



The big picture

Forests burn, glaciers melt and one million species face extinction. Can we humans save the planet from ourselves? Legendary naturalists Dame Dr Jane Goodall and Sir David Attenborough look at the big picture and see reasons for hope →

Image Endangered rainforest, Indonesia

“Every single day that we live, we make some impact on the planet. We have a choice as to what kind of impact that is.”

“In 1986, I helped organise a conference on how chimpanzee behaviour differed according to the environment. There was a session on conservation and one on conditions in captivity – in both cases, it was utterly shocking. I went to the conference as a scientist, and I left as an activist.

Since then, I’ve been travelling the world raising awareness not only of chimpanzee conservation and welfare, but also of wider environmental issues.

We have just one home, one planet, and we’re destroying it very, very fast. The human population is growing, but on a planet with finite natural resources, and we’re using up these resources faster than nature can replenish them. We’re polluting the air, the water and

the land. We’re recklessly pumping out CO₂ into the atmosphere and, at the same time, we’re destroying our forests and oceans – the two great lungs of the world. If we carry on with business as usual, in 20 years’ time, we may have a planet that’s virtually unliveable.

We must not give up hope. Every single day that we live, we make some impact on the planet. We have a choice as to what kind of impact that is.

I see reasons to be optimistic. Nature is resilient. If we work to restore those places that we have destroyed, if we give them time, they will recover. A bleak, destroyed area can become beautiful again as the insects and birds and other animals come back. Animals on the very brink of extinction can be given another chance.

I truly believe we have a window of time during which we can begin to heal some of the damage we’ve inflicted and at least slow down the climate crisis. But we have to act now.

My greatest hope is our young people. There’s a saying, ‘We haven’t inherited this planet from our parents, we’ve borrowed it from our children’. But we haven’t borrowed our children’s future – we’ve stolen it. In my travels, I have met so many young people who seemed depressed, angry or just apathetic, feeling that their future has been compromised and that there’s nothing they can do about it. That was why we started our Roots & Shoots education programme in 1991, to empower young people to make the world a better place.

Cambridge, like all universities and schools, can play a role in shaping the attitudes of young people. We need

to educate and inspire them, to teach them to respect each other and to respect other living organisms. We need environmental concerns to be taught not just in science, but in every discipline.

We are finally beginning to use our intellect to come up with technological solutions that will enable us to live in greater harmony with our planet – electric cars and renewable energy, for instance – and to think about our own ecological footprints. We need the scientific endeavour for which institutions such as Cambridge are famous to be directed towards doing something about the mess that we’ve made of our planet.

The human spirit is indomitable. Throughout my life, I’ve met so many incredible people – men and women who tackle what seems impossible and won’t give up until they succeed. With our intellect and our determined spirit, and with the tools that we have now, we can find a way to a better future.”

At the age of 26, Dame Dr Jane Goodall travelled from England to what is now Tanzania, Africa, and ventured into the little-known world of wild chimpanzees. Among her many discoveries, perhaps the greatest was that chimpanzees make and use tools. She completed a PhD at Newnham College in Cambridge in 1966, and subsequently founded the Jane Goodall Institute in 1977 to continue her conservation work and the youth service programme Roots & Shoots in 1991. She now travels the world as a UN Messenger of Peace, speaking about the environmental crises we face, and her reasons for hope.



Credit: © Vincent Calmel

“The only way to operate is to believe we can do something about it, and I truly believe we can.”

“It might seem like an obvious thing to say but we need to keep saying it: our planet is precious.

It provides the air we breathe, the food we eat, the water we drink. You have only to take a walk through a forest and look up at its canopy to see the outstanding beauty and complexity of ecosystems. Pause in the stillness among the trees and contemplate what is surrounding you: it’s mind-blowing.

But, rather than cherish this planet – our home – we have too often treated it with contempt. Today, as a consequence, we face disaster on a global scale.

Everywhere we look, we see how ecosystems are threatened. The most striking illustration of climate change that I have seen is seared on my memory:

the first time I saw a dead coral reef. It had actually bleached. Where once it had been full of hundreds of species, now it was like a cemetery.

A few decades ago, the idea that humans could change the climate of our planet was unthinkable. Now this is incontrovertible and we are talking about the risk of irreparable damage. Rising temperatures mean parts of the planet are becoming uninhabitable. Species less able to adapt to rapid changes will be wiped out. Famine will lead to forced migrations. There will be major upsets in natural boundaries, leading to social unrest.

Fortunately, we are now better informed about the state of the world than ever before. We’ve seen a worldwide protest movement grow, led by young people afraid for their future and the future of their planet. We must listen to them. We must respond. We must act – and act now.

We’ve seen before what can be done. When scientists identified the cause of a catastrophic hole in the ozone layer, the world acted. We saw global leaders listening to scientific evidence and taking action.

The climate crisis is a much larger problem, but if we can all pull together, I believe we can solve it. What each one of us does in the next few years will determine what happens in the next few thousand years. There is hope if we all – every single one of us – take our share of responsibility for life on Earth.

Those in power can influence change. And those with knowledge and the ability to innovate can provide solutions to a great number of problems.

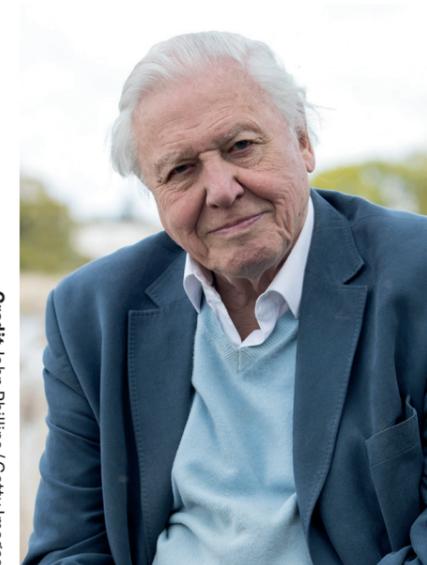
I have had the honour of being part of the Cambridge Conservation Initiative from its inception 12 years ago. I’ve seen what can be achieved when great talent is combined with great ambition: bringing together leaders in research, practice, policy and teaching gives us the greatest chance of developing the solutions required to save our planet.

In the same way, the new initiative Cambridge Zero will be vital. Combining expertise, from science and technology to law and policy to artificial intelligence and engineering, Cambridge Zero will help drive a vision for a carbon neutral future.

It’s a source of comfort to me that people are recognising that their world is at stake, that the ocean is not infinitely full of food, that the ground is not infinitely full of minerals, that life on Earth is not impervious to the damage we cause.

Our planet hangs in the balance. The only way to operate is to believe we can do something about it, and I truly believe we can.”

Broadcaster Sir David Attenborough’s documentaries have brought the wonders of the natural world to our screens – from the splendours of terrestrial life, to the otherworldly underwater kingdoms and the frozen ends of the Earth – but they also increasingly show our planet’s fragility in the face of habitat destruction and climate change. He is an alumnus of Clare College and has given his name to the campus of the Cambridge Conservation Initiative – the largest cluster of biodiversity conservation organisations on the planet.



Credit: John Phillips/Getty Images



Plastic has become a malevolent symbol of our wasteful society. It's also fundamental to almost every aspect of our lives. How do we shift our 'take, make, throw-away' plastic world towards 'recycle, recover, re-use'?

Words Louise Walsh

THE 'P' WORD



IN Tokyo, a householder consults her 60-page 'Garbage Separation and Disposal' system to check whether it's a recycle day for plastic bottles or for all other plastic packaging. In a coastal village in Kenya, an order has been received for 2,000 bricks made from waste plastic and earth. On a chemistry bench in Cambridge, bubbles of hydrogen form and rise around a thumbnail-sized square of plastic cut from a water bottle.

All around the world there are instances where we are getting things right with plastic – recycling, recovering, re-using – and instances where we are getting things very wrong.

Our awareness of just how wrong is riding the crest of a plastic-polluted wave: every year, more than 8 million tonnes of plastic waste ends up in the world's oceans. Environmental agencies have predicted that if these trends continue, our oceans will contain more plastic than fish by 2050.

But plastic is also one of the most successful materials ever invented: it's cheap, durable, flexible, waterproof, versatile and lightweight. It's also a resource that we are wasting, says Professor Erwin Reisner.

"As a chemist I look at plastic and I see an extremely useful material that is rich in chemicals and energy – a material that shouldn't end up in landfills and pollute the environment. Plastic is an example of how we must find ways to use resources without irreversibly changing the planet for future generations."

Reisner leads the new Cambridge Creative Circular Plastics Centre (CirPlas). Funded by UK Research and Innovation, it aims to eliminate plastic waste by combining blue-sky thinking with practical measures, connecting expertise across the disciplines, and collaborating with industry and local government.

In doing so, their research reaches from the Tokyo householder to the Kenyan brickmaker to the Cambridge chemist, and further, to help shift the balance from drastic plastic to fantastic plastic.

Words to live by "There's a word in Japanese that conveys a feeling of regret when something useful is wasted. It's *mottainai*," says anthropologist Dr Brigitte Steger, from the Faculty of Asian and Middle Eastern Studies. →

Fast Facts



New Cambridge Creative Circular Plastics Centre focuses on innovations in plastic use, re-use and avoiding use

Roadmap sets out how to achieve zero plastic packaging waste by 2030

Researchers examine business case for packaging manufacturers adopting a localised circular economy

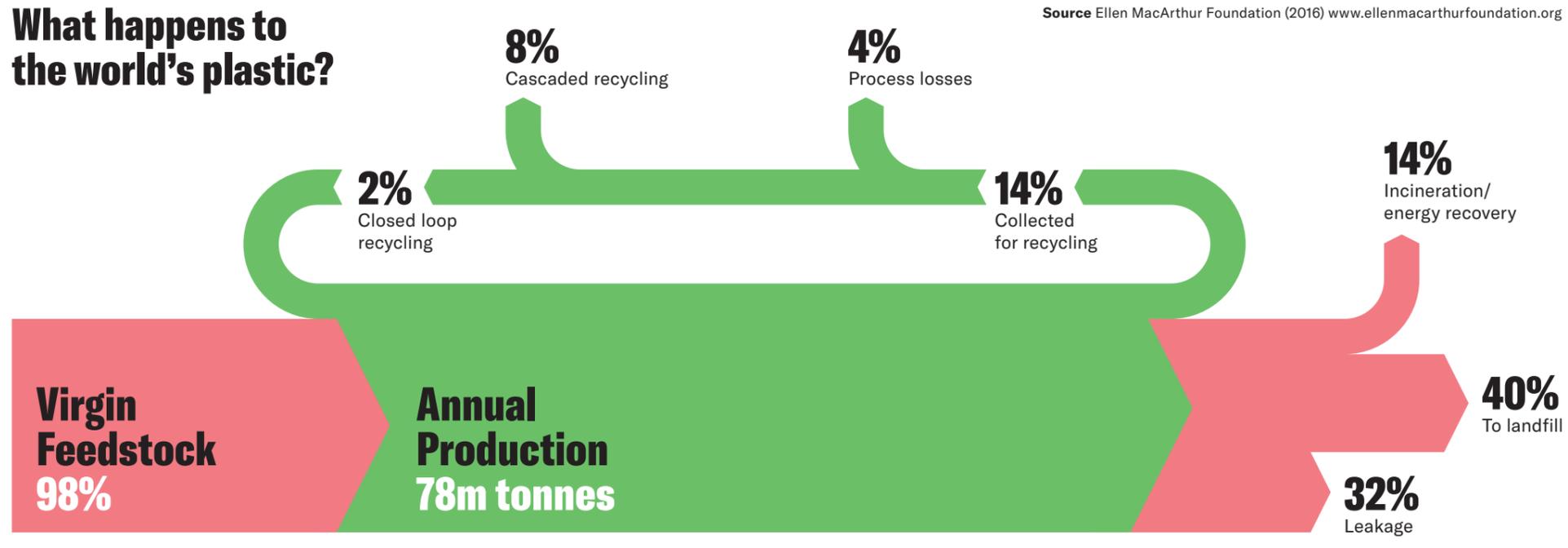
“One woman being rehoused after the Fukushima Daiichi nuclear disaster told me she would only move to an area where she was familiar with the complexities of the recycling system. The Japanese are very good citizens in terms of sorting and recycling but they also use a huge amount of plastic – and don’t regard single-use plastic with *mottainai*.”

Steger and her team look at cultural attitudes to plastic and waste globally: “We need to understand what practical and moral needs plastic fulfils to know what can be done to shift behaviour towards living more sustainably. Moreover, policymakers define solutions in response to how problems are defined. We need to clarify these.”

“It is argued by some that we are using resources 50% faster than can be replenished,” says economist Dr Khaled Soufani, who leads the Circular Economy Centre in Cambridge Judge Business School. “It has also been said that by 2030 we will require the natural resources of two Earths, and by 2050, three.”

He and Steger are contributing to CirPlas by asking how individuals, communities, companies and public bodies approach their use and recycling of plastic. He adds: “Today’s cradle-to-grave economy sees around 80% of plastic landfilled, incinerated or lost into the natural environment. What we need is a circular economy with re-use of products and recycling of embedded materials into new products for as long as possible.”

What happens to the world’s plastic?



Keeping track of plastic Ask anyone what they know about plastic and they might tell you about the need to ban single-use materials, or that it’s essential for healthcare, or that it’s lighter and more fuel efficient than packaging alternatives.

“What no-one will tell you is how any of this relates to how much and what type of plastic we use, how long those products are in service, and what happens to them afterwards. The fact is – no-one knows,” says Dr André Serrenho.

It seems a simple enough set of questions but the data is complex and held by many different bodies. And so, as part of CirPlas, he and Dr Jonathan Cullen in the Faculty of Engineering are creating a map of the flow of plastic in the UK economy by amassing all of this data in one place.

Meanwhile, engineer Dr Ronan Daly is exploring digitally enabled solutions to label and track plastic, and zoologist Dr David Aldridge is using sensing technologies to measure how much microplastic is entering the food chain.

“All of these studies will take us closer to answering something we’ve never been able to answer before,” adds Serrenho. “Plastic helps us live safer, more convenient lives but how much is enough plastic and how much is too much?”

Plastic rematerialised Our need for plastic is here to stay, and so Cambridge researchers are exploring how we re-use it – as well as developing alternatives to take its place.

For instance, Taylor Uekert, working with Reisner in the Department of Chemistry, has developed a technology called photoreforming that turns plastic waste into hydrogen fuel, using only water, a photocatalyst and sunlight. The technology is still very new but already they’ve produced enough hydrogen from polyester fibres to power a phone for 40 seconds.

Dr Aazara Oumayyah Pankan is also exploring electricity generation from waste plastic – this time using biology. She’s testing microorganisms from environments like toxic waste dumps for their ability to decompose plastic. Working with Dr Adrian Fisher in the Department of Chemical Engineering and Biotechnology, her aim is for these ‘plastic composters’ to provide off-grid power for rural communities.

In Kenya, a coastal community has started converting waste plastic into bricks, using a method developed by a student-led team from Cambridge’s Department of Engineering and prototyped by the Kenyan community. They have just received an order for 2,000 bricks for a local school.

Physicist Professor Jeremy Baumberg is using plastic waste as the raw materials for low-cost 3D printers. His team’s approach is to design printable scientific instruments like microscopes for resource-poor countries to turn low-value waste into high-value locally manufactured components.

Meanwhile, biochemist Professor Paul Dupree and materials scientist Professor James Elliott have set out to design a

completely new class of materials based on modified plant fibres that have some of the good properties of plastic and yet are easy to recycle or decompose naturally.

Zero waste from industry One area where plastic has transformed modern-day living is in food safety. Of the 5 million tonnes of plastic used each year by the UK, 37% is used for packaging, of which almost three-quarters is for soft drinks. The challenges presented by waste from this packaging cannot be ignored, least of all by the industries that depend on it.

“What’s needed now is collective and informed action from individuals, government and business to shift us back in the right direction,” says Beverley Cornaby.

Last year, she and colleagues at the Cambridge Institute for Sustainability Leadership worked with 10 of the UK’s largest bottled drinks companies to understand what this collective action might look like. The result was an ambitious roadmap for zero plastic packaging waste from the industry being sent to landfill or escaping into the natural landscape by 2030.

“One of the areas we identified was around design. Businesses can sometimes move faster than government policy and so making changes to their own products can provide quicker fixes. We’ve worked with companies to understand how to reconsider their approach to using plastic packaging. We’re now looking at alternative

packaging choices and what the relative impact might be on carbon emissions, and water and land use.”

Circularity by design Cambridgeshire-based packaging company, Charpak, is, they believe, the first in the UK to adopt a ‘localised circular economy’ in which local plastic waste is collected, re-processed and re-manufactured into new packaging. The company has been chosen by Soufani’s team as a case study to look at the viability of a circular business model.

“Before any company will look at embedding circularity, they are going to ask a very simple question: how will it impact on me financially? Communities, companies and governing bodies need to see practical business cases and models in action,” adds Soufani.

“Minimising plastic leaking into our environment is a responsibility we take very seriously, so we must ensure plastic becomes a resource and not waste,” says Charpak Managing Director Paul Smith. “Why transport essential plastics resources nationwide, or overseas, and risk ocean plastics when the plastic resource is required for manufacture and re-manufacture within the UK? We want to be part of the solution.”

Soufani agrees, adding: “We need to shift from a culture of mass consumption and waste towards renewability, dematerialisation and reduced resource loss. Our need to reduce, remake and recycle is a continuous journey towards circularity that will define our relationship with the planet forever.” ●

Snapshot The solution catalyser

Bringing the right people together to solve a major global environmental problem like waste is essential. With this in mind, Dr Curie Park from the Institute for Manufacturing took her emergent circular economy process for creating the right mix of people to Thailand.

“Thailand uses a staggering amount of single-use plastics every day, but its waste management system lags far behind its economic advances. We saw first-hand the marine waste at a coastal village, where plastic debris floats from the rivers and is washed up as current changes seasonally.

Everyone recognised the problem, which seemed too big for any one individual to tackle. But there had been regular beach cleaning activities and some of this collected plastic could be turned into viable products locally.

We brought together a construction company, an environmental NGO, university students, a local windsurfing world champion turned beach cleaning heroine, municipal officers, local primary schools and start-ups, and applied our innovation process.

Giving everyone a chance to share their views, providing stimuli and sharing what’s happening in other communities ignited a creative momentum to come up with novel solutions. We ended up with 56 ideas for using the waste as a raw material – paddleboards, compost bins, roof tiles – seven of which are in the commercialisation pipeline by the construction company and the local start-ups.”

Funded by a Global Challenges Research Fund Impact Acceleration Award

Dr Curie Park

