

# #MYPLANET

by The Navigator Company

A piece of paper is an empty stage, an unplanted garden covered with snow, with freedom underneath. Have you thought about what pen you're going to use? And what do you think you'll be writing about?

Miguel Esteves Cardoso



# Turning around time in a paper boat

By Miguel Esteves Cardoso



*When words move around in the dark the only way to make them stop is to let up and write them all down.*

*When I arrived in Rome all my books had been stolen. I had nothing to read. I drove around looking for a bookshop but they were all closed. I finally had my room of hell.*

I'm writing these words on paper that I like a lot, using a fountain pen. Before I reached for this notebook - the pages ironed so smooth and neatly stapled - I thought about what I was going to write.

But thinking without paper is different. The words don't flow in the same way. At night, when I'm in bed, I write in my head, using the darkness as paper.

I'm practising for when I'm in prison and they take away my notebook. I started practising when I was six, because of a book that I shouldn't have read, using a roll of toilet paper.

It was the first time I ran away from home. I hid among the brambles, laden with blackberries, lit a fire and started to grill the slices of bacon I had stolen.

It was the early sixties and, biro in hand, I started to write on the roll of toilet paper, against the fascist tyranny of my parents. They wanted to send me to a "school" where my freedom of expression would be forever crushed, along with the little liberty I still enjoyed.

If they took the paper out of my life, there would be little life left. What would be the point of living, if I couldn't write it down? How would I do what I'm doing here? Now I'm cheating because I'm adding a paragraph - using the same pen - on a different sheet of paper where I printed out the first version of this column.

I don't yet know how these words will turn out when they're finally printed in the magazine you're now holding. Did they turn out OK? Do they smell nice? Do they weigh a bit more than these ones?

When I wrote plays I realised that the part that actors play is actually a paper role, that they carry around with them, writing on it, hunting down what's wrong and lifeless, what doesn't jump off the page.

But the paper is what it jumps off. The paper is to the role on stage what the trampoline is to the jump, for the trampoline artist.

It's the paper that lets you fold it up, the paper that means you can tear out a sheet, the paper you hand to someone, the paper you scrunch up and throw.

A world without books is something I can't imagine. A hell I'm lucky not to imagine.

When I walk into a library, I feel an ecstasy that manifests itself physically in an embarrassing way.

It's all those possibilities open before me, protected only by the weight of a cover. It's a treasure store of time - time as climate, time as stage-of-life, time as epoch, time as writing, time as reading - that glows with the light of eternity.

It was my parents who taught me to write in books. It angers me that people are taught they mustn't write in books.

What does it matter what you must do? What matters is what you can.

You can write in books. They're made of paper. Take a pen and write here "what nonsense!" or "how rude!" or "rubbish!". That's what the margins are for. To write in a book is to take it seriously.

Will you write in pencil? Or in ink? Or, better still, without thinking about it?

My father had a room where he kept the paper under lock and key. He had old paper and new paper, foolscap and drawing paper, reams and rolls, notebooks and notepads, cards and cardboard.

His excuse was that he was a naval architect but the paper he could use to draw ships filled not even a third of the shelves.

I didn't rest until I could pick the lock. It was difficult because it had a special kind of key. It took years of visiting scrap yards. But I managed it.

There was so much paper! I rested.

Even if I lived for many years, I would never be able to fill it all.

And that's what paper is for: to put us at ease. They're sheets in which we sleep, to which we can return, where we can get lost. Is it or is it not odd to talk about bed without talking about sheets?

It was also where he stored the best bottles of whisky. It took me a few more years to get interested in those.

And, when I started to drink, I found that paper and alcohol got on well together: the newspaper with the smell of newsprint on a summer's day, the glass of beer drained without interrupting the reading; the open notebook, pen in hand, ice in the glass; wine in the mouth, book in hand. Company.

Paper is like water. It appears to us to exist in great quantities. How much does a kilo of paper cost? How much does a kilo of water cost? How easily can you find them? What can you do with them?

Human beings are happy in water. When we come out of the shower or the sea, we feel better than when we went in. Water does something to us. You don't need to drink it. There's no need to say how easily we die without it. It's enough to dip your fingers in water, or to hear it flowing in a stream, to feel intuitively how important it is.

Paper is also water. Writing in water is not in vain - words on paper do not disappear. Or not so quickly. They give us a few years to breathe.

Paper knows how to wait, it is patient. It's what comes from being able to contain time. And to count it.

Of all the enthusiasms of our young selves, paper is by far the most enduring.

And one of the things that it preserves is the pleasure, which never vanishes or fades, of using it for the first time.

Like now. ♦

*I don't understand people who go on about the sterility of a blank piece of paper. It's like blaming clean sheets for a sleepless night.*







# 46



# 28

**A modern medium, 2000 years old**  
From the start, paper came into our lives to stay. **P 08**

**Advantages of reading on paper**  
We may live in an increasingly digitalised world, but our brains still prefer paper for learning. **P 18**

**Journey through the senses**  
Paper involves all our senses and appeals to our emotions. **P 24**

**Where books live**  
Some of the world's most beautiful libraries. **P 28**

**Trees for making paper**  
The trees from which paper is made are planted especially for this purpose, adding to the total area of woodlands. **P 30**

**Ecological footprint**  
Paper/digital: from production to use and end of life, what pollutes more? **P 34**

**Natural alternative**  
Paper is a natural alternative and helps to resolve the huge problem of plastic pollution. **P 38**

**Paper house**  
A Dutch design studio has created a micro-house made from cardboard. **P 42**

**Circular Economy**  
Portugal takes part in European paperChain project, for using waste in the pulp and paper industry **P 44**

**Pollination**  
The importance of bees to mankind and to life on Earth **P 46**

**Interview**  
The secretary-general of BCSD Portugal talks about natural capital **P 50**



# 42



**#MYPLANET MAGAZINE DELIVERED TO YOUR HOME**

Just register on [myplanet.pt](http://myplanet.pt) or follow the link from the QR Code.

You can also join us at:

- [facebook.com/myplanet.pt](https://facebook.com/myplanet.pt)
- [instagram.com/myplanet.pt](https://instagram.com/myplanet.pt)

## MYPLANET #06

**Published and coordinated:** Corporate Communications and Brand **Director:** Rui Pedro Batista **Design:** Ray Gun / Creativity Worldwide **Content:** Key Message Comunicação Estratégica **Proprietor/Published by:** The Navigator Company **Address and editorial office:** Av. Fontes Pereira de Melo, 27. 1050-117 Lisboa **Printing:** Printed on Inaset Plus Offset paper 100 g/m<sup>2</sup>, sourced from responsibly managed forests. Exempt from registration with ERC under Reg. Dec. 8/99 of 9/6 Art.12.1-a). Legal Deposit no. 437518/18 **Publication:** Bi-monthly **Print run:** 383 copies **Printer:** Sprint, Impressão Rápida, Lda. **Distributed free of charge**



# 08



# We are for paper

We are for the smell, the texture, the weight, the feel, the sound it makes when we handle it. We are for folding down the corners, making notes in the margins, and leaving inky fingerprints. We are for writing love letters that bring on a blush. We are for flowers pressed between the pages of a book. We are for the tears that mark forever the letter from a much missed distant loved one. We are for the trees planted for paper. For the way it helps people to learn. For the natural alternative to products that damage the environment. We are for the promise of an empty page, ready to record indelible memories and precious experiences. We are for the folds, the stains, the crumpling, the marks, and the creases of an incredible journey.

We are for paper. Paper as a medium. Paper as object. But also, paper as a place. A place of calm, full of wisdom, entertainment, history, magic, sensations, and emotions. A place that is always waiting for us, with unique possibilities.

Join us on this journey through the wonderful world of paper. ♦



# Paper will be part of the future

Invented 2000 years ago, paper is now finding its place in an increasingly digital world. Lightweight but strong, paper is reinventing itself with success, at the same time as scientists point to its advantages for learning. To bear witness to its versatility, timelessness, and fascination, we talked to people for whom paper is essential for what they do. For working, thinking, taking time out or creating.

**S**ince the earliest times, men and women have set down their memories in writing or drawing. To do this, they invented a great variety of media. In India, people used palm leaves, in China, books were made from tortoise shells, eskimos used whalebones and the teeth of seals, and the Maya stored their knowledge on the bark of trees.

The most famous raw materials, and those closest to paper were papyrus (from which the word paper derived) and parchment. Papyrus was invented by the Egyptians, and the oldest specimens date from 3500 B.C. It was made from strips cut from inside the stem of the papyrus plant, which grows abundantly in the River Nile. The strips were then overlaid at right angles, moistened, hammered out and glued together. After the Arab invasion, papyrus was replaced by parchment, which is stronger. Made from animal skins (general sheep, goats, or cattle), soaked in lime and then stretched smooth, parchment (the word derives from the ancient city of Pergamon) was widely used in the Middle Ages.

## Invented to order

The invention of paper is attributed to a Chinese court official, Tsai Lun, in 105 B.C. According to legend, the emperor, Chien-chu, fed up with writing on silk and

bamboo, ordered Tsai Lun to invent a new material for writing on. Tsai Lun came up with a substance made from the fibres of mulberry bark and hemp rags, adding water, and beating it until it formed a pulp. When laid out in the sun, and thin layer of this pulp dried into a sheet of paper. Kept secret by the Chinese for almost six hundred years, the basic principle of the process is the same as that used to this day.

Paper manufacture was gradually perfected by the Chinese, and then spread rapidly through Central Asia and India. When the Arab powers expanded eastwards, they came into contact with this new material and set up paper mills in several cities, using almost exclusively rags as the raw material. In Europe, the first paper was produced in Italy and Germany, and the industry soon spread and manufacturing improved. Under the influence of the Reformation, and with the expansion of printing, the increase in production from the sixteenth century onwards led to serious shortages of raw materials and new regulations for the rag trade.

## Inspired by wasps

In 1719, the French entomologist René Réaumur observed how wasps chew wood and use the resulting paste to produce a substance similar to paper in building their nest, inspiring him to suggest that wood be used in the industry instead of rags. But it



Invented 2000 years ago, paper is an irreplaceable part of our lives, even in an increasingly digital world.

was only in 1850 that a machine was developed to grind wood and extract its fibres, which were separated and processed into what became known as mechanical cellulose pulp. A few years later, another process was discovered in England for producing cellulose pulp by treating wood with chemicals, resulting in the first chemical pulp, as it was known.

From the outset, Portugal was at the forefront of European paper manufacture; Leiria and Braga were known to be centres of production on the early fifteenth century. In the second half of the twentieth century, Portugal became a global pioneer by producing bleached eucalyptus pulp, using the innovative kraft process (chemical separation of wood fibres using the sulphate method). This landmark achievement took place at the mill in Cacia, owned by Companhia Portuguesa de Celulose, today part of The Navigator Company.

Thanks to the sue of wood, paper when from being a luxury item, produced to high quality standards but in small quantities, to being an affordable, mass produced article. And it became the naturally sourced, renewable, biodegradable and recyclable product we know today. ♦



## Life alongside digital media

**L**ightweight, permeable, strong and recyclable, paper quickly established itself as the prime medium for written information and as a raw material for receptacles and packaging, as well as many other uses. However, with the arrival of the hi-tech world, this natural material is now searching for a new role, at a time when, for many people, letters have been superseded by emails, newspapers are read online and e-books have taken the place of printed volumes. But has swiping a screen forever replaced the act of leafing through pages? It turns out that things are not so simple...

Electronic devices and digital information have reshaped our gestures and behaviour. This new world is for many the only world they have ever known: post-Millennials, or Generation Z (those born from the mid-nineties through to 2010), are known as digital natives, the first generation to have grown up with internet access, tablets

and smartphones, using technology to communicate, study and work, and also to access information, share files, photos or videos.

Even so, paper has held its own, with fans of all ages who, as well as feeling its emotional tug, as we explore in this issue, are unwilling to swap the sensation of turning pages for the touch of a screen.

At the same time, new uses are being found for paper. In communication, artificial intelligence and engineering. One example is that of paper electronics, a completely new technology, first invented in 2008 at Universidade Nova in Lisbon, where researchers came up with the idea of making micro-electronic components - such as transistors, memory devices, batteries and gates - out of paper, instead of the traditional silicon. The potential is huge, the costs are lower and perhaps the greatest attraction is sustainability. ♦



## Better for the brain



**O**ne thing on which more and more scientists agree is that, when it comes to learning, paper is far superior to digital media. Several research projects have looked into this issue, and their findings make for interesting reading.

For example, a study by the University of California estimates that readers of paper books learn fifty per cent more new words than readers of the same works in the e-book format. The same findings show that children who are encouraged by their parents to read books start to form full sentences earlier than those who just watch TV.

Another study, by the University of Valencia (you can read more about this starting on page 18) has provided proof of paper's advantages for reading comprehension. The researchers report that when we read on paper, we have a better understanding of what we are reading, and that this difference is particularly great in children. They explain this as being due to a "more superficial style of processing" when we use digital media, as well as possible failings in our ability to pay attention. In Sweden,

researchers had already observed something similar: turning the pages of a book helps us to understand what we read and to memorise details, whilst online readers tend to push ahead, even if they have failed to understand something, because they are too lazy to look up and down a text until they find a particular passage.

But there's more. Other research by the University of Sussex, in the United Kingdom, shows that reading books can also help you relax, because it stimulates the production of dopamine and endorphins (whilst TV stimulates stress), at the same time as helping to preserve your memory and promoting neurological and emotional development. In addition, children who write letters on paper have their brains more intensely activated than those who type letters on a computer, using a keyboard.

Despite appearances, paper and digital are not mortal enemies. An accommodation between them is not just inevitable, but desirable. There will be more and more technological solutions to help in our daily lives, but paper continues to offer unique and, in some cases, irreplaceable advantages. ♦

## “Paper will always be used in the classroom”

**Carla Fernandes**, a primary school teacher with thirty years' experience, has no doubt that paper will always be the best medium for writing in the classroom. This is because it is uniquely able to facilitate reading, writing and experimentation. One of the great advantages of paper for primary school learning is for children to practise their handwriting, "because this trains our motor skills in drawing the letters, and also develops our visual literacy".

## “Books will survive on paper”

**José Prata**, chief editor for the Lua de Papel imprint at Leya, a Portuguese publisher, believes in the future of books on paper. Personally, he can't do without them, calling them "intelligent company": "Whenever I read just for pleasure, I have to feel the physical object." Hence the great care he always takes, as a publisher, in the "choice of materials".



Ana Paula Gonçalves, craftswoman

## “Art is what saves us”



**B**icho de Papel is an urban craft project in progress but, as she told us, “it’s an idea I’ve been hatching for a long time”. It all started with a drawing teacher, in the classroom in Mozambique, where she lived until she was fourteen. “We were working with strips of newspaper that we would soak in buckets of watery white glue. We would then build up forms on gigantic wire figures, and then paint them in bright colours, using them to decorate the classroom and the school corridors,” she recalls. This gave her the basic idea. “So now I still use strips of newspaper, but I’ve gradually perfected a recipe for paper pulp that I use for a lot of the sculptures and objects I build”.

Her materials are any waste she can get her hands on, the environment is one of her great concerns. Ana Paula Gonçalves and her husband periodically organise expeditions to collect waste cardboard and paper around Marinhas, the

small town where they live in Portugal’s Ribatejo region. The paper and cardboard is sorted and cut up, and a significant part of its processed into papier mâché, used to create her sculptures.

Each piece is imperfect and unique. “I’m not interested in perfection and a faultless finish. What interests me is the organic process of the artisan,” she says. They can be sculptures of animals, cups, plates, vases, figures... but they’re all “different pieces”, each one tells a story, “and each wrinkle or imperfection is mark of the hands that shaped them.”

### An emotional lifeline

The idea, she says, “is to brighten up my house, or someone else’s house. I agree with what Victor Hugo said: ‘The beautiful is as useful as the useful’. Maybe even more so”. In reality, Bicho de Papel is about much more than producing decorative objects. It ends up being a form of recycling and, above all, a

“coping strategy”, she tells us. “The combination of the crisis in work, lots of free time and high levels of anxiety have created the perfect conditions where I urgently needed to do something to cope with the anguish created by this pandemic,” she told us, adding that “it started spontaneously, but has increasingly gained form and structure”. She lives in the country, has a studio in the garden and room to indulge this “fanciful escape”. All this came together to produce Bicho de Papel.

Having studied sociology and psychopedagogy, she works in behavioural training, a job which can be demanding and mentally very intense. She knows from personal experience that “we all need other channels of expression in addition to verbalisation, which is overvalued.” She became aware of this very young. Smiling, she says this is perhaps why “since childhood I have needed to doodle, make drawings and smell the paper... it’s my favourite scent!”. ♦



She makes sculptures from paper and cardboard she finds in the rubbish, objects with a “special meaning”. A way of escaping to keep the brain elastic, and to cope with uncertainty. Because, **Ana Paula Gonçalves** say, “one way or another, art is is a lifeline”.

Patrícia Alves, illustrator

## “Paper makes illustrations more real, more authentic.”

**A**fter training in equipment design, Patrícia Alves (her artistic name is Bolota, or acorn) started to work with an illustration studio and discovered what she truly wanted to do.

“I’ve always had a relationship with paper,” she told us. “I always need to put things down on paper to sketch, draw, write, erase, cross out, underline, build... As if the ideas only came to life on paper”. As an illustrator, she went on, “I started to use paper even more, with a lot of sketches and studies.”

When she moved into professional illustration, she started to use a computer. “At the time, I was doing a number of school textbooks and the kind of illustration I did was suited to using the computer as a tool. Almost always, I would first draw it on paper and then colour it in on the computer, which made a lot of the work much easier,” she says.

She admits that computers have the advantage of “having the raw materials included”. For example: “You can do illustrations on a computer today that look like watercolours, acrylic, pastel or charcoal, you can use textures and transparencies, filters, etc.”. But for Patrícia Alves this will always be “just another tool”. On paper, she explains, “the process is completely different. You need more time to think about what you’re doing, you have to choose the type of paper, try out the lines and colours, and you have to do it again when you make a mistake, and sometimes improvise”.

It takes longer, but it’s more real, and more rewarding. “In the end,” she stresses, “you get something with more identity, with its textures laden with charcoal lines and layers of ink.” This is what perhaps prompts her to say “paper makes illustrations more real, as if they had a life of their own.” ♦



Designer and illustrator, **Patrícia Alves** always needs to “put things down on paper” in order to draw, write, erase and build. In the end, she says, “paper makes illustrations more real.”





**Luís Gomes, antiquarian bookseller**

## “A book tells a lot of stories”



An antiquarian bookseller for 30 years, **Luís Gomes** cannot imagine a life without books. This fascination for paper is shared by many.

**F**ive years ago, Luís Gomes moved his legendary bookshop Artes & Letras, from its premises on Rua da Misericórdia, in Lisbon, to Livraria Adega, in Óbidos, a Unesco Creative City of Literature. With more than twenty thousand titles on public display, he also has a full warehouse, a personal library and books in every room of the house. “It’s hard to live with books, but much harder to live without them,” he smiles.

Books are his passion. These are unique and valuable specimens, for the different stories recorded in them, and as objects in themselves. “A book tells us many stories: in the binding, in the notes they contain, in the signatures, the way they have been well or badly treated... And then there’s the smell, touch, the spine”, he says.

Over the years, Artes & Letras has served a host of authors and intellectuals. Some of the best known of these made a lasting impression on Luís Gomes, such as Luís Pacheco, Herberto Helder, Mário Cesariny, Agostinho da Silva, Mário Soares and Raul Rego. But most of all it has been the great book-loving public who have sought out the shop, people of whom he still has “happy memories”. Like the tram conductor who, whenever he could, would “stop his tram to drop into the shop and see the latest books or collect something he had ordered”; or the fishmonger, who “started to go there to find things about his home region, and ended up with an excellent collection of Portuguese first editions.” The love for books, he says, “is something found across all of society”.

### **Learning to read... in the bookshop**

His interest started very young. “In Santa Catarina, the Lisbon *bairro* where I was born, there was a very friendly antiquarian bookseller. Daniel would set me up with two stools, one

higher than the other: one to sit on, the other to put my books on. The least valuable books were on the lower shelves, where I could reach, and I would spend hours in there looking at the books on zoology or National Geographic,” he remembers. That was how he learned to read.

He grew up surrounded by books. He later used his own library to open a bookshop on Largo Trindade Coelho. “Books have never been a business for me. What I liked was to buy books, give them as presents and read them,” but as this was an expensive taste, “I found a compromise solution between selling books to survive and to be able to continue living surrounded by books”, he explained.

He cherishes all the books with devotion, even those he has not read. “I have books I haven’t read, just as I have books that I won’t sell”. Special books, that he preserves religiously, either because the typeface used tells a story or else because they point to hidden memories. “One of those that means a lot to me - and that I won’t sell - has a flyleaf dedication by António Feliciano de Castilho, who was blind. It’s fantastic, it still has the power to move me”.

But there’s a lot more than dedications. There’s an almost mystical attraction. “There are people who come into a bookshop just to look, smell the books, or simply to see if a particular spine calls to them, captures their attention. I would leave the bookshop every day with a story to tell, every day I would learn something. And if I didn’t, it would be a sad day.”

Despite the dwindling number of customers, Luís Gomes does not expect books on paper to disappear: “Books will endure as a cult object, a luxury. As a vehicle for culture of some kind. They’ll be the connoisseur’s information article”. ♦



Maria Inês Guilherme, author of the blog Mais Tinta & Papel ("More Ink & Paper")

## "Paper can take us out of ourselves"



**Maria Inês Guilherme** writes a blog that reaches out to the community of paper lovers, and has got to know a host of people who value the art of writing by hand. Paper, she says, helps us "to be creative and to stop for a moment".

**M**aria Inês Guilherme, a 30 year old marketing and media graduate, is passionate about stationery. She is unsure how or why this came about, "I was maybe born with it", she says. She clearly remembers "being happy in the midst of notebooks, pens and pencil cases". Her blog, More Ink & Paper, started up on 8 December 2015, aimed at stationery enthusiasts.

"The idea was to turn the spotlight on Portuguese stationery brands, and to create a community of paper lovers," she tells us. She had stumbled on a surprising world. There was everything from notebooks bound using sewing machines to conceptual stationery, articles with original illustrations or plain notebooks with jokes on the cover. She discovered luxury articles, in natural and pastel shades, as well as "the purest, uncompromising minimalism." Notepads "so irresistibly stylish and elegant that they take on dreamlike quality, but with real feelings and life experiences."

Her journey into this world of objects, brands and people brought her some big surprises, but also some

curious stories. Like an email from a young man, "asking for help in choosing a diary for his girlfriend". She is often approached for advice. "I get lots of messages asking me to suggest specific items of stationery."

### Unfilled notebooks

So where did she get this fascination for paper? Maria Inês maintains that "it's impossible not to feel something for a notebook". Because, she explains, "paper is able to grab our attention and leave our worries behind". And that's not all. "Paper helps us to be more creative, to plan things better and to stop for a moment - It makes us stop to

change to a different pen, to move the bookmark, to feel the paper, to choose colours and to change pencil case".

She loves paper so much that it's hard to choose and start on a new notepad. Most of them she never writes in - "they're far too beautiful for my handwriting". When she takes the plunge and writes, she always leaves a few blank pages - "it's like I'm reluctant to start writing in certain notebooks, they're so beautifully made and exceptionally well designed". She makes no bones about how strongly she feels this: "stationery gives me butterflies in my stomach". ♦



João Freire Aragão, architect

## "Paper helps me think"



**H**e started to work at the age of nineteen, while still a university student, and has always used paper. "It's a very important tool for the working process. When I want to 'see' quickly how something I'm working on will turn out, I always use a quick sketch on a sheet of paper".

He went on, "it's also important as a tool for communication", and explained: "A quick sketch can be a way of showing something to a colleague, to a client at a meeting or to a contract on a building site".

But in his profession, "computers and paper always work hand in hand", he acknowledged. When he is

starting on a project, he uses the computer, because, he explains, "I have to set out the plans to scale, and then print them out and start to work on them by hand". This digital-paper alternation can be seen throughout the process.

### A truer relationship

He remembers that, at university, even after learning to do certain things on a computer, he had to do them by hand, on paper. "It was important to instil in us a working process based on drawing by hand, for us to realise how important it is".

By way of example, he says: "When I'm working on plans by hand, as well as being careful about every detail I put down, I start to develop

a relationship with the scale and the proportion, which is much more conscious than if I did the whole process on the computer. On the screen, you can change the drawing scale, I'm always zooming in and out, to look at something. But on paper, we have to have a much truer relationship with the scale, because it's something static and immutable".

This young, 24-year-old architect tells us that although "all the drawings and other final designs in architecture are all done by computer these days", there is one area where paper remains fundamental: for thinking. "Where technology can't substitute paper, is for the process of thinking about architecture", he stressed. ♦



**João Freire Aragão** uses paper to make a quick sketch, to print out the plans or to see the end result of his design work. But in architecture, he admits, technology now leads the way. Except for one thing: "thinking about architecture".



# The place of paper in a digital world

As technology evolves and becomes more accessible, e-readers and tablets have gained in popularity. But science suggests that reading on paper offers unique advantages, impossible to find on a screen.

There are people whose days alternate between long hours of work in front of a computer in the office, and lounging on the sofa reading books and magazines at home, eager to keep technology at a distance during their leisure time. And other people who love the convenience and portability of their tablet or kindle, taking them out on public transport and during lunch in the canteen, but still sigh at the smell of a book and the feel of paper. And there are those who only read on electronic devices, and feel their arms starting to ache just at the thought of the one thousand or more pages of War and Peace.

However people feel about this, there is one question worth asking all of them: how does the medium we use to read change the way we read? Whilst it is true that, as digital technologies become ever more dominant, we are learning new ways of reading, do we still read with the same concentration and attention to detail? Do our brains respond differently to a text on paper or on the screen?

A great quantity of ink has been expended on the issue, by researchers around the world. To analyse all the studies in this area would be complex, not least because, for those of us without special scientific expertise, it might leave us even more puzzled. Luckily, a team with just the right skills has done this for us.

The Reading Unit at the University of Valencia, in Spain, led by Pablo Delgado, Cristina Vargas and Ladislao Salmerón, of the Faculty of Psychology, assisted by Rakefet Ackerman, of the Israeli Institute of Technology, has analysed more than 1 840 scientific articles on this subject. They then selected and conducted a detailed analysis of 54 studies which allowed for a statistical comparison on the basis of stable and relevant criteria.





**"I can't imagine my work without digital tools and texts. All the same, if I need to, or if I just want to close the door to the world to concentrate on a text for a long period of time, I prefer paper. And in that respect I'm not the exception, but rather the rule." Pablo Delgado**

The sample in the meta-analysis they undertook included more than 170 000 participants in 19 countries and five continents. They concluded that reading comprehension is better when we read on paper than when reading on a digital device. Their findings were set out in a scientific article entitled "Do not throw away your printed books: A meta-analysis on the effects of reading media on reading comprehension", published in the Journal of Educational Research Review, and can be read using the QR Code on page 22. To clear up any doubts we may have, we spoke to Pablo Delgado, of the Department of Evolutionary and Educational Psychology of the University of Valencia, one the authors of the study, and asked him to give us the low-down.

#### The physicality of reading

We started at the beginning, to understand how the brain interprets written language. From a layman's point of view, when we think about reading as an activity, we think of an abstract activity in the brain, connected to ideas and the interpretation of tone, motives, metaphors... But the truth is that, for our brains, texts are a tangible part of the physical world in which we live, and so it regards letters as physical objects.

"The neural networks that recognise letters are those which originally developed to recognise objects", confirms Pablo Delgado. "In reality, letters consist of basic shapes that we can find in objects, in other words, straight lines, curves and angles". However, he goes on, "this is something

that underlies the most basic part of the decoding processes on which reading is based, and there's no reason to think that we do this differently depending on the medium in which we read. Instead, the hypothesis is that the reading medium affects comprehension processes at a higher level, making us slower to process information".

#### A question of attitude?

There are two main hypotheses that seek to explain the possible differences between reading media, in which paper comes out on top. The first is the tactile hypothesis, which is based on the idea that cognition is embodied in, and so based on the way we interact physically with the environment around us and with the physical objects involved in cognitive processes. "This says that the



way we interact physically with texts on screens is very different from how we do this on paper. The idea is that, when we hold a book or a magazine, when we turn the pages, our visual interaction with this object may benefit the cognitive processes involved in reading, such as, for example, developing the mental representation of the plot of a book", explained Pablo Delgado.

Then there is the hypothesis of superficiality, which is based on the idea that the way we normally interact with texts in digital contexts is shaping the way we read. We are talking here not about physical, but cognitive interaction. "This idea", explains the specialist, "was proposed by Nicholas

Carr, in *The Shallows*. This author is a writer, not an educational researcher, and he based this on subjective impressions. But the assumption is that, when we read on screens, especially online, we're used to reading short pieces, we skim through them, we're distracted by links, we jump from one text to another... In addition, we normally use our digital devices to do several different things (read, check our social media accounts, look for music...), which also affects how well we perform in the task of reading. This type of interaction might be creating reading habits characterised, for example, by a reduction in attention span and immersion in the text, which would cause information to be processed more

superficially. Adriaan van der Weel [a researcher at the University of Leiden, in Holland] refers to this as 'a zapping attitude to text', and some research findings appear to support this idea".

#### People learn better with paper

Context is relevant to how readers approach the task of reading: their aims, the level of comprehension they need to achieve, and so on. For this reason, Pablo Delgado explains, given the hypothesis that, when we read on screens, we create highly consolidated reading habits, which get in the way of deeper processing, what happens is that we activate that cognitive scheme when we are faced with texts on the screen. In other words, "it is not the medium itself

**When we read on screens, especially online, we're used to reading short pieces, we skim through them, we're distracted by links, we jump from one text to another... This is called the "zapping attitude to text".**



that influences how the brain reads, but rather how the reader is used to reading in each medium”.

The result is that reading and learning on screens appears to lead to less successful results. “There is more and more evidence for that”, explains Pablo Delgado. “Not just the meta-analysis we recently conducted in our research group, but another two published almost at the same time found comprehension to be better overall when we read on paper. It appears that reading on screens hinders comprehension most particularly when the task requires additional cognitive effort, such as reading descriptive or factual texts, or when the reading situations requires time management.”

Of course, researchers who look into these matters will also find studies which identify no differences between the media. But as Pablo Delgado explains, “when differences are found, they are consistently in favour of reading on paper”.

#### No such thing as “digital natives”

Contrary to what we might imagine, research has suggested that the disadvantages of digital media have actually increased over time, indicating that the drawbacks of digital are not disappearing in younger generations. Pablo Delgado explains that our relationship with screens and digital tools is fairly complex and that we are just beginning to understand it: “In the case of reading, the idea is that the more we read on screens, the more of an obstacle effect it has. So this effect would today be greater than fifteen years ago.

For now, we have seen that digital devices are not always suitable for reading and learning, and younger generations do not appear to overcome this effect”.

This sets aside the idea that, in these matters, the brains of generations who were born into a digital world function differently. “The term ‘digital natives’ was coined by Prensky almost 20 years ago, but subsequent research evidence has shown that those young student who are really good at learning through aleatory access to information, who learn better in digital environments, who are really good at multitasking... they don't exist”, says Pablo Delgado. “Some studies show that recent generations are not especially well equipped with good strategies for digital learning just because they grew up surrounded by digital technology. The existence of ‘digital natives’ was based on the idea of different ‘learning styles’, which is also considered a myth by educational researchers. Indeed, Prensky himself suggested, some years later, that it is better to use the term ‘digital wisdom’ rather than ‘digital natives’.”

Future research will continue to shed light on this rivalry between paper and digital as regards reading comprehension and learning. What is clear is that the history of paper is one of resilience, and that it still has much to give us. ♦

Read here the findings of the University of Valencia's meta-analysis.



**Recent generations are not especially well equipped with good strategies for digital learning just because they grew up surrounded by digital technology.**



## “Paper is time, a moment, respite”

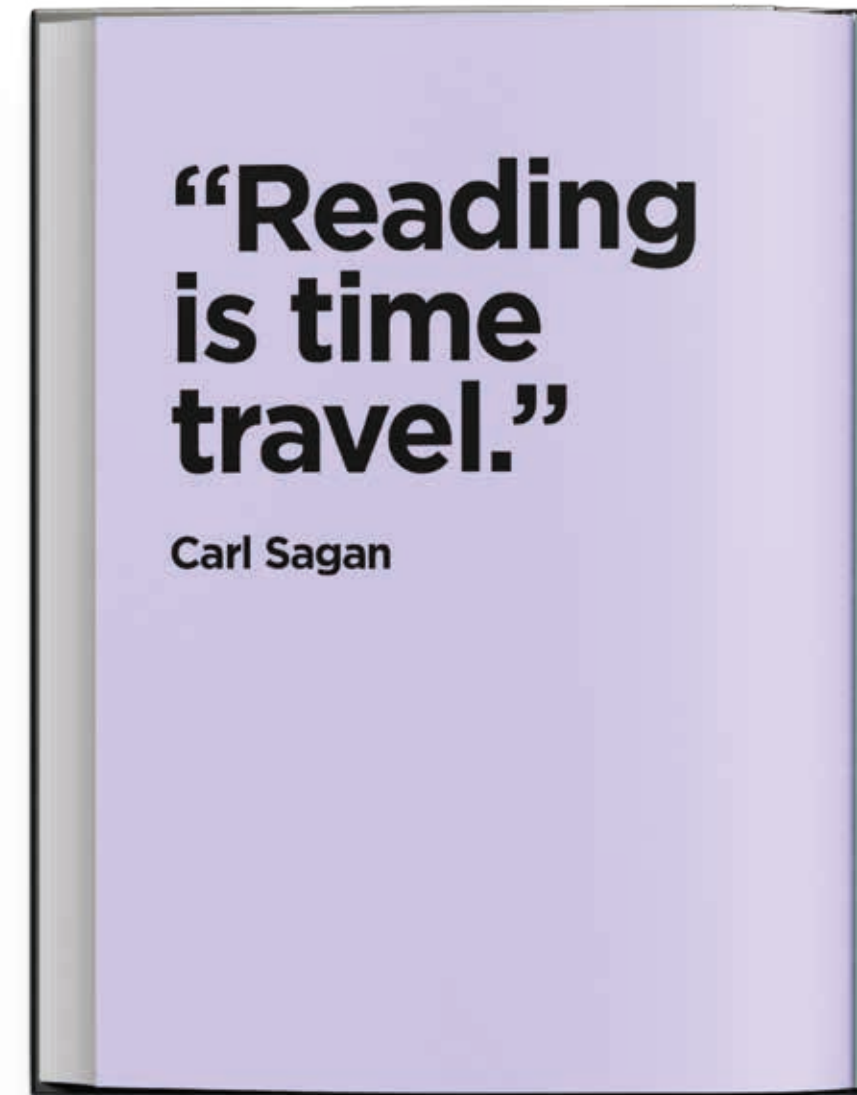
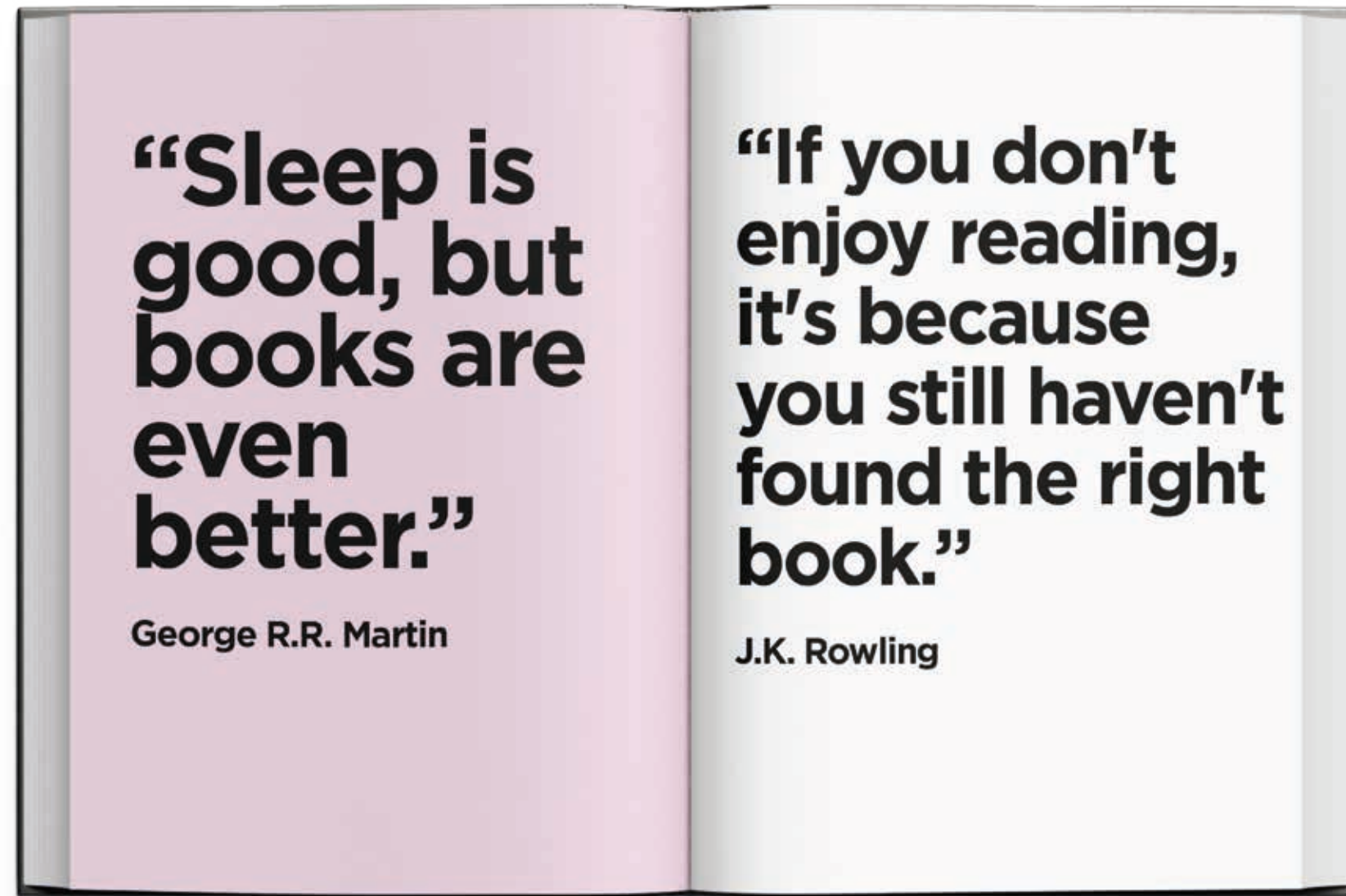
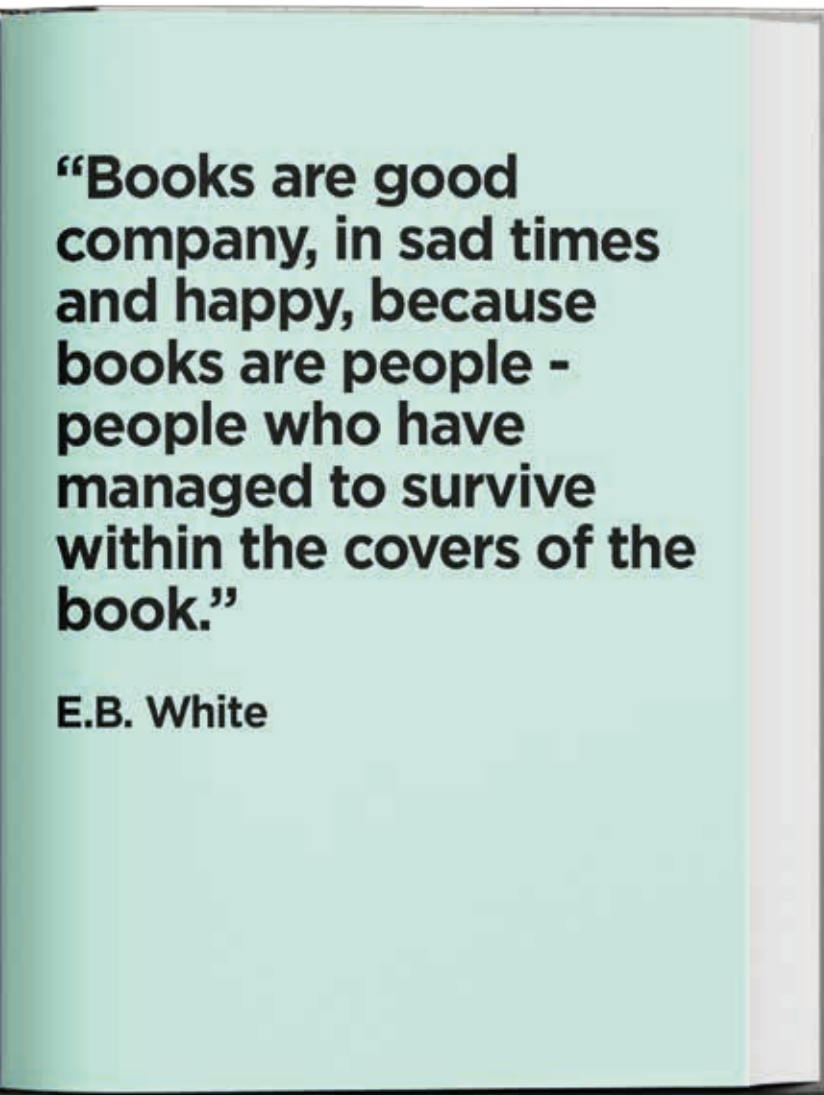
The differences in reading comprehension between paper and digital also point to differences when we want to communicate in one medium or the other. Pedro Bidarra, who has long experience of advertising in Portugal, has no doubt about this: “It's more difficult to engage people through digital media”.

“Advertising messages are constrained by the medium in which they are placed. There are significant differences in how you write and get things across, that have to do not just with ‘size’ but also with people's attention span”, explains Pedro Bidarra.

“Engagement - the advertising expert stresses - is more difficult to achieve in digital media, because people don't stop to assimilate messages, they jump around, they concentrate less, they're more restless, and this is not compatible with reading slowly and in depth.”

Of course, it all depends on the message we want to convey: “Once we're created the concept for a campaign, it then has to be dramatised in accordance with the instruments offered by the different media. It has to be adopted to the constraints of the medium in question”, added Bidarra, who concluded: “In advertising, the medium depends on the message we want to get across and who we want to get it across to. Paper is time, a moment, respite. That means it allows us to say other things, to go deeper, to build a brand.” ♦





## Journey through the senses

I love the inky smell of books in the morning", Umberto Eco used to say, paraphrasing Robert Duvall's famous line in "Apocalypse Now". And the Italian writer was not alone in his sensory delight. Liking the smell of paper, and of books in particular, is something that most of us identify with. Science can tell us why.

Researchers at University College London carried out an experiment<sup>(9)</sup> to determine how participants classified certain smells, including that of books. Without knowing what they were smelling, more than a third of the volunteers described the smell of the

book in question as reminding them of chocolate. Coffee was the next most frequent response.

The findings came as no surprise to the researchers because, strange as it may seem, chocolate and coffee have some of the same volatile chemical compounds as paper. This is how the smell is produced: through chemical substances dispersed in the air (of differing physical and chemical composition and structure), able to stimulate the receptor cells in the olfactory bulb. Curiously, when invited to identify the smell of a room full of books, in the

library of St Paul's Cathedral in London, the participants steered away from chocolate shops and cafés. They all said the library smelled of wood, and most described the aroma as smoky and earthy.

In this study, the book that the participants smelled was old. Some people prefer this smell, but others are drawn more to that of a brand new book. The smell of new books can be attributed to three factors, as we can read at [www.scienceabc.com](http://www.scienceabc.com): "the paper itself - which has a smell due to the products used in manufacturing it -, the ink with which it was printed, and

The touch, smell and sound of turning pages, the texture under your fingertips. Paper engages all our senses, forming a strong emotional bond.

the glues used in the binding process".

**Feel it, see it, smell it, hear it**  
"We assess the world using all our senses - with vision, our senses of smell and touch, and through sound", says the journalist and writer David Sax.

And "who" better than paper to engage all our senses? When we reach for a book, or when we slowly turn the pages of a magazine, in addition to everything we see, we can also feel, hear and smell the physical "incarnation" of the content. This is also what David Sax argues in his book "The Revenge of Analog: Real Things and Why They

Matter", a mix of psychology, sharp observation and reporting, in which the author seeks to show that, on the road to a digital utopia, we have started to fall in love again with the analogue products and ideas that technology gurus insisted we no longer needed.

For David Sax, it has everything to do with the real world and tangible things. "Analogue experiences can offer us the type of pleasures and rewards of the real world, that digital experiences cannot", he says. For instance: pen and paper give writers and designers a direct means of sketching ideas, without the propensity of software for

complicating things; the pleasure of a fountain pen scraping quickly across the silky-smooth lined sheets of a notebook; the slow magic of a Polaroid revealing itself before our eyes; the satisfying snap from turning a page in a newspaper.

This is why, in what he calls the "revenge of the analogue", businesses that appeared outdated are reviving, and notebooks, notepads and writing paper are again in fashion.

"Reality is multi-coloured", says David Sax, "with infinite texture and emotional levels". Just like paper.



“A great book should make us live many experiences and leave us rather exhausted at the end. We live several lives when we read.”

William Styron

“I always imagined that heaven was a kind of bookshop.”

Jorge Luis Borges

“Happiness. It’s what book smell of.”

Sarah MacLean

“Books are portable magic.”

Stephen King

## As the keeper of past memories and our plans for the future, paper is our oldest friend.

### Awakening emotions

It is precisely because it creates this tactile and real interface with the world that paper triggers emotions.

At one time or other in our lives, we have all felt this for ourselves. When we print out the dissertation that we have worked on for months and at last feel the physical embodiment of our hard work, the weight (literally) of words in our hands. When we find the invitation to our best friend’s wedding in the post. When a colleague leaves a note to thank us for helping with a task.

Paper allows us to hold in our hands the

physical embodiment of an experience or memory, which would otherwise be intangible.

Joint research by Temple University and the United States postal service<sup>(2)</sup> analysed people’s emotional responses to reading on paper and on digital media, measuring their heart beat, sweat, movement and breathing. Paper documents consistently caused a more substantial emotional response.

Another research project, by the Royal Mail<sup>(3)</sup> in the UK, which included a neuromarketing component as part of a wider study of post, also found

that physical post elicited stronger responses in terms of engagement, emotion and memory, when compared to email and television.

The part that analysed emotional responses is suggestively entitled “Mail in the heart” and one of its many conclusions pointed to the power of touch. On the one hand, people value things they can touch (24% more than something they can only see). On the other hand, they feel more emotions, with 38% of respondents saying that the physical properties of the post influence what they feel for the sender. The Royal Mail points out that, in the videos,

participants spoke openly about how the layout and quality of the paper affect how they felt in relation to the sender.

Dealing with physical items, with different textures, also changes the way people describe the item: talking about physical post and about paper, participants used more words and were more animated and creative in the way they described them. The words used were more emotional and less functional, with an emphasis on the

sensations these things caused them.

Because trust is also an emotion, it is worth mentioning that research by MarketingSherpa<sup>(4)</sup>, focussed on the US market, found that 82% of internet users said they had more trust in printed advertisements. With the advent of fake news, and in an increasingly less trustworthy world, paper transmits greater assurance because, in the respondents’ opinion, of the ease with which opinion is

presented as fact in digital media. We measure the world with all our senses, and paper is able to engage them, one by one. It is through the senses that it plays with our emotions and finds its way into our hearts.

If it were a friend, paper would be someone warm and complex. A friend bursting with contagious enthusiasm about the future, but with a wonderful memory for the past. A trusted friend, who would stay with us for life. ♦

(1) Smell of heritage: a framework for the identification, analysis and archival of historic odours (<https://heritagesciencejournal.springeropen.com/articles/10.1186/s40494-016-0114-1>); (2) Enhancing the Value of the Mail: The Human Response (<https://www.uspsig.gov/sites/default/files/document-library-files/2015/rarc-wp-15-012.pdf>); (3) The Private Life of Mail: Mail in the Home, Heart and Head (<https://www.royalmail.com/sites/default/files/Royal-Mail-MarketReach-Private-Life-of-Mail.pdf>); (4) Print Is Still the Most Trusted Type of Ad (<https://www.inma.org/Business-Intelligence-and-Research-Platform-for-News-Media/dni-projects-detail.cfm?wo=27>)



## Where books live

For booklovers, few places are as inspirational as libraries, where the wooden shelves display line after line of books of different shapes and sizes. All libraries are wonderful, but there are some whose physical beauty puts them in a class of their own, making them irresistible.

**T**o lose oneself in halls lined with books, smelling the paper, lingering over the spines, anticipating all the knowledge contained inside - this is many people's idea of heaven. The almost religious silence is intoxicating. Broken from time to time by the sounds of pages turning, it offers us a reinvigorating mental retreat.

As institutions dedicated to preserving, cataloguing, protecting and organising books, libraries have an intrinsic beauty that never fails to fascinate. But there are others which, in addition to their inner splendours, are also

architectural triumphs, to be enjoyed as works of art in their own right.

Opinions of beauty differ, and so there are as many online listings of the world's most beautiful libraries as you care to look for. But because at #MYPLANET we can never resist a good book, we have taken our inspiration from that of the Italian photographer, Massimo Listri, who travelled the world to take pictures of the finest libraries. "The world's most beautiful libraries", published by Taschen, is an astonishing photographic journey, abounding in tiny, satisfying details. We have chosen five of the libraries photographed by Listri to share with you. ♦

### Royal Portuguese Cabinet of Reading

*Rio de Janeiro, Brazil*



Built by Portuguese expatriates in the nineteenth century, this library is home to more than 350 thousand books, and boasts the largest collection of books in Portuguese outside Portugal. There are four storeys of books, held up by extravagantly sculpted bookcases, crowned by a magnificent chandelier and a stunning dome in blue and red stained glass.

### Admont Abbey Library

*Admont, Austria*

Located in the Austrian Alps, this is the largest monastic library in the world. It was opened in 1776 and houses more than 180 thousand works, including 1.4 thousand manuscripts and incunabula (works printed prior to 1500), as well as ancient volumes and original editions of rare works. The roof of the dome has paintings by the Austrian artist, Bartolomeo Altomonte, celebrating learning and faith.



### Johannine Library, University of Coimbra

*Coimbra, Portugal*

Named after the Portuguese king who had the library built in 1717: D. João V, the Magnanimous, known as a great patron of culture, science and the arts. It is home to many great rarities, such as a first edition of *Os Lusíadas*, a Hebrew bible, published in the second half of the fifteenth century, of which there are only around 20 copies in the world, the 48-Line Latin Bible (so called because it has exactly 48 lines to a page), printed in 1462 by two partners of Gutenberg. At night, a colony of bats helps to protect the books against insects.



### Library of the National Palace of Mafra

*Mafra, Portugal*



The library is 88 metres long, with marble floor, Rococo wooden bookcases and a collection of more than 36,000 leather-bound volumes. There are several rare works, including the collection of incunabula, the famous Nuremberg Chronicle (1493), as well as several bibles and the first ever encyclopaedia (compiled by Diderot and D'Alembert). It also houses an important collection of musical scores by Portuguese and foreign composers.



### Trinity College Library

*Dublin, Ireland*

Founded in 1712 as part of Ireland's oldest university, it includes the stunning Long Room, a hall 65 metres long in dark wood, where the 200 thousand oldest books in the library are on display. In all, the library has almost three million books, including the Book of Kells, an illuminated manuscript produced by Celtic monks in around 800 A.D., containing the four Gospels of the New Testament; on account of its beauty, excellent finishing and state of conservation, it is regarded by many experts as one of the most important relics of Medieval religious art.



# Trees are also grown from paper

The "trees that give us paper" are planted, harvested and replanted on a sustainable basis. That is why these woodlands are growing, in contrast to the global tendency for shrinking forests. Every year, the pulp and paper industry plants more trees than it cuts down.

If you are one of the 72% of people who, according to an international study conducted by Two Sides, prefer to read on paper instead of using digital alternatives, you are sure to have come across the slogans "Don't use paper" or "Save trees". However, the truth is that the production and use of paper is not causing forests to disappear. On the contrary: it is when demand for paper falls that the number of trees also declines, reducing the important positive impacts that forests have for mankind and the planet, from oxygen to drinking water.

Every year, the pulp and paper industry plants more trees than it cuts down: an average of five for every tree used to make paper, according to TAPPI (Technical Association of the Pulp & Paper Industry). This means that the sector helps to counterbalance the global tendency for loss of forests.

Figures from The State of The World's Forest 2020, published by the FAO (the United Nations Food and Agriculture Organisation), confirm this scenario. On the one hand, between 2015 and 2020, ten million hectares of forest were destroyed each year, due above all to the expansion of farming (extensive cattle rearing and cultivation of soya and palm oil accounted for 40 per cent of all tropical deforestation between 2000 and 2010, and local subsistence farming accounted for more than 33 per cent). On the other hand, the planting of new forests has grown, reducing the rate of loss of the total forested area: from 7.8 million hectares a year in the nineties, to 4.7 million hectares a year in the decade from 2010 to 2020.

In Europe, figures from the FAO's Global Forest Resources Assessment 2020 show that the





wooded area has expanded by 17.5 million hectares in the past 25 years. And in Brazil, from where we are constantly confronted with heart-breaking images of deforestation, Ibá, the organisation representing the planted forestry sector, tells us that each day the equivalent of around 500 football pitches are planted with trees for paper and other products; the industries that use these trees are responsible for conserving 5.6 million hectares of natural forests.

Worldwide, the FAO tells us that approximately 50% of all wood harvested is used as fuel, and more than 30% is processed for industrial uses such as construction and furniture. Only around 13% is used for paper.

**Forests, paper and the green economy**

When it uses raw material sourced from renewable forests, the cellulose and paper industry takes a leading role in what is called the green economy.

“Environmentally correct, socially just and economically viable forest management helps meet the needs of society without exhausting natural capital”, says the WWF (World Wide Fund for Nature), whose Forest Solutions Platform sets out some of the ecological and economic contributions made by the sector: trees used to make paper are planted primarily in areas previously degraded by arable and livestock farming, thereby helping to renew both the soil and biodiversity, the plantations are laid out on a mosaic basis, with conservation areas and reserves co-exist with forest plantations and rural areas, and this type of crop offers additional income for farmers, while having no impact on the production of food.

In addition, the impact of forests in the fight against climate change is indisputable. Trees absorb and store carbon dioxide, one of the main causes of the greenhouse effect, and produce raw materials for countless products that can substitute those derived from fossil fuels, such as petroleum, coal and natural gas.

As a renewable, recyclable and versatile material, wood is also fundamental for achieving the aims of sustainable economic development, through the circular economy, in which all waste from industrial processes is reused. Examples of this are biomass and ethanol, used to produce green energy, lignin, left over from producing pulp, which has applications in industries ranging from civil construction to the automobile sector, as well as in the food and pharmaceutical industries, and paper and cardboard themselves, which can be reused up to five times (recycling), thereby reducing waste and landfill pollution.

However, recycled fibres degrade once they are used several times, and so the paper industry needs a constant supply of virgin cellulose fibres. Where do these come from? Not from the woods where you have your picnic, nor from the natural park you know from your hikes. Indeed, more than 34% of the world's forest (covering 4 billion hectares, something like five thousand square metres per person) is still primary forest, regenerating naturally without visible human intervention, as reported in The State of The World's Forest 2020.

**The tree for the best paper**

Paper can be produced, basically, from two types of tree: conifers, such as pine or spruce, which provide long fibre, and from leafy trees, such as



eucalyptus, birch or acacia. After decades of research, from the 1970s onwards, cellulose from the eucalyptus species *E. globulus* (in the Iberian peninsula) and *E. grandis* (in Brazil) began to substitute birch pulp (from Scandinavia) in the European short fibre market.

Thanks to its better volume, opacity, flexibility and elasticity, the quality of short fibre makes it better for producing various types of paper, from fine papers (graphic and writing papers) to tissue, for home and sanitary use. In terms of yields, eucalyptus from the Iberian peninsula is also more efficient: to produce the same quantity of paper pulp, the volume of *E. globulus* wood needed is 70% that of birch or Brazilian eucalyptus. It also requires less chemicals for processing and bleaching, and less water in the industrial process, when compared with other forestry species.

Due to the climate and soil, Portugal enjoys a competitive advantage in the production of *Eucalyptus globulus*, which provides raw materials for the world's best-selling premium paper, under the Navigator brand. Indeed, the eucalyptus plant used by The Navigator Company in its forests represents the fourth generation in a genetic improvement programme, with yields 40% better than its ancestors. The commitment to sustainable management of the company's forests means that the raw material obtained from them is 100% certified and that plantations are planned to respect local biodiversity. Over the last year, in Portugal, Navigator replanted 3 141 hectares of forests.

That is why trees are also born from paper. ♦

Of all the wood felled around the world, only 13% is used to make paper.



## Paper or digital: which has the largest ecological footprint?

Digital has a larger ecological footprint than paper, because of the energy consumed in its use, the manufacturing process and the difficulties in managing electronic waste.

Someone spends the afternoon researching online in a library, surrounded by books. At first sight, it might appear that an online search is more sustainable than the many books arrayed on the shelves, but the truth is that the communications industry has a much heavier carbon footprint: it accounts for 3% of the world's greenhouse gas emissions<sup>(1)</sup>, as compared to just 1% of emissions produced by the pulp and paper industry and printing activities<sup>(2)</sup>.

This imaginary scenario also conceals another surprising reality: the library, with its shelves groaning under the weight of books, is an authentic reservoir of CO<sub>2</sub>, as the carbon sequestered by the tree during its lifetime remains in the wood, and consequently in the paper.

With wood as its main raw material, paper is a sustainable product from its origin, insofar as forests perform an important function in mitigating climate change, thanks to their ability to sequester carbon.

During photosynthesis, trees capture carbon from the atmosphere and release oxygen, and this is especially

significant in eucalyptus production forests - from which paper is produced. In reality, because this is a fast-growing tree, with high rates of photosynthesis, eucalyptus captures much more carbon than pine or cork oak woodlands: eucalyptus sequesters between 4 and 9 tons of carbon per hectare, whilst the same area of maritime pine woods retains between 4 and 7 tons, and cork oak savannas between 0.3 and 3 tons<sup>(3)</sup>.

### More woodlands and more sustainable industry

On a world scale, the area of forests has decreased over recent decades. But in Europe, the reverse has been true. According to the latest figures from the United Nations Food and Agriculture Organisation (FAO), between 2005 and 2020, European forests grew by 58 390 square kilometres, an area the size of Switzerland. This growth has been accompanied by an increase in carbon storage capacity, which according to the Global Forest Resources Assessment 2020 published by the same organisation, increased from 159 gigatons in 1991 to 172 today.

As underlined by the report entitled European Forest Ecosystems - State and Trends, 2016, from the European





Environment Agency, the growth of woodlands in Europe is due not only to forests naturally taking over abandoned farmland, but also to forestation policies, because most European countries require woodlands to be replanted after felling. This report also points to the increased focus on sustainable forestry management and on the protection of biodiversity.

The conservation of natural habitats and biodiversity conservation is moreover a commitment that the paper industry in Europe is required to make by law, just as it is committed to using only wood from sustainable forests.

In terms of the production process, paper has become more sustainable over recent decades. At present, the European industry obtained 60% of its energy from biomass, as is the largest individual industrial producer and user of renewable energies.

The same applies to water consumption; in Europe, 93% of the water used in the pulp and paper production process is returned to the environment after being treated<sup>(1)</sup>.

The use of toxic products has also been reduced. Over the past three decades, there has been a reduction of 95% in levels of AOX (measuring the toxicity associated with chlorine compounds) and of 77% in the quantity of oxygen consumed in the decomposition of organic matter.

When produced and used responsibly, paper is a sustainable way of communicating. ♦

## The less green side of digital media

**D**igital communication has taken over the world and it is hard now to imagine everyday life without computers, smartphones and a series of electrical appliances, both large and small. However, their increasing use places a heavy burden on the planet. The telecommunications industry is responsible for 2.5% to 3% of greenhouse gas emissions, a figure expected to rise to 14% in twenty years<sup>(2)</sup>. To this we should add the growth in energy consumption by digital technologies, which currently stands at an annual rate of 9%, fed by ever-expanding demand for digital content, which requires the creation of gigantic servers in order to store data. The projections are alarming: it is estimated that the share of greenhouse gas emissions attributable to digital technology will increase to 8% by 2025, a figure

comparable with the current share taken by motor vehicles<sup>(2)</sup>.

The difficulties posed by managing electronic waste (which includes end-of-life electrical and electronic equipment, ranging from mobile phones and computers to refrigerators and air conditioning apparatus) is another of the problems that adds to the carbon footprint of digital communication. According to The Global Waste Monitor 2020, published by the United Nations, the International Telecommunications Union and the International Solid Waste Association, in 2019 the world produced 53.6 million tons of electronic waste (around 7 kilos per capita), equivalent to the weight of 350 cruise ships of the size of the Queen Mary II.

With global consumption of

electrical and electronic apparatus growing by an average of 2.5 million tons/year, predictions point to annual production of electronic waste rising to 74.7 million tons in 2030. These are worrying figures, because of all the electronic waste produced last year, only 17.4% was properly collected and recycled, and it was not possible to determine how the remaining 82.6% was disposed of.

Recycling and processing Despite the low recycling rates, it is the wealthy nations that have facilities to process this type of waste, with 8% being incinerated. In the developing world, electronic waste is largely managed in the

informal sector, without specialist facilities. The consequences for the environment and for the population are damaging, because many of the devices contain toxic additives and hazardous substances, including heavy metals, such as mercury.

Failure to process electronic waste or incorrect management of this waste also contributes to global warming. According to The Global Waste Monitor 2020, the lack of processing facilities for these materials prevents the equipment from being reused as raw materials, meaning that new materials need to be mined and refined, resulting in greenhouse gas emissions. In addition, appliances

such as refrigerators or air conditioning units use gas coolants that contribute to the greenhouse effect. The report estimates that 98 million tons of CO<sub>2</sub> (around 0.3% of global emissions of greenhouse gases in 2019) were released into the atmosphere by refrigerators and air conditioning units disposed of without proper processing.

In contrast to this, the recycling rate in Europe for paper is 72%, according to figures from the Confederation of European Paper Industries (CEPI). This figure is very close to the theoretical maximum of 78%, and paper is recycled and reused an average of three and a half times. ♦

(1) Belkhir L. & Elmehri A., Journal of Cleaner Production, Assessing ICT global emissions footprint: Trends to 2040 & recommendations, 2018; (2) ASN and Ecofys, 2015; (3) Avaliação para Portugal do Millennium Ecosystem Assessment, João Santos Pereira, O Futuro da Floresta em Portugal; (4) CEPI Water Profile.

(1) Belkhir L. & Elmehri A., Journal of Cleaner Production, Assessing ICT global emissions footprint: Trends to 2040 & recommendations, 2018; (2) The Shift Project, 2019. Lean ICT: Towards Digital Sobriety.





NATURAL ALTERNATIVE



NATURAL ALTERNATIVE



# Paper in the fight against climate change

Warning: plastic pollution will reach 1.3 billion tons in 2040. What is one thing experts recommend? Replace plastic with paper, a renewable and recyclable material, produced by one of the world's most sustainable industries.

**A**t the current pace at which we use materials obtained from fossil fuels and produce waste, in twenty years' time plastic pollution will grow to 1.3 billion tons. In other words, the plastic waste entering the oceans will triple: it is currently 11 million tons a year, and will be 29 million in 2040. To help us visualise the scale of the problem, these figures are equivalent to 50 kilos of plastic per metre of the world's coastline. But if we add to this the quantity of plastic that ends up in landfill, the figure rises to 1.3 billion tons of waste plastic in the environment in two decades' time. If it were spread over the ground, it would cover an area four times the size of mainland Portugal.

The figures are from the latest report on Evaluating Scenarios Toward Zero Plastic Pollution, financed by the US NGO Pew Charitable Trusts and published in Science magazine.

Despite the measures implemented in Europe to achieve a rate of 55% for plastic recycling (and 85% for paper and cardboard) in 2030, such as eradication of single-use plastics and a promise to recycle 90% of plastic bottles until 2025, and although China has this year decided to ban plastic bags in 2022, the report estimates that all the efforts announced by governments and companies around the world would reduce by only 7% the volumes projected for

2040. So what is the solution? One of the recommendations of the experts and academics involved in the study is to replace plastic with paper and compostable materials. They use three arguments for this: paper is obtained from a natural and renewable raw material, paper and cardboard have an effective recycling system already in place, and the paper industry is one of the most sustainable in the world.

This can be weighed against a total of 359 million tons of plastic produced in a year (2018), of which 40% goes into packaging which, in turn, makes up 60% of the waste of this extremely durable and long-lasting material. The bad news, according to the Alliance to End

Plastic Waste, is that only 9% of all the plastic ever produced, since the 1950s, has been recycled.

In Europe, in 2018, the recycling rate for plastic packaging was 42%. But research by the National University of Ireland Galway, published this year in the scientific journal Environment International, raises the alarm: around 31% of the plastic exported by European countries for recycling (as much as 46% of the plastic sent for recycling) in Asian countries, is not actually recycled, and 7% (180 558 tons) actually ends up in the oceans.

In Portugal, Eurostat figures for 2017 confirm that almost two thirds (65%) of plastic packaging went





unrecycled. And figures from the Portuguese Environment Agency and Sociedade Ponto Verde for 2018 show that only 12% of plastic in urban waste was recycled.

**Paper's changing role**

The researchers behind the Pew Charitable Trusts report take all these facts into consideration when they recommend systematic changes which involve reducing the production and consumption of plastic, reducing exports of plastic waste and increasing waste collection rates in poorer countries, and then go on to confirm that replacing plastic with paper is the solution with the most potential for success in the long term.

On the one hand, the recycling system for paper and carbon is more efficient, with a recyclability rate in Europe currently of 72.3%. Unlike plastics produced from fossil fuels, paper is also an environmentally friendly material, whose raw material - cellulose fibre extracted from wood - is naturally and renewably sourced. It is reusable and recyclable and biodegradable in a short space of time.

On average, paper is recycled in Europe 3.5 times, but cellulose fibre can be reused up to six times, before being transformed into bioenergy or composted at the end of its life cycle, thereby reducing pollution from emissions produced by landfill. In 2017, recycled paper accounted for 54% of the fibre used in Europe. However, recycled fibres degrade over time, and virgin fibre needs to be introduced into the cycle. This is obtained from new trees, grown in sustainably managed forests. Here too, the pulp and paper industry bases its production cycle on a resource of fundamental importance to the fight against climate change. ♦

# It all starts at the source

**F**orests absorb carbon dioxide from the atmosphere and release oxygen. Forest-based products retain that CO<sub>2</sub> during their useful life. The carbon sequestered in European forestry biomass each year averages 719 million tons - something like the total CO<sub>2</sub> emissions generated in a year by Germany.

By certifying its value chain, the paper industry ensures that it uses raw material obtained from sustainable woodlands, where the plantations respect the environment and biodiversity and are continuously renewed. In the past 25 years, for example, Europe's woodlands have grown by 17.5 million hectares thanks to this industry, bucking the global trend for shrinking forests.

In the actual production process, the negative environmental impacts are reduced as far as possible, using cutting edge technology which ranges from using starch-based glues and the use and production of green energy, as well as cutting water consumption (93% of water used is returned to the

environment in keeping with good quality standards), as CEPI confirms.

In reality, between 2005 and 2017, direct CO<sub>2</sub> emissions in the pulp and paper industry were cut by 25% in Europe, according to figures from CEPI, and in the European Union the sector's products accounted for only 0.9% of total greenhouse gas emissions from industry. When each European uses an average of 125 kilos of paper a year, this means emissions of only 84 kilos of CO<sub>2</sub>, the equivalent of driving 800 kilometres.

Consumers themselves prefer paper to plastic. The latest survey by Two Sides, European Packaging Preferences 2020, discovered that 62% think that paper is better for the environment (in a survey by the consultancy firm IPSOS, conducted in seven European countries, this number rises to 93%), with 57% saying that paper/cardboard is easier to recycle and 70% saying that they are cutting down on their use of plastic packaging.

It turns out that forests can still save the world. ♦



The raw material (wood), drawn from responsibly managed forests, is the start of the sustainable paper cycle.

**How long for materials to be absorbed by nature**

- Paper packaging: 1 to 4 weeks
- plastic bottles: indeterminate
- Paper napkins: 3 months
- Newspaper: 2 to 6 weeks
- Plastic bags and cups: 200 to 450 years
- Bottle tops: 100 to 500 years

**Lifetime in the ocean**

- Cardboard box: 2 months
- Polystyrene buoy: 80 years.
- Plastic cup: 50 years.
- Plastic bottle: 400 years.
- Kitchen roll: 2 to 4 weeks
- Disposable nappy: 450 years.

Source: Lipor

## Paper's advantages



**Sourced from sustainably managed forests**

Continuous replanting of trees: in the past 25 years, Europe's woodlands have grown by 17.5 million hectares. Conserves biodiversity and ecosystems. Provides habitats for wildlife, areas for recreation and jobs.



**Natural and renewable resource**

Based on wood. Growing raw material.



**Effective against climate change**

The carbon sequestered each year in European forests averages 719 million tons of CO<sub>2</sub>. CO<sub>2</sub> retained in wood fibre stays in paper products. Produces renewable energy through biomass at end of life cycle.



**100% biodegradable**

Degrades in 2 to 5 months. Does not harm the environment (produced in natural colours based on water and starch-based glues).



**100% recyclable**

72.3% is the recycling rate in Europe. Recycled an average of 3.5 times in Europe, but can be reused up to six times. Recycling reduces pollutant emissions from landfills.



**Alternative to plastic**

Reduces pollution by plastic waste. Eliminates danger of microplastics. Reduces consumption of fossil fuels.



**Demonstrates environmental commitment**

Suits consumers' sustainable lifestyle. Highlights brands with environmental concerns.



**Certified and sustainable industry**

71% of wood and 83% of pulp in the European industry certified by FSC® or PEFC™. 91% of production capacity has environmental certification under ISO 14001 and EMAS. 93% of water used is returned to environment with good quality standards. Reduction of 25% in direct CO<sub>2</sub> emissions in Europe between 2005 and 2017. Circular economy cycle and production of other forest-based bioproducts.

Sources: "State of Europe's Forests 2015" FOREST EUROPE, 2015; European Paper Recycling Council, "Monitoring Report 2017"; CEPI Sustainability Report, 2018; CEPI, Water Profile 2016; análise da Two Sides dos dados de 2017 da FSC e da PEFC; cleanenergywire.org; https://foresteurope.org/wp-content/uploads/2018/10/INFOGRAFIAS.pdf; www.thepaperbag.org





There is the option of a glass front. This is ideal when the house is put up in a natural setting, letting you feel part of the environment around you.

The interiors have plywood panels on the walls. The resulting look is minimalist, but cosy.

With its contemporary and engaging design, the Wikkelhouse also offers a new and fascinating way of turning cardboard into a strong and naturally insulating material.

## The paper house

The Wikkelhouse is a sustainably built house, made of cardboard. No traditional foundations are needed, it is put up in a day and, the builder guarantees, will last at least 50 years.

**A**t first sight, cardboard might not appear suitable for civil construction. But the Dutch design studio, Fiction Gactory, has created a micro-house made of cardboard, that it has christened the Wikkelhouse.

Four years of research were needed to arrive at the innovative technology allowing this to go into production. It is made by wrapping ("wikkelen" is the Dutch word for wrap) 24 layers of high quality cardboard, made from virgin fibre, around a mould in the shape of a house. The result is a robust structure, with excellent insulating properties.

The concept is flexible and modular, comprising individual segments with a depth of 1.2 metres. When assembled they create a rather small house, or else an office, a showroom or a stand for a fair.

These segments, constructed with 24 layers of cardboard, are finished with a waterproof and breathable film and wood panels, leaving the house protected against all weathers.

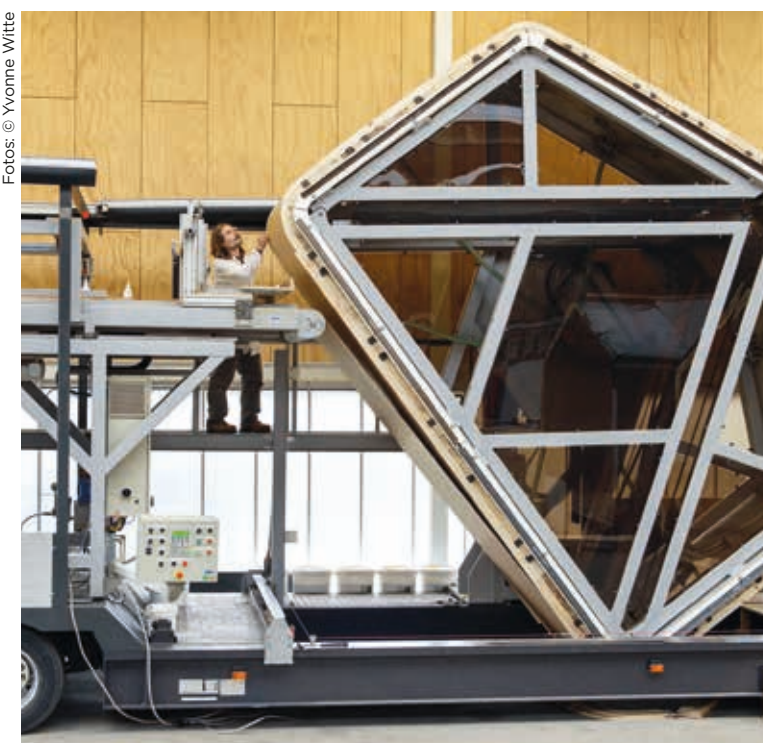
With its unique, contemporary design, the Wikkelhouse ([www.wikkelhouse.com](http://www.wikkelhouse.com)) can be supplied with glass fronts or else closed in, and with a kitchen and a bathroom. But because they are made to order, the customer is free to choose to have more windows, or less, or a particular colour scheme.

The cardboard segments can be reused and are 100% recyclable

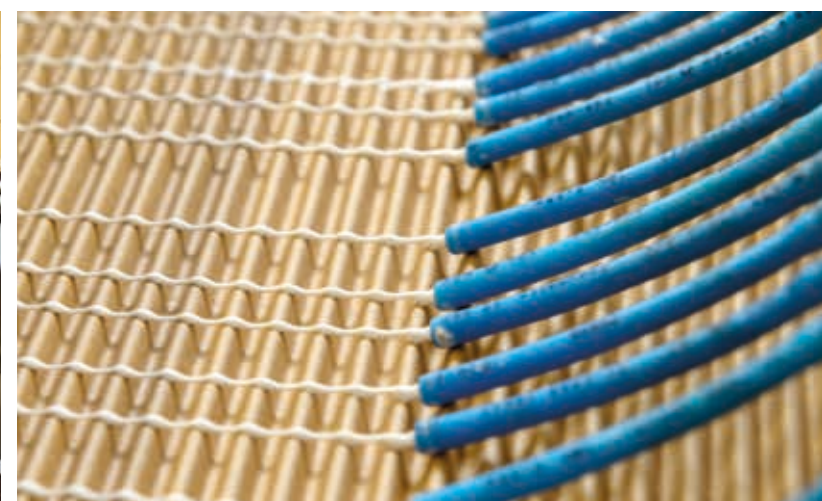
(the glue used is non-toxic and eco-friendly). According to Fiction Factory, the other materials have a minimal environmental impact, allowing the company to claim that its Wikkelhouse is three times more environmentally friendly than traditional houses. And it guarantees a useful life of at least 50 years.

Prices start at 30 000 euros (with three segments), but the concept is modular, depending on what the customer chooses. Fiction Factory says that most of their houses are sold for between 50 000 and 85 000 euros. The segments are transported separately and then assembled in situ, in just one day.

Are you already imagining a guest house or a sustainable office in your back yard or on the terrace? So are we. But it's not all good news. Firstly, the paper houses have been such a success that deliveries are now taking around eight months. And secondly, Portugal is not yet included in the delivery area. For now, these small houses are available only to people living in Holland, Belgium, Luxembourg, Germany, France, the United Kingdom, Scandinavia and Chile. But Fiction Factory has plans to expand. While you wait, watch the video using the QR code below. ♦



Fotos: © Yvonne Witte



The layers of cardboard are rolled around the mould 24 times, using a large rotating machine.

The corrugated cardboard is strong and durable, and the glue is eco-friendly.



Once transported to the building site, the house is assembled in just one day.



# Closing the circle of the paper chain

The pulp and paper industry is an example of the circular economy, from its raw material to the end product. In order to boost circularity, Portugal has joined the European paperChain project, which in this country is assessing the used of the industry's waste in the civil construction sector.

Unlike the traditional linear economic model, based on the "extract-produce-consumer-discard" pattern, the circular economy is based on sharing, reusing, repairing and recycling, in an almost closed circuit, in which products and the materials they contain are highly valued. In practice, this concept entails reducing waste to a minimum.

Nature functions in renewable circles, where nothing is wasted; life is born, grows and dies, the nutrients return to the soil and the cycle continues. This renewal also underpins the pulp and paper industry, which is based on a natural and renewable material (wood), sourced from sustainably management forests. Wood is processed into various type of paper products which, after serving their purpose, are collected and recycled, becoming a raw material once more and closing the circle. And the production process is also part of this circularity, with the reuse and recycling of water, most of which is returned to the environment after being treated, energy generated for the industry's own use from biomass, and industrial symbiosis, which involves collaborating with other sectors to close even more circles.

### Reuse and create value

This collaboration between sectors is the focus of the paperChain project. This is a research and innovation project funded by the European Union's H2020 programme, bringing together 20 entities from five countries to demonstrate how waste can be reused. Portugal is participating in two case studies for reusing waste from the pulp and paper industry, one in pre-cast concrete structures and another in bituminous mixtures for paving roads.

The national entities involved are the University of Aveiro, The Navigator Company, the RAIZ Research Institute, Spral, Megavia and the Sustainable Habitat Cluster.

The first case in which Portugal is involved has to do with using lime ash as a filler in pre-cast concrete. This is being tested at the Spral site in Ilhavo, in an industrial warehouse built for this

purpose, with a structure prepared for long-term monitoring.

The second case focuses on the use of dregs and grits (inorganic waste generated during the chemical recovery of reagents in the paper production process) as fine aggregates and fillers in the surface layer of roads. This has been implemented at The Navigator Company's Cacia site, near Aveiro, and consists of a 250 metre section of road with different bituminous mixtures (the standard bituminous mixture, and others containing dregs and grits). This section of road is being monitored until February 2021.

These two new circular solutions are now at the technical and environmental monitoring phase, in order to validate their durability and long-term performance. The tests are being carried out by the University of Aveiro and by RAIZ, Navigator's forest and paper research institute.

The aim of paperChain is to implement new circular economy models centred on reusing waste generated by the pulp and paper industry, using them as a secondary raw material in other sectors.

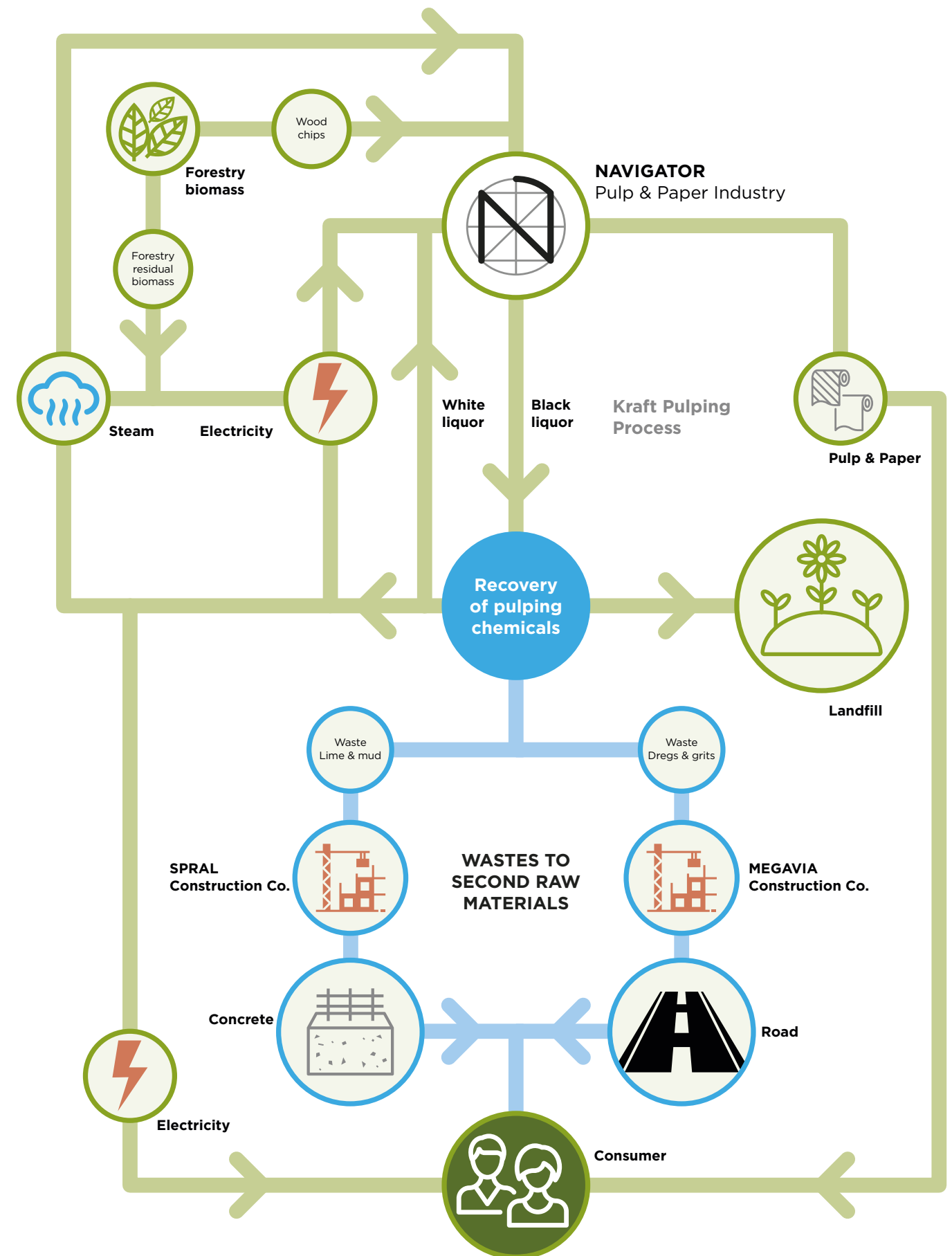
It is important to these companies to move towards a more circular economy, insofar as this offers enhanced security of raw material supplies and also an opportunity to innovate and gain a competitive edge.

According to the European Commission, the transition to a circular economy may bring savings of 600 billion euros to European Union companies, equivalent to 8% of their annual turnover, as well as creating 580 thousand new jobs.

But the circular economy is also the best route to reducing pressure on the environment. Better waste management, reduction in the resources used in production and large-scale reuse of raw materials has the potential to significantly bring down greenhouse gas emissions, as well as to avoid disturbing habitats and reducing marine waste, which would help to limit biodiversity loss. ♦



## New waste management model for the paper industry, from a circular economy perspective







## Bees: labouring for biodiversity on Earth

The role played by bees in pollination makes them a supremely important element in the terrestrial ecosystem and in the survival of the human species. A third of the world's food production depends on their activity.

The United Nations has instituted World Bee Day, which since 2018 has been celebrated on 20 May. The FAO (the United Nations Food and Agriculture Organisation) is managing the International Pollinator Initiative 2018-2030, designed to promote coordinated action worldwide to safeguard pollinators and to promote sustainable use of pollination services. The European Union (EU) has also launched its own initiative to protect pollinators. Three examples that highlight the importance of these animals to life on Earth.

Production of one third of the world's food depends on the work of bees, which are the species that pollinates flowers most effectively. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services has actually quantified the value of the ecological and economic services provided by bees worldwide: 577 billion dollars.

Bees are also crucially important to the environment, helping to maintain ecosystems and biodiversity, as they not only ensure the survival of many different plant species, but are also part of the diet of birds and reptiles. Indirectly, bees also help to preserve and improve soils, because they contribute to maintaining plant cover.

Even so, 40% of invertebrate pollinators (different species of bees, butterflies, beetles and certain types of wasps and flies) are at risk of extinction. Indeed, the existence in Europe of the domestic bee, *Apis mellifera*, is today entirely dependent on the work of beekeepers, insofar as wild colonies are no longer viable in the wild.

The disappearance of bees has to



do with the modification or loss of habitats, due to changing land use, intensive farming and climate change. These threats are joined by the use of pesticides and other pollutants, and also the action of invasive exotic species, such as the Asian hornet, and the existence of diseases and pests.

This worrying scenario has led to concerted position being taken internationally. In Portugal, there are several organisations working in the field, both in community education, such as the Portuguese Entomology Association and the Gaia Bio Park, and in scientific projects, such as the PoliMax project. This last project has European Commission funding and looks at the effect of the population density of different pollinators on fruit yields, and studies strategies for promoting biodiversity in these species.

### Growth in beekeeping

The European Commission has

identified honey production as offering "green employment", because this is both a business that exploits wild resources, and also a way of preserving and helping to renew those resources.

Portugal produces a wide variety of monofloral honeys and has recorded growth in beekeeping, despite this still being perceived as just a complement to farming. According to figures for 2018 from the Directorate-General of Food and Veterinary Services, there are 11 883 beekeepers in Portugal, and the number of apiaries (42 thousand) and hives (768 thousand) grew by 25% from 2012 to 2018.

According to the Action Plan of the Beekeeping and Biodiversity Skills Centre, also dating from 2018, most of the country's apiaries are concentrated in areas of great environmental wealth and diversity, reflecting a strategy by farmers to ensure quality honey. ♦



## 5 tips for helping bees

- 1 In your garden or on your window ledge, plant species that flower at different times of year.
- 2 Buy natural honey from local producers;
- 3 Buy products from sustainable sources and producers;
- 4 In your garden, avoid using pesticides, herbicides and other harmful products;
- 5 Keep a source of water for bees, placing a small vessel outdoors.



### Urban beekeeping in Paris

What do the Paris Opera, the Musée D'Orsay, the French National Assembly, the Hotel Pullman and the Guerlain and Louis Vuitton stores have in common? All these Parisian buildings have apiaries on their roofs. Since the 1980s, the Paris city authorities have encouraged people to place beehives on the tops of buildings, as a way of helping to defend biodiversity; in the last census, in 2015, there were more than 700 urban apiaries in the city. Curiously, the beekeepers have discovered that bees adapt well to city life, where they benefit from the great variety of flowers on window ledges, balconies and gardens, and the absence of agricultural pesticides. ♦

Worldwide, the following depend on pollination:

**90%**  
of wild flowers

**75%**  
of food plants

**35%**  
of arable land



## Eucalyptus as a food source

The contribution of eucalyptus forests to the production of honey has been increasingly recognised in Portugal, as in other countries. In the northern hemisphere, eucalyptus woodlands offer advantages for beekeepers, because the trees blossom in the winter, when bees are faced with a shortage of food. Although this is also the season when bees are least active, a guaranteed and secure source of good is appreciated by the beekeepers who install the hives in the vicinity.

The early flowering of eucalyptus allows bees to produce a characteristic honey, dark amber in colour and with an intense flavour and aroma. In addition, according to the Journal of Pharmaceutical Sciences and Pharmacology, its anti-inflammatory and antiseptic properties make eucalyptus honey useful in natural treatments for respiratory complaints, such as bronchitis, coughs, asthma and sinus infections.

In Portugal, The Navigator Company's forests are increasingly a prime habitat for bees. Although there have always been hives on the company's properties, in the past four to five years this has been actively encouraged, through collaboration with beekeepers, resulting in significant growth in the number of apiaries and hives. "There are now 20 apiaries on Navigator properties up and down the country. But they are most frequent in the southern and interior regions", explained Vânia Oliveira, land use manager.

"As well as the advantages for biodiversity and the ecosystem, collaboration with beekeepers strengthens ties with local communities and so contributes to the security of the plantations and to preventing fires, because there are more people using them", Vânia Oliveira pointed out.

"It's a win/win situation", she told us, explaining: "Bees are responsible for 80% of pollination, and the presence of hives clearly brings advantages for our plantations, especially in terms of

flowering. What is more, we are also responsible for other types of woodlands, such as umbrella pines, and bees play an important role in ensuring the production of pine kernels".

Once the apiaries are installed, the bees then pollinate flowers of all types and help to ensure biodiversity on Navigator's properties. This is particularly important for the presence of insects, birds and reptiles. "A lot of the apiaries are in conservation areas, where they are important for maintaining biodiversity and the quality of the ecosystem", she continued.

Navigator's increased focus on beekeeping has also worked in the interest of beekeepers. "Many of them admit they feel more protected on our properties, because of the risk of forest fires". The other advantage has to do with the fact that, as we have seen, eucalyptus trees blossom in the winter. "Even though bees are less active at that time of year, it is important for beekeepers to know they have a source of food, even during the cold months", said Vânia Oliveira, who also pointed to growing consumer demand for eucalyptus honey as another factor attracting beekeepers to The Navigator Company's properties.

In Mozambique, where Navigator is undertaking an integrated project for forestry and paper pulp, the company has supported beekeeping through the Social Development Programme run by Portucel Moçambique. By the end of the year, it is expected that the number of hives installed around eucalyptus plantations in Zambézia and Manica provinces will have risen to 800. This project is one way in which Navigator, which owns Portucel Moçambique, contributes to the income of local families, at the same time as ensuring pollination.

This is an example of what companies can do to preserve environmental diversity and quality on the planet and, in the final instance, to ensure the future of human life on Earth. ♦



# “We are all dependent on natural capital”

BCSD (Business Council for Sustainable Development) Portugal has launched act4nature Portugal, an initiative designed to mobilise Portuguese companies to protect, promote and restore biodiversity. **João Wengorovius Meneses**, secretary-general of BCSD Portugal, talks to us about the importance of nature to business.

## How did act4nature Portugal come about?

In 2019, Portugal hosted the annual Council Meeting of the World Business Council for Sustainable Development (WBCSD). In the course of the meeting, BCSD Portugal signed up to the Business for Nature network, an international coalition of businesses working for sustainability. The network's prime aim is to help liaise between the different currents in civil society to make it possible, at COP-15 [the UN biodiversity conference, scheduled for 2021 in Kinming, China], to sign an international agreement for biodiversity, equivalent to the Paris Agreement for the world's climate.

It was through the commitments we made as a member of Business for Nature that we established his partnership with Entreprises pour l'Environnement (EpE), a French member of the global WBCSD network, to launch in Portugal the act4nature project that has been under way in France since 2018.

## What exactly does this project consist of?

It's a way of mobilising companies around biodiversity, in a context where recent scientific studies report an unprecedented scale of loss in this field: we are changing the Earth's ecosystems dramatically, and there are around a million animal and plant species at risk of extinction.

Act4nature Portugal consists of a declaration of 10 shared principles, which all the companies sign, and a set of individual commitments, which are defined to reflect each member's particular business activities and the specific features of its value chain. On joining, companies make a commitment to integrating nature into their business strategies and

models, and to implement solutions along their value chain to assign increasing importance to the protection and improvement of biodiversity, and to issues of natural capital and ecosystem services.

We are all profoundly dependent on natural capital. More than half the world's GDP is based on natural resources, most of them non-renewable or with very long renewal cycles.

## Even companies without a direct connection with nature in their core business?

I'll give you the example of the mobile phone. It's produced by a technology company, but this object is all natural capital. The integrated circuits are in silver and copper, the plastic casing comes from a fossil fuel, the battery contains lithium... It might look 100% technological, but without natural capital, this phone wouldn't exist. Just as there would be no houses, cars, clothes, medicines or food. In some sectors, it's more obvious, such as in food, in others it's less obvious, like in the more technological sectors, but all goods and all sectors depend on natural capital. Not to mention the fact that ecosystem services provide us with the air we breathe and the water we drink. They regulate the planet's temperature, and without all this there would be no economy. Without life on Earth, there would be no jobs and no economy. So yes, directly or indirectly, in some cases more obviously than in others, all companies depend on natural capital.

## But are they aware of this dependence and the importance of their own role?

You can tell that companies realise that sustainability is the next challenge. Only sustainability is a very wide ranging and rather complex issue. And companies have to assign priority to certain issues, either

to comply with the law, or because their customers demand it, or because of internal decisions.

For example, some companies realise that their employees are a key factor, and invest in their human assets, working to attract and preserve talent; and that's sustainability, in social terms. Others prioritise governance issues, how they pay taxes, their reporting, measuring their impacts (water and carbon footprints...), sharing information, making their value chains more transparent, certifying their operations, etc..

The issue of natural capital, and of dependence on nature and the biosphere, is an issue in which I see companies taking a growing interest. We all have an increasing perception that the biosphere is collapsing and that companies are called on to play their part: this is the future in terms of consumer behaviour, and it's the present in terms of investor behaviour - the risk of exhaustion of raw materials, or of rising prices driven by shortages, is growing by the day.

## Does this mean that stakeholders also have a word to say?

Of course. And that means regulators, customers, investors and employees. On the stock exchanges, for example, non-sustainable companies increasingly present poor performance. And this was something that emerged clearly from the lockdown periods, both on the European securities exchanges, and in the US. And the regulators are making tougher demands. Companies that fail to take ESG [environmental, social and governance] principles on board are increasingly penalised in terms of legal compliance, competitiveness and access to finance.

Companies have understood that there's not just one challenge, it's not just carbon, or the atmosphere, or climate change, and they're starting to respond to different sustainability issues, such as social inequality and nature. In this case, they do it by reducing the intensity of energy, water and materials use, by producing less waste, and so making their business models more circular. And in that way they contribute to preserving natural capital.

## Biodiversity is already a focus issue in sustainability. What





“ At least half of global GDP is based on natural capital. In the Global Risks Report , from the World Economic Forum, the main business risks identified are environmental risks. ”



#### can companies do here to reverse biodiversity loss?

Companies first have to understand their own dependence on natural capital and ecosystem services, and to value these things. Valuing them means rethinking their value chains, so as to drastically reduce their ecological footprint. At the same time, and the two things are connected, they must try to make their business models as circular and regenerative as possible: in the final instance, all waste is a raw material in the wrong place.

It's possible to redesign the value chain for products to make big reductions in the carbon footprint, the water footprint, etc., what we call the ecological footprint. It's also possible to (re)invent products so as to extend their life cycle, so that they last longer. But on top of all this, there has to be a solution for waste, and the ideal thing is for it to be someone else's raw material. Waste should only be recycled when it can no longer be reused.

Through technological innovation and design, by reducing the intensity of our use of natural capital and by extending the lifetime of goods as far as possible, finding a worthy end-of-life solution, based on reuse or recycling - this is what companies can do to preserve natural capital, and consequently biodiversity.

#### How do companies implement commitments, and how does BCSO Portugal help them?

Act4nature, in Portugal, is a decade-long commitment. So at the initial stage, there are a lot of companies for which the challenge is to analyse, understand, measure and share information. They

then move on to a phase of incremental innovation, for example, by reducing the intensity of water, energy and materials use, reducing the amount of waste and pollution they generate, as well as other improvements to the value chain. Finally, they will reach the stage of disruptive innovation, where the challenge will be to adopt new technologies, new design solutions, new materials and raw materials, and new business models, among other improvements.

BSCD Portugal helps companies to understand their dependence on natural capital and on ecosystem services along the value chain, and the impact that their activities have. It then helps to set individual targets, with support from an advisory board (experts representing leading organisations in this sector). A commitment is also made to gearing up the companies' ambitions every two years, inciting them to step up their commitments and to be more audacious, through to 2030.

#### Where does Portugal and Portuguese business stand on this aspect of sustainability?

On some sustainability issues, Portugal is a global pioneer. For instance, on climate change, it was one of the first countries to commit to carbon neutrality by 2050. This was admirable and courageous. On other issues, such as biodiversity, we have not yet been so bold.

The picture in business is very uneven. Some large companies are doing well, but we need companies to sign up *en masse*, especially SMEs.

So with the European Green Deal, and

the Recovery and Resilience Plan 2021-2026, and with the next Multiannual Financial Framework 2021-2027, European Union money will now be handed out on ESG criteria. For the first time in the history of the European Union, ESG criteria will have a profound influence on the distribution of its financial resources, which is excellent news. It is not enough to respond to the pandemic crisis and the resulting economic and social recession, it is fundamental, at the same time, to take the chance (at last!) to make the transition to a sustainable development model - or else the pandemic and the economic and social crises will be every more frequent and severe. When companies, especially SMEs, apply for these funds and realise that some capital projects will be rejected and others are embraced, because some are sustainable and others are not, they will then have an excellent incentive to make the transition.

#### Can nature and the economy go hand in hand?

At least half of global GDP is directly based on natural capital. In the Global Risks Report 2020, from the World Economic Forum, the main business risks identified are environmental risks. Because certain raw materials will be increasingly scarce, because we're going to feel ever more severe impacts from climate change, because the biosphere and ecosystems are under great stress.

So we urgently need to protect nature and biodiversity, not just for the sake of future generations and the quality of life, but also for the sake of the economy. There'll be no economy, and no jobs, in a dead or dying world. ♦



# The true value of natural capital

It's fundamental both for business, and for nature and society. The debate on Natural Capital, at The Navigator Company's Sustainability Forum, showed that the challenge of finding a balance between production forests, conservation forests and recreational and leisure forests is a shared responsibility.

"Renewable and non-renewable natural resources that combine to produce a flow of benefits for society." This was the definition of Natural Capital chosen by 93% of the participants at Navigator's tenth Sustainability Forum, when asked to respond to the question online.

This forum is an opportunity for dialogue with the company's main stakeholders on sustainability issues, and this year, because of the pandemic, the event took place online, on 5 November, to debate the topic "Natural Capital . Value for business, nature and society".

The forum has adopted a new, regional format, designed to take its events into our local communities. This session was focussed on the Serras do Porto Park (POSeP), an uplands reserve that served as a practical example for the social, environmental and economic benefits of managing woodlands with the twin aims of production and conservation.

Covering an area of 6 000 hectares, the protected landscape in the Serras do Porto Park represented the combined efforts of the Valongo, Gondomar and Paredes municipalities, with the involvement of local communities and landowners, including The Navigator Company, which manages 25% of the woodlands within the park's boundaries.

The chairman of the Serras do Porto Park Association of Municipalities, and member of Paredes Municipal Council, Alexandre Almeida, reminded the participants that the project originated from concerns for conservation and reforestation, and that work is now being done to welcome tourism, with new hiking trails around the natural, cultural and historical heritage of this periurban area. This heritage was presented by Teresa Andresen, coordinator of the PSeP Management Plan, and was debated in a panel discussion moderated by José Carlos Mota, a lecturer at the University of Aveiro, and on which the executive secretary of the Association, Raquel Viterbo, stressed the importance of well managed forests in the fight against climate change and fires, and in controlling invasive species and protecting water courses.

In the same panel discussion, Sandra Sarmiento, Northern Regional Director for Nature and Forestry Conservation, confirmed that "a well drawn up plan,

like the PSeP plan, makes ICNF's task easier", and that the participatory process is an example for others to follow. Fernando Seara, a forest landowner and director of the Douro Museum, spoke of the need to raise local awareness that opening up the hills to outsiders and to tourism will bring them benefits. For his part, João Melo Bandeira, The Navigator Company's Northern Region Coordinator, underlines the important role of landowners and investors in ensuring active management of woodlands within the park, where almost 95% of the land is in private ownership.

## Shared responsibility

"The work done proves that the challenge of managing territory at the landscape level, creating sustainable value for the community, for the environment and for the different economic players, is only possible on a participatory basis. It also became clear that the challenge of striking a balance between production forest, conservation forest and even recreational and leisure forest, is a shared responsibility", concluded António Redondo, The Navigator Company's CEO, at the close of the forum.

José Manuel Ribeiro, mayor of Valongo, had drawn attention to the importance of private landowners to the balanced use of natural resources, and Marco Martins, mayor of Gondomar, expressed his satisfaction at the success of the networking and partnerships that have been achieved in the past five years in the PSeP.

António Redondo expressed his view that "in a country where the State owns only 2% of woodlands, conservation forests will not be developed only with heavy public subsidies. They will be developed above all with the involvement of private owners, particularly the main actors in the industrial forestry sectors". In order for this commitment to be sustainable, conservation forests have to exist in a symbiosis with production forests, which "can offer a unique opportunity for significantly reducing scrubland and uncultivated land of no conservation interest, thereby limiting the land not subject to any form of management, which is where most fires start".

Humberto Rosa, Director for Natural Capital at DG Environment, European Commission, spoke about "Natural capital and the economy in the 'green recovery'", and stressed the importance of silviculture



With its new regional format, Navigator's Sustainability Forum debated natural capital against the backdrop of the Serras do Porto Park project.

geared to biodiversity, making forests more resilient, in particular against fires, and drew attention to the importance of forests as a carbon sink and a source of products which form the basis of the circular bioeconomy.

## Balance between production and conservation

Nuno Gaspar Oliveira, partner and co-founder of Natural Business Intelligence, a consultancy firm, summed up the issue. "Restoring natural capital means restoring options for the economy", he said. Nuno Banza, chairman of the governing board of the Institute of Nature Conservation and Forests (ICNF), spoke about "Forests and landscape management", saying that the connection between environmental, human and animal health is today clear to everyone.

This balance between productivity, conservation and social welfare was also described in the presentation of The Navigator Company's management of natural capital, made by Paula Guimarães, Sustainability manager, and Nuno Rico, Conservation and Biodiversity manager. In its nature conservation strategy, the company's rule is to start by learning about the natural capital in the 108 thousand of woodlands under its

management. In order to conserve them, the company assesses the potential impacts of its activities, designs measures to mitigate these and, when possible, plans measures to improve those woodlands. In addition to planted production forests, 25% of the area under Navigator's management is occupied by woodlands with a variety of species (such as maritime and umbrella pine, and cork oaks), and by areas of conservation interest (such as oak, willow and arbutus woodlands), which account for 11% of the total area, with around 4 100 hectares of habitats protected by Rede Natura 2000.

Closing the event, António Redondo said that this session of the Sustainability Forum had shown that "there is no living forests without active management, and there is no active management without an income for landowners". For Navigator's CEO, "there can be no sustainable conservation projects without well managed land and without the involvement of production forest operators. Forests cannot live without their different functions being assured. To defend natural capital and ecosystem services it is important to have a strong and cohesive social and economic fabric with landowners, producers and companies in the sector managing woodlands responsibly". ♦



## Porto Santo joins Unesco's world network of Biosphere Reserves

Unesco defines biosphere reserves as "living laboratories, where the main functions are the conservation of landscapes, ecosystems and species, and development that is sustainable on a social, economic, cultural and economic basis". The United Nations Education, Science and Culture Organisation explains that they also act as platforms for "research, monitoring, education and awareness raising, with a view at all times to sharing information and the experience acquired".

The Biosphere Reserve on the island of Porto Santo, in the Madeira archipelago, combines terrestrial and marine areas. Among different species of marine reptiles and mammals, it is home to the world's rarest seal, the Mediterranean monk seal (*Monachus monachus*). Another characteristic species is

the loggerhead sea turtle (*Caretta caretta*). Unesco's international network comprises 714 reserves in 129 countries, where efforts are made to "conciliate human activity with the conservation and sustainable use of biodiversity."

With the recent classification of the island of Porto Santo, Portugal now has twelve biosphere reserves in this network. The other eleven biosphere reserves are those of Castro Verde, the International Tagus (transboundary reserve), Fajãs de São Jorge, in the Azores, Meseta Ibérica (transboundary reserve), Santana, in Madeira, the Berlenga islands, off Peniche, Gerês-Xurês (transboundary reserve), the islands of Flores, Graciosa, and Corvo, in the Azores, and Paul do Boquilobo, near Golegã. ♦



The Biosphere Reserve on the island of Porto Santo combines terrestrial and marine areas.

## Portugal in the top twenty of the global energy sustainability ranking



Portugal has risen ten places in the World Energy Trilemma Index 2020, and is now one of the top twenty countries in terms of energy sustainability.

The annual report from the World Energy Council ranks 130 countries according to their latest progress in policy design and actual performance with the aim of achieving energy sustainability. The categories analysed as Energy Security, Energy Fairness and Environmental Sustainability. Portugal is ranked in 19th place, having achieved the top score in Energy Equity.

Portugal obtained a score of 63.7 (out of 100) for Energy Security (a country's capacity to meet its current and future energy needs), 92.2 in Energy Equity (ability to assure access to affordable and safe energy), and 78.1 for Environmental Sustainability (transition to a decarbonised energy system). ♦

Portugal obtained a score of 78.1 for the transition to a decarbonised energy system.

## Europe earmarks one billion for ecological innovation

The European Commission has a billion euros to support research and innovation projects that address the climate crisis and help to protect Europe's biodiversity and unique ecosystems, as part of the new Green Deal.

Designed to power Europe's recovery from the crisis caused by the pandemic, this initiative is looking for projects able to achieve results in the short and medium term, and which can be quickly scaled up, disseminated and adopted more widely. "Specific actions that interact with citizens in innovative ways and increase relevance and social impact", in the words of the European Commissioner for Innovation, Research, Culture, Education and Youth, the Bulgarian Mariya Gabriel.

The closing date for applications is 26 January, and the projects selected should start up in the autumn of 2021. The priority will be projects that transform today's ecological challenges into opportunities for innovation and growth. ♦



The EC wants to support research projects that address the climate crisis and help to protect Europe's biodiversity and ecosystems.

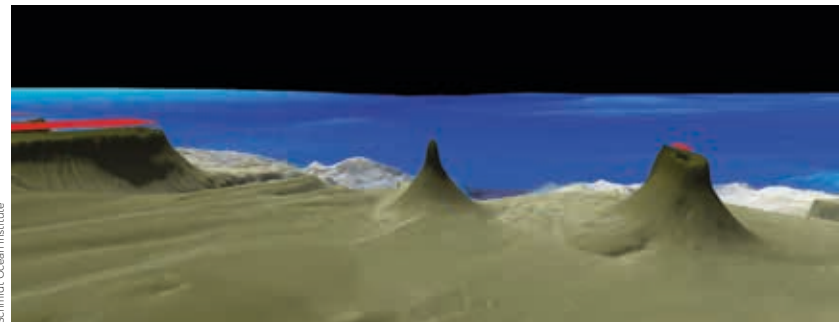


# 500 metre coral reef discovered

In October, Australian scientists discovered an enormous independent coral reef on the northern edge of the Great Barrier Reef.

Five hundred metres high, this reef - the first of the kind discovered in 120 years - is higher, for example, than the Empire State Building, in New York. Although supported on the ocean bed along the coast of North Queensland, the structure is detached, in other words, it is not part of the main body of the Great Barrier Reef. It was discovered by scientists working on 3D mapping of the sea bed in the region. On board a research ship belonging to the Schmidt Ocean Institute (SOI), a non-profit body based in California, the team used an undersea robot to explore the reef, streaming the discovery live. You can see the video using the QR code provided below.

"The discovery of a new reef, half a kilometre high, in the area of the Great Barrier Reef, shows how the oceans are still a mysterious world", said Jyotika Virmani, executive director of SOI. The Great Barrier Reef, the largest coral reef in the world, is an extraordinary example of marine biodiversity: it is home to more than 1.5 thousand species of fish, 411 species of hard corals and dozens of other species. ♦



Schmidt Ocean Institute

The scientists found the reef during work on 3D mapping of the sea bed.



Schmidt Ocean Institute

The research ship, Falkor, waits while the SuBastian robot does its work on the sea bed.



Schmidt Ocean Institute

The Great Barrier Reef is an extraordinary example of biodiversity.



Watch the video of the discovery.

# Navigator's value to the Portuguese economy

The Navigator Company was one of the winners of the 2020 Export and International Expansion Awards, coming out top in the Large Companies and Services category. This award provides recognition of the company's value to Portugal and to the Portuguese economy.

In the context of the current pandemic, the ability of the country's economy to bounce back will also depend on its export capacity and investment by companies in international expansion. If we add to this equation the need for sustainable development models, based on natural, renewable, recyclable and biodegradable raw materials, Navigator is at the forefront of the country's endeavours.

With clients in more than 130 countries, Navigator is Portugal's third largest exporter and the leading generator of national value added, given that it relies mostly on Portuguese suppliers and raw materials. It accounts for approximately 1% of GDP, around 3% of exports of goods, and more than thirty thousand jobs, including direct, indirect and induced employment.

The Export and International Expansion Awards are organised by Novo Banco and Jornal de Negócios, and seek to highlight the success of Portuguese companies in export markets and in internationalising their business. ♦



# Nature at the heart of the economy

The European Forest Institute (EFI) has announced a 10-Point Action Plan to catalyse a Circular Bioeconomy of Wellbeing. This will consist of placing nature at the heart of the economy, and so steering the world on to a sustainable course.

The action plan is founded on new scientific perceptions and innovative technologies, and was drawn up by a multidisciplinary team of 25 experts, who have called for concerted efforts from everyone, from global leaders to investors, including companies, scientists, governments, intergovernmental and non-governmental organisations, funding agencies and society in general.

The EFI action plan for "investing in nature as the true driving force of our economy" involved the following ten points:

- Focus on sustainable wellbeing;
- Invest in nature and biodiversity

- Generate an equitable distribution of prosperity;
- Rethink land, food and health systems holistically;
- Transform industrial sectors;
- Reimagine cities through ecological lenses;
- Create an enabling regulatory

- framework;
- Deliver mission-oriented innovation to the investment and political agenda;
- Enable access to finance and enhance risk-taking capacity;
- Intensify and broaden research and education. ♦



The European Forest Institute has developed a 10-point plan for investing in nature.



# 10.4 million for ocean research

The European Research Council (ERC) has awarded a grant of 10.4 million euros to an international project led by a Portuguese researcher at Universidade Nova de Lisboa (UNL), which seeks to “learn about the past of the oceans and the impact of marine life on human societies, in order to understand the present and anticipate the future”. The 4-OCEANS project is led by Cristina Brito, and will be conducted from 2021 to 2027, looking, as the name suggests, at four oceans (Arctic, Atlantic, Indian and Pacific), with a focus on the relationship with ten groups of animals, including cod, salmon, tuna, sharks, whales and walrus. “The oceans have clearly had an influence on human history and, vice versa, humans have had an impact on marine ecosystems and populations. But how, where, when, how and with what consequences for society? These are answers that do not yet exist and will transform our understanding of the past”, write the authors in the project summary. ♦



4-OCEANS is a humanities research project that will study the influence of the oceans on human history, and vice versa.

## Cork for treating Alzheimer's



Three Portuguese researchers have identified a significant concentration of antioxidants in ethanol-water extracts from the innermost part of cork oak (*Quercus suber*) bark and cork residues. It is known that these extracts inhibit acetylcholinesterase (AChE), a crucial enzyme in Alzheimer's disease, which destroys the neurotransmitter acetylcholine and affects communication between nerve cells in the brain, harming memory. Having established this evidence, Joana Ferreira, Sara Santos and Helena Pereira, of the Forestry Studies Centre (CEF) at the Higher Institute of Agronomy, may have found in cork a less toxic and more efficient alternative to the AChE inhibitors that are used as medicines for people diagnosed with Alzheimer's. ♦

The cork oak, together with eucalyptus and pine, is one of the three main species in woodlands managed by The Navigator Company, where 740 species of flora have been identified.

# In defence of environmental sustainability



Protecting biodiversity is one of the priorities of the #GreenSource initiative.

CEPI, the Confederation of European Paper Industries, and EPIS, the European Pulp Industry Sector Association, have launched #GreenSource, a joint initiative by the European pulp and paper industry to support common endeavours to make the aim of carbon neutrality by 2050 a reality. A scientific study undertaken by CEPI on the climate effect of the forestry sector in the European Union shows that, thanks to forests and forestry products, a total of 896 million tons of CO<sub>2</sub> are removed from the atmosphere each year - equivalent to 2% of annual emissions in the EU. The pulp and paper industry is able to offer innovative solutions for the needs of European citizens, on the basis of a natural and renewable raw material, thereby contributing to a sustainable lifestyle. At the same time, it ensures that forests continue to grow, to absorb CO<sub>2</sub> and to protect biodiversity. In Portugal, #GreenSource involves CELPA (the Portuguese Paper Industry Association), and two companies, The Navigator Company and Celulose Beira Industrial. Learn more at [www.eugreensource.org](http://www.eugreensource.org) ♦

## Government earmarks 665 million for forests

The government has earmarked a total of 665 million euros to protect and develop woodlands in the preliminary version of the Recovery and Resilience Plan (Portuguese Recovery 2021-2026), where it explains to the European Commission how it intends to invest the funds that will be made available under the European Recovery and Resilience Mechanism. The largest slice will go to “landscape transformation in vulnerable woodlands”, with 270 million euros allocated in this five-year plan. The rest of the funding will go into investment in the primary strips network for fuel management (166 million), in reorganising registers of rural property (96 million), in aerial resources for fighting rural fires (93 million) and also in modernising facilities and resources for improving the operational response capability of civil defence units (the MAIs Floresta Programme), which will receive 40 million. The aim of including the forestry component in the policy area for Competitiveness and Territorial Cohesion in the Recovery and Resilience Plan is essentially “to develop a structural responsible capable of protecting Portugal against serious rural fires, in a context of climate change”. ♦



The Portuguese government's Recovery and Resilience Plan includes 665 million for investment in forests.



## Sustainable quality

In reading this magazine, you will have learned much more about paper as a sustainable medium. In leafing through the pages of the printed edition, you will have experienced the unique tactile sensation offered by paper, its touch and its texture. You will have run through the articles and topics, without any of the bother of screens, network connections or batteries. That's the joy of paper. Paper transmits quality at your fingertips. There's nothing like it for savouring the pleasure of reading.

What you perhaps did not know is that the paper produced in Portugal is among the best in the world. Known around the world for its high quality standards, Portuguese paper produced by The Navigator Company is exported to 130 countries and made from a raw material recognised internationally as the best species for paper production: *Eucalyptus globulus*. First introduced to Portugal two centuries ago, this variety of eucalyptus has found in this country its ideal soil and climate conditions, an advantage that makes it even more exceptional when we learn about efforts made by other countries to establish the species, which are overwhelmingly unsuccessful.

Portuguese eucalyptus is outstanding because of the intrinsic quality of its fibre, and because of the environmental sustainability it assures for the end product. So at the same time as forming the foundation for an industry like the pulp and paper sector, which accounts for 4.3% of all Portuguese exports and around 2% of GDP (in turnover), this raw material also opens up enticing prospects for a more sustainable development paradigm, and also for a determined and robust transition to a circular economy model.

I shall start with paper itself: the fibre from our eucalyptus is recognised as permitting more recycling than its competitors, making it more sustainable in environmental terms. Recent scientific studies have shown that after being recycled five times, fibre from *Eucalyptus globulus* produced in Portugal by The Navigator Company is able to maintain greater specific volume than virgin birch fibre, easily surpassing

the average figure of 3.5 recyclings. Of course, as happens with any fibre, paper can also not be recycled *ad aeternam*, and it is essential to use virgin fibre at the start of the cycle, to keep it going. Despite this, the sustainable cycle is long and replete with opportunities: each fibre can feature in four or five products, in a cascade chain that starts with paper made from virgin fibre - such as office stationery - and ends with products in recycled fibre, such as packaging cardboard.

At a time when the world is increasingly aware of the need to take concrete steps to combat climate change, paper has established itself as a significant player in a future of more sustainable development, based on products sourced from natural and renewable raw materials, able to substitute others derived from fossil sources, such as plastics.

The history of environmental sustainability is being written today, on paper. It is produced by an industry based on a renewable resource, that nurtures increased biodiversity, that is resolutely opposed to illegal logging and that has contributed to growth in woodlands, thanks to the sustainable planting and management it implements in its forestry holdings. But this story would not be complete without a quality and meaningful end product, of which we can be proud.

The Navigator Company is today the leading European manufacturer of uncoated woodfree (UWF) printing and writing paper and the sixth largest in this segment worldwide. It is also Europe's top manufacturer, and the sixth in the world, of BEKP (Bleached Eucalyptus Kraft Pulp), a type of high quality pulp used to produce printing and writing paper and tissue.

The market's enthusiasm is the clearest pointer to the excellence of Portuguese paper, which serves as an ambassador for the quality and expertise of our country's forestry industry.

In short, paper shows us how environmental sustainability is completely compatible with economically sustainable models of business success. And that is perhaps its greatest quality. ♦

**Vitor Paranhos Pereira**  
Member of the  
Board of Directors of  
The Navigator Company



## Once upon a time

Once upon a time... how many blank sheets of paper have been filled after penning those words! When we think about paper, we think of school exercise books, stories and sketches, paper aeroplanes, books, comic strip, the Little Prince, our delight in a fresh notebook. But to think about paper is also to think about the wrappings that protect many of our goods and conserve our foods. From waking in the morning to our book at bedtime, paper is with us all day long, it is inseparable from our lives, so much so that we sometimes fail even to notice it. Today, as a renewable and recyclable material, paper is a real alternative for the future. We have good reasons for saying that paper is good for us, for the economy and for the environment.

Paper is a **versatile** material.

In addition to all its familiar uses, in education, hygiene, health, leisure or good, there are more and more innovations to surprise us. A growing number of leading brands have been looking into paper as an alternative for sustainable packaging for their products, both liquid (paper bottles) and solid. We are also familiar with the work of Elvira Fortunato, the scientist who invented transistors on paper, and we can also mention clothes or bullet-proof vests made from the same cellulose fibres used to make papers. The examples are endless.

Paper is a **renewable** material.

This is perhaps its most distinctive and most promising feature, because innovation is showing the way to using paper as a substitute for, and an improvement on, materials which are not renewable, such as those derived from petroleum and plastic, in particular. How is it renewable? Paper is made from trees which are planted specifically for this purpose, and eucalyptus is the tree best suited to making paper. Trees from natural forests are never used. It is renewable because, as with other crops, the trees are planted and then harvested, after which there is a new cycle of planting and harvest, and so on, in cycles that last 8 to 12 years. We are proud to say that we are experts in how to plant trees and manage forests sustainably, because we have done this for many years - more than sixty. This has been a learning process which has been recognised and certified by independent bodies. We then use this expertise to protect natural forests, because they are the source of biodiversity, which is essential to life on Earth. We take this matter very seriously and, at Navigator, around 11% of the woodlands directly managed by the company are classified as areas of conservation interest, safeguarding 41 habitats and dozens of endangered or vulnerable species. Did you know that we have identified 235 species of fauna and 740 species of flora in Navigator's holdings?

Planted forests have played an essential role in preserving natural forests, because they can reduce the pressure of demand for wood for many different purposes, such as industry, furniture and energy. Remember that energy is still the main use of wood worldwide!

Paper is good for the **environment**.

I like to compare trees to millions of natural factories, that we plant and care for each year. That's right, we don't just have pulp and paper factories! These fabulous natural factories produce cellulose, hemicellulose and lignin, capture CO<sub>2</sub> and renewal life on the planet, on a permanent basis.

That is why planting trees is good for the environment and enables us to count on the consequences of climate change, absorbing some of the CO<sub>2</sub> in the atmosphere, which is one of the main causes of global warming. Did you know that eucalyptus forests account for 50% of the removal of CO<sub>2</sub> emissions by Portuguese woodlands, making them the country's leading sequester of carbon?

Interestingly, a hectare of eucalyptus releases enough oxygen for 37 to 80 people to breathe during a year.

In my own case, when I had still not learned at school about photosynthesis and the contribution of trees to the fresh air we breathe, paper already allowed me to learn to read and write those difficult words in lined exercise books, to do sums on graph paper and to add colour to my artistic imaginings, in the drawings that I still derive great pleasure from doing.

Paper is good for **people** and for the **economy**.

Forests currently provide employment for 100 thousand people in Portugal. They account for 5% of our national wealth and 10% of exports. There are 400 thousand forest landowners in Portugal and a third of the country is occupied by woodlands. Proper management of these woodlands is the key to countering this country's serious problem of abandoned rural land, extracting value from these resources and retaining the population in countryside. For these reasons, because this is an economically dynamic sector, that creates jobs, holds the landscape together and benefits the environment, we can only argue in favour of expanding the areas where forests can be managed responsibly, harmonising the aims of production, conservation and other valuable uses that society is willing to remunerate (what are called ecosystem services). So now when you start to write, you will remember that paper makes trees grow and that you are contributing to a better environment and to economic growth.

Once upon a time... paper always has a good story to tell! ♦

**João Lé**  
Executive Director of  
The Navigator Company





# PORTUGAL'S FOREST MOSAIC

Diversity is one of the main features of Portugal's woodlands. European figures on land use and type of plant cover confirm this, showing that no one species is predominant, unlike the Scots pine in Finland, accounting for 67% of woodlands, or spruce trees in Austria, where they occupy 60% of forests, as well as 50% of all woodlands in Ireland and the Czech Republic.

The Mediterranean region, to which Portugal belongs, boasts a wealth of biodiversity and one of the world's richest habitats. The climate is mild, with rainy winters and summers that are hot and dry. The relief is varied and so too is the soil, contributing to a high degree of diversity, making woodlands more robust and resilient.

The Portuguese Institute of Nature and Woodlands Conservation has identified more than 80 native species of woodland trees in the country, which account for 72% of the forest mosaic (predominantly maritime pine, cork oak, holm oak, umbrella pine and oaks). These have been joined over the decades by other woodland species, such as walnut, sycamore, birch, white oak, and eucalyptus, among many others.

Woodlands are the leading form of land use in mainland Portugal, covering one third of its territory (36%).



## THE FOUR GREAT FAMILIES OF PORTUGUESE WOODLANDS

Cork oak savannas, known as montado, and other cork and holm oak woodlands (evergreen hardwood species) account for the largest slice of mainland Portugal's forests, covering just over a million hectares, or 34% of the total forested area.

Pine woods (maritime pine, umbrella pine and other conifers) are the second most important group, covering 959 thousand hectares (30%).

The third largest component in Portugal's forest mosaic is eucalyptus (industrial evergreen species), accounting for 26% (845 thousand ha) of the country's woodlands.

Deciduous hardwood trees (oak, chestnut, and others) occupy 10% of Portuguese forests (320 ha), a proportion that has grown consistently over the past twenty years, contributing to the high level of diversity in the nation's woodlands.

NB: These figures are from the 6th National Forest Survey, conducted in 2015. The make-up of woodlands will have changed in the meantime, due to natural ecosystem dynamics and the consequences of fires, especially in 2017 and 2018.

Content published in National Geographic Portugal.

Sources: 6.º Inventário Florestal Nacional – Relatório Final 2015, ICNF 2019 | Espécies arbóreas indígenas em Portugal Continental – Guia de utilização, ICNF 2016 | Eurostat Regional Yearbook 2014 – Focus on land cover and land use | State of Europe's Forest, 2015 Report