

Royal Botanic Gardens
Kew

Our manifesto for change

2021–2030



Our manifesto for change



Earth is the only planet in the universe we know for certain supports life. Yet life on Earth is in crisis. Natural resources are being degraded at a rate unprecedented in human history. As a result, we are living through an age of extinction.

We also face a climate emergency. Actions such as burning fossil fuels and clearing wild lands have released greenhouse gases, disrupting natural climate patterns. In a vicious cycle, damaged ecosystems are less able to absorb emissions and mitigate the worst consequences of climate change.

The next decade will be critical if we are to reverse this environmental devastation. Humanity stands at a crossroads. The future of our planet is in grave jeopardy. Action is needed now to end biodiversity loss and repair our world.

The mission of the Royal Botanic Gardens, Kew (RBG Kew) is to understand and protect plants and fungi for the well-being of people and the future of all life on Earth.

Our aspiration is to end the extinction crisis and to help create a world where nature is protected, valued by all and managed sustainably.

‘WHAT WE DO NOW, AND IN THE NEXT FEW YEARS, WILL PROFOUNDLY AFFECT THE NEXT FEW THOUSAND YEARS.’

Sir David Attenborough, broadcaster and natural historian

To deliver our mission, we have five priorities. These commitments are based on how we believe we can best deploy our expertise and other assets to make a distinctive and substantial contribution to tackling global challenges. RBG Kew commits to:

1

Deliver science-based knowledge and solutions to protect biodiversity and use natural resources sustainably.

Our scientists will identify and strive to protect species of plants and fungi globally, as well as revealing those that could be new sources of food, medicine, fuel or materials.

2

Inspire people to protect the natural world.

We will promote and provide access to knowledge, ideas and beautiful gardens that motivate individuals to be advocates for nature.

3

Train the next generation of experts.

The world needs brilliant scientists and horticulturists. We commit to training students from the UK and around the world.

4

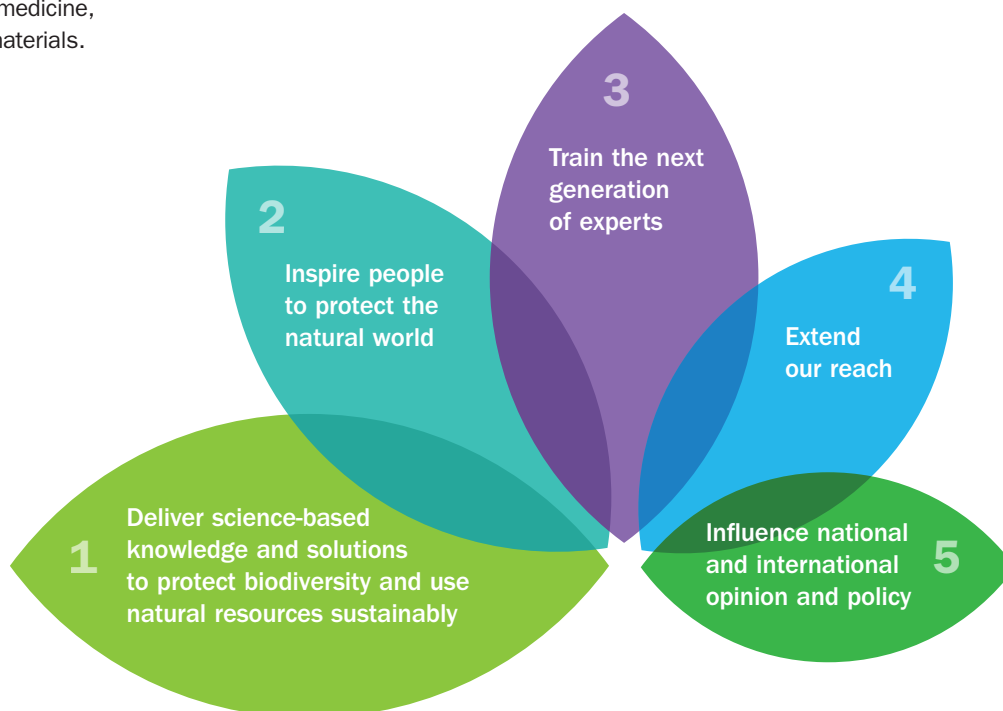
Extend our reach.

RBG Kew is a public body and charity with global collections and influence. We must be for everyone, disseminating our knowledge and collections both physically and digitally for global benefit.

5

Influence national and international opinion and policy.

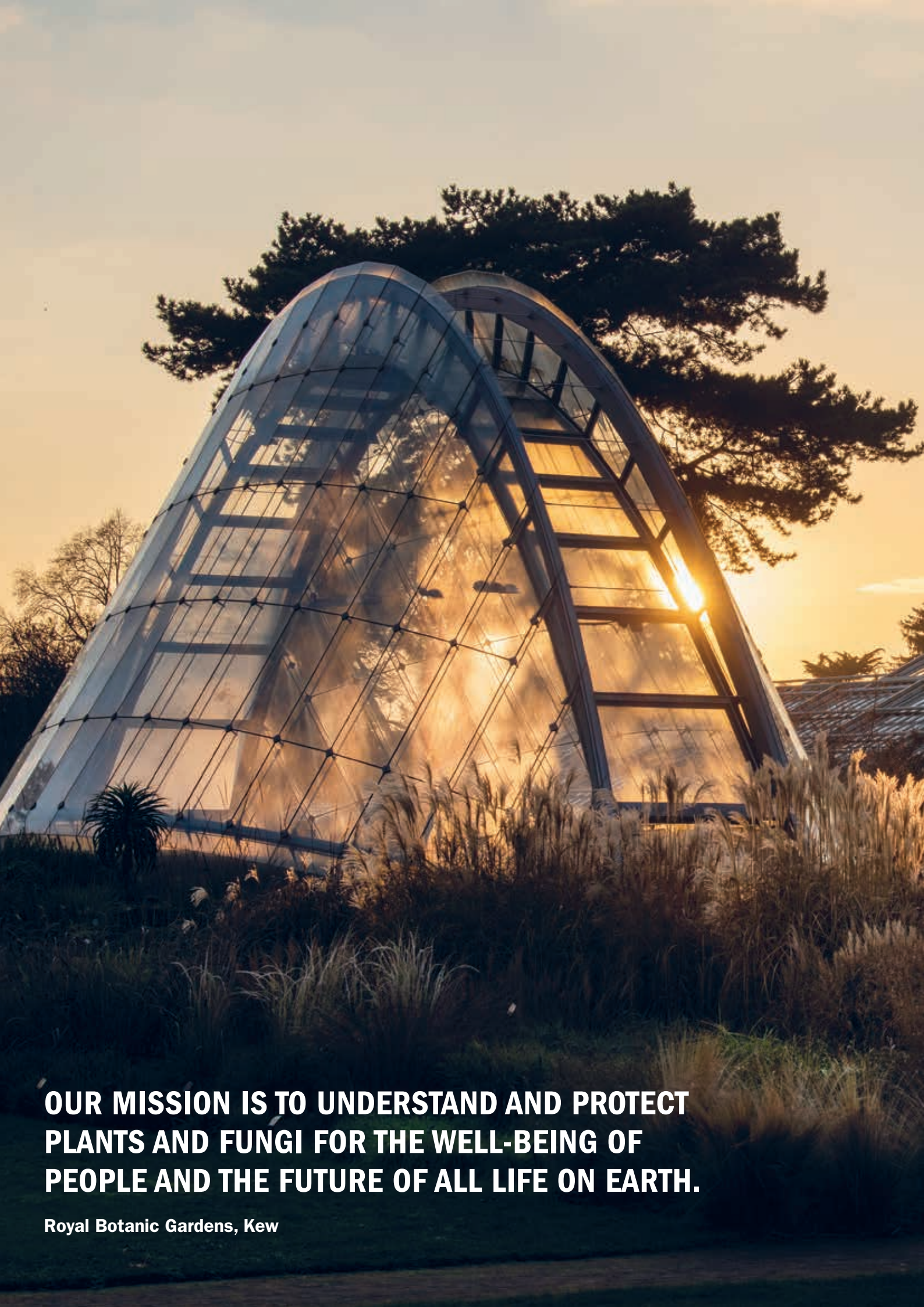
We will speak with confidence and prominence to advocate policies aligned with our mission. We will be an exemplar of environmental responsibility in all that we do, including by exceeding net-zero carbon emissions to become climate positive by 2030.





**WE WILL WORK IN PARTNERSHIPS NATIONALLY
AND GLOBALLY TO MAXIMISE OUR IMPACT.
AND WE WILL ACT WITH THE UTMOST URGENCY.**

Royal Botanic Gardens, Kew



**OUR MISSION IS TO UNDERSTAND AND PROTECT
PLANTS AND FUNGI FOR THE WELL-BEING OF
PEOPLE AND THE FUTURE OF ALL LIFE ON EARTH.**

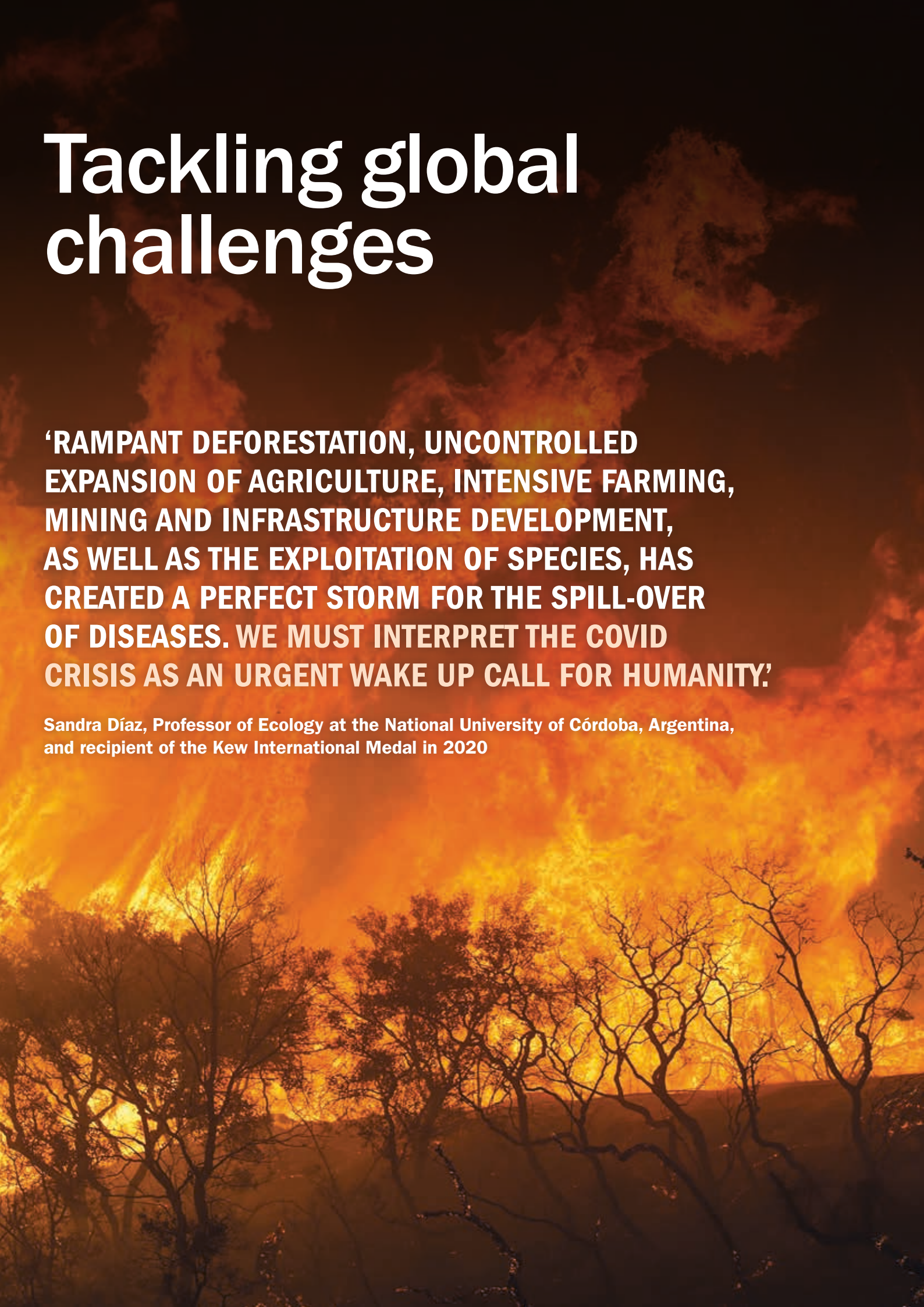
Royal Botanic Gardens, Kew



Tackling global challenges

‘RAMPANT DEFORESTATION, UNCONTROLLED EXPANSION OF AGRICULTURE, INTENSIVE FARMING, MINING AND INFRASTRUCTURE DEVELOPMENT, AS WELL AS THE EXPLOITATION OF SPECIES, HAS CREATED A PERFECT STORM FOR THE SPILL-OVER OF DISEASES. WE MUST INTERPRET THE COVID CRISIS AS AN URGENT WAKE UP CALL FOR HUMANITY.’

Sandra Díaz, Professor of Ecology at the National University of Córdoba, Argentina, and recipient of the Kew International Medal in 2020



Our life-supporting ecosystems, such as our vast rainforests and grasslands, are in peril. We are degrading them so quickly that species are dying out a thousand times faster than before humans existed.

Biodiversity – the totality of all life on Earth – is interconnected, so we all face the consequences of this damage. For example, a decline in bee populations can affect food production, hindering vital pollination and reducing yields. Meanwhile, the emergence and spread of human diseases such as COVID-19, which scientists believe originated in wild animals, will become more likely if habitats continue to be degraded.

We are also facing a climate emergency, because we have overpowered natural climate cycles by rapidly releasing greenhouse gases into the atmosphere. Climate change is contributing to the loss of Earth's biodiversity by altering environmental conditions within habitats. Having adapted to their surroundings over millions of years, many species are unable to survive the pace of climate change.

And, at a time when Earth's wild places are under intense pressure, the global population is rising. By 2050, there will be two billion more people on the planet. We will need to find ways to sustainably feed and house everyone, under changing climatic conditions, while revitalising nature. If we are to succeed, we must act now.

Our pledge

The Royal Botanic Gardens, Kew (RBG Kew) is committed to restoring our planet to health. We will focus all our expertise and resources on understanding the diversity and properties of plants and fungi, and finding long-term ways to protect and restore natural habitats, so we can end biodiversity loss and safeguard life on Earth.

We will respond with haste to resolve Earth's environmental plight, drawing on our world-class research; our unrivalled collections of preserved specimens, including the Herbarium, Fungarium and Millennium Seed Bank (MSB); the diverse plants and fungi growing in our gardens; our global network of partners; and our 260 years of history.

Time is running out. We must stop biodiversity loss. RBG Kew will use all its resources to overcome this global emergency.

SCIENCE EXPLAINED

What is biodiversity?

Biodiversity, shortened from 'biological diversity', describes life on Earth, in all its forms and at every scale. So, plants, fungi, animals and bacteria are all part of biodiversity. But so, too, are single genes, individual species, communities of organisms and entire ecosystems, such as coral reefs or rainforests. Over millions of years, the environment on Earth has evolved to support myriad life forms that depend on each other in complex ways. Losing individual species makes ecosystems less resilient. Lose enough, and those ecosystems can quite suddenly collapse. Halting biodiversity loss is critical for maintaining conditions in which all life, including humanity, can thrive.





How plants and fungi support life

'HUMANITY IS WAGING A WAR ON NATURE, AND WE NEED TO CHANGE OUR RELATIONSHIP WITH IT.'

António Guterres, United Nations Secretary-General

Plants make food using energy from sunlight, carbon dioxide from the air, and water from their surroundings. They provide some of this to fungi in exchange for nutrients and water.

Healthy communities of plants and fungi provide us with valuable 'ecosystem services'. For example, they supply the air we breathe, regulate the global climate and provide us with food, medicines and fuel.

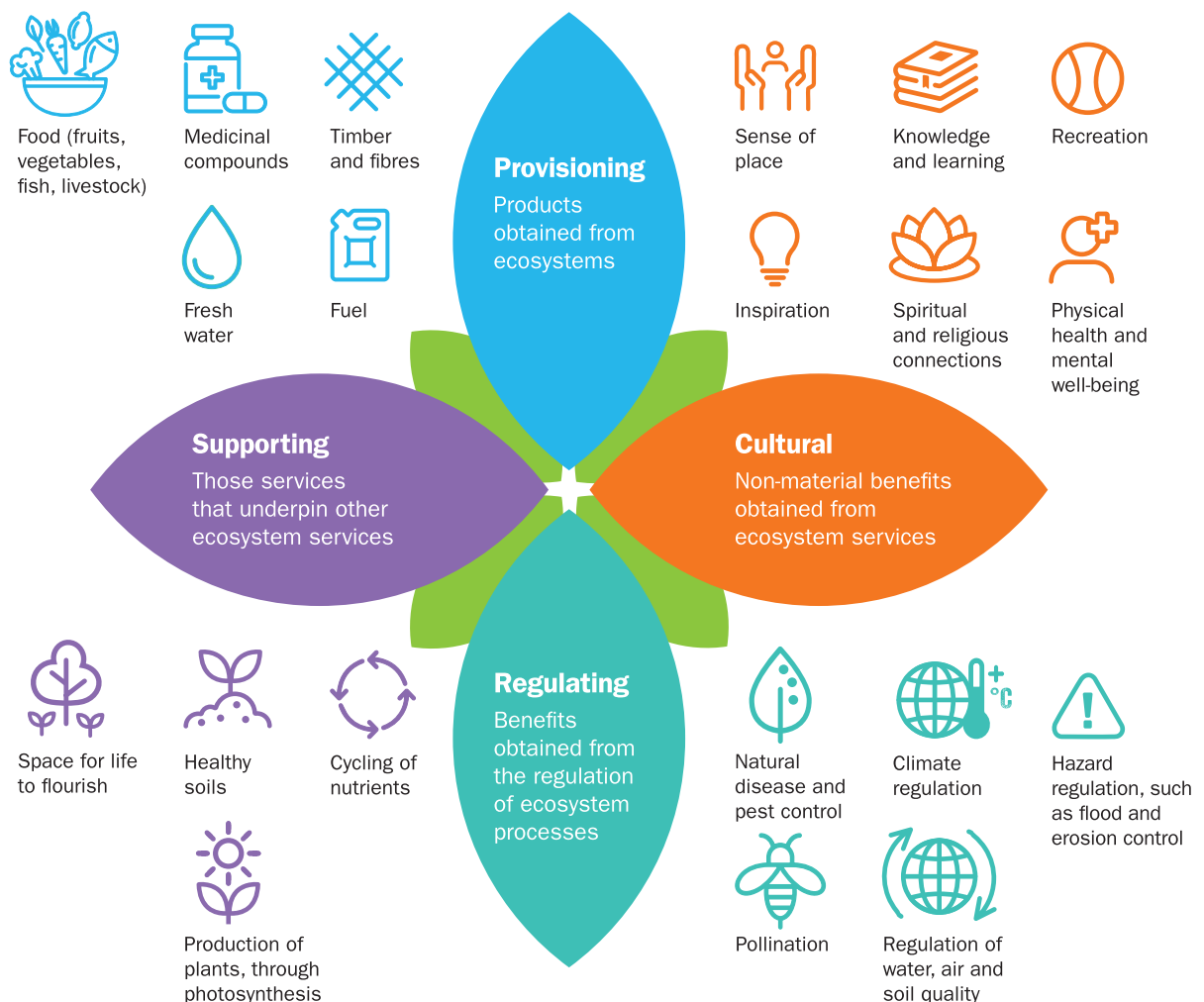
There are more than 7,000 edible plant species but, according to the Food and Agriculture Organization of the United Nations, we currently rely on just 15 major crops to provide 90 per cent of our food energy intake. It's a similar

story for energy crops, with just six crops producing 80 per cent of global industrial biofuel.

Relying on so few species makes our societies vulnerable to plant diseases, pests and climate change. However, technology is enabling us to make today's crops more robust using genes from their wild relatives. And the wealth of untapped plants and fungi could yield numerous new foods and sustainable sources of energy in future.

How Earth's ecosystems support all of our lives

When healthy and functioning well, Earth's ecosystems provide provisioning, cultural, regulating and supporting services.





Keeping disease at bay

Plants and fungi have provided or inspired many important drugs, including those used to treat cancer and malaria. In total, 25,791 species of plants have been documented to be of medicinal use, but over 347,000 species of plants are known to exist and many new species are described every year. So, nature represents a largely unexplored medicine chest that may contain treatments for existing and emerging diseases.

Clothing and housing us

How much thought do we give to the provenance of our clothing? Many natural fibres used to weave fabric for clothes derive from plants; think cotton, bamboo and linen. Meanwhile, wood used in construction and to make furniture comes from trees such as pine, teak and oak. Ensuring the timber we use is grown sustainably, rather than logged from wild forests, can help us reduce biodiversity loss.

Underpinning livelihoods

The incomes of many millions of people are entirely dependent on plants and fungi. Biodiversity represents a vital source of value to the global economy, yet it is over-exploited and insufficiently accounted for. Activities from growing fodder for livestock, to harvesting rattan for cane products and cultivating the beans for our morning coffee, all rely on nature. Assisting communities to use biodiversity sustainably will ensure Earth can support the rising global population.

Nurturing our well-being

On top of all these benefits, there is good scientific evidence that immersing ourselves in nature is good for us. Being among plants improves our mental and physical health; we are rejuvenated by their beauty, fragrance and tranquillity. It is no surprise that plants and fungi have become embedded in cultural and religious practices, and today represent peace and love in many cultures.



KEW AT WORK

Assisting Colombia to build a green economy

Colombia is one of the most biodiverse countries in the world. In 2016, the Colombian and UK governments jointly launched the Colombia Bio programme, with the aim of quantifying and preserving the country's plants, fungi and animals, and using them in sustainable ways that promoted development. Colombia had only recently emerged from a long civil war, during which many of its most biodiverse forest areas had been inaccessible. This presented a unique opportunity for RBG Kew and partners to study relatively intact ecosystems.

To date, our scientists have contributed to ten projects, including: six initiatives to document potentially useful species in Boyacá, a region rich in flowering plants; a project to study how plant biodiversity in the páramo mountain ecosystem affects water provision to major cities; development of an online resource of Colombia's plants and their uses; a project to safeguard biodiversity, promote social cohesion and create income sources through ecotourism; and the Useful Plants and Fungi of Colombia programme, which seeks to enhance livelihoods and reduce inequality through the sustainable use of biodiversity.

Researching useful plants

RBG Kew works across all of these aspects of plants and fungi. As we classify species, we seek to identify and develop those that might provide new foods, energy crops, medicines or useful materials.

We strive to conserve species, habitats and ecosystems around the world using both *in situ* (on-site) and *ex situ* (off-site) conservation approaches. And we pass on our knowledge and expertise globally. In doing so, we enable communities to develop and support sustainable livelihoods based on plants and fungi, and we promote the value of biodiversity to all.



SCIENCE EXPLAINED

Using wild relatives of crops to safeguard food production

Many modern crops have low genetic diversity. This is because, down the millennia, farmers have chosen to propagate or breed from plants with favourable properties, such as a high yield or tasty fruit. Their actions have, over time, limited the gene pool of our crops. Fortunately, the wild relatives of modern crops still retain diverse genes. And modern breeding techniques are enabling scientists to bring some of the lost genetic diversity back into crops. This will make them better able to withstand higher temperatures, droughts and floods as climate change advances. RBG Kew is contributing to programmes to find, classify and bank seeds from crop wild relatives, in order to safeguard this vital genetic resource.

KEW AT WORK

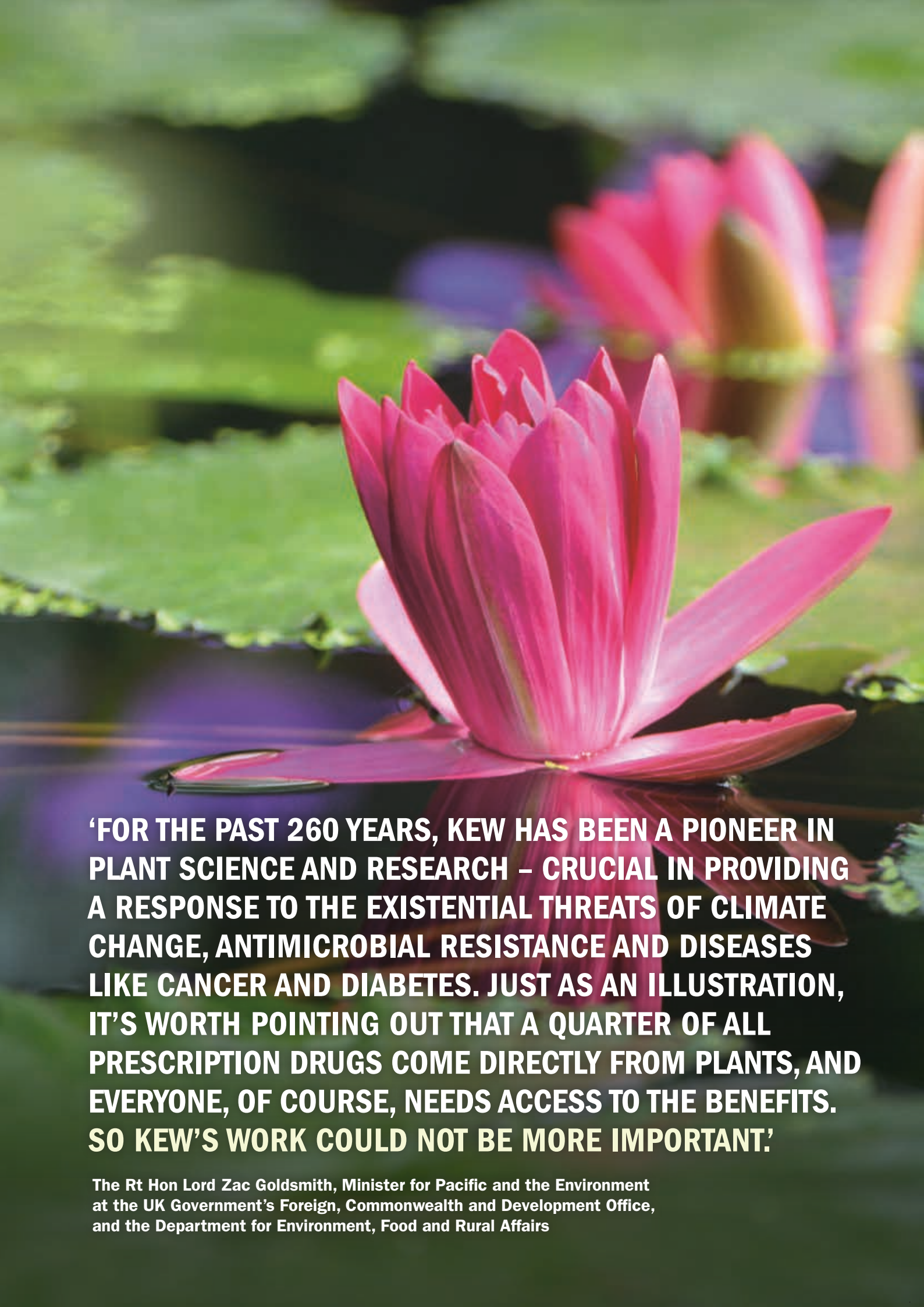
Revealing the state of the world's plants and fungi

Until 2016, no institution had ever conducted a comprehensive review of the state of the world's plants or fungi. To remedy this knowledge gap, RBG Kew scientists and collaborators researched and published annual *State of the World's Plants* reports in 2016 and 2017, followed by *State of the World's Fungi* in 2018. Then, in 2020, RBG Kew published the first-ever report assessing plants and fungi together, reflecting both the mutual interdependence of plants and fungi, and our world-class expertise in these two kingdoms of life.

The reports have provided vital information on the ecosystems that support life on Earth. For example, they have revealed that scientists identify around 2,000 species of both plants and fungi as new to science each year; that we have only described 148,000 of the estimated 2.2 to 3.8 million species of fungi on Earth; and that two in five species of plants are threatened with extinction. However, they have also shown that, with the help of modern technologies, we could sustainably use many more species than we currently do for food, fuel, materials and medicines.

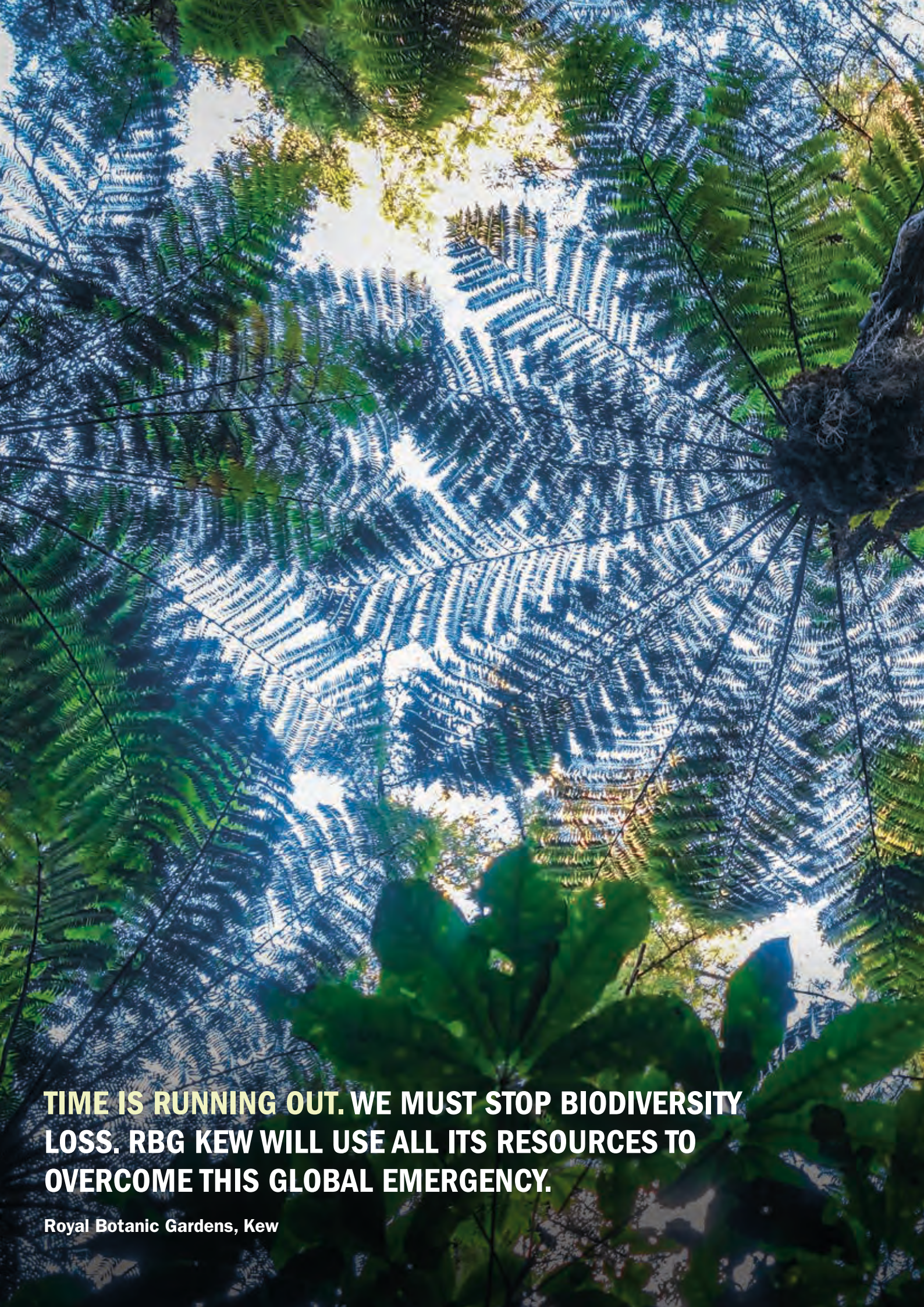
As well as being presented to scientists, campaigners and policymakers in dedicated symposia, findings from the reports have been covered by hundreds of TV, print and online media outlets around the world. Funded by the Sfumato Foundation, RBG Kew's *State of the World's* series has therefore played a vital role in raising awareness of the value of biodiversity to humanity, and of the critical importance of conserving plants and fungi for posterity.





‘FOR THE PAST 260 YEARS, KEW HAS BEEN A PIONEER IN PLANT SCIENCE AND RESEARCH – CRUCIAL IN PROVIDING A RESPONSE TO THE EXISTENTIAL THREATS OF CLIMATE CHANGE, ANTIMICROBIAL RESISTANCE AND DISEASES LIKE CANCER AND DIABETES. JUST AS AN ILLUSTRATION, IT’S WORTH POINTING OUT THAT A QUARTER OF ALL PRESCRIPTION DRUGS COME DIRECTLY FROM PLANTS, AND EVERYONE, OF COURSE, NEEDS ACCESS TO THE BENEFITS. SO KEW’S WORK COULD NOT BE MORE IMPORTANT.’

The Rt Hon Lord Zac Goldsmith, Minister for Pacific and the Environment
at the UK Government’s Foreign, Commonwealth and Development Office,
and the Department for Environment, Food and Rural Affairs



**TIME IS RUNNING OUT. WE MUST STOP BIODIVERSITY
LOSS. RBG KEW WILL USE ALL ITS RESOURCES TO
OVERCOME THIS GLOBAL EMERGENCY.**

Royal Botanic Gardens, Kew



Our five priorities for the next ten years

A silhouette of a person's head and shoulders in profile, looking through the eyepiece of a microscope. The background is a solid green color. The microscope is positioned on the right side of the frame, and the person's head is on the left, tilted downwards towards the eyepiece.

'I WELCOME RBG KEW'S PLEDGE TO DIGITISE ITS COLLECTIONS. I HOPE THIS WILL HAPPEN IN THE NEAR FUTURE SO THESE SPECIMENS MAY BE USED BY MANY COUNTRIES TO CONSERVE THEIR BIODIVERSITY SUSTAINABLY, AND SO THAT THE INFORMATION THEY CONTAIN CAN BE USED TO ADDRESS THE EFFECTS OF CLIMATE CHANGE ON BIODIVERSITY AT A GLOBAL LEVEL.'

Sebsebe Demissew, Professor of Plant Systematics and Biodiversity at the College of Natural Sciences, Addis Ababa University, Ethiopia

Priority 1

Deliver science-based solutions to help us protect biodiversity and use natural resources sustainably

Conducting scientific research and conserving plants and fungi will continue to be the bedrock of RBG Kew's contribution to ending biodiversity loss and restoring and maintaining healthy ecosystems.

We will focus on scientifically naming and classifying the vast numbers of plant and fungal species that we still know nothing about. That will enable us to assess the threats facing biodiversity better, to prioritise species and ecosystems for conservation, and to identify potentially useful species.

We must understand how species are distributed on Earth and how this is changing. The vast gene store represented by our living collections and seed bank will be a key tool in helping us to understand species' requirements and restore habitats.

Many species could yield valuable new foods, medicines or materials, or provide nature-based solutions to mitigate climate change. So we will investigate the properties of plants and fungi, to uncover useful attributes.

We will deploy cutting-edge genomics, artificial intelligence and 'big data' analyses to rapidly deepen our scientific understanding. All our knowledge will be disseminated through world-class biodiversity information tools and portals that are accessible to all.

To deliver these changes, we plan to make major investments to digitise our collections, and to rejuvenate and expand our science facilities and capabilities.

Changes by 2030. We will:

- **Safeguard valuable and endangered species and ecosystems** within the UK and around the globe. We will use cutting-edge techniques such as genomics (the study of the full set of an organism's genes), metabolomics (the study of small, biologically produced molecules), machine learning, statistical modelling and satellite remote sensing to speed up how we identify and characterise species, predict extinction risks and reveal species' potentially useful characteristics.
- **Safeguard species outside of their natural habitats and explore their properties**, through banking seeds and cryopreservation; new germination and cultivation techniques; prioritising rare, economically important and endangered species; and using our collections and data to explore the useful properties of plants and fungi, help restore landscapes and protect livelihoods globally.
- **Transform Wakehurst**, our wild botanic garden in West Sussex, to become a **national centre of excellence in conservation science and practice, seed research and landscape ecology**. Combining innovative horticulture and research, the conservation work of the Millennium Seed Bank and public outreach, we will raise awareness of how plants and fungi could be used to tackle environmental problems, underpin human well-being, and encourage stewardship of the natural world.
- **Digitise our collections**, starting with our 8.25 million preserved plant and fungal specimens, and 200,000 botanical illustrations. Liberating this knowledge and making it universally accessible – with the support of new online tools for data retrieval, analysis and visualisation – will facilitate new discoveries in plant and fungal science and conservation.
- **Expand and enrich our network of cross-disciplinary partnerships**. We will build new collaborations with institutions and policymakers in some of the world's most biodiverse tropical countries, such as Madagascar, Colombia, Ethiopia and the island of New Guinea. As well as engaging with botanists and mycologists, we will forge relationships with experts in related fields, such as pollination and urban environments, and in other disciplines such as computational science, climatology, medical science, and the social sciences. This will enable us to coordinate cross- and multi-disciplinary work to achieve the greatest scientific and societal impact.

An aerial photograph of the Wakehurst estate in West Sussex, UK. The image shows a large, historic stone house with multiple gables and chimneys, surrounded by extensive green lawns and mature trees. A winding river or stream flows through the estate, with a bridge crossing it in the foreground. The landscape is a mix of open fields, wooded areas, and formal garden paths. The lighting suggests a late afternoon or early morning scene, with long shadows and a warm glow.

A LIVING LABORATORY

New conservation centre will answer big environmental questions

RBG Kew is redefining Wakehurst, Kew's wild botanic garden, as our centre for ecology, conservation and seed research, connecting the rich natural assets of our West Sussex estate with the organisation's scientific and horticultural expertise. Our overarching aim will be to research the values, services and benefits that biodiversity provides for people and the environment, to help find ways to tackle the current climate and extinction crises.

Wakehurst has a particularly biodiverse landscape of European significance, making it ideal for testing all kinds of research hypotheses. It will help RBG Kew scientists and others to answer questions, such as: How does the landscape capture and store carbon? Should we conserve meadows, restore old-growth woodland, or create new tree plantations to best mitigate climate change? And how does being in a biodiverse location improve people's well-being?

The rich data that emerge will underpin long-term management that enriches biodiversity and increases the benefits we derive from nature, providing evidence for policymakers and land managers that will deliver impact beyond our boundaries.

KEW AT WORK**Boosting nutrition and enhancing livelihoods with yams**

Madagascar is a biodiversity hotspot, with 90% of its flora and fauna found nowhere else. It is also one of the poorest countries in the world, with a growing percentage of the population suffering from poverty and food insecurity. RBG Kew has been applying its expertise on yams to help ensure that rural Malagasy people, most of whom survive on less than GBP 1.50 per day, can access food sustainably.



Yams are rich in carbohydrates, and provide protein and micronutrients. As a result, they are relied on as a go-to food especially during 'hungry gaps' when more favoured staples, primarily rice, have run out. Seeking to reduce the pressure of wild harvesting and enhance lives and livelihoods, RBG Kew scientists distributed seed tubers of winged yam (*Dioscorea alata* – originally introduced from Asia), and trained 3,209 people to propagate, cultivate and harvest wild and winged yams and to survey wild populations.

Engaging a total of 15,000 of Madagascar's poorest people, this project helped to increase the mean protein intake of participants by 20% and raise mean household incomes by 23% from GBP 0.30 to GBP 0.37 per day, primarily through winged yam community cultivation. It also led to seeds from 25 species of wild yam being conserved. As a result, the initiative was extended to investigate wild and cultivated yam nutrition, marketing and storage.

**A BOLD VISION****Uniting biodiversity institutions**

At RBG Kew, we aspire to catalyse a partnership of like-minded organisations to create a global biodiversity institute. Such an institute could help us to end biodiversity loss this century, through global leadership and scientific excellence.

Our hope is to bring together a unique coalition of national and international partner organisations, with wide-ranging scientific and economic expertise, to deliver the following outcomes:

- Develop and implement science-based solutions to protect biodiversity and build sustainable livelihoods.
- Build capacity globally by educating and training students.
- Raise public awareness of the importance of nature, focusing on the biodiversity crisis and potential solutions.
- Provide a locus for conferences, symposia, debates and the formulation of policy.

An institute of this nature would be well placed to weave together and strengthen existing, yet fragmented, capabilities. It could provide a globally respected and valued source of knowledge, data, advice and solutions, and would work with the UK Government to provide global leadership for addressing the biodiversity crisis.

To make our contribution to such an institute, we plan to rejuvenate and redevelop our science buildings and laboratories at Kew Gardens to create world-class facilities for our own staff, partner organisations and visiting scientists. This project, 'The Science Quarter', will provide critical infrastructure for a future Biodiversity Institute, and will facilitate a step-change in the quality and impact of RBG Kew's own research in the coming decades.



Priority 2

Inspire people to protect the natural world

Too few of us fully understand why biodiversity is fundamental to our lives and how its degradation or loss affects us personally. We need to change that, so that people from all walks of life are motivated to protect nature. RBG Kew will actively promote and provide access to knowledge, ideas and inspiration to empower individuals to care for Earth's rich biodiversity, and help the wider public understand why biodiversity matters.

We aim to make this the priority for our gardens at Kew and Wakehurst. Using innovative educational approaches, we will enrich day visitors' and members' experiences and help them to understand the wonder and interconnectedness of the natural world. Our goal is to instil in people a life-long appreciation of the beauty and importance of plants and fungi.

KEW AT WORK

Empowering communities to take action for nature

For ten years, RBG Kew's Grow Wild programme has brought people together in communities across the UK to take positive action for biodiversity. By providing native wildflowers and fungi for people to grow, the initiative has helped communities launch a range of transformative programmes, from replanting neglected spaces to encouraging nature-based artworks.

Funded by over GBP 13 million from the National Lottery, Grow Wild has engaged 82,000 volunteer groups and one million young people. It has shared enough seeds for 2.4 million people to cover 1,000 football pitches with wildflowers, and distributed sufficient fungus-growing kits for 103,350 people to grow their own mushrooms. Since 2013, more than four million people have joined Grow Wild on the ground and online.

The initiatives launched through Grow Wild are diverse. In one, young people from Southwark designed and created a peace garden to help raise awareness of knife crime. Another, in Belfast, involved women who had suffered domestic abuse creating a nurturing garden. And a third, in South Glamorgan, Wales, used fungi and photography to connect local residents with nature.

The benefits that people gain from nature have been widely documented, from improved well-being and health and reduced isolation, to greener urban spaces and increased appreciation of the environment.

Changes by 2030. We will:

- Create a new public **science engagement centre** to inspire and educate visitors on global sustainability and biodiversity conservation issues, through events, exhibitions and digital experiences.
- **Bring together scientists, horticulturists and artists to enrich our storytelling, events and science festival** with innovative, challenging and contemporary narratives and experiences.
- **Undertake a major re-visioning of our iconic glasshouse, the Palm House**, to engage new generations of plant-lovers with conservation. We will recreate a verdant tropical rainforest to explain how these extraordinarily diverse and important ecosystems regulate the global climate for all of humanity, and why they merit immediate protection.
- **Create a 'carbon garden'** at Kew Gardens. This space will explore the ways in which plants provide valuable carbon-related services, from capturing CO₂ through photosynthesis, to providing sources of biofuels and underpinning nature-based solutions for mitigating climate change.



Priority 3

Train the next generation of experts

Training the next generation of environmental scientists is critical to the future of life on Earth.

We will create exceptional scientists and horticulturists through a suite of education initiatives, working in partnership with outstanding universities and institutions globally.

KEW AT WORK

Training the next generation of conservation scientists

'Nature-based solutions' – such as restoring peatlands and planting trees – offer ways to simultaneously tackle climate change and biodiversity loss, while underpinning wider environmental benefits and supporting local livelihoods and development. These benefits, along with the potential for nature-based solutions to create many jobs, are prompting nations to include them in their post-pandemic recovery plans. RBG Kew's planned expansion of its higher-education training programmes will provide a new generation of professionals with the skills required for these 'jobs of the future'.

One area we plan to expand is our MSc offer. We launched our flagship MSc in Plant and Fungal Taxonomy, Diversity and Conservation in partnership with Queen Mary University of London (QMUL) in 2015. Over the next five years, we will launch further MSc courses with university partners, covering areas such as conservation and landscape restoration, sustainable land use and bioinformatics.

Our students go on to work in a wide range of environmental roles. One took a break from her role as Botanist for the Rwanda Wildlife Conservation Association (RWCA) to study for the Kew/QMUL MSc in 2020. The skills she learned equipped her to take on the expanded position of Botanist and Habitat Restoration Manager at RWCA, where she is now responsible for establishing RWCA's seedbank, and managing its indigenous tree nursery and restoration sites.

Changes by 2030. We will:

- Collaborate with partners to **significantly expand our PhD, MSc and diploma programmes, as well as our apprenticeships and short courses**, to train researchers and practitioners from around the world using both online and on-site teaching.
- **Strengthen capacity in the most biodiverse tropical countries** by sharing our expertise and collections, to enhance the global conservation effort. We will train staff in governments, conservation organisations and academia so they can competently assess biodiversity, preserve threatened species, restore habitats and steward ecosystems sustainably. We will use our base in Madagascar to provide practical training within a mega-biodiverse landscape.
- **Develop new learning centres at Kew Gardens and Wakehurst** to enrich and strengthen our schools, adult education and community outreach programmes. These innovative centres will provide inspiration and hands-on experiences to motivate and mobilise a new generation of environmental guardians.
- **Equip millions of young people across the UK and globally with the knowledge, skills and values to protect biodiversity.** By developing excellent digital resources and training programmes for schoolchildren, students and teachers, we will rapidly assemble a diverse community of dedicated and passionate environmental stewards.



KEW AT WORK

Online Endeavour takes RBG Kew's science into schools

Since 2018, our Endeavour learning platform has enabled teachers and pupils to go behind the scenes at Kew Gardens and Wakehurst without leaving their classrooms. Established to bring our science to young people who are unable to visit us, the online initiative has been signed up to by over 3,500 teachers. This means around 100,000 pupils are learning first-hand about Kew's vital work on themes from the use of DNA to classify plants, to the work of modern-day plant hunters.

The platform provides resources for teaching pupils from Key Stages 1–5, spanning children in primary schools to teenagers taking A-levels. Specially designed to be interactive, the free resource includes lesson guides, infographics, quizzes and competitions, and video clips of our experts at work. The topics encompass broad themes, such as biodiversity and climate change, as well as honing in on specific projects. These include our Plant and Fungal Trees of Life project, which involves analysing DNA from all plant and fungal genera to piece together their evolutionary relationships.

RBG Kew already has the largest on-site schools programme delivered by a botanic garden; our aim is to widen the scope of our offer to deliver our important scientific messages online to schools globally.





Priority 4

Extend our reach

RBG Kew should be the go-to place for anyone and everyone to explore how plants and fungi add value to their lives. We will adopt new approaches to ensure people across society are excited to visit our gardens. No one should be excluded, or feel excluded.

Digitisation will make our collections accessible around the world. We will ensure we distil and digest our knowledge in ways that make it accessible and useful to the widest possible audiences, from experts to citizen scientists.

Changes by 2030. We will:

- **Increase ten-fold the number of visitors from presently under-represented communities** to the gardens.
- **Expand our reach beyond the gardens** through world-class digital services and outreach.
- Ensure the diverse countries and cultures that partner with RBG Kew and contribute to our collections are **accurately and equitably represented**. We will move quickly to **'de-colonise' our collections**, re-examining them to acknowledge and address any exploitative or racist legacies, and develop new narratives around them.
- **Liberate vital data**, making the information concealed in our collections universally accessible through portals, analytical tools, digital maps and user-friendly digests. We will facilitate universal access to our gardens via films, digital interpretation and virtual experiences.

KEW AT WORK

Award-winning volunteers bring RBG Kew to a younger audience

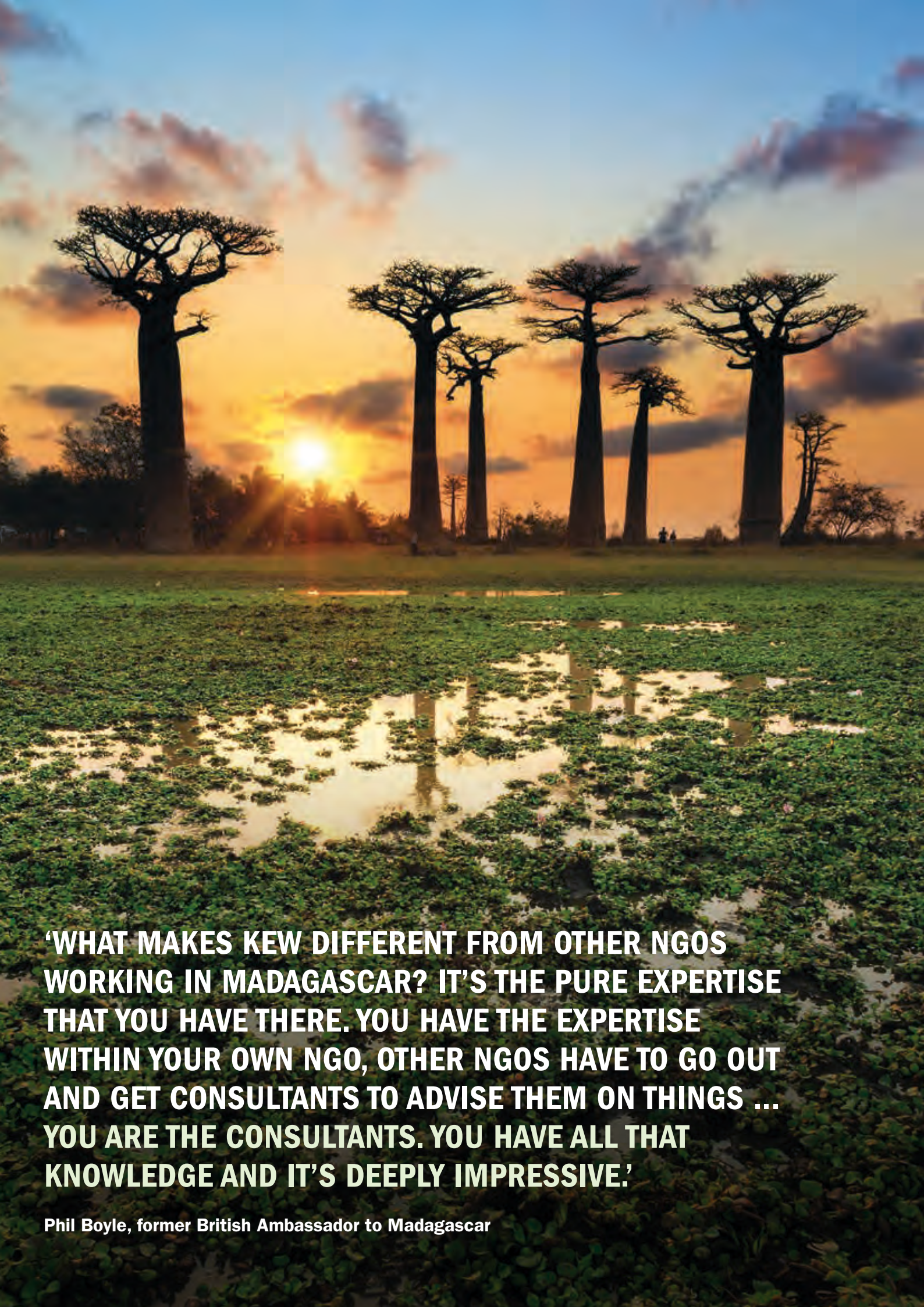
Since 2017, enthusiastic young volunteers have been helping RBG Kew to connect with wider audiences. Aged 14 to 17, and largely recruited from schools in boroughs with a high proportion of black, Asian and minority ethnic families, these 'youth explainers' are changing the perception of RBG Kew from a highbrow and historic institution to an accessible, contemporary, global science resource.

The volunteers have dedicated their Saturdays for a year or more to promote RBG Kew's science. They have worked extremely hard to learn new skills, as well as conducting their own research to prepare them for the role. In turn, they have helped thousands of visitors to adopt new ideas about plants, fungi and conservation. For example, they have created imaginative and innovative bespoke games to engage younger audiences.

Each volunteer learns to communicate confidently with people from all walks of life, becoming an ambassador for our science work. In addition, our explainers complete the Silver Duke of Edinburgh Volunteering and Skills Award, and complete investigations to gain Crest Awards. In 2018, they won the team category of the London Volunteers in Museums Awards, and in 2019 reached the finals shortlist of the Museums and Heritage Volunteers of the Year Award.

One youth explainer said: 'Now I can speak confidently to the public ... telling people about Kew's science protecting rare and endangered species, and the changes they can make in their everyday lives.'





'WHAT MAKES KEW DIFFERENT FROM OTHER NGOS WORKING IN MADAGASCAR? IT'S THE PURE EXPERTISE THAT YOU HAVE THERE. YOU HAVE THE EXPERTISE WITHIN YOUR OWN NGO, OTHER NGOS HAVE TO GO OUT AND GET CONSULTANTS TO ADVISE THEM ON THINGS ... YOU ARE THE CONSULTANTS. YOU HAVE ALL THAT KNOWLEDGE AND IT'S DEEPLY IMPRESSIVE.'

Phil Boyle, former British Ambassador to Madagascar

Priority 5

Influence national and international opinion and policy

To deliver successful and enduring change, we need to encourage debate and shape decision-making. We will do so with contributions that draw on robust scientific evidence.

We will use our voice to influence public attitudes and encourage individuals to be champions of protecting nature. We will ask more of policymakers, supporting them with evidence, expertise and arguments to make well-informed and bolder decisions. In particular, we will work closely with the Department for Environment, Food and Rural Affairs (Defra), our sponsoring department within the UK Government.

KEW AT WORK

Bringing biodiversity back to English farmland

Farmland makes up 70% of land across England, so nurturing biodiversity involves working within the agricultural landscape. Currently, arable plants – such as cornflowers and poppies – are the fastest declining suite of plants in the UK, due to more intensive farming practices and the use of herbicides. Seeking to reverse this situation, RBG Kew collaborated with conservation charity Plantlife on the Colour in the Margins project. This aimed to restore ten threatened species by working with farmers to re-establish wildflower-rich field margins.

Our scientists used collections held at the Millennium Seed Bank (MSB) to produce large quantities of seed of five threatened annual species. Detailed propagation and reintroduction protocols were developed for these and a further five species. RBG Kew experts also trained partner organisations to collect seeds, both for immediate use and long-term storage in the MSB.

Between 2017 and 2020, 50 new populations of plant species were established across England, helping to support birds and insects. We secured 24 new seed collections in the MSB. These restored populations and banked seeds, along with the new knowledge gained from working on the initiative, are a powerful legacy for the future conservation of threatened arable species in the UK.

Changes by 2030. We will:

- Use our trusted voice to call for an end to biodiversity loss and for natural habitats to be restored. We will help to deliver these goals by **working with the UK Government** and supporting its priorities and commitments, including the UK 25 Year Environment Plan, and the United Nations Sustainable Development Goals.
- **Work with governments and non-governmental organisations (NGOs) around the world to shape and support global treaties**, such as the Convention on Biological Diversity and the Convention on International Trade in Endangered Species of Wild Fauna and Flora.
- **Provide scientific evidence, expertise and advice** to help shape effective policies for protecting the natural world and restoring it to health. We will focus on ecosystems that are particularly vulnerable (such as those containing high numbers of species that grow nowhere else) and valuable.
- **Lead by example and be an advocate for environmental responsibility**, including to our visitors, partners and suppliers. This will include becoming climate positive (going beyond net-zero carbon emissions to remove additional CO₂ from the atmosphere) by 2030. RBG Kew will be an exemplar of environmental responsibility in everything we do.




RBG Kew's role in guiding environmental policy

Knowledge and evidence gathered by Kew scientists helps to shape and fulfil national, international and global goals to protect biodiversity, use natural resources sustainably and reduce the impacts of climate change. We are committed to continuing and expanding this vital work.



'WE FACE UNPRECEDENTED LOSSES OF BIODIVERSITY AND RAPID ENVIRONMENTAL CHANGE. THE INVALUABLE SCIENTIFIC WORK THAT KEW DOES GLOBALLY IS HELPING TO CONSERVE AND SUSTAIN THE PLANTS AND CROPS THAT MATTER, SUPPORTING LOCAL COMMUNITIES FOR A SUSTAINABLE FUTURE.'

Mary Robinson, former President of Ireland and United Nations Commissioner for Human Rights



KEW AT WORK

Botanical data helps to save Cameroonian forest from logging

Thanks to lobbying by RBG Kew scientists, other experts and the actor Leonardo DiCaprio, in 2020 the President of Cameroon revoked the logging concession in one of the country's most biodiverse areas. The concession had been granted in the Ebo Forest, a vast area of lowland evergreen and cloud forest dissected by rivers.

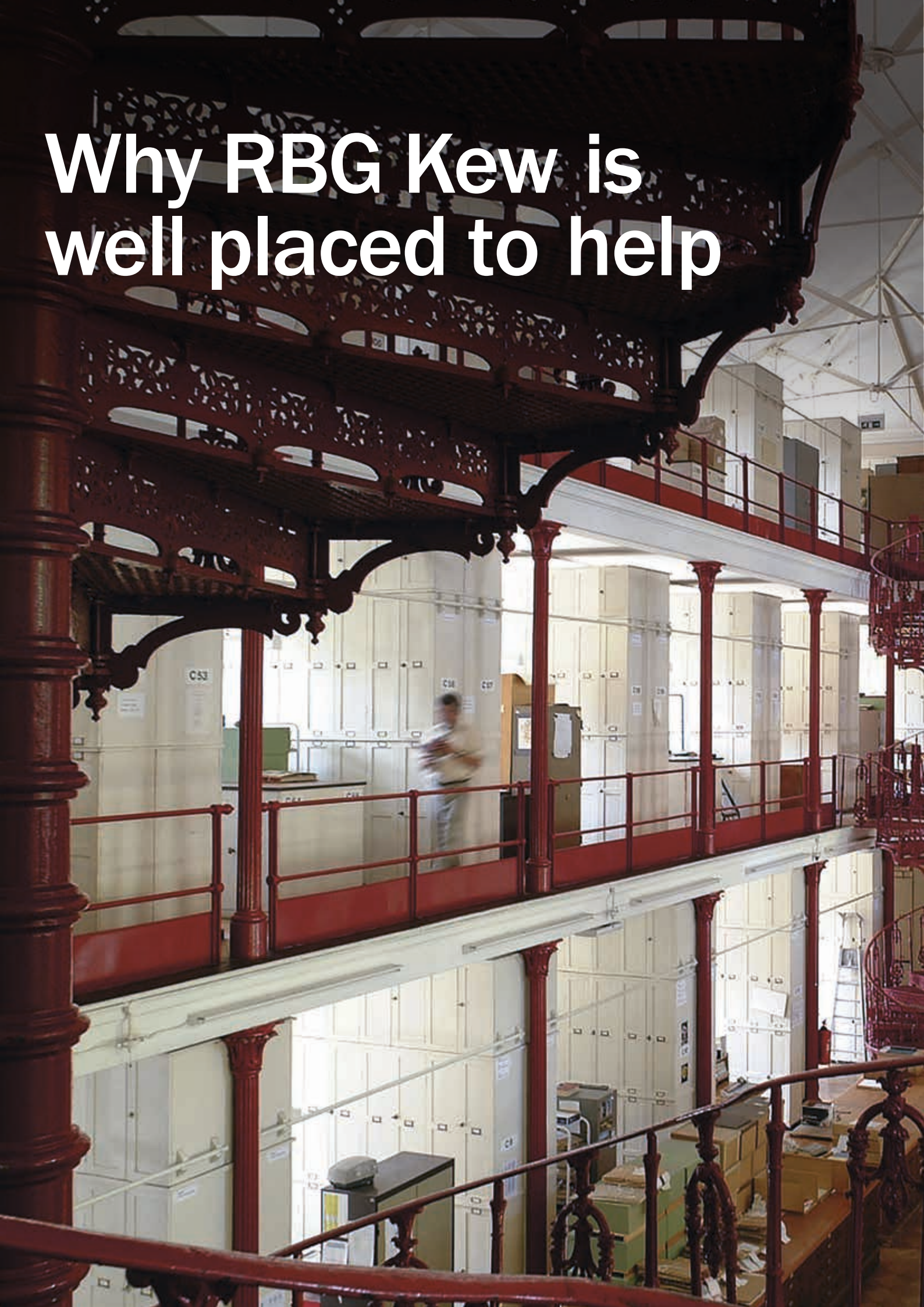
Ebo's natural treasures were almost entirely unknown to science until the early 21st century, when primatologists found the largest global population of drill (one of Africa's most globally threatened primate species) living there. When Kew scientists were subsequently invited to survey the forest's vegetation, they found 69 threatened species of plant, including 14 species new to science, of which six were globally unique to Ebo.

RBG Kew's preserved herbarium specimens underpinned the work to identify known species in Ebo and describe others new to science. This is because identifying plants involves collecting a specimen from the field, comparing it to existing reference specimens, and then either classifying it as a known species or describing and naming it as a plant that is new to science.

RBG Kew scientists were thus able to demonstrate that Ebo had exceptional botanical richness, meriting its designation as a Tropical Important Plant Area. This finding, coupled with those of the primatologists, seems to have been crucial in prompting President Paul Biya to revoke the logging concession.

RBG Kew is continuing to collaborate with scientists and conservationists in Cameroon and overseas to secure the future of Ebo in perpetuity.

Why RBG Kew is well placed to help



For 260 years, RBG Kew's goal has been to further humanity's understanding of plants and fungi.

Now our purpose is to understand, protect and find ways to sustainably use the natural resources that support life on Earth, while fighting biodiversity loss and the climate crisis. Mobilised by our 350 science staff and 120 horticulturists, we bring a powerful and unique combination of assets to this challenge:

RBG Kew's Herbarium is one of the largest in the world, containing around 7 million preserved plant specimens, some of which date back to Ancient Egyptian times. It is a vital inventory of plant life on Earth, which is used to identify and name species unknown to science, research the evolutionary history of plants, conduct conservation assessments and guide fieldwork.

Kew Gardens is home to the **world's largest fungarium**, a globally important collection of more than 1.25 million dried specimens of fungi. The Fungarium underpins research into fungi that are beneficial (used in medicine, brewing and renewable fuels, for example) and detrimental (such as those that cause plant diseases).

RBG Kew's Millennium Seed Bank (MSB) at Wakehurst is the largest and most diverse wild plant gene bank in the world. The seeds it stores have the potential to help species adapt and become more resilient to global change, and can be used to restore habitats to health.

The **Living Collections** – 20,000 species of plants growing in our gardens at Kew and Wakehurst – are the most diverse of their kind in the world. When combined with our horticultural expertise and scientific research, these collections and those of partner botanic gardens around the world, are a powerful tool for restoring and conserving biodiversity.

Our **Economic Botany Collection** of 100,000 plant and fungal materials and artefacts informs our understanding of using natural products sustainably. Going forward, it can help us to open up important conversations about RBG Kew's – and Britain's – colonial legacy. Meanwhile our **library, archive and botanical art collections** of 7.5 million items bring additional perspectives to research.

KEW AT WORK

Past specimens reveal the need to conserve coffee species

The global trade in coffee is worth USD 100 billion annually, with the livelihoods of as many as 25 million smallholder farmers depending on it. Around two-thirds of this crop comes from *Coffea arabica*, a long-established hybrid between *C. canephora* and *C. eugenioides*.

Originating in Ethiopia and South Sudan, coffee was first cultivated in Ethiopia more than 1,000 years ago but is now also widely grown in other parts of Africa, as well as South and Central America, and Asia. Ethiopia remains the largest exporter in Africa, with 95% of the country's coffee produced by poor, smallholder farmers.

However, climate change is affecting crops. For example, in Ethiopia, where the mean annual temperature is rising at around a third of a degree per decade, numbers of successful coffee harvests are declining, increasing the vulnerability of these local farmers.

It is possible that genes from the wild ancestors of *C. arabica* could help to make cultivated crops more robust, or that new heat-tolerant species could be developed to make coffee. However, this requires healthy populations of wild *Coffea* species.

In 2019, RBG Kew scientists conducted the first-ever assessment of the conservation status of the *Coffea* genus. Using herbarium specimens to map changes in the distribution of different wild species over time, they revealed that 60% of the 124 species – including *C. arabica* – were threatened with extinction in the wild. Moreover, 28% of the species were not known to occur in any protected area, and 45% of species were not held in any collections of living plants or seeds.

This invaluable work is now helping to inform strategies for conserving *Coffea* species, for preserving biodiversity and sustaining the coffee sector for the long term.



Global partnerships: Our network of partner institutions, located in more than 100 countries, is united in the goal of uncovering and sharing knowledge about the natural world. We work in partnership with leading UK universities to train large numbers of postgraduate students. We are also proud of our corporate partnerships with global organisations that support our mission and share our values.

Our gardens: Our two beautiful landscapes at Kew Gardens and Wakehurst – encompassing everything from our world-famous glasshouses and important national tree collections, to stunning herbaceous borders and semi-natural meadowlands – showcase the most diverse collection of plants in the world. They enable visitors to celebrate the joy and beauty of plants, replenish their sense of well-being and understand the many benefits plants bring to humanity. Importantly, the gardens help us to spread important messages about the value of species – and why, as an integral part of biodiversity, the rare and well known, the exotic and everyday, are all worth saving.

A trusted voice and convening power in the UK and internationally: RBG Kew speaks with authority and trust on plant and fungal science, conservation and sustainability, at scales from local to global. We are able to galvanise our members and visitors to act individually and collectively to protect biodiversity. And we can convene expertise, at home and from our partners, to develop the ground-breaking techniques needed to resolve the planetary emergency and heal Earth's ailing ecosystems.

KEW AT WORK

Working with partners for mutual benefits

RBG Kew has a successful track record of working with a broad range of partners to achieve shared goals and objectives, ranging from the sustainable use of plant-based products and ingredients to delivering climate-positive initiatives.

Our Commercial Phytochemistry Unit links our unparalleled expertise in identifying and authenticating plant extracts to everyday products and services. We have a diverse portfolio of licensing partners, which benefit by aligning with a brand recognised globally for plant science expertise, horticultural excellence, and beautiful gardens.

Corporate donations and grants provide additional funding for Kew Science, while sponsorship enables opportunities for partners to align with RBG Kew festivals, events and audiences. We offer employee engagement and well-being opportunities, including volunteering, through our successful corporate membership programme.

We will continue to use our expertise to identify best practice, influencing positive change while growing our wide-ranging partnership programme.

KEW AT WORK

Pioneering seed bank proves its relevance in its 20th-anniversary year

The year 2020 marked the 20th anniversary of the Millennium Seed Bank (MSB) at Wakehurst. Described by Sir David Attenborough as 'perhaps the most significant conservation initiative ever', the MSB today stores 2.4 billion seeds from more than 39,000 plant species, collected in 190 countries and territories. Working with partner organisations around the globe, the MSB has helped to protect 46,664 species – some 16% of the world's seed-bearing plants.

In early 2020, the MSB's value was clearly demonstrated after bushfires, fuelled by record-breaking temperatures and months of severe drought, burned 24 million hectares of bush, forest and parks across Australia. One affected area, Cudlee Creek, was home to the rare clover glycine pea (*Glycine latrobeana*).

Fortunately, more than 1,000 seeds of the species had been collected from Australia's Mount Lofty Ranges in 2007. As this collection was relatively small, all the seeds were sent to the UK, rather than being shared between the MSB and Australian seed banks. In 2020, we were able to send 250 of those seeds back to the country for propagation in a seed orchard. Around 90% of the seeds germinated successfully, generating new plants for restoring the Cudlee Creek fire scar and from which to gather further seeds.



'A GOLD RESERVE, A PLACE WHERE THIS RESERVE CURRENCY, IN THIS CASE LIFE ITSELF, IS STORED.'

HRH The Prince of Wales

Cover: BoBoPhoto/Adobe Stock; Inside cover: Marcio Isensee e Sá/Adobe Stock; 3: Joerg Boethling/Alamy Stock Photo; 4–5, 13, 20, 23, 25, Back cover: Jeff Eden/RBG Kew; 6: Max Pixel [CC0 Public Domain]; 7: Nikada/iStock; 8: K J/Alamy Stock Photo; 10: agephotostock/Alamy Stock Photo; 11: Mauricio Diazgranados/RBG Kew; 12: (Top) boezie/iStock, (Bottom) Serhiy/Adobe Stock; 14–15: daboost/Adobe Stock; 16, 30: Andrew McRobb/RBG Kew; 18: Visual Air; 19: (Left) Dr. Mamy Tiana Rajaonah, (Right) Edward Parker/Alamy Stock Photo; 21: Grow Wild/RBG Kew; 22: David Rabehevitra/RBG Kew; 24: FangXiaNuo/iStock; 26: Dennis van de Water/Adobe Stock; 27: Arterra Picture Library/Alamy; 29: Xander van der Burgt/RBG Kew; 31: Allan Schaller; 32: Uzuri/Adobe Stock; Inside back cover: Greg Funnell

Editorial consultant: Carolyn Fry; Design: Creative Services; Picture research: Alex Benwell, Jeff Eden; Science editor: Rhian Smith

© The Board of Trustees of the Royal Botanic Gardens, Kew (2021) (unless otherwise stated)

Printed on 100% recycled paper

**‘WE WILL NOT BE SATISFIED WITH ANYTHING LESS
THAN A SCIENCE-BASED PATHWAY, WHICH GIVES
US THE BEST POSSIBLE CHANCE TO SAFEGUARD
THE FUTURE LIVING CONDITIONS FOR HUMANITY
AND LIFE ON EARTH AS WE KNOW IT.’**

Greta Thunberg, climate activist

