from rural areas and the reduction in active management of woodlands.

One of the main forestry pests today is the pine wilt nematode, *Bursaphelenchus xylophilus*, a parasite that originated in North America and is disseminated by infected insects (pine longicorn), causing pine trees to wilt. This is one of the most dangerous pathogenic organisms for conifer forests worldwide.

Preserving biodiversity

Plant health is fundamental to the Sustainable Development agenda (SDGs) and had prompted organisations to adopt phytosanitary strategies to protect plants against the spread of devastating pests. This has involved encouraging scientific research and promoting responsible practices in farm and forest management, including preservation of species that sustain ecosystems and serve to control invasive insects.

In Portugal, The Navigator Company, as a forest-based company, is actively engaged in conserving biodiversity in its woodlands, seeking to encourage natural control of pests, using methods which present advantages in relation to the conventional application of pesticides, which then have an effect on bees and other pollinating insects.

For example, since the start of the year, Navigator has installed nesting boxes on its Espirra estate, for birds such as blue tits, wrens, and nuthatches to breed successfully. This is intended to preserve the birds, which are predators of insects and also offer an effective solution for natural control of the spread of forest pests, such as the beetles that attack the bark of cork oaks.

Protecting plant health is fundamental for combating hunger, reducing poverty, protecting the environment and biodiversity, and for economic development.

Pests in history

Pests and diseases in plants are found throughout history. An outbreak of *Phytophthora infestans* (potato blight) brought famine to Ireland in 1845, whilst today the armyworm (*Spodoptera frugiperda*) threatens food security in Sub-Saharan Africa. Phenomena such as these have also left their mark on southern Europe, especially since the mid-nineteenth century, as in the case of phylloxera, and insect that invaded European (and Portuguese) vineyards between 1869 and 1909, or the Moroccan locust, that brought serious devastation to cereal crops in mainland Portugal in the early twentieth century. Woodlands are also vulnerable to the voracity of insects, fungi, bacteria and viruses. Since 1999, the pine nematode has destroyed millions of trees. More recently, in Italy, the bacterium *Xylella fastidiosa* has spread rapidly in the Apulia region, with a negative impact on farming (olive trees) and on the regional landscape.





WHEN BIODIVERSITY IS YOUR DAILY WORK

From locations as varied as Iceland, Mozambique, Ílhavo and Lisbon, **José Alves, Catarina Eira, Nuno Rico, Miguel Bugalho, Francisco Petrucci-Fonseca** and **Alexandra Jorge** work every day to promote biodiversity. And even when reports show new threats emerging, they never lose heart, certain in the knowledge that this is the only way.

Scientific knowledge and their contact with the real situation on the ground do not always add up to an upbeat picture of the future of biodiversity. But even so, whether they work to help endangered species, in the planning and management of land use, in preserving genetic heritage or in raising funds for conservation projects, the experts who have made a career in defending biodiversity refuse to give up. What does climate change have to do with the migratory and breeding behaviour of certain birds? How does the presence of certain wildlife species help to protect forests against fires?

Is it possible to conciliate fisheries with the survival of increasingly vulnerable whales and dolphins? How can wolves survive in a fast-changing landscape? What is the importance of well-conserved riverbank areas to maintaining biodiversity? How can parks and reserves secure sustainable funding for their projects? It is these and other questions that the professionals we feature on the following pages have to answer every day. Sometimes the answers are complex and unexpected, sometimes they are surprisingly simple, but what they all show is that it is impossible to think of biodiversity conservation without a global approach.

The data from recent decades is sobering, as reports from several organisations point to a rapid decline in the planet's biodiversity. In its 2018 Living Planet Report, the World Wide Fund for Nature (WWF) showed, for example, that between 1970 and 2014, global populations of vertebrates fell by 60%. Aware that extinction may already be inevitable for many species, the scientific community has continued to work to reverse the trends of recent decade. Something that can only be done if supported by greater public awareness, and above all by a shift in the direction of political, economic and business decision-making.

JOSÉ ALVES

Researcher at the Biology Department, University of Aveiro

José Alves remembers collecting stickers for the WWF album of endangered species, the only album that interested him as a kid. "I was thrilled when I managed to get the last sticker. As I recall, that was when I first went crazy for animals," reminisced the biologist and researcher at the University of Aveiro, speaking to us from Iceland where, since 2010, he has spent four months a year studying the influence of climate change on the behaviour of wading birds. This is the main research focus of this Portuguese researcher, a native of Braga who, in his youth, was a boy scout and divided his interest between wildlife and music on the radio.

At the University of Wageningen, in Holland, where he did an internship for his first degree, José Alves decided on his future. "I met people who encouraged my passion for wildlife conservation, for ecology and biodiversity. My interest shifted away from music, bands and the radio, and I felt a vocation as a biologist," he told us. His interest in wader birds started with his doctorate, at the University of East Anglia, in Norwich, for which he did the fieldwork in Portugal.

José Alves explains that, as these bird use above all coastal wetlands, they are under great pressure from human activity. In addition, because they are migratory, breeding in the Arctic or Sub-Arctic and then

migrating elsewhere, they are in the front line of climate change.

His area of study is the influence of climate change on the behaviour of these birds, especially during the breeding season. Black-tailed godwits, curlews and oystercatchers are some of the species that must cope with phenomena such as Arctic amplification, which means that temperatures are rising faster at the poles than elsewhere on the planet. "In the past twenty years, oystercatchers have overwintered in Iceland. And this may have consequences for their survival," explains the researcher, telling us that in colder winters, most of the birds die.

José Alves follows the migratory route of the birds, spending four months in Iceland and dividing the rest of the year between the University of Aveiro (where he does research and teaches) and trips to West African countries. "I follow them around all year. They must think, not him again!", he jokes. But he also gets excited about desk work: "A lot of 'eureka moments' happen at that stage," he explains.

Almost two decades of research have convinced him of one thing: "The threats to biodiversity are the same [climate change, habitat change and invasive species], but the way we understand them is changing. I'm hopeful that the powers that be will understand that, in a planet with finite resources, constant growth is impossible, and I believe that public opinion carries a lot of weight".



"We have to be optimistic. Because the only other option is to give up. If public opinion shifts and gets behind these causes, then all the rest will follow. I'm hopeful, not least because I can see that it's the only way for us to survive."

NUNO RICO

Biodiversity Conservation Officer at The Navigator Company

Spring and autumn are the best times to find Nuno Rico doing fieldwork on Navigator's estates. As the company's biodiversity conservation officer, his job is to research and monitor wildlife, to develop appropriate action plans. But he does not work alone. "In the field of biodiversity and biology we assess a range of groups and habitats, and no one person has all the expertise. We look for input from specialists, and then design an action plan," he explains.

The work often involves creating conservation areas. But in more endangered areas, a more active approach is needed, to restore ecosystems. This is Nuno Rico's specialist area: at the age of

eighteen, he decided to study Biophysical Engineering, precisely because of the areas it covers. "The course deals with a range of topics, from territorial planning through to biology and geographical information systems. In the final year, I opted for soil bioengineering as my specialist field," he told us.

Looking back, he can see that his work with a few environmental NGOs, in Évora, where he was born and studied, also helped in his choice. By coincidence, as a volunteer at the Iberian Birdlife Research Centre, Nuno Rico saw the start of the project for the Bonelli's eagle, which he was to follow through at a more advanced stage at Navigator.

In the meantime, he completed an MSc in Natural Resources Management and Conservation, with a thesis on Estimates of Carbon Stocks in Riparian Zones. "My research highlighted the importance of these ecosystems to mitigating the effects of climate change, meaning they are critical for conservation," he explains.

Nuno Rico is apprehensive about the future. "More and more reports are pointing to what is happening to biodiversity, and also in climate change. There are reports that predict that a million species face extinction in the decades ahead. There's a lot of concern, but little action." The solution is to work increasingly towards a circular economy, he argues.

Industry here has an important role to play. "The market and consumers are already demanding this, and business has to change," he says, citing the example of Navigator's commitment to carbon neutrality at its industrial complexes. "If everyone does their job, we can force through measures that help companies and individuals to achieve the aims of environmental conservation," he went on.



- 1 "The basic stuff you learn at university, but the real learning is every day in our work, being out in the field and talking to different specialists. There is no single solution, not every problem is the same. Portugal is a small country, but still remarkably diverse."
- 2 "Change doesn't mean lowering our standard of living, it means living in a different way. This change will come through scientific understanding, which needs to be translated into policies that change the world sustainably."
- 3 "Certification includes a series of indicators of biodiversity conservation. For a company to be certified, it has to do a lot of the conservation work."

CATARINA EIRA

Biologist and scientific director of ECOMARE

It was while she was doing fieldwork about forest carnivores on the Quiaios dunes that Catarina Eira discovered an interest in cetaceans- whales and dolphins. A lot of animals, mostly porpoises and dolphins, were being washed up dead on the beaches, and the team collected them to study the causes of death. The cetaceans of the Portuguese coast became her main area of study. "When people learned that there was a team working in this field, we started to be tipped off about animals arriving on the beaches still alive, and were able to respond to these situations," she recalls. Catarina Eira is today the scientific director at ECOMARE, the Laboratory for Innovation and Sustainability of Marine Resources

of the University of Aveiro, which also has a Marine Animals Research and Rehabilitation Centre.

Having known from an early age that she wanted to work in ecology and wildlife conservation, Catarina studied biology at the University of Coimbra, her home city, and then completed a doctorate in animal parasitology at the University of Barcelona. She told us about ECOMARE's work in seeking to avoid dolphins and porpoises being accidentally caught in fishing nets, their main cause of death along the Portuguese coast. "We work with the authorities and with fishermen, by providing education and giving them acoustic alarms to enable the animals to detect the nets. It's

been tested with promising results, although it's not 100% effective," she explains.

The effects of pollution are the second greatest threat. ECOMARE has detected high levels of mercury and pesticides in cadavers, which are often undernourished. The small porpoise, which inhabits coastal areas, is the most endangered cetacean in Portugal, with no more than 1 600 individuals. "The population has been classified as vulnerable, but we're trying to change its status, to secure better protection," Catarina Eira explained, dispelling a few myths about how biologists spend their daily lives. "People sometimes think we spend our lives at sea, peering at dolphins through binoculars, but we actually work more with dead animals, and in my case I spend most of my time at my desk, preparing project plans to get us funding so we can continue our work," she explained.

Although her experience has made her "utterly pessimistic" about the future of biodiversity, Catarina Eira refuses to give up the fight. "We have to continue doing the best we can. We have to carry on working to preventing things getting so bad, so quickly".



"We're seeing higher and higher levels of mercury, organic compounds and pesticides in these animals. These compounds cause problems to the neurological and immune systems, meaning that the animals are less able to survive in their normal life."

MIGUEL BUGALHO

Researcher at CEABN (Prof. Baeta Neves Centre for Applied Ecology) and lecturer in Forestry and Wildlife Management and Ecology at the Natural Resources Department of the Higher Institute of Agronomy

Using resources and conserving biodiversity are not just compatible, they are both necessary. To stop using the natural world is an impossibility. What we have to do is to use it sensibly," argues Miguel Bugalho, head researcher at the Prof. Baeta Neves Centre for Applied Ecology, belonging to the Higher Institute of Agronomy (ISA). His parents were forestry engineers, and he soon learned to enjoy trips to the countryside. He graduated in Agronomy from ISA, specialising in management of natural resources, and is today a researcher and lecturer at the same institution. He first felt an interest in ungulates when, as a child, he first saw a deer in the wild. "I often used to go to

the Alentejo with my parents and the gamekeepers. On one of these field trips, at dusk, I saw a deer in the wild. Ever since then I've been really interested in wildlife, in deer and ecology," he recalls.

His main area of research today is wildlife and how wildlife management can have an impact on improved conservation of ecosystems. "Ruminants are animals which play a key role for biodiversity, as they end up changing the array of species in plant cover, that of the animals that depend on the plant cover, and consequently all the properties of ecosystems," he told us. The team has monitored a population

of deer over several year and one of his doctoral students has studied the effect they may have on reducing the severity of fires. "They can be used to manage vegetation," explains Miguel Bugalho.

For this researcher, biodiversity issues must be considered within a socio-economic framework. "In 2050 we will have nine billion people on the planet. And according to the FAO, food production will have to increase by 70% to feed them all. The demand for logging products is increasing and there are scenarios that point to it growing threefold. And we also need to conserve biodiversity, because our survival depends on it."

With the creation of natural parks and reserves proving insufficient, Miguel Bugalho thinks it is essential for us to start using resources that maintains and increases biodiversity. "Forestry certification is one of those tools," he argues.

"Biodiversity conservation is intricately connected to land use. We'll only be successful in conservation if we think how to integrate different uses at the landscape scale, with certain areas assigned to biodiversity conservation and others to production," he concludes.



1 "The income generated from productive use of the landscape can be used to fund the maintenance of conservation areas."

2 "The WWF Living Planet Report has shown that biodiversity continues to decline systematically. We urgently need to start using resources in a way that maintains and increases biodiversity."

3 "By creating conservation areas, the entities required to apply good practices are creating areas where biodiversity will be managed and conserved, and perhaps even complement the national networks of protected areas."

FRANCISCO PETRUCCI-FONSECA

Assistant Lecturer at the Faculty of Science, University of Lisbon, founder and chair of Grupo Lobo

I can't imagine doing anything other than working to protect wolves." Francisco Petrucci-Fonseca's words sum up the passion of a lifetime. His first encounter with wolves was when returning from an uncle's wedding. "I was still a kid, and I was in the car with my grandparents and the bride's parents, close to Penhas da Saúde, and they said: 'Look, a wolf!', and I saw what looked like a dog go past," he recalls. The books of Jack London, the stories told by older people and the respect for nature and animals instilled in him from an early age by his parents did the rest: when the time came for him to choose a university course, he opted for biology, in what was then the Department of Zoology and Anthropology at the University

of Lisbon's Faculty of Sciences. "I was keen on two areas of biology: ecology and genetics. I had the chance to work in the field of ecology, and what interested me in the field was predators, and I wanted to work on protecting wolves," he recalls. From his undergraduate days, he has fond memories of the lectures by Carlos Magalhães, with whom he again saw wolves in the 1970s and who, some years later, put him in touch with the person who was to be the co-founder of Grupo Lobo. "He introduced me to a Scotsman who was living in Portugal. He told me: he's also crazy about wolves, you'll get on!" He could not have predicted better. An awareness campaign about

wolves was followed, in 1985, by the founding of Grupo Lobo, a charity which has worked since then to protect this top predator, both by raising public awareness and through work with communities, as well as setting up the Iberian Wolf Recovery Centre, in Gradil, which takes in animals that can no longer live in the wild.

In contrast to the rest of Europe, where wolf populations have expanded, the species has further declined in Portugal, although society is today more accepting of wolves. "We know more and more about wolves. And the more we know about things, the better we understand them, and the more we understand them, the more we accept them. People understand that human society and wolves and exist side by side," explained Francisco Petrucci-Fonseca, who has seen attitudes shift, including among shepherds and livestock farmers.

"In some areas, wolves are seen less often, because of the growth in their wild prey, such as deer and wild boar, and because people have fewer domestic livestock. This means there are more and more people who are happy for human activities and wolves to co-exist," he told us.

Petrucci-Fonseca believes that conservation of wolves is inextricably linked to conservation of the ecosystem in which they live. These are the values he seeks to convey in his work: in lectures, field work, in the laboratory, in his joint projects with various NGOs and public and private bodies. "We have to have hope, or it wouldn't make sense to carry on".



"I love the mountains, snow, night, belonging to a group and feeling that I'm working on something collective. And wolves, with their social structure, also represent that."

ALEXANDRA JORGE

Biofund Director of programmes

The Mozambique of Alexandra Jorge's childhood and youth was taking its first steps as an independent nation. The difficulties faced by the country in the 1980s, especially in access to food products, combined with a feeling that everyone needed to pull together for growth influenced the educational choices she had to take. "I graduated in agronomy from Eduardo Mondlane University and I started to work at the National Institute for Agronomic Research, looking to improve the properties of cassava and sweet potato, to produce healthier and more productive plants. That was where I first got involved in biodiversity," she told us.

A job offer for her husband took her to Zimbabwe, where she continued her studies, completing a PhD in Biotechnology and Plant Physiology. This was followed by eleven years in Ethiopia, where her work at the Livestock Research Institute was another formative experience. "I worked at a seed bank for fodder plants, to preserve the biodiversity of those plants. It was a collection of global importance," she said. Alexandra Jorge stresses the importance of preserving this genetic material - much of which was sent to the Svalbard Global Seed Vault, in Norway, the seed bank regarded as a kind of Noah's Ark of the plant world - for the future of species, as it can help develop plants that are more

resistant to diseases, for example.

Her research took her as far afield as Italy, Mexico and South Korea, but she eventually returned to Maputo in 2014, when she joined Biofund, whose mission is sustainable funding of biodiversity conservation. "We raise funds, invest and allocate funds to specific conservation projects, most of them with parks and reserves," Alexandra Jorge explained. She has seen Biofund grow. "In 2014 we were just four people, and we all did a bit of everything. Six years later, we are a team of twenty and we have a project portfolio worth more than 30 million dollars, and capital investment of more than 35 million dollars, the income from which is used to support conservation areas. Now my work contributes to biodiversity conservation in Mozambique, not just of species, but also of habitats," she went on.



1 "We've done exhibitions in five different provinces, where we've attracted around 18 thousand participants. My dream was to get the materials resulting from the exhibitions - panels, posters, films, educational games - into classrooms. Because there we can have a huge impact."

2 "When Mozambique was hit by hurricane Idai, the forested areas withstood the impact of the rain and wind better, and the mangroves protected coastal areas. At that time, we tried to show that our best defence is to protect biodiversity."

FORESTS: ALWAYS IN OUR LIVES

Forest biodiversity is also seen in the species of trees occupying a plantation, and this is reflected in the resulting products, of which wood is just one example.

According to the FAO (United Nations Food and Agriculture Organisation), non-wood forest products (NWFPs) "are goods of biological origin other than wood derived from forests and other wooded land and trees outside forests". Some examples, apart from those derived from animals (game meat, honey...), are walnuts, pine kernels, mushrooms, fruit (such as *medronho*, the fruit of the arbutus), spices and condiments, aromatic plants, medicinal plants, cork, resin...

Also according to the FAO, several million families around the world use and depend on NWFPs, meeting their nutritional, health and economic needs, principally in developing countries. Although, in many countries, some of these products are regarded as important items on the list of forestry exports, the general tendency is to regard them as "minor" forest products. For this reason, the FAO argues that they are often ignored in forest management plans, in many

cases leading to conflicts on the use of resources, such as when the extraction of timber interferes with the production and gathering of NWFPs. However it would be ideal for wood producing forests to be managed in a responsible and sustainable way, which entails considering the importance of these non-wood forestry products, both for the subsistence of local communities, and in order to maintain forest biodiversity and the mosaic of species involved in a well-managed plantation.

And stoppers were made from cork oaks

In Portugal, in the woodlands under The Navigator Company's management, biodiversity is a critical factor in forestry planning. On newly acquired land and in areas already operated, the work always includes an analysis of the biodiversity and the areas needing protection, such as water courses, habitats and protected and endemic species, both flora and fauna. In addition, several forestry species grow side by side, in a mosaic that encourages biodiversity and constitutes



After stripping, the year of the extraction is marked on stripped surface of the cork oaks in white paint, to be clearly visible.

Desbóia (the first harvest)

The first stripping is known as the *desbóia*, around 25 years after the tree is planted. This is only permitted when the trunk of the cork oak has grown to a girth of more than 70 cm (measured at a height of 1.30 metres from the ground). This first cork is called "virgin cork", and its highly irregular outer surface means that its market value is lower.

Secundeira (the second harvest)

The second harvest of cork (*secundeira*) is obtained nine years later, and still presents a degree of irregularity.

Amadia (the mature cork)

Amadia cork is that extracted in subsequent harvests, every nine years. This cork is normally more uniform and has characteristics more highly valued by the industry. It is suitable, for example, for producing top quality stoppers.

the defining feature of sustainable management. In addition to eucalyptus, which occupies 74% of the 108 586 hectares of woodlands managed by the Company in Portugal, Navigator's holdings include 3 890 hectares of cork oak and 3 463 hectares of pines and other conifers, allowing the company to harvest important products from the forest, such as cork and pine kernels.

The cork oak (*Quercus suber*) is a species found only in a limited region, with just four countries - Portugal, Spain, Morocco and Algeria - accounting for around 90% of the world's cork forests. The tree has an average lifespan of two hundred years and, although it is not the only tree to produce cork, it is the only one that yields quality cork on a sustainable basis. Protected by law, the cork oak was named as Portugal's national tree in 2011.

The cork oak's main distinguishing feature is that it produces a uniform outer bark, formed by an elastic and impermeable material that is also a thermal insulator. This is cork. Portugal represents 34% of the world's total cork oak woodlands (*montado*), and accounts for 49% of global production of cork.

In 2019, Navigator harvested 13 400 arrobas of mature cork (*amadia*), on 29 of its properties, in Odemira, Sines, Idanha-a-Nova, Estremoz, Redondo and Penamacor. The cork is extracted every year, between late May and August/September, depending on the weather. At the start of the season, the workers are given on-the-job training in good environmental practices and in the health and safety rules for this task.

Rare seeds

They are called "the forest's white gold" or "woodlands caviar", because of their rarity. Pine kernels are the fruit of the umbrella

pine (*Pinus pinea*), and Portugal and Spain together account for 85% of the world's production. The kernels are rather different from those elsewhere in the world: longer, in a tear drop shape, and the colour of ivory.

Navigator sells the pinecones from its properties. The purchasers then extract the kernels: this is a complex process with tiny yields, which explains the high price of the product. "a pinecone is around 3% kernels", explains Vânia Oliveira, land use officer at The Navigator Company.

With a market geared mainly to export, between sixty and seventy million pinecones are gathered each year. Portuguese law only permits cones to be harvested from 1 December to 31 March, to prevent harvesting before they are fully ripe, so as to ensure a quality product, and to secure the next year's harvest.

These limits can be challenge, as these are winter months and, because of the harvesting process, pinecones "cannot be picked in foggy, rainy or windy weather," Vânia Oliveira told us. Experience and expertise accordingly count for a lot.

Last year, Navigator harvested 96 tons of pinecones, on seven properties, all in the Setúbal district.

The whole process, from gathering the cones through to the clean kernel, with its ivory colour and velvety texture, is time-consuming and complex, with the result that the price for a kilogram of pine kernels is around 100 euros.

Pine kernels have a very particular flavour, sweet and resinous, which manages to be delicate and intense at the same time. In order to preserve the full flavour, kernels must be recently harvested, meaning that the ideal is to pick a pinecone, open it, extract the kernels and eat them on the spot, in the woods. How's that for a plan?



Pine kernels are a product of umbrella pines (*Pinus pinea*).

Reviving traditions

The strawberry tree, or arbutus unedo (*medonheiro*, in Portuguese), is another species well established on Navigator properties. "It is important to ecosystems and biodiversity conservation," explained Vânia Oliveira, the company's land use officer, and it is planted for that reason.

Harvesting the fruit is a recent development and is more of a social enterprise than anything else.

Three years ago, Navigator teamed up with Santa Casa da Misericórdia and the Monchique Municipal Council on the Reviving Traditions project, in which the *medronho* is harvested in a social responsibility initiative, involving different generations in the task. Last year, residents at the old people's home run by the Santa Casa da Misericórdia in Monchique were able to relive moments from their past, by helping in a harvest that many remembered from their youth. Once harvested by the elderly residents, the *medronho* is then made into the fruit brandy for which the region is famous. The elder people are involved in every stage of the process, from harvest through to the end product.



FREE TREASURES FOR YOUR PALATE

Everyone in Portugal is familiar with blackberries and *medronho*. But how many know about crowberries and haws? Up and down Portugal, along the coast and inland, in the country and on the seashore, as well as in towns and cities, there are trees and bushes that offer wonderful edible berries. Take the chance to discover them!

Crowberries

Corema album

These are gathered in summer, from July to September, as you walk to and from the beach. They are the fruit of the Portuguese crowberry bush, similar in appearance to rosemary, which grows close to the dunes of many Portuguese beaches - from the Alentejo coast to the beaches of Nazaré, Figueira da Foz and Vieira de Leiria. But they are also found much further north, such as in Moledo do Minho. In times gone by, they were much enjoyed. On some beaches, these small berries, white and round, were regarded as a delicacy and a good business in summer - they were sold in punnets at more popular beaches. The species is now at risk of extinction, and so enjoy legal protection.

Crowberries are sweet and should be eaten when freshly picked. They can also be used in juices and preserves. They are highly nutritious and rich in antioxidants which, together with their shape and colour, justifies their being known as "Iberian pearls".



Myrtle

Myrtus communis

These are small fleshy berries from the myrtle, a quite common shrub in Portugal. They are black with a tinge of blue and can be gathered in the autumn. Some people call them *mastruços* and others confuse them with blueberries, because the colour is remarkably similar. But they are much less sweet. They can be eaten straight off the bush, or dried.

They have several uses in cooking, to add their aroma to sauces and syrups. Like other wild berries, they are also good for making liqueurs.



Elderberries

Sambucus nigra

This is one of the most widely used medicinal plants in the world. Elderflower tea is famous for its therapeutic properties. But the berries are no less beneficial. They ripen from August to October, turning from green to black. They should only be eaten once ripe, and then only in moderation.

They can be used in juices or as a food colouring. In addition to being beneficial in treating flu and fevers, researchers at the University of Aveiro Department of Chemistry have recently reported that they can help to control diabetes.

Hackberries

Celtis australis

In autumn, the pavements of many Portuguese streets and squares are covered with the brownish berries of the nettle tree, or hackberry tree. But few people are aware that these berries are edible. In fact, they are sweet and can be used to make a liqueur - which is why they have acquired the Portuguese nickname of "ginginhas do rei". Another curious fact: a yellow pigment is extracted from the trunk and root of this tree, which was once used as a fabric dye.

Mastic berries

Pistacia lentiscus

The small berries of the mastic tree turn from red to black, as they ripen between September and November. These small trees or shrubs are found mainly in southern and central Portugal, where they grow spontaneously. The berries are edible and highly aromatic. In the East, they were used to make oil for lamps and soap. The essential oil has several therapeutic uses. They are a distant relative of the pistachio, as the trees belong to the same genus.



Berries of the sea-buckthorn

Hippophae rhamnoides

Like crowberries, the orange berries of the sea-buckthorn can also be found in the dunes of some Portuguese beaches. But unlike the crowberry, they are sour-tasting and difficult to pick, because of the thorns. Only when very ripe, or even dry, are they pleasant to eat. But they are extremely rich in vitamin C and are excellent when used in jellies, jams, liqueurs and even in fish and meat dishes. The essential oil has several therapeutic applications and is also used in the cosmetics industry.



Haws

Crataegus monogyna

It is in late summer and early autumn that haws, the fruit of the hawthorn, a shrub found nearly everywhere in Portugal, turn bright red, signalling that they are ripe. They are now especially pleasant to eat raw, but make an excellent jam and are much appreciated in liqueurs. They also have therapeutic properties. But care must be taken when picking the haws, which are protected by long thorns. Hence the tree's name.



NATURE IN THE CITY

Hemmed in by cement, steel and glass, people are increasingly searching for nature in urban spaces. Biophilic architecture may have the answer.

When we are surrounded by trees and vegetation, our pulse slows, we breathe more deeply, our creativity and ability to concentrate improve and our immune system is strengthened. But finding nature within the confines of urban life is not always easy. Although the idea of organic architecture is already more than a century old, only in recent years has technology progressed to where this type of building can be achieved in all its glory and efficiency. Biophilic architecture is an innovative approach to design, using natural elements to transform spaces, bringing benefits for the environment and the climate, as well as for the health and welfare of people. More than just an architectural fashion, it is seen by most as the most sensible approach, integrating nature into every corner of the city.

This tendency is putting down roots all over the world, from New York to the major conurbations of South-East Asia, from railway stations to company headquarters and private houses, for interiors and exteriors. This new concept can be seen in major projects like that of the architect Stefano Boeri, who integrated 900 into the two residential towers of his "Bosco Verticale" ("Vertical Forest"), in Milan. But also on a smaller scale, as in the small flower beds in more than 300 bus stops in the Dutch city of Utrecht, which the locals fondly call the "bee stops".

In New York, the consultancy firm Terreform One, led by the architect Mitchell Joachim, won the 2019 Architizer A+ prize, in the category for "Architecture Plus Climate Change", with its design for a "Monarch Sanctuary", an eight-storey building with a



An unmistakable landmark on the Milan skyline, the wooded facade of the green residential towers designed by Stefano Boeri absorbs more than 30 tons of carbon dioxide and 80 kg of particles every year, as well as cooling the interior by up to three degrees.



Mitchell Joachim

In Manhattan, Mitchell Joachim's architectural vision has brought monarch butterflies back to the city.

Nature plays an important role in the innovative ideas of the Mexican architect Tatiana Bilbao. In her holiday house in Monterrey, the mirrored glass reflects the trees, allowing the building to blend into the surrounding forest.



Tatiana Bilbao



1



2



3

The vertical gardens designed by the botanist Patrick Blanc are improving energy efficiency all round the world. From Kuala Lumpur (1) to Paris (2), as well as in Amadora (3), where the covered piazza of the Dolce Vita Tejo shopping centre has walls covered by a vertical garden of his design.



The Dutch city of Utrecht has put green roofs on 316 bus stops, most of them planted with succulents belonging to the Sedum genus, which are low-maintenance and flower nearly all year round.

With the "25 Verde" complex in Turin, the architect Luciano Pia offers us an updated tree house.



butterfly garden built into its façade. A safe place for the monarch butterflies, which are rapidly moving towards extinction. The designers of Terreform One explain that "this vertical meadow serves as an incubator and safe haven for monarch butterflies all year round". The façade includes "climbing and flowering plants to feed the butterflies at each stage of their life cycle." Another interesting feature is the façade in EFTE (a flexible polymer used in buildings such as for the roof of the Allianz Arena), containing hydrogel bubbles to help maintain optimum levels of humidity.

The slogan of this non-profit architectural and urban design research group is "Design Against Extinction", reflecting how much biophilic architecture can do for environmental issues as critical as preserving biodiversity. Frank Lloyd Wright, one of the leading architects of the twentieth century, is often quoted as saying: "I go to nature every day for inspiration in the day's work. I follow in building the principles which nature has used in its domain."

That is perhaps precisely the spirit of biophilic architecture. More than simply seeking to be pleasing to the eye, it aims to promote well-being, which is provided through communion with nature.

ECOLOGICAL GENERATION

Sustainability education is new buzzword and something that parents and teachers have eagerly embraced. The upshot is that our children are more environmentally friendly and more engaged. But we need to do more.

João Pinto, aged six, thinks it is normal to separate the rubbish, turn off the tap, eat vegetables from his grandmother's garden and walk to school. "I don't think of sustainability as anything out of the ordinary; it's part of our everyday life," said his mother, Filipa Miguel, who assured us that this has been central to how she brings up her son. She is the first to admit that some of the choices are tough. "Living in the Algarve, where there's a permanent drought, saving water is where I have to be almost quite radical. It's a daily struggle," she confesses. Recycling is also part of their routine: "He doesn't even think about it. It's just the way it is, and for João it's automatic. He was born with the chip, but you still have to update the software," she jokes.



Rita Fernandes, mother of Catarina, aged sixteen, and Rodrigo, thirteen, has always been concerned to teach her children how to have a sustainable lifestyle. "From an early age I talked to them about the importance of reusing things rather than throwing them away, and recycling," she told us. "And I often tell them it's better to walk, if it's not too far, or to take a bus, which takes a lot of people, and so has less CO₂ emissions. I am always reminding them to turn off the lights or the TV if they're not using them. I refuse to buy new clothes just because they are fashionable or cool. And when they ask for fruit and vegetables out of season, I tell them about food miles - I explained to them, for example, about the production of palm oil, which is used in a spread they love, and what it's done to Amazonia, and they stopped eating it." These are two emblematic cases. But the fact is that parents, children, and young

people are increasingly concerned about sustainability, and young people find it easy and natural to learn environmentally friendly habits. "We have a generation that's more aware, responsible and engaged", enthused Margarida Gomes, the national coordinator for Eco-Schools, a programme run by the Foundation for Environmental Education, and implemented in Portugal by the European Blue Flag Association, that promotes and supports environmental education in schools.

The Navigator Company also runs a project - Give the Forest a Hand [see insert] - that works closely with the school community to raise children's awareness of the need to value woodlands and wildlife.

Helena Freitas, Professor of Ecology and coordinator of the Functional Ecology Centre at the Department of Life Sciences at the University of Coimbra, told us that "young people are increasingly committed to sustainable practices and choices, and are more aware of the environmental problems that societies face on a planetary scale." Her explanation for this is that "children are quick to learn the simple language of sustainability: we consume more resources that we have, we produce more waste than the environmental can cope with, we're losing biodiversity, and we redistribute the benefits from our planetary resources on an increasingly unequal basis."

Mikaela Övén, coach and founder of the Mindful Parenting Academy, also shares the view that we have "and more responsible and environmentally friendly

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generation”, in which she has “huge hope”, but she says “we still have a lot of work ahead of us”. So, what should parents do?

Set an example

“The main way of educating is through example”, argues Mikaela Övén, pointing out that doing things like “not letting taps run, turning off the lights, recycling or making mindful choices about shopping are things that will develop into habits that children will not even question if they’ve always done it”. In addition, she added, “it’s important to pay attention to how we behave outside the home”, such as by “taking reusable water bottles and not accepting plastic straws and lids, or avoiding unnecessary packaging.”

But there’s more. A good idea is to “get the family together for a brainstorming session on how the family can become more sustainable”. If we make sustainability “a joint project and answer the question ‘what can we do as a family to contribute to a better world’, children will understand the importance of all this, and not see it all as an imposition”.

At the same time, she went on, “involving children in sustainability decisions and holding them to account also works really well” and “observing that other people also assign importance to sustainability can be decisive”. Lastly, she adds, “visiting exhibitions and fairs and watching films and documentaries (appropriate for their age) about the issue are other excellent ideas”.

An approach to be adopted from the start. All this is connected to “our approach to life and the habits we form over time”. And if they are applied early, these habits are internalised as a matter of course. Because “habits stay with you”.

Engaged students

As well as parents, primary and secondary school teachers also have a key role to play in sustainability education. And sustainability increasingly features on the curriculum. This can be seen in subjects that deal directly with environmental topics (such as Geography, or Education for Citizenship) and also in extra-curricular projects, such as those organised in Eco-Schools, or projects that tour different schools, such as the theatre and workshop events offered by the Give the Forest a Hand project [see insert].

The truth is that “children get interested and involved in environmental projects,” as we heard from Conceição Marques, a geography teacher and Eco-Schools coordinator at the Terrugem primary school, in Sintra, for the past ten years. “The students really engage, they have a real, deep vision of the environment, and take home what they learn, often getting their families to change their habits”.

Rodrigo, a year 8 student at Pedro Santarém School, in Benfica, was one of the few in his class that last year joined the “rubbish brigades” - wearing special vests and gloves, they picked up litter, teaching their fellow students about the importance of not dropping litter. Because, he says, “there’s still a lot of people who don’t think it’s important to recycle”, or who “think there’s no such thing as global warming”. He sometimes got teased for doing this job, but he didn’t give up. This year he signed up for “The Sea Starts Here”, this time to explain the impact of what goes into street gutters. He is adamant that “it’s important to raise awareness, or we won’t have the world”.



A challenge for everyone

Sustainability education cannot be left just to parents and teachers. “Educating for sustainability is a challenge for everyone, we need to get all of society involved,” argues Helena Freitas, who sits on the committee for Adaptation to Climate Change, including Societal Transformation, under the European Horizon programme, and Unesco Professor of Biodiversity Safeguard for Sustainable Development. “Involving children is essential, but educating them for sustainability means putting these concerns at the heart of the political agenda, our education system and society itself,” she went on, pointing out that “the political authorities have an essential role, through public policies that driver change and are sufficiently consistent to ensure a credible framework of continuity”. Helena Freitas was also one of the authors of the Environmental Education for Sustainability Benchmark of the Directorate-General of Education, and reminds us that “the challenge of sustainability depends more and more on societies that have access to education and professional training, and to free and democratic participation in decision-making processes.” Which is why “a policy on education for sustainability is essential to provide a framework”.

LEARNING TO VALUE WOODLANDS

The Navigator Company is raising youngsters’ awareness of the importance of protecting forests and at the same time encouraging a healthy lifestyle - the “Give the Forest a Hand” is a success story in environmental education.




L launched in 2011, the International Year of Forests, “Give the Forest a Hand” is one of Navigator’s social and environmental responsibility projects, which has since grown significantly, bringing environmental education to more and more children. Designed to teach children about the need to protect and value forests and their products, and also to protect the environment, the project is a way of bringing the company closer to children and young people through educational fun and games organised hand in hand with the school community.

The project staff travelled the length and breadth of the country, mobilising more than ten thousand children. Raising awareness of biodiversity conservation and rational water use were the themes of the roadshow that visited around 90 schools in Lisbon, Porto, Coimbra, Aveiro, Almada, Setúbal, Figueira da Foz and Vila Velha de Ródão. Alongside this, “Give the Forest a Hand” made appearances in Monsanto Park, the Lisbon Zoo and in the Bussaco national woodlands, as well as taking the scent of the forest to several shopping centres.

The project has already won prizes from the Portuguese Corporate Communication Association for the best social responsibility campaign and further proof of its success is found in

the growth in its followers on social media (up 30% on Facebook and 150% on Instagram, in relation to 2018), while the “Give the Forest a Hand” magazine has almost tripled its number of subscribers.



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THE TREE OF MY LIFE

Personal memories in the shade of a tree. Stories from our childhood with roots in our grandparents' garden. Literature, art and science have all found inspiration here, but what we're looking for is something more personal: is there a "tree of our lives"?

Our language uses several metaphors inspired by trees: our ideas flourish and bear fruit, our values are deeply rooted, but we sometimes cannot see the wood for the trees.

But trees also inspire ideas. One of the most remarkable instances of this involved an apple tree, now protected by a fence, in a Lincolnshire orchard. It was here that, in 1666, an apple fell from the tree, leading a young man called Isaac Newton to wonder why the apple always falls in a perpendicular line to the ground. This led him to formulate his law of gravity.

And trees can lead to spiritual awakening: Siddhartha Gautama, the historical Buddha, achieved this state when he sat to meditate under a Bodhi tree, a type of fig tree native to India. Or inversely to eternal damnation, in the case of the tree of the knowledge of good and evil, from which Eve picked the fruit, disobeying God's orders and causing mankind to be driven out of paradise.

Trees can also reawaken memories of the past - what would Marcel Proust's classic have been had the narrator not started his journey into time past after dipping his madeleine in a tea made from lime blossoms?

And they help us appreciate the cruelty suffered in the lives of others, when we read Anne Frank writing about the chestnut tree outside number 263 Prinsengracht, in Amsterdam, that she managed to see out of her attic window, helping to mark the seasons of the year.

Or they can fill us with happiness, with the extreme care taken each morning by the Little Prince in removing the seeds from the baobab trees on his planet B612, so that not too many would grow and destroy the planet he loved so much.

We went in search of trees that speak to people's hearts. And here are four examples.



GROWING WITH A PINE TREE

A short time before Alexandre Marques was born, his grandfather said to his father: "We should plant a tree". No one really knows why. Probably, because it was his first grandson and he wanted to commemorate the occasion. But also, no one really asked. "Although no one actually discussed the matter, the idea you get is that it seemed to everyone a natural thing to do, so they did it," said Alexandre.

The family lived in a big house in the country, so the grandfather's suggestion was not out of place or difficult to do. The tree they chose was an umbrella pine, planted near the entrance to the *quinta*. It has grown alongside Alexandre, and today, at their shared age of forty-eight, there it stands, welcoming people as they arrive.

Alexandre, who lives at the family *quinta*, has seen his pine tree grow, and so he confesses to having a soft spot for it. "I help prune it, take care of it, do all the upkeep," he says.

There is another pine tree on their land, nearly eighty years old, that Alexandre's mother and uncle planted when they were children. The family has always felt intricately connected to nature. "Again, it's not something we talk about or announce to anyone, but it's deeply rooted in us," he explained. So much so that Alexandre, a jeweller by trade, creates organic pieces, where nature is always clearly present: "When I'm designing a piece, I don't consciously decide to draw my inspiration from nature, but it's something that just happens."

Although still childless, Alexandre Marques has not yet excluded the possibility of fatherhood, and smiles when we ask if would plant a tree for birth of a child. "And why not? It's an interesting tradition, that I wouldn't mind carrying on."





IN THE SHADE OF A CHESTNUT TREE

High summer in Moura da Serra, in the municipality of Arganil, is too hot for playing outside during a good part of the day. But for Rui Maia and his cousins, spending their holidays in the village, sitting quietly indoors was out of the question.

So, their summer playground was under the huge chestnut tree in the vicinity, with a hollow big enough for a child to hide inside, complete with a peep hole out the other side. "We spent long August afternoons there playing or, when it was really hot, just sitting and talking," remembers Rui. "It was the perfect place, because the tree gave us shade and there was a freshwater fountain nearby that was really handy

My mother, who grew up in the village, told us that as a child she had played under the same chestnut tree." Curiously, Rui Maia's happy childhood memories include another chestnut tree, opposite the church square, which he used to climb with one of his holiday friends. "It was our spaceship. We imagined its branches as the levers in the cockpit and set off to discover new planets around the universe," he reminisced.

Now aged forty-six and with a career in the army, he continues to visit Moura da Serra. The older chestnut tree, with the hollow, is no longer there, but the one in the church square is still standing, beckoning him for a trip around the Milky Way.

AN ORANGE TREE, AND A LESSON IN CAUTION

Carlos Costa's family history features an orange tree that he believes must be over a hundred years old. It was his favourite place to play in the school holidays, putting his climbing skills to the test, either to pick oranges, for games of hide-and-seek, and even to wrong-foot the grown-ups when they were looking for him in the *quinta*. "The orange tree has a sturdy trunk, around a metre and a half high, and then it splits into strong branches that open up into a wide crown. It was simply perfect for climbing," he told us, describing the tree that dominated the family's land in Travasso, a small village in Mealhada.

More than the taste of the oranges he picked, Carlos has fond memories of his adventures with his sister and cousins on the branches of the tree, and also the nervous look on his aunts' faces when they spotted them messing around atop the tree. He remembers: "My father also liked to climb trees, especially that orange tree. One day, when he was a teenager, he decided to show off by leaping out of the tree, resulting in a broken leg. My aunts never forgot how painful it was for their brother and would always remind us of the story. Nowadays, the orange tree has much less fruit. Perhaps it misses having children playing around it..."



EUCALYPTUS TREES THAT REFRESH MEMORIES

The scent of eucalyptus leaves has the ability to awaken childhood memories in Rita Magalhães. That particular fragrance takes her back in time to when, in the Benfica woods, she would climb the steep paths up to a bench where she would sit, next to her father, António, for long afternoons drawing the natural world around them.

"There was just one thing better than the shade of those eucalyptus trees on hot days - it was the scent, which seemed to refresh the air", remembers Rita, thinking back to the sensations of those days prior: "Down on our bench, it was sheltered, and you only knew the evening wind was picking up from the sound of the leaves rustling at the top of the trees".

Although memory is often triggered by sensory experiences, this forty-five year old psychologist tells us that what has endured are the moments of

affection and learning: "My father loved to draw and paint in his free time, and those trips to the Parque Silva Porto were a real artistic education".

Rita is sorry not to have kept tangible souvenirs of those time. "It's always the way, we never value things at the time," but she remembers following the vertical lines up the trunks of the venerable eucalyptus trees in the Benfica woods. "My father was able to draw leaves with a few deft lines... for me they were the greatest challenge!", she remembers, not without recalling something else that now makes more sense to her than ever: reading "The Wonderful Adventures of Nils", by Selma Lagerlöf.

"It was one of my father's favourite books, that he made a point of handing on to me and my brother," says Rita. "It tells the story of a child who sees all of Sweden as he flies on the back of a goose, but it's more than that - it explains why people need to have communion with nature". At the time, for the little seven or eight-year-old girl, it was a nice story her father had suggested. Today, when she looks back to those days, Rita can see that the afternoons in the shade of the eucalyptus trees in Benfica taught her more than the pages of the book or those of her sketch pad.



Trees evoke memories of childhood, of simpler times when we were closer to nature.

Winning people over to biodiversity

BY NUNO FARINHA



Nuno Farinha is a scientific illustrator, which is what he loved doing as a child, long before he studied biology at university. In his childhood, he devoured wildlife documentaries on the television, as well as books and illustrated magazines on the subject. Today, he has made a career out of what he loves most. He believes that illustration is a way of introducing people to biodiversity, citing himself as an example.

Illustration can help to simplify complex subjects, making them easier for the general public to understand, as well as helping to gain a wider audience for some interesting areas of knowledge, which are often only covered by specialist scientific journals or other media. But above all, good scientific illustration can successfully appeal to

the public imagination, and more effectively raise their awareness of the pressing issues that face us, such as preserving biodiversity and the planet's genetic resources, or else climate change and the real impacts we're already feeling.

The biology course developed much further the interest I

had always had in the natural world, teaching me much more about fauna, flora and ecosystems, and so preparing me to illustrate these areas more clearly and more accurately. Over time, my work as a scientific illustrator has widened into many for areas, such as archaeology, palaeontology, cartography, geology and astronomy."



Science at any age

CASSIA ATTARD

Cassia Attard may be just eighteen years old, but this young Canadian has already made herself a name in the scientific community. What motivates her is the fight against climate change, and this is where she wants to make a difference.

It all started when she was fifteen and spent a fortnight in the Bahamas to work on marine research. She became aware of interesting and important sustainability practices. It soon became her ambition to help solve the problem of climate change.

After lengthy research, she realised that exponential technology was the only way of achieving her goals. She was accepted as a member of the

Knowledge Society, in Toronto, and started to learn more about these technologies.

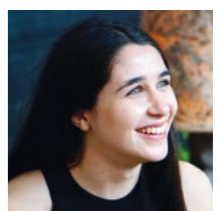
When she discovered quantum dots, she knew she had found the way to overcome the technological barriers that prevent solar energy from being scalable. In a local laboratory, she experimented in making her own quantum dots and, later, partnerships with the University of Waterloo and the University of Toronto enabled her to transform them into a transparent solar panel.

Quantum dots are a semiconductor nanoparticle, which means they are extremely small (50 atoms, in all). And they can absorb light energy, so when they are

placed in a material such as metal or glass, they transform it into a solar panel, whilst remaining invisible.

The result? Most cities lack the space needed to install solar panels on a large scale, in locations where they are out of the shade of other buildings. But quantum dot solar panels can transform existing windows into solar panels. In other words, the houses, apartment blocks and skyscrapers of a city can generate power, using solar panels we never even see!

Cassia believes it was a great advantage that she had the chance to start so young. "If I want to sort out climate change, I can't wait until I'm thirty!" she says.







Cassia Attard never felt that age was a barrier. Instead, she says that the professionals were excited to help young people who got involved in important causes.

Everything you always wanted to know about forests



The Navigator Company and RAIZ, its in-house forest and paper research unit, have launched a platform for people to learn about Portugal's forests. It's all just a click away, at www.florestas.pt. The website provides access to technical and scientific information, in language that is easy to understand, all produced with support and contributions from the Portuguese scientific community and several institutions and initiatives with forestry connections. A wide array of information is on offer concerning different dimensions – natural, environmental, recreational and socio-economic – of the forestry sector. At the launch event for the platform, organised online to comply with the health and safety rules required by the current situation, Navigator's CEO, António Redondo, explained the project: "There's an urgent need to provide the public with technical and scientific information about Portugal's forests, and also about the historical, geographical and socio-economic context in which they have developed. It is in a fact-based, open and rational debate drawing

on all these areas of knowledge that it will be possible to find common ground on which to develop long term public policies, designed not to squander Portugal's uniquely strong position on the international markets for forestry products, conciliating different approaches to sustainable development." For his part, João Lé, executive director of Navigator responsible for forestry operations, explained that "This project serves to demonstrate our commitment, as a company that is eager to share knowledge with society as a whole, especially at a time when the abundance of information does not always result in a clear understanding on the part of the public. As we know from our daily work, it is vital for our forests that the Portuguese public should feel more involved in them, be aware of their importance and discover all they have to offer". The aim is to provide credible, impartial, and validated information to a wide range of stakeholders, while persuading users of the website to explore, value and care for Portugal's woodlands.

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Forestry producers find a voice

A magazine, a website, social media, and events. But above all, a desire to bring together a community in which woodlands are the common denominator. The new "Forestry Producers" website is now online.




Gonçalo Vieira, João Lé, António Redondo and Nuno Neto at the debate about future challenges for forests.



The appreciative audience combining representative of the forestry sector and local government.



The Navigator Company has just launched its "Forestry Producers" project, designed to bring together all those who have or aspire to having a professional relationship with forests, by sharing knowledge and experience, and encouraging the values of sound management and sustainable production. The project was launched online (at the website www.produtorestais.pt, Facebook and Instagram) and with a bi-monthly magazine, and as soon as circumstances allow there are plans to take the project into the field, with training sessions and raising awareness of better woodlands "As a forest-based venture, operating in the field on a daily basis, up and down the country, we have long known that there is a community of resilient and dedicated people, who are faced with difficulties because of their distance from the main decision-making centres. We hope this initiatives helps to give forestry producers the voice they deserve and that they unfortunately have not had," said António Redondo, CEO of The Navigator Company, at the presentation session for the project, held in Luso in July. João Lé, a director of The Navigator Company, referred to the project as a "community" because "that is the reach we want to have with this information platform". He also underlined the fact that Forestry Producers is intended to "help all forestry players, in all their occupations and regardless of scale, to come together as a wide group that can pool their experience, helping to create better forests in Portugal." The final part of the session consisted of a debate between the guests and The Navigator Company's manager, centring on how to create the dynamics for forests based on standards of good management and environmental, social and economic sustainability. Other speakers at the event, held at the Grande Hotel do Luso, included Rui Leal Marques, the mayor of Mealhada, and António Gravato, chairman of Fundação Mata do Buçaco, who took the opportunity to praise Navigator's contribution to Portugal's forests, once again illustrated by this new project.

-  www.produtorestais.pt
-  facebook.com/produtorestais.navigator
-  instagram.com/produtorestais



The state of forests and biodiversity

Expansion in agriculture continues to be the main driving force behind deforestation and forest degradation, according to the recent FAO report, The State of the World's Forests 2020, which attributes 73% of global deforestation and the consequent decline in biodiversity to the agricultural sector. As the United National Biodiversity decade (2011-2020) draws to a close, this document examines the relationship between biodiversity,

forestry, and agriculture, and stresses the need to conciliate these three dimensions, each of them essential for life. The report reminds us that forests occupy 31% of the planet and are home to 80% of amphibian species, 75% of birds and 68% of mammals, and that tropical forests account for 60% of vascular plants. Conservation of biodiversity is therefore dependent on maintaining forests, which are also part of the lives of millions of people.

Electric vehicles added to Navigator fleet



Electric vehicles belong to a more efficient and sustainable future and, in line with its total commitment to this development, Navigator has added the first 100% electric vehicles to its fleet. After becoming the first Portuguese company, in 2019, to make a pledge of carbon neutrality by 2035, fifteen years ahead of the national and European targets, the electric cars are a further example of the Company's determination to reduce its environmental footprint. Over its life cycle, an electric vehicle produces less greenhouse gases and atmospheric pollutants than the equivalent vehicle running on petrol or diesel; using the vehicles results in zero CO₂ emissions.

The best paper for a home office

Navigator Home Pack is the best solution for people now working from an office in the family home. With the familiar quality of the world's best-selling brand of premium office paper, but with a lighter than usual ream (250 sheets), this product is easy to deliver to Portuguese homes and facilitates stock management. So, it's the ideal solution for the way we're living just now. The new campaign, focussed on working from home, includes a sticker on the Navigator Home reams with a special message: "Together is our favourite workplace".



A toast to our prizes!

The wines produced by The Navigator Company at the Espirra Estate, in Pegões, won prizes at the Frankfurt International Trophy, the largest international wine competition in Germany. *Herdade Espirra Método Tradicional 2010* and *Herdade Espirra 2015* both won silver medals. The first is a structured, intense and complex wine, made from Castelão grapes from established vines, aged in the bottle for a long period, whilst the second is a rich and aromatic wine, aged for 12 months in French oak barrels.

EIB supports Navigator's decarbonisation strategy



The European Investment Bank (EIB) is set to support The Navigator Company's decarbonisation strategy with a loan of €27.5 million for construction of a new biomass boiler at the Figueira da Foz industrial complex. This project is the Company's next major stride towards achieving carbon neutrality at all its industrial sites by 2035, fifteen years ahead of the targets set by Portugal and the European Union. "We are delighted to support The Navigator Company's ambitious decarbonisation strategy and its efforts to modernise production to become more sustainable and more competitive. At the same time as driving post-COVID economic recovery, this project will promote the circular economy and help the EU to achieve its aims of carbon neutrality by 2050," declared the EIB's Vice-President, Emma Navarro, responsible for operations in Portugal and climate-related investment. The European Investment Bank is the world's leading provider of finance in the climate field, seeking to mobilise the funds needed to limit global temperature rises to 1.5° C, so as to achieve the aims of the Paris Agreement.

Navigator expects rebate of 25.7 million dollars from USA

The Navigator Company has won the case it brought in the United States Court of International Trade, confirming that the customs duties payable will be reduced to 1.63%. As a result, the Company expects to receive a rebate of 25.7 million dollars in respect of the excess amounts deposited.

TAKING A STAND

Planting tree is something in which almost all of us have been or will be involved at some point in our lives. And it is difficult to imagine childhood without grandparents, parents or teachers explaining the importance of trees and forests.

Today, we can visit forests in the most hidden away places, all of them just a click away. More than ever before, we can learn more about the natural resource that sustains life on Earth. And even get more involved in preserving it. Regard it as a personal aim, one of our life's ambitions. Why not?

First and foremost, forests are the habitat for a great diversity of species, including man. And also a place for recreation, where we find peace, joy and contemplation. It is an ecosystem where animal and plant species live side by side. Where a balance is established, and imbalances are resolved. I am always eager to believe that humanity will understand the importance of forests as a habitat, as a setting for biodiversity and a means of mitigating climate change. This is where circularity makes its home and CO₂ is captured.

The European Union's Biodiversity Strategy for 2030 is itself an acknowledgement of the importance of preserving forests.

Forests mean life, and livelihoods. They speak to us as individuals and, above all, represent incalculable value for communities. Our great, all-consuming cities have drawn people away from the countryside, and left us exposed to one of the greatest enemies of biodiversity: abandoned woodlands.

We urgently need to turn back to our forests,

with a fresh, global perspective. The good practices of sustainable forest management should lead to forests being used in line with their central values, including conservation and protection.

Professional management of forests encourages producers to take a renewed interest, stems the exodus from the countryside, promotes replanting and protects biodiversity, which can then be conciliated with commercial forestry. Forestry businesses should be operated by people and organisations attuned to the balance and fragility of woodlands.

The foundation for sustainable forestry is the peaceful co-existence of different forests, for production, protection, conservation, pasture, game, and fishing, and for leisure. The yields achieved by planted forests relieves the pressure on natural forests and can finance conservation, allowing them to exist side by side, conciliating positive impacts for the environment, and for society and the economy.

Natural resources are not infinite, but they can be renewed or replenished. The forest does not belong to us. It belongs to everyone and must be respected. We so often wonder how to combat climate change, and forget the role of forests.

We feel helpless to protect the Earth on which we live, and sometimes we underestimate the huge value of individual and collective initiatives to protect our forests.

The United Nations estimates that 30% of the planet's land is covered by forest. It is one of the Earth's most important resources. And yet it continues to depend on each one of us.

On the stand we each take.

Sandra Santos
Member of the Board
of Directors of
The Navigator Company



WE NEED TO FEEL CLOSER TO OUR WOODLANDS

More than ever before, we know that preserving biodiversity is important for the sustainability of the planet and of humanity as a species. We can see, more clearly than ever, the connection between the balance of ecosystems and our own welfare, and our own health. We are even more aware than ever that economic prosperity goes hand in hand with biodiversity. In other words, we have never had so much information at our disposal. So, what do we need to move from words to action? Far from being merely rhetorical, this question seems to be absolutely crucial at a time when the global health crisis has reminded us that the challenges transcend the frontiers of the individual, or rather, that these frontiers do not exist. Recent events and a groundswell of public opinion have done much to strengthen the case for preserving biodiversity, underlining the need for collective action, which includes action by governments and companies.

The call to action is not just for the scientific community or environmental organisations. The issue has gained the attention of decision-makers and, in a welcome development, has been incorporated into State development policies, as shown by the European Biodiversity Strategy, which draws a clear connection between environmental factors and social and economic prosperity. Biodiversity is accordingly the element that connects the three pillars of sustainability: environmental, social, and economic. Biodiversity is life in all its glory.

As a forest-based venture, The Navigator Company is aware of the importance of this natural balance and the direct impact of the environment on the creation of socio-economic wealth. The Company's everyday experience in the field shows how biodiversity intersects with business aims - because it is the driving force for better forests and expresses the interdependence existing in harmonious management of production forests alongside protection forests, each safeguarding the other. Biodiversity conservation has been built into the responsible forest management model that Navigator has implemented on close to 108 000 ha of woodlands that it manages in Portugal. This set of good practices presupposes creating a diversified landscape on a mosaic pattern, that integrates woodlands, areas of natural vegetation, fields for agriculture and pasture.

In its conservation areas - around 12 thousand hectares, more than 11% of the total area - the Company has identified 235 species of fauna and 740 species of flora. These species are subject to regular monitoring, especially where their conservation status is "endangered". In addition, 4 100 hectares of the forest land managed by Navigator are classified as habitats protected by Rede Natura 2000. Examples of the Company's systematic efforts in this field include its work

to protect the Bonelli's eagle, which nests in eucalyptus trees, or its reclamation projects, such as the restoration of riparian gallery forests with degraded habitats, with a view to reviving the associated ecosystem services.

I would also like to point out that Portugal's forests are among the most diverse in Europe, with no single dominant species. Eucalyptus, our fundamental raw material, occupies little more than 25% of the country's woodlands, whilst 72% is occupied by indigenous species, such as cork and holm oaks, maritime and umbrella pines, and other native oak species.

However, the country's forests still suffer from structural problems, reflected in a truly clear indicator: Portugal is among the European countries with the smallest proportion of managed forests - a mere 20%. Setting other valid concerns aside for the moment, this should sound alarm bells because of the resulting fire risk. Managed plantations, where spontaneous vegetation is controlled, have more paths and fire breaks (strips of land with little vegetation), allowing fire-fighters to act quickly and preventing flames from spreading.

Sustainable forest management is one of the great challenges, and simultaneously the answer to how to conciliate the different functions of this great ecosystem. As well as their inestimable environmental value, in sequestering carbon, regulating the water cycle, or improving soils, forests play a fundamental role in retaining populations in interior regions and in creating wealth. Today, there are around 24 thousand companies in the forestry sector (2% of all companies in Portugal, and these directly employ more than a hundred thousand people. No less important, the forestry sector accounts for around 9% of Portugal's exports.

Our forests, with all the different environmental, social, and economic benefits they bring us, are a precious asset in a country otherwise poor in natural resources. But to develop them sustainably, in space and time, it is fundamental to feel a closer connection to them.

Incentives for active management are urgently needed.

Because well managed forests bring opportunities, generate wealth and attract a working population. If we look out for the forest, it will look out for us.

João Paulo Oliveira
Executive Director of
The Navigator Company



THE FOREST THAT CREATES SPACE FOR CONSERVATION

Population growth and climate change are having an impact on natural resources, threatening habitats and biodiversity conservation. As vital ecosystems for a balanced planet and for people's lives, forests are a central concern: how can we conciliate conservation values and the need for raw materials for humankind? The answer can be found in a fundamental concept: sustainable woodlands management.

Sustainable woodlands management consists of a set of good forestry and planning practices and sets out to promote the compatibility and vitality of what we call "ecosystem services", in other words, everything the forest offers, for the environment, society and the economy. Biodiversity conservation is built into this type of management, which entails operating woodlands in a way compatible with the protection of natural resources and preservation of the environment.

By allowing for intensive production in demarcated and properly managed areas, able to respond to the growing need for wood resources, planted forests play a fundamental role by reducing the pressure on native and indigenous forests. Producing more wood in a smaller area, and in plantations created specifically for this purpose, makes it possible to preserve forest wildlife, helping to conserve habitats and biodiversity.



WHAT WOODLANDS GIVE US

As the terrestrial ecosystems best able to store carbon, forests help us to respond to climate change, but they also protect soils and water, improve air quality, provide a home for more than three quarters of the planet's terrestrial biodiversity, and supply a range of products and services that contribute to socio-economic development.

PRODUCTION POTENTIAL IN A SMALLER AREA

Planted forests respond to the need for raw material and for preserving natural forests: although they account for only 7% of the planet's woodlands, they provide around one third of the world's output of wood used in industry.

PROTECTION OF BIODIVERSITY

Modern forest-based industries have developed strategies that integrate biodiversity conservation in their forest management model, seeking to ensure that the planning and execution of operations result at least in maintaining the natural values found in our woodlands.

Content published in National Geographic Portugal.

Sources: FAO. The State of the World's Forests 2018. Forest pathways to sustainable development | WWF. Climate, Nature and our 1,5°C Future. A synthesis of IPCC and IPBES reports, dez. 2019 | D'Annunzio et al (2015). Projecting global forest area towards 2030. Forest Ecology and Management | Plantations for people, planet and prosperity. 10 years of the New Generation Plantations platform 2007-2017.

