Synthetic Biodiversity

A Biodiversity Scenario for 2042-2045

Part of TF 2042 Nature Meets Future

Imperial Tech Foresight

CREDITS

Authors

Claudio Sanna, Nick Price

Production team

David Silverman (Copyediting), and Julia Zanghieri (Project Director)

Disclaimer

TF 2042 nature Meets Future: Biodiversity Scenarios for 2042-2045 was produced by Imperial Tech Foresight to provide inspiration and visions of possible futures. They represent the independent opinions of the authors and do not constitute any form of recommendation, validation, or investment advice.

Publisher

Imperial Tech Foresight is an in-house futures research practice. Drawing directly on Imperial's world-leading research and innovation, it offers businesses a unique perspective to guide their strategy development and direction-setting. Imperial Tech Foresight is one of the services provided by Imperial Business Partners, the College's flagship corporate membership programme, which provides a gateway to the forefront of science and technology.

Imperial is consistently ranked amongst the world's top ten universities and boasts a world-class reputation for teaching and research in science, engineering, medicine, and business. It is home to the greatest concentration of high-impact research of any major UK university. Imperial is renowned for its application of science, innovation, and business to tackle global challenges and its collaborations, discoveries and networks are transforming lives and creating opportunity in the UK and around the world.

Copyright

Version 1. London, March 2023.

“Anything else you’re interested in is not going to happen if you can’t breathe the air and drink the water. Don’t sit this one out. Do something. You are by accident of fate alive at an absolutely critical moment in the history of our planet.”

Carl Sagan

Table of contents

Introduction

Unthinkable Futures

Why Biodiversity?

So What?

Background

A Plethora of Change

A Key Tension

The Timeline of the COP Scenario

2042

COP25 Summary Report article - Kinshasa, DRC 10-25th November 2042

2045

The Transhumanist Biosphere, 2045

A New Park for a New Age

Garden of New Creationism

Beyond 2045

A Transformational Path for Humanity: Moving from the Anthropocene to the Meta Anthropocene

The Origin of Our Own-Made Species – Synthetic Biology

Introduction

“(Our scientists) talk about ideas that have some plausibility based on current evidence, and it's from there that we lift off.”

Professor David Gann. Professor of Innovation and Technology Management at Imperial College Business School and former Vice-President (Innovation) at Imperial College

The future of biodiversity

At Imperial Tech Foresight, many of our clients have been looking at the problem of declining biodiversity through activities such as scenario planning. Some have felt the need for a more divergent biodiversity scenario to test their strategies and thinking.

We've taken inspiration from research not only in biodiversity but also in fields such as synthetic biology, along with the UN Conferences of the Parties (COPs) on biodiversity. We've combined these with our foresight techniques to create a deliberately provocative but plausible vision of the future of biodiversity.

The scenario covers the years 2042 to 2045. The purpose of this three-year timeline is to show the cause and effect of a future COP.

We used AIs to generate some of our content in order to heighten the visualisation and draw on the narrative base of field experts. For visuals we used www.midjourney.com. We also generated quotes from the future using ChatGPT from OpenAi.com.

Unthinkable futures

Imperial Tech Foresight explores the direct implications of **plausible** futures, and posits **possible** ones.

These possible futures push the bounds of plausibility: not only because they depend on uncertain science, but also because they depend on human society making far-reaching collective decisions. Most of these decisions will not deliver beneficial outcomes for the majority without adverse effects on at least part of the global population.

In democracies, political leaders are under pressure to make decisions that prioritise short-term popularity over long-term benefit. Some long-term decisions are almost impossible to enact by individual governments. They can sometimes be successfully addressed at a higher level, such as the United Nations.

This Biodiversity scenario from Imperial Tech Foresight explores one possible future, which we call ‘Synthetic Biodiversity’

Synthetic Biodiversity

Synthetic biology has the potential to redesign not only the flora and fauna of our planet but also to reconstruct our economies. The types of food offered and demanded may change, the need for their transportation may decrease, and the materials that form our lived environment may be grown instead of built. We need to think not just about this endpoint, but the journey we take to get there.

The transition to a future shaped by synthetic biology will take the form of a race. Bioengineering will enable the production (or perhaps incubation or cultivation) of new and personalised products, greater sustainability and reduced needs for transportation and importation. This will coincide with the emergence of new societal values and the possibility of genes as intellectual property. And many more consequences that we cannot explore in this short document.

Imperial College London explores this new scenario, and its transition, with our partners through its foresight work and the influence of leading researchers and scientists.

Background

A plethora of change

It’s worth looking at some of the changes that will play out in the background of our scenario:

Social – Leadership values of self-interest in Baby Boomers and Generation X are replaced by leaders concerned with fairness. Developed world populations are ageing. The problems with over-fed and under-fed people continue.

Technological – There is emerging energy-abundance through fusion energy. Carbon capture for healing the air is beginning to scale. There are potential population centres beyond Earth (Orbital, Moon and Mars.) There is an interest in terraforming and how that may be applied to Earth itself. There are increasing bioengineering capabilities. There are new food and agriculture categories.

Environmental – Enduring and increasing problems with a changing climate. Unmasked pollution problems: spoiled soils, compromised waters, species die-off (avian, bovine, piscine). Rampant transplanted species. Species diversity reduction. Climate change compromising former biodiversity sanctuaries. Biodiversity parks (Beyond the Eden Dome)

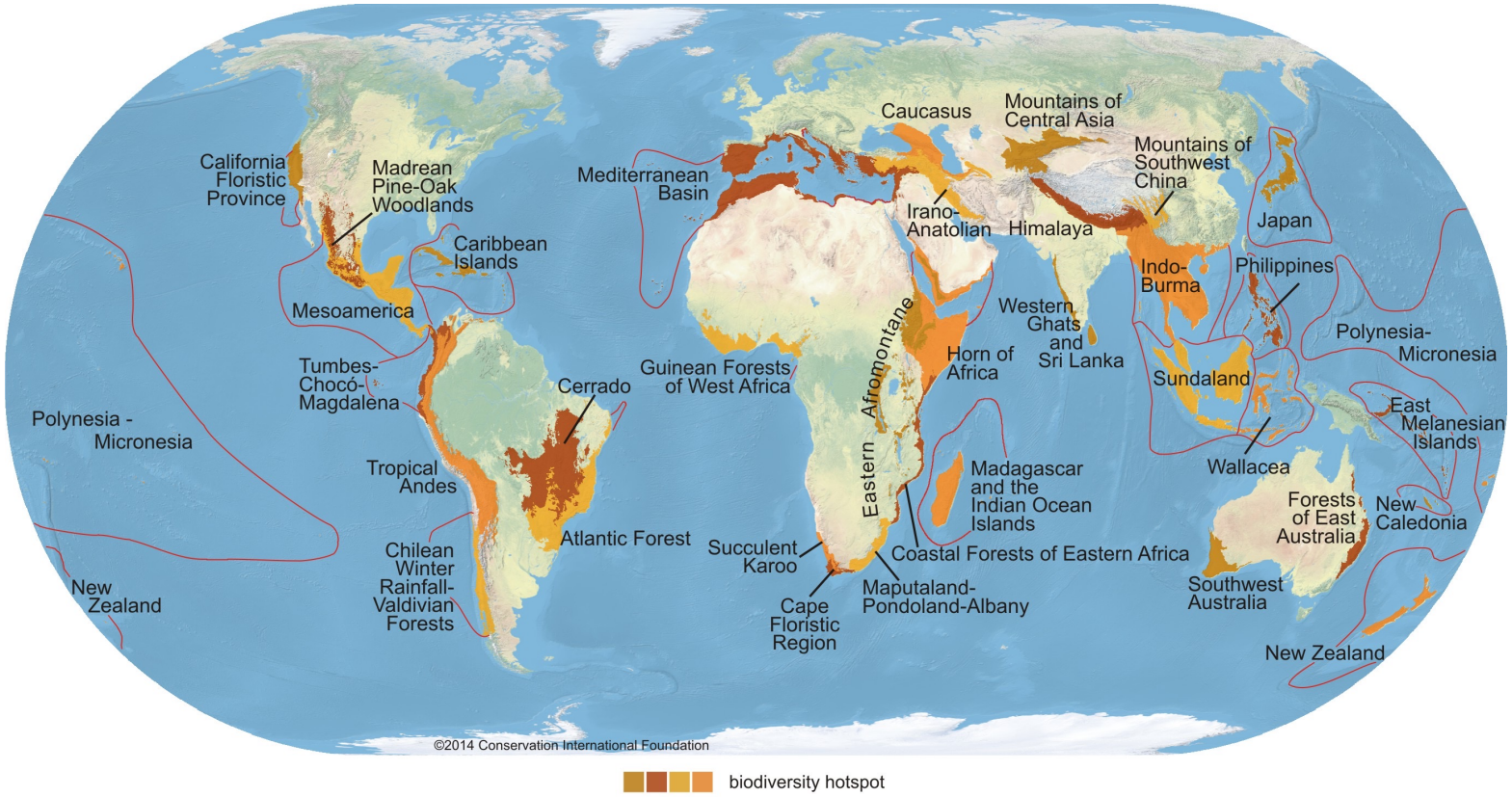
Economic – Resource-based politics weakened by new energy technologies. Climate change disrupting past economic models

Political – Societies are more accepting of actions for the collective interest. Shareholder activism increases but with social interest over self-interest

Values – Religion-based disputes over synthetic biology – is humanity playing at (insert your deity here)

A key tension

It is notable that greater biodiversity is found in areas that have been less industrialised. Areas that also suffer from a lack of economic strength. Our scenario seeks to present how that imbalance could be redressed.



Conservation International (conservation.org) defines 35 biodiversity hotspots — extraordinary places that harbor vast numbers of plant and animal species found nowhere else. All are heavily threatened by habitat loss and degradation, making their conservation crucial to protecting nature for the benefit of all life on Earth.

Source: Conservation International

Timeline of the COP scenario

2022 COP15 sets goals for 2030

2032 in South Africa :

Establishment of *Gross Biosphere Restoration (GBR)*

2042 at Kinshasa, DRC:

1. *Fair sharing of food, energy, and computation resources*
2. *Managed application of gene editing*
3. *The GAIA AI*

2045 Transhumanist Biosphere

2042

"Biodiversity is the backbone of our planet, and we owe it to ourselves and future generations to protect and preserve it. Synthetic biology offers us new tools and solutions to achieve that goal, and it's our responsibility to use them wisely."

James Lee, environmental activist and founder of a sustainable agriculture non-profit. *(AI Gen)*

COP25 Summary report

Kinshasa, DRC 10-25th November 2042

We have depicted our scenario through a fictitious report of a Conference of Parties (COP) meeting centred on Biodiversity in the year 2042.

It shows how new technology and human diplomacy could act together to tackle biodiversity issues at larger scales and with deeper impact than today.

It also presents a future in which biodiversity becomes more relevant in international discussions. The intention is to explore the way industries can operate on a global scale with consideration for biodiversity – under new constraints but also with new opportunities.

By envisioning a future COP, we're trying to make biodiversity and its role in planetary well-being more relevant in the present.

Biodiversity is a relatively niche area of discussion in business, but understanding its value is paramount. In 20 years' time, climate change and biodiversity loss are predicted to have devastating global effects. These call for drastic interventions and innovative thinking today.

Our scenario aims to inspire businesses to take action now. start to imagine ways in which technology can be used to tackle biodiversity loss, and to develop new sustainable business models that foster both economic and societal value.

This means new industry collaborations and new ways of operating businesses in highly biodiverse areas that reduce harmful environmental impact.

COP25 Summary Report article – Kinshasa, 10-25th November 2042

25th meeting of the Conference of the Parties (COP) to the UN Convention on Biological Diversity (CBD)

Note: This report was authored by the GAIA_AI [United Nations general material archive (checkpoint UN0000A56EH740), COP25 event material (checkpoint UN0000B78KL261) prompt-engineering (checkpoint UN0000C112263A)]

Background

Biodiversity is vital to life on our planet. It is essentially the life support system for humanity. From our oceans to our forests, nature underpins the world's food system; provides fresh water; sustains the quality of the air and soils; regulates the climate; provides pollination and pest control; absorbs carbon emissions and reduces the impact of natural hazards.

The UN Convention on Biological Diversity, CBD, is an international treaty on the conservation of biodiversity, the sustainable use of the components of biodiversity, and the equitable sharing of the benefits derived from the use of genetic resources.

The beginning of the COP

Much has changed since the first COP held in 1992 in Rio de Janeiro and a major key turning point has been COP10 in 2010 (ratification of Nagoya protocol) and COP15 in 2022, with the adoption of the Kunming-Montreal Global Diversity Framework (KMGDF), that established four major goals towards 2050.

The KMGDF's goals broadly encompassed objectives on:

- ecosystem conservation
- increase of natural ecosystems
- sustainable use of biodiversity
- reduced extinction rates
- increase of abundance of wild species
- equal and fair benefit-sharing from the utilisation of genetic resources
- technology transfer between developed and developing countries

The COP from 2022 to 2032 and towards 2042

In 2032, the COP held in South Africa represented another breakthrough in global collaboration with the establishment of the Durban pact. A pact that set guidelines for a new global approach to the protection and valorisation of ecosystem services.

The Durban pact involved more than 200 countries and its major goal has been to establish an economic value to ecosystem services.

Valuing our biosphere

Biodiversity is greater in areas like South America, Africa and Southeast Asia, and through this treaty, it has been possible to value how much these areas contribute to the well-being of the global ecosystem.

The Amazon forest, for example, helps stabilize the global climate. Billions of tonnes of carbon are stored in the Amazon and its trees release 20 billion tonnes of water into the atmosphere per day. These play a critical role in global carbon and water cycles. It is also home to a huge variety of plants and animals that contribute to the development of novel pharmaceuticals.

For this reason, the Durban pact proposed the International Monetary Fund (IMF) provide yearly payments to the countries hosting these biodiversity champions. Payment amounts according to the estimated value of their ecosystem services, ensuring the global interest in these areas and their importance for the world's health. The Nations hosting such ecosystems now receive part of the global GDP in order to protect, enhance and restore these areas. This GDP contribution is known as the GBR – Gross Biosphere Restoration

Gross Biosphere Restoration (GBR)

The GBR balances the depletion effects on the biosphere from production, provision and consumption activity funding its restoration, preservation and extension. This is applied in biosphere sanctuary areas and areas near damaging activities.

Natural riches have become part of the economic output of countries. International authorities supervise the use of monetary resources to guarantee the application of appropriate measures, effectively transforming such areas as global commons, whose health and functioning depend on continuous global monitoring and effort.

While assigning ecosystem resource preservation a monetary value – including them in the economic output of the country – has been the major focus of the Durban pact, some major decisions have been taken towards 2042, which has finally been implemented with the Kinshasa protocol in COP25.

And at COP25?

During the COP25 in 2042, the fair sharing of natural and genetic resources among countries and the use of emerging technology to restore and enhance biodiversity was discussed.

Climate change has been testing the capacity of plants and animals to adapt to its shifts and despite the efforts to protect biodiversity with natural means, a need for enhancing it through artificial methods has been identified.

This has been captured in the COP25 Kinshasa Protocol

The COP25 Kinshasa Protocol

Three major points agreed with the Kinshasa protocol have been the following:

1. Fair sharing of genetic, food, energy, and computation resources

Nations with higher economic output and less biodiversity agree to share key resources with nations with lower outputs and higher biodiversity. This means a circulation of energy resources such as fusion energy, fundamental for the growth of less developed countries and to limit the use of fossil fuel alternatives degrading highly protected and valued ecosystems.

Food resource sharing will be also key (e.g., wheat, meat) to safeguarding protected areas, avoiding overuse of local land and deforestation, enhancing local biospheres and to rewilding. Nations agreed on sharing the profit and the benefits coming from medical research using genetic material acquired in these areas. This establishes a pathway for pharmaceutical revenue to end in the wallets of the nations providing the genetic resources.

Furthermore, such nations will be able to receive the derived pharmaceutical products at a lower cost. Computation resources will also be shared, with the aim of reducing local energy consumption and contributing to the fair development of less developed countries.

2 Managed application of gene editing

Well-established technologies such as gene-editing will be used to create tailored plant, fish and insect species aimed at enhancing local biodiversity and its effects on the local and global ecosystem in testing areas.

These will limit extinction rates, provide more carbon capture capacity, more resilience towards desertification and habitat change, new food sources for local inhabitants, animals, and insects. New species will be specifically bred for ecosystem roles and their integration within the biosphere. A biosphere accurately predicted and monitored through technologies such as artificial intelligence.

3 The GAIA AI

Creation of a “Gaia” global AI system which is trained and groomed to be objective in directing the best for maximising planetary health. Planetary health measured by the perpetuation of biodiversity.

The system will be internationally used to benchmark anthropocentric activities over natural interests and suggest ways in which humans can terraform and coexist with Earth to optimise symbiosis with the biosphere.

Conclusion

With these ground-breaking decisions being agreed with the Kinshasa protocol, the signing members aim to take more drastic actions towards the protection of highly biodiverse ecosystems that are fundamental for planetary health and human survival, guaranteeing the safeguard of the sustainable development of the nation’s hosting them. Excessive industrialisation and use of land has been identified as a risk to the well-being of such ecosystems and their role in stabilizing global climate and provision of genetic diversity.

The COP25 is a milestone towards a more globalised and fair society that recognises the role of each nation into supporting the healthy continuation of the human species and the delicate ecosystem which supports us.

COP25 represents also a key turning point in understanding the role of human artificial intervention to restore and enhance biodiversity, accepting the opportunity coming from our mastery of SynBio (synthetic biology) technology to reshape our environment and positively and accurately intervene with modifications directed to sustain and support biodiversity for the benefit of all.

2045

"We must view the biosphere as an interconnected system, and synthetic biology as a powerful tool to ensure its long-term health. By applying cutting-edge techniques to support biodiversity, we can create a more resilient planet for all species."

Alex Kim, biotech entrepreneur and founder of a biodiversity-focused startup *(AI Gen)*


The Transhumanist Biosphere, 2045

Following on from the Imperial Tech Foresight scenario of the COP25 in 2042 we invite you to read this vison of a transhumanist future in which humanity has chosen to intervene in the flora and fauna of the earth through bioengineering.

Would this be this be a technological disaster or a cultural and social lifeline for future generations?

We have a vision and story, the underlying premise, and an explainer of the science behind it, as a provocation of one possible biodiverse future.

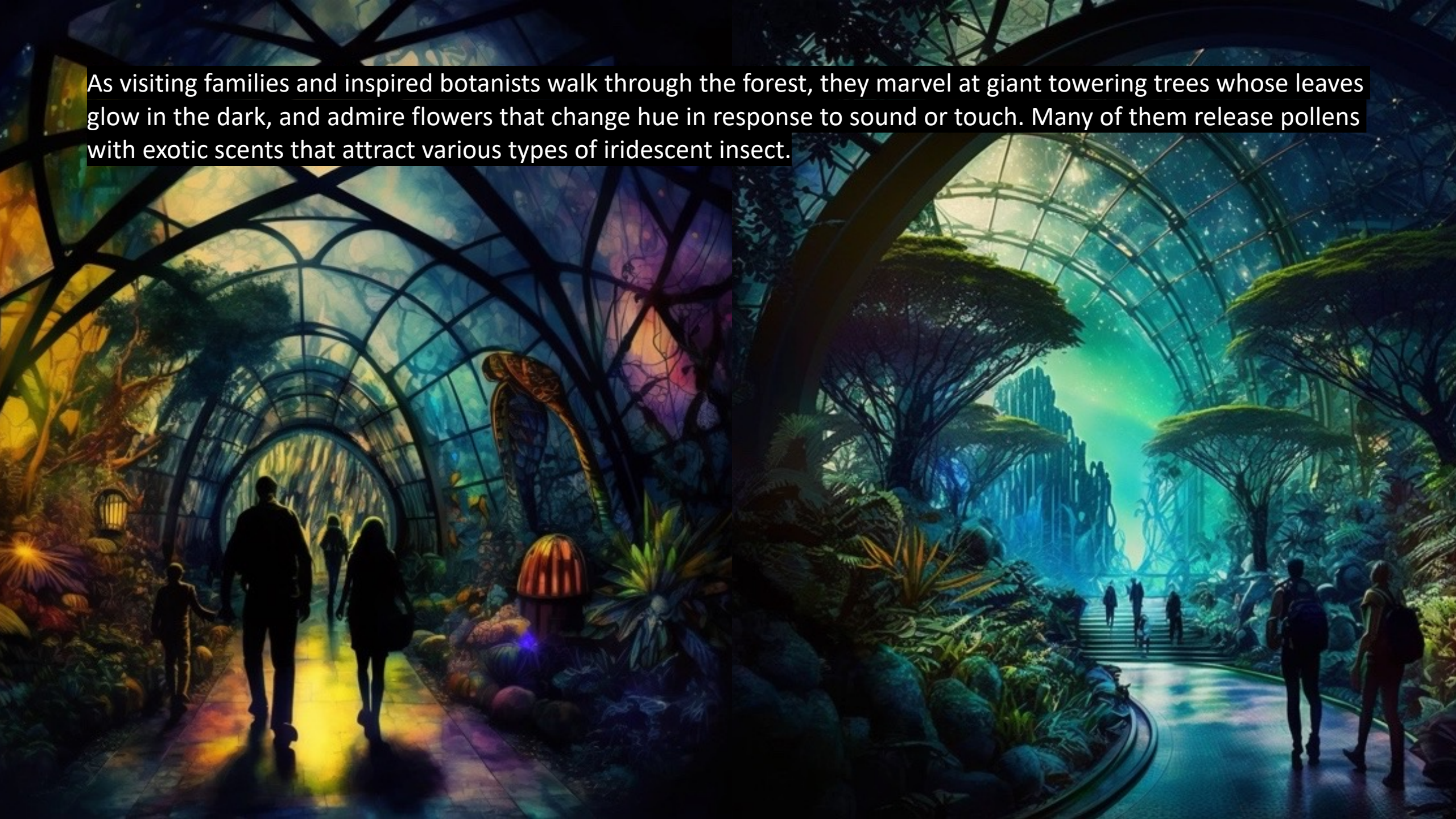
A new park for a new age

Since opening to the public two years ago, the Transhumanist Biosphere and its artificial forest has attracted millions of visitors worldwide. Nestled a few kilometres from Oxford, the forest is encapsulated in a giant transparent dome to contain its wildlife and prevent its alien organisms to spread in the surrounding environment.

This ambitious pilot project, pioneered by the UK, has swiftly evolved into the world's most preeminent hub for biotechnology research and development. Here, thousands of scientists tinker with synthetic biotech, cultivating genetically modified plants and insects and generating novel forms of life. With the help of sophisticated AI systems, the growth and development of these life-forms are carefully monitored and evaluated via smart dusts, assessing their impact on the biosphere.

The result is an oasis of biodiversity, an ecosystem unlike any other in Nature. Each plant, tree and insect species has been carefully engineered for a specific ecosystem purpose, and also provides a special aesthetic value, creating a symbiotic and thriving environment.

The project's ultimate goal is to test and establish living organisms that can be widely used to terraform the earth, combat climate change, and artificially boost biodiversity for the planet's well-being.



As visiting families and inspired botanists walk through the forest, they marvel at giant towering trees whose leaves glow in the dark, and admire flowers that change hue in response to sound or touch. Many of them release pollens with exotic scents that attract various types of iridescent insect.

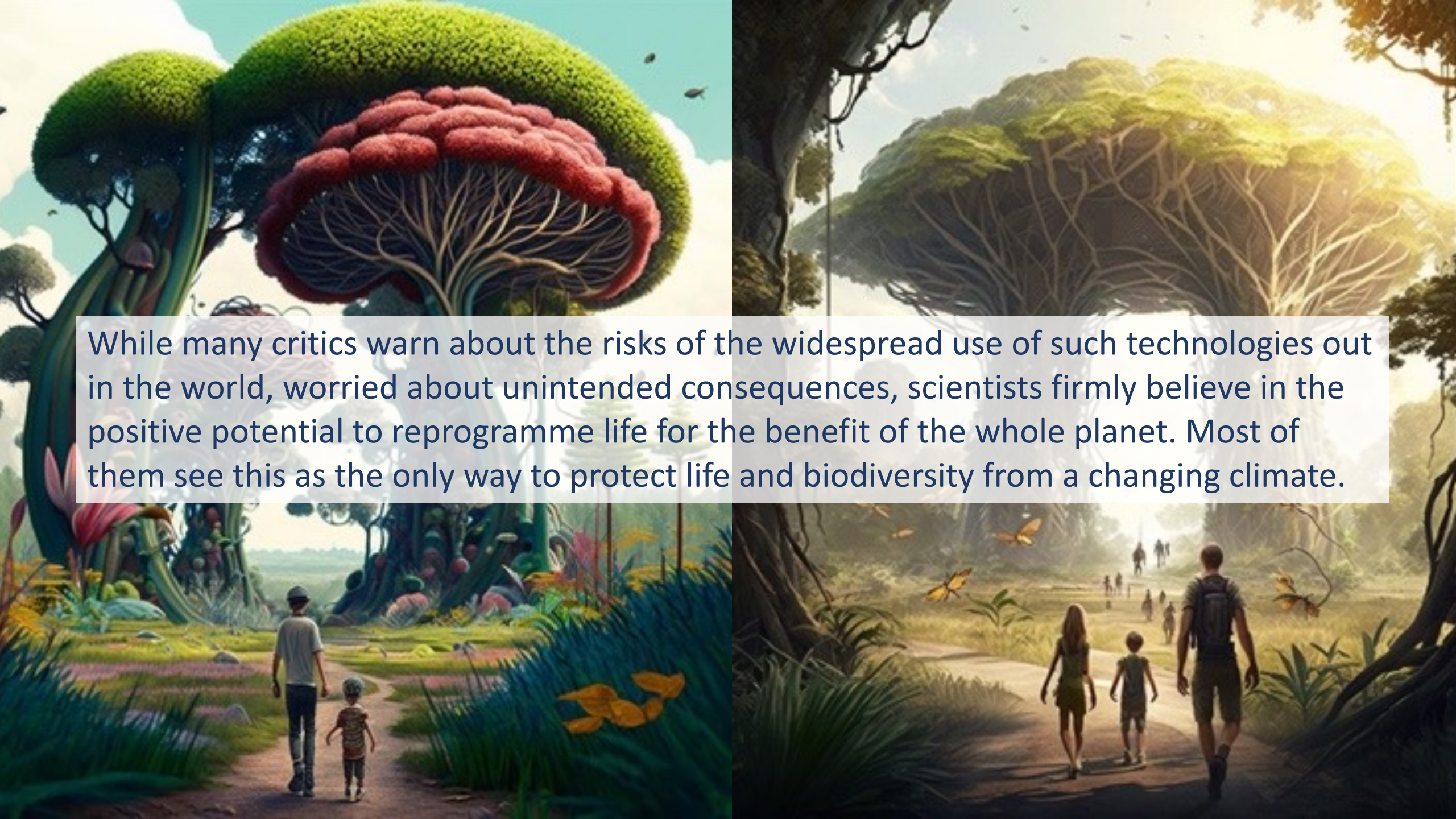
Some of these majestic plants are bio-remediation organisms, engineered to clean up pollutants and chemicals from contaminated soil and water. Nitrogen-fixing grass provides nutrients to the ground to increase its health and productivity, while certain species of carbon-capturing bushes purify the air and produce sugar-like excretions that provide nutrients that revitalise the soil in desert areas. Researchers also test soil-stabilising plants that help to hold the soil in place and prevent erosion, especially during heavy rains.

Networks of trees are programmed to transpire more and raise moisture levels in the air as outside temperatures grow, cooling the surrounding area to optimise living conditions. They are designed to produce large-scale flows in atmospheric water vapor and attract rainfall.


Water-conserving plants with deep roots also help maintain the moisture levels in the forest and fire-resistant plants are designed to prevent forest fires.
Some of these trees produce highly nutritious leaves with astounding medical properties, which could provide food for a wide range of wildlife.

Thanks to the project’s exceptional results, scientists are optimistic they can convince governments to push forward widespread global terraforming. Visitors and enthusiasts dream up the possibility of generating completely novel forms of natural beauty to enrich areas surrounding cities with awe-inspiring wildlife.

Humans seem on the verge of redesigning and optimising nature according to their will, and of creating fantastical landscapes with beauty that transcends the limits of human imagination.



While many critics warn about the risks of the widespread use of such technologies out in the world, worried about unintended consequences, scientists firmly believe in the positive potential to reprogramme life for the benefit of the whole planet. Most of them see this as the only way to protect life and biodiversity from a changing climate.

Garden of new creationism

"We never tire of looking at nature”
Robin Jones (human, 2023)

Some of the plants and flowers are designed specifically for aesthetic purposes, pushing natural boundaries of beauty. An example here is a flower that changes colour tone in response to touch.

As the iridescent pollinating bee lays on the flower it activates a chemical reaction that causes the stems to become pink. Other bees learn to recognize this as a signal that the flower is already “busy” and move on to the next flower.

These flowers are engineered to have fluorescent qualities and glow in the dark, providing a source of guiding light for visitors at night. These plants are aimed at populating city parks and provide a source of natural light that is an alternative to artificial sources.

Fluorescent plants that change hue according to air quality.

Some of these majestic plants are bio-remediation organisms, engineered to clean up pollutants and chemicals from contaminated soil and water areas. Nitrogen-fixing grass provides nutrients to the ground to increase its health and productivity, while certain species of carbon-capturing bushes purify the air and produce sugar-like excretions that provide nutrients, revitalising soil fertility in desert areas. Researchers also test soil-stabilising plants that help to hold the soil in place and prevent erosion, especially during heavy rains.

In the middle, is a tree that produces huge fruits with augmented nutritional value, high in protein, minerals and vitamins. It is a result of an engineered jackfruit tree whose genetic material has been mixed with that of mangoes and papayas.

Bio-remediation plants are engineered to clean up pollutants and chemicals from contaminated soil and water areas.

Species of carbon-capturing bushes purify the air and at the same time produce sugar-like excretions that provide nutrients revitalizing soil fertility in desert areas.

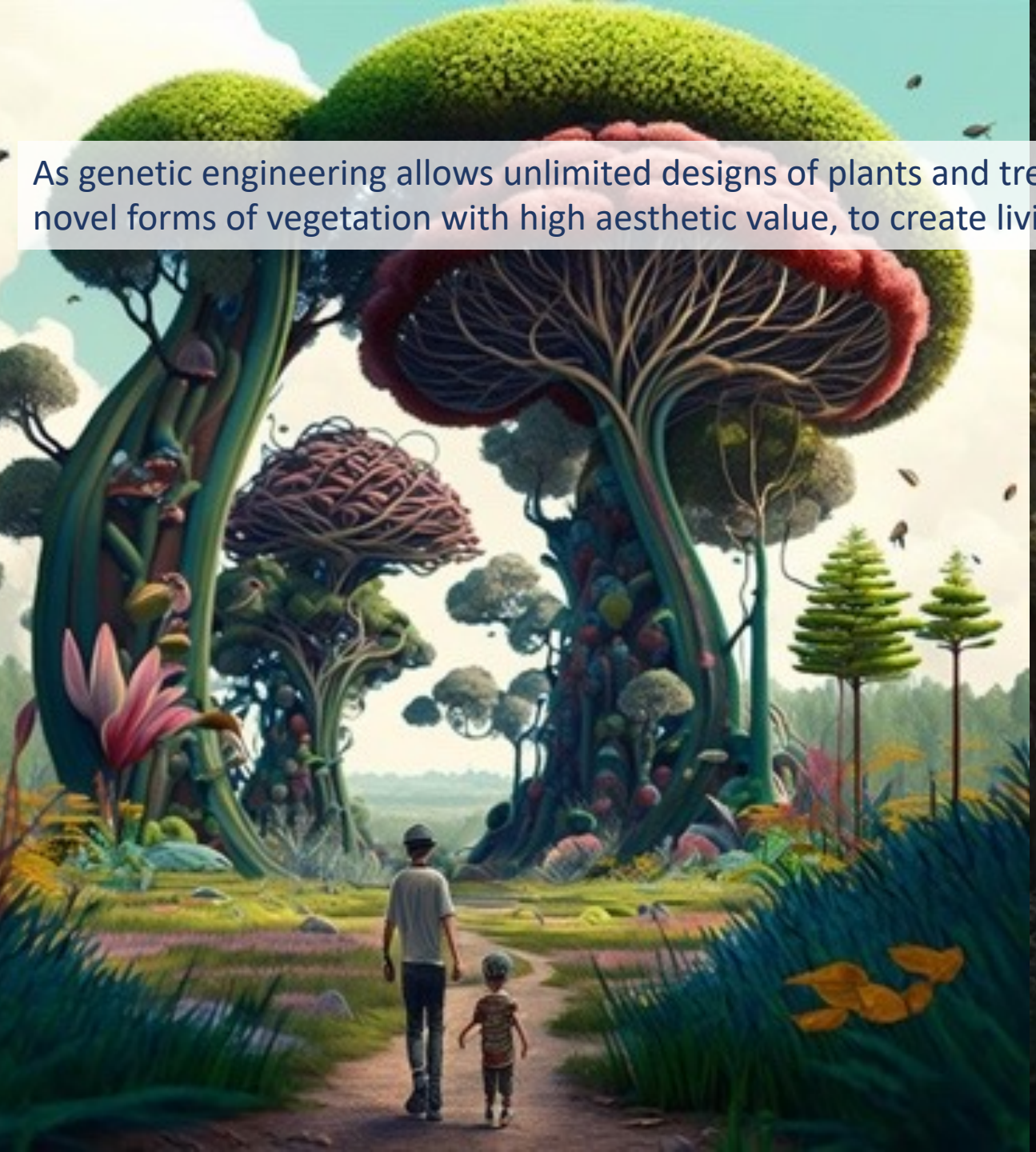
Soil-stabilising plants that help to hold the soil in place and prevent erosion, especially during heavy rains.

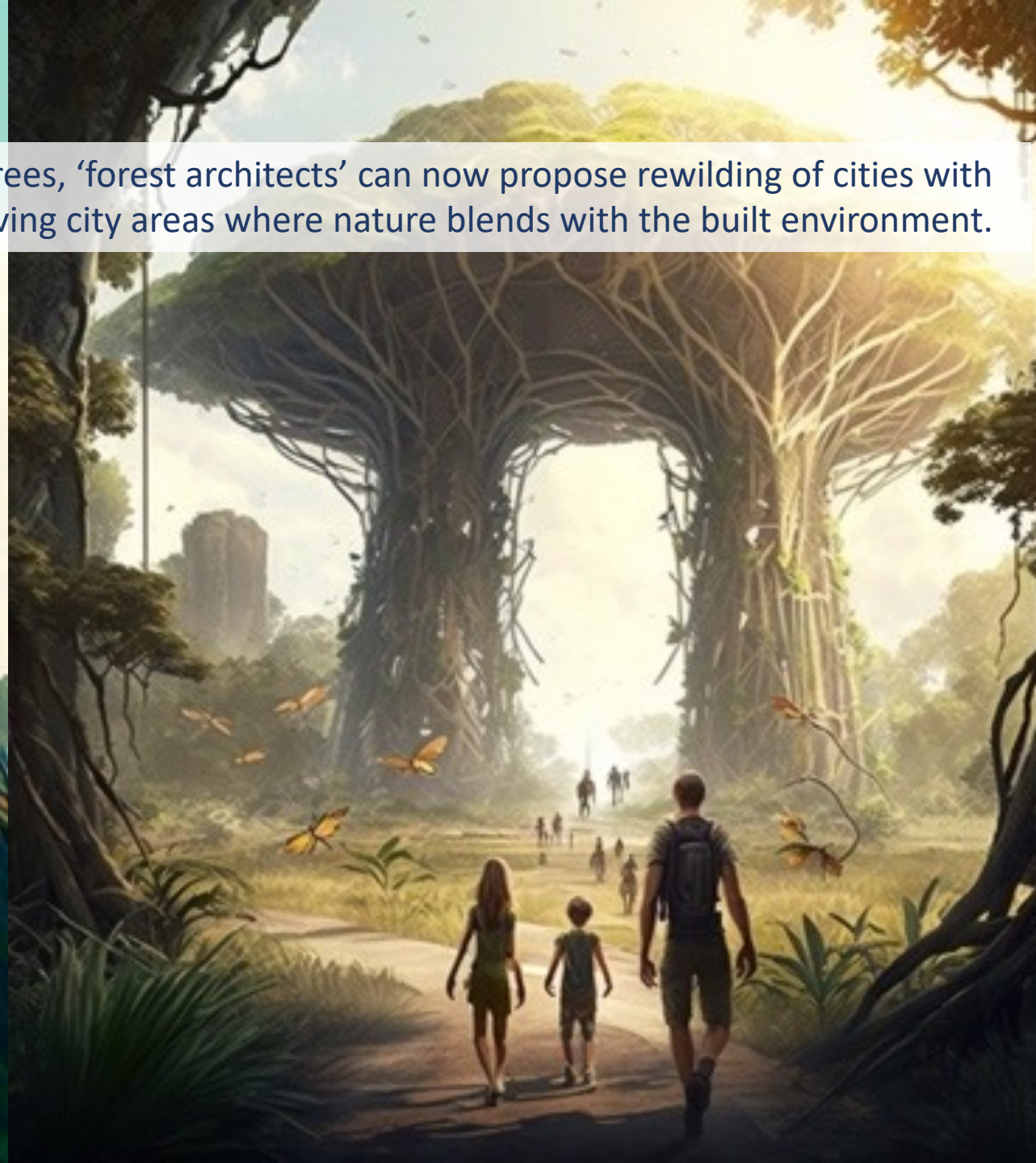
Networks of trees programmed for augmented transpiration, they increase moisture in the air as outside temperatures grow, cooling the surrounding area to optimise living conditions. They are designed to produce large-scale flows in atmospheric water vapour and attract rainfall.

A plant produces an exothermic reaction that heats the surrounding environment in extremely low temperatures, providing a source of warmth for animals in distress.

A winter plant that produces nutritious leaves with medical properties down to -20 degrees Celsius, feeding wildlife during extremely cold periods while protecting the health of animals.

As genetic engineering allows unlimited designs of plants and trees, ‘forest architects’ can now propose rewilding of cities with novel forms of vegetation with high aesthetic value, to create living city areas where nature blends with the built environment.





Beyond 2045 – what’s next?

Humans are part of the biosphere too

"Being genetically modified has allowed me to live a life free of disease and physical limitations. With synthetic biology, we can create a world where everyone has access to the same benefits of genetic modification, and where disability is a thing of the past.”

Sarah Patel, a disability rights activist and advocate for genetic engineering. *(AI Gen)*

A transformational path for humanity

Moving from the Anthropocene to the Meta-Anthropocene

A transformational path

Meta-Anthropocene

Over the past centuries, human actions have caused a decline in biodiversity, leading to a rise in species extinction, loss of genetic resources, habitat destruction, and the spread of invasive species. These problems not only impact ecosystem health, stability, and capacity to support life, but also food security, cultural heritage, and climate change.

The root of the problem can be traced back to industrial and technological development, which has led to overuse of land for agricultural purposes, deforestation, mining activities, and degradation of habitat through pollution. Economic growth, globalisation, consumer demand, and energy consumption have fuelled these activities.

Furthermore, there is a lack of political will and governance mechanisms that take into account the long-term consequences of these actions.

Transformational path (continued)

An issue of mindset

The dominant worldview today is anthropocentric, where human needs are prioritised over those of the natural world. This worldview is underpinned by the capitalistic ideology of infinite progress, the idea that ‘growth is wealth’, and that it is acceptable to exploit the natural world for human purposes, regardless of the consequences for other species and ecosystems. In addition to that, nations prioritise short-term profits over long-term benefits, and lack systems thinking.

This might be rooted deep into the myths of the western mind, as the exploitation of nature is even supported by the Bible: "Be fruitful and increase in number, fill the earth and subdue it, rule over the fish in the sea and the birds in the sky and over every living creature that moves on the ground". This reinforces the idea that humans are invested with the power of exploiting nature and expanding infinitely within it.

The human myth is to conquer and tame nature, given our manifest superiority. There is also a myth that Earth provides limitless resources. This has resulted in humanity being so far in a sort of “childish phase” of its evolution, where it is still learning to understand the consequences of its actions and to develop sustainable practices that protect the natural world for future generations.

Transformational path (continued)

Entering the Meta-Anthropocene

However, a transformative path for humanity is possible. In the future, humans might have fully embraced their responsibility to sustain the diversity of life on earth, and might transform into what Yuval Harari calls “Homo Deus”. With the help of advanced technology, we might even become capable of programming the planet's life and climate.

The Anthropocene marked the rise of humans as a climate and geological force shaping the biosphere. The Meta-Anthropocene might mark a new phase in which humans become an actual evolutionary force capable of rewriting the rules of Life.

This transition could mark a significant shift towards a biocentric and eco-centric worldview, where human prosperity depends on the health of the biosphere and its biodiversity. Humans might no longer view technology as a tool for progress and growth, but as an instrument to sustain life. Through synthetic biology and artificial intelligence, we can create a novel way to interface with nature and co-create our shared future.

Transformational path (continued)

A deep change of perspective

A new economic paradigm might focus on industries that are regenerative, restoring the ecosystems they inhabit and promoting positive impact. This could help to rebuild the natural systems that have been lost due to past human activities and to create a world that is more resilient to climate change and other environmental pressures.

The effects of these changes would be significant, and biodiversity loss, ecosystem degradation, and extinction episodes could become a thing of the past.

Areas that once hosted a low amount of biodiverse flora would thrive with novel human-engineered species that contribute to the ecosystem's richness and ecological value. Oceans could be rich with new species of fish, and once-endangered animal species could finally thrive in these areas.

With the ability to terraform the earth successfully for the thriving of all life, human progress will be defined by the ability to live closely in contact with nature. The understanding of the value of rewilding cities will be a core part of human life, and living sustainably will be the norm.

Transformational path (continued)

Conclusion

This future scenario is not only possible but necessary. It is the result of humans embracing their responsibility as caretakers of the planet, and using technology to create a more sustainable and harmonious world for all. It's time to change our myths to accommodate the Meta-Anthropocene, a future where humans live finally in harmony with nature.

The origin of our own-made species

Synthetic biology

Synthetic biology

Synthetic biology (SynBio) is a field of science that combines the principles of biology and engineering to design and construct novel biological systems that can perform specific tasks. The origins of synthetic biology can be traced back to the development of insulin-producing microbes back in the seventies.

Since its inception, synthetic biology has evolved significantly and has been used in fields such as medicine, agriculture, and environmental biotechnology. In the medical field, synthetic biology has been used to develop new therapies for diseases such as cancer and genetic disorders. In agriculture, synthetic biology has been used to improve crops and increase food production. In environmental biotechnology, synthetic biology has been used to develop new technologies for cleaning up pollution, producing biofuels, and reducing greenhouse gas emissions.

Synthetic biology today offers engineers the possibility of rewriting the DNA and genetic code of living systems, programming it to alter the functions and qualities expressed. By being able to manipulate the source code of life, engineers and scientists can open unthinkable avenues of research and technology. Designing living systems to perform any kind of function at the molecular level and create organisms with properties never seen in Nature.

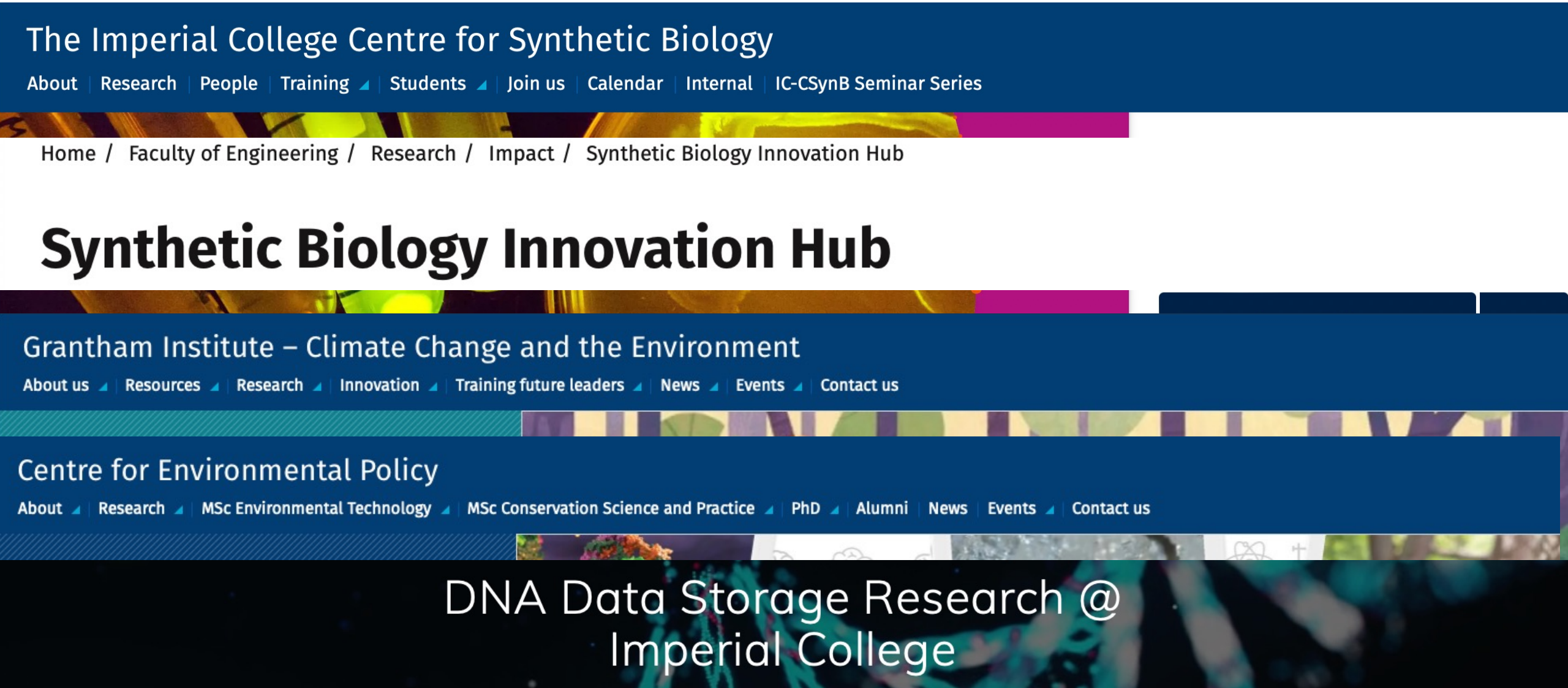
Synthetic biology (continued)

Imperial College London performs extensive research in the area of synthetic biology at centres such as The Imperial College Centre for Synthetic Biology and the Innovation and Knowledge Centre for Synthetic Biology. Its teams focus on the possibility of engineering the underlying biochemical processes to solve many of the challenges facing society, from healthcare to sustainable energy. In particular, researchers model, analyse, design and build biological and biochemical systems in living cells and/or in cell extracts, both exploring and enhancing the engineering potential of biology.

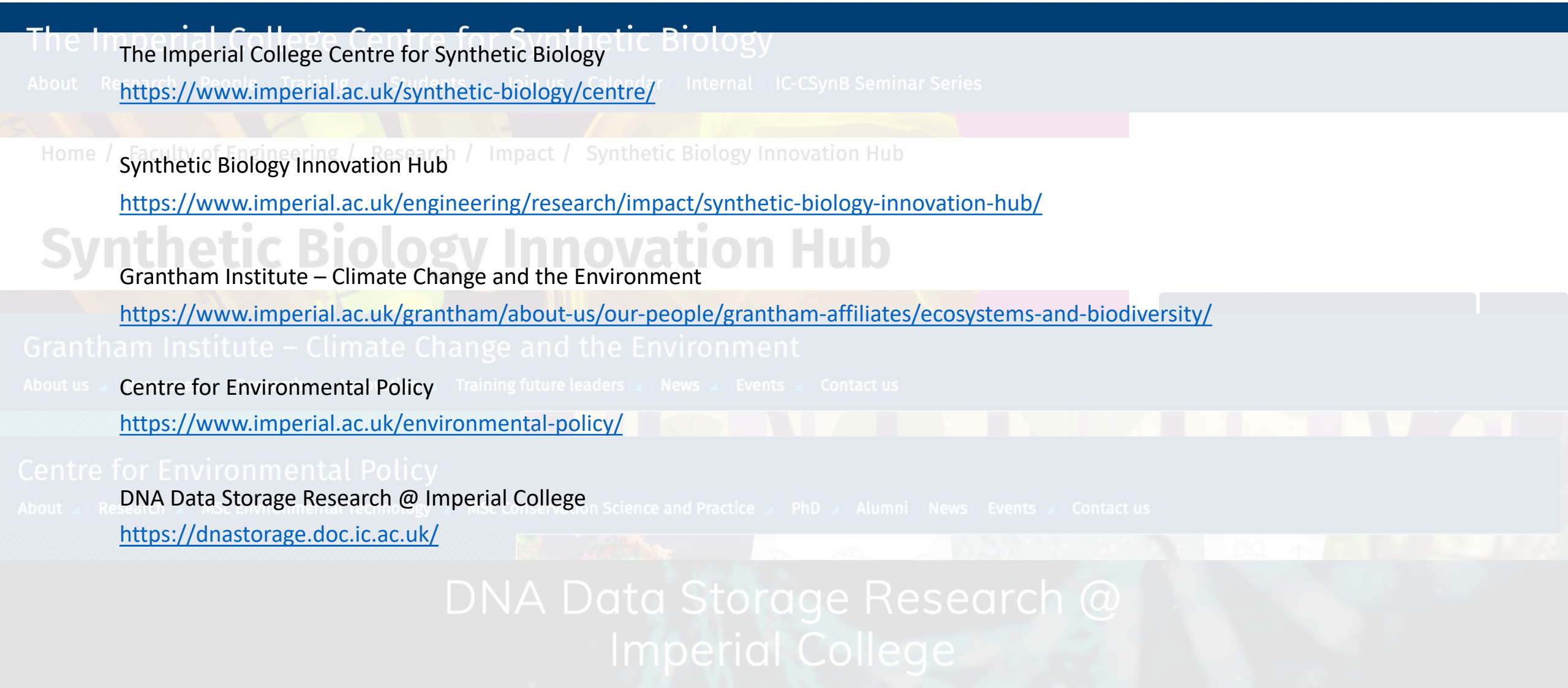
Synthetic biology has the potential to play a significant role in protecting and enhancing biodiversity. For example, scientists are exploring the possibility of using SynBio to address the ongoing pollution and climate crisis. By engineering organisms to perform specific tasks, such as cleaning up oil spills or restoring damaged ecosystems, synthetic biology could help protect biodiversity and ensure the long-term survival of threatened species.

In the future, it could allow scientists to engineer completely new species of plants, microbes and animals, for specific ecosystem roles. This would mean revolutionising the role that humans have in Nature. We could become an evolutionary force and shape the future of biological life on Earth.

Imperial College London, Biodiversity and Synthetic Biology



Imperial College London, Biodiversity and Synthetic Biology



The Imperial College Centre for Synthetic Biology

https://www.imperial.ac.uk/synthetic-biology/centre/

Synthetic Biology Innovation Hub

https://www.imperial.ac.uk/engineering/research/impact/synthetic-biology-innovation-hub/

Grantham Institute – Climate Change and the Environment

https://www.imperial.ac.uk/grantham/about-us/our-people/grantham-affiliates/ecosystems-and-biodiversity/

Centre for Environmental Policy

https://www.imperial.ac.uk/environmental-policy/

DNA Data Storage Research @ Imperial College

https://dnastorage.doc.ic.ac.uk/

Synthetic Biodiversity

A Biodiversity Scenario for 2042-2045

Part of TF 2042 Nature Meets Future

Imperial Tech Foresight