Imperial College London

Imperial Tech Foresight briefing

How business can champion biodiversity

Siân Halkyard

Imperial's technology foresight unit recently published a plausible account of how bioengineering could shape biodiversity by 2042. Here we explore the new thinking that could help your businesses protect biodiversity today.

Imperial Business Partners

Imperial TechForesight ///

How businesses can champion biodiversity

With biodiversity rapidly declining, urgent action is needed, and academic insights could help companies update their models to protect the natural world and the viability of their business models.

Biodiversity is currently declining at the fastest rate observed in human history. Our economies and livelihoods rely on nature; over half of global GDP has a moderate to high dependency on biodiversity. But in recent decades more than 85 per cent of wetlands and half of coral reefs have been lost; a third of fish stocks are overexploited and 32 million hectares of biodiverse forest has been destroyed. Change is needed, fast.

In 2022, the **Convention on Biological Diversity** set a target to protect 30 per cent of the Earth's land and seas and restore 30 per cent of degraded ecosystems, by 2030. This formed part of the **Kunming-Montreal Global Biodiversity Framework (GBF)** which also called on businesses and financial institutions to 'regularly monitor, assess and transparently disclose their risks, dependencies and impacts on biodiversity'.

The **International Union for Conservation of Nature (IUCN)** has warned that companies must transform business models and operations if they are to avoid major economic losses caused by the current degradation of ecosystems and the vital services they provide. Yet a recent **KPMG survey of sustainability reporting** showed that only 40 per cent of 5,800 leading companies around the world currently report on it.

So, with time running out, what action should businesses be taking and how can individual companies make a difference?

Photo: Thomas Angus

Dr Caroline Howe is a Senior Lecturer in the Centre for Environmental Policy

Dr Caroline Howe is a Senior Lecturer in Environmental Social Science at Imperial College London. Her work looks at what we need, value, and take from the environment and the relationship between people and nature.

For Dr Howe, the first problem is that current models of business biodiversity are often too focussed on biodiversity offsets, trade bans, certification schemes or environmental accounting. These practices are very much business as usual, she argues. "It's akin to saying: I'm going to do something quite destructive, but I'll plant some trees over here and hope we'll be OK," she says.

There is increasing evidence to say that this piecemeal approach does not work. Dr Howe believes that businesses need to look to a more transformative approach. "This isn't just about swapping one problem from here to there anymore; it's about giving something back as well as running your business," she explains.

"Whether you invest in food, or water, climate, energy, or health, biodiversity underpins everything; if we don't conserve and protect it, all those other elements will collapse."

A new focus on an important trend

Dr Paul Taylor is Sustainability Innovation Manager at Hitachi Europe Ltd, and coordinator of the new **Hitachi-Imperial Centre for Decarbonisation and Natural Climate Solutions**. Launched in 2022, the Centre brings together

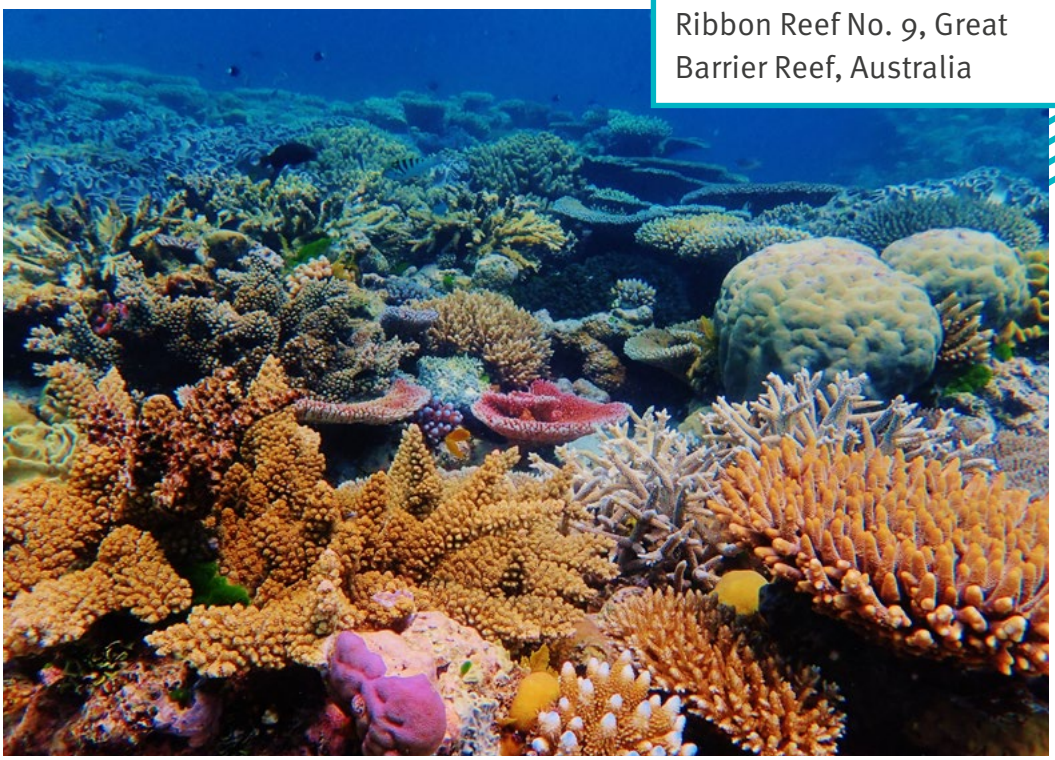
Imperial academics and industry to tackle key challenges in decarbonisation and climate repair, collaborating in fundamental and applied research to drive the transition to net zero pollution.

With a background in climate and environmental science, Dr Taylor's work in biodiversity is relatively new, and reflects how companies are rapidly realising the extent of the impacts and dependencies they have on biodiversity – either directly or in their value chain. He explains: "There is a huge focus on how to get to net zero – which is vitally important. But what happens if we have degraded the environment so badly that we no longer have enough food, clean air and clean water, or an environment to enjoy once we get there?"

"Hitachi recognises the urgency of this issue, and that the work we do now will be critical to both our business and our customers in the future."

Measurement and recording

Dr Taylor's latest project with Hitachi is simple, but necessary. It looks at how you can measure and record biodiversity. "Biodiversity is more difficult to measure than CO_2," he explains. "CO_2 has the same value around the world, but biodiversity is both temporal and very region specific."



Ribbon Reef No. 9, Great Barrier Reef, Australia

Photo: Getty Images

New reporting frameworks are emerging to help companies measure and monitor biodiversity. The **Taskforce for Nature Related Financial Disclosure (TNFD)** is one such example – a market-led, science-based framework that enables companies to integrate nature into their decision-making.

But not everyone can afford to send a trained ecologist or field surveyor to site. So how do companies measure that variance when they might have many sites around the world and complicated supply chains, where their main impact might be downstream in their value chain?

Dr Taylor is trying to address that problem by developing a reporting app through which non-experts can log observations and data so that ecologists and managers can see centrally what the trends are, and where the opportunities lie.

He explains: "This kind of citizen-science approach for biodiversity is quite effective; you can build up large data sets of timing and numbers, it works for both animal life and plants, and you can use it at different levels of resolution – from satellite data all the way down to site level."

This year Hitachi will start co-piloting the app and building in additional functionality, including onsite sensors for acoustics and motion, and light traps for insects. The more information they gather, the more their data can help unpack some of the complexity in monitoring biodiversity.

Defining a value

Once you have a means of monitoring and measuring biodiversity, how does that translate into the type of government and corporate policies that can affect businesses?

Dr Shefali Khanna is a Research Associate in Energy and Environmental Economics at Imperial, with an interest in biodiversity and particularly how we might value it. She believes that without a proper framework and methodology for applying a monetary value to the services that biodiversity provides to human society, it becomes virtually impossible to do anything to protect it. The monetary value may not be the only reason to protect biodiversity, but it is arguably what will motivate businesses to act.

She explains: "It's incredibly challenging to try to put an economic value on biodiversity, but it matters for the development of policy and measures to encourage conservation and protection."

"We need a method for valuation that can be widely adopted so that the value of biodiversity can be accounted for in market transactions, which it currently is not."

Economists have used several methods to try and place a value on biodiversity. Back in the 1990s, economists focussed on the idea that species may contain some yet undiscovered valuable compounds that could yield useful pharmaceuticals in the future – their 'option value'. This became known as bioprospecting, but it was thought to be overly simplistic, generating estimates of the average value rather than the marginal value.

Where previous surveys focussed on individual species, economists have now started thinking about valuing ecosystems as a whole. This presents its own challenges, as we need to understand the full extent and range of services that ecosystems provide.

Dr Khanna explains: "Studies that have tried to attempt broad scale evaluations of ecosystem services have fallen short. One famous study conducted more than two decades ago calculated that the mean value of global ecosystems was more than $33 trillion annually – greater than the world's GDP at the time.

"The study garnered a lot of attention and remains one of the most widely known works, but it has been profoundly criticised, given that many economists would perhaps value global ecosystems at a much larger number."

Dr Khanna adds: "There is a huge need to gather more data and come up with a more robust scientific understanding of ecosystem functioning."

Dr Shefali Khanna is a Research Associate in Energy and Environmental Economics in the Imperial College Business School.

Photo: Simon Jarrett

Contingent valuation

In an attempt to overcome this lack of data, more recent research has focussed on Contingent Valuation (CV), a survey method which aims to elicit a monetary measure of welfare. This is framed as the 'Maximum Willingness to Pay' to obtain something that is not currently possessed by the respondent. These surveys can provide an insight into the value that human beings obtain from using biodiversity – be it produce, things that we consume, and the existence value of, for example, 'just knowing that forests are being protected'.

Dr Khanna adds: "That's where these techniques are particularly powerful because they help us to assign a value both for use and existence."

In a recent CV study, Dr Khanna's MSc student, Anil Olgun, found that 70 per cent of respondents voted in favour of funding a large-scale conservation programme through additional income tax. On average, they were willing to pay £5.00 per month to conserve 9.7bn hectares of land, and £5.54 per month to conserve 19.6bn hectares.

While there are some drawbacks – respondents may not necessarily have the same idea of what conservation means when they complete the survey – Dr Khanna believes these approaches are worth exploring further and could in turn translate into policy.

Ancient field boundaries near Zennor, Cornwall, UK

Photo: Getty Images

Translating value into policy

It is clear there is a need for policy incentives. Dr Khanna explains: "The first rule should be do no harm, but that is difficult to enforce unless you have markets where developers and companies and business have to pay for the land they are degrading or the biodiversity that they are failing to protect."

"This is where market-based approaches for biodiversity protection can be helpful," she adds.

Cap-and-trade

One example, known as transferable development rights, is similar to the cap-and-trade schemes used to limit pollution emissions. The government or policy maker assigns the amount of land that can be developed, and the developers trade the right to develop that land. The main challenge with this approach is how to decide what measurement or unit you will trade, and what it is worth?

Dr Khanna notes: "Cap and trade has been proven to be an effective allocation method for reducing greenhouse gas emissions, and it can certainly be an effective method for protecting biodiversity as well."

Payments for ecosystems services

Another market-based approach that has been used extensively, particularly in Central America, is payments for ecosystems services, where farmers or landowners are offered an incentive in exchange for managing their land to provide ecological benefit or service.

Costa Rica has a Forest Law that recognises four environmental services provided by forest ecosystems: biodiversity conservation, watershed protection, regulation of greenhouse gas emissions and scenic beauty. The government enters into contracts with landowners to ensure that forests are preserved, with funds coming from fuel use, the sale of carbon credits, and payments from industries such as agriculture, mining and construction, travel.

These sorts of measures have been adopted in other countries as well, where green payments are targeted to farmers who adopt environmentally friendly management practices or land uses.

But for these systems to work it is crucial to understand the range of stakeholders involved.

Dr Howe believes that there are limitations, and more work needs to be done: "What often happens is a business may invest in an ecosystem, but only the top echelon of that community sees the money; the people who would benefit from it, don't. Where they do work well, they have been implemented in such a way that there's no power grabbing."

Dr Khanna believes that once more countries start introducing similar policies and the value of biodiversity is incorporated into the benefits for landowners and governments to protect their resources, then compliance will rise globally.

"We want to get to the stage where the planet is covered under a uniform regulatory framework. It won't happen all at once, but once the value of ecosystem services is incorporated into environmental regulation, businesses won't have a choice, they will have to pay the price," she adds.

Dr Howe agrees: "It needs to be clear that business can make money, but not at the expense of other communities, or the environment. The bottom line is that the desire to make a profit should never result in ecosystem destruction in the short-term, as ultimately, in the long-term, business (and societies) will fail if our natural systems collapse."

Dr Howe has recently finished a collaborative project in Tanzania focussing on dignified development – supporting communities to retain their connectedness to the environment that we have often lost in the developed world. She believes that we have to understand people's relationship with biodiversity, so that we can not only maintain and support symbiotic relationships with nature, but also ensure that benefits from nature are shared justly and fairly.

A kelp forest at Catalina Island, California

Photo: Getty Images

Writing in the journal *Global Environmental Change*, she argues that to get that synergy you must be aware that there's going to be conflict and plan for where those problems might be. She explains: "As a business interested in the environment you need to get experts in – not just ecologists and natural scientists, but also social scientists. If you do that in advance, then there's potential for enormous success."

Dr Khanna agrees: "Economists can develop methods to come up with more holistic values, but we also need ecologists and scientists to give us a better understanding of the full range of services that ecosystems provide us with including to the communities that they are embedded in."

Nature-based solutions

If we are to preserve biodiversity, then perhaps we should look to nature as the solution. Nature-based solutions (NBS) are defined as innovative approaches that address societal challenges whilst also providing benefits to well-being and biodiversity.

Whether it is integrating hedgerows into arable land to reduce flooding risk, or growing mangrove forests to prevent storm surges during hurricanes, these measures are estimated to generate $170 billion in estimated global benefits in ecosystem services, adaptation, and mitigation. It has also been suggested that a third of the climate mitigation measures needed to meet the Paris Agreement could be provided by these nature-based solutions.

This presents huge opportunities to protect biodiversity by working with nature to develop truly sustainable businesses from the ground up.

A new project and startup led by one of Dr Howe's PhD students, Ryan O'Shea, is doing just that. Algacon is proposing the development of seaweed farms in conjunction with wind farms in what is known as a Multi-Use Setting. She explains: "Seaweed is amazing; you can use it for food, cosmetics, biofuel, medicine, or as a plastic replacement. In this case the space in which it's growing is already being used for wind power and thus isn't affected by shipping. Algacon are based on a circular bioeconomy approach – a system which doesn't waste anything, and that potentially creates a whole new industry."

Another of Dr Howe's PhD students, Ebba Engstrom, has been researching the UK's expanding wine-making (viticulture) industry. The UK's climate is becoming increasingly suitable for wine production and many new vineyards in the UK are creating a high-end product, have their own energy sources on site, provide new employment, green infrastructure and can re-use all their waste.

Dr Howe believes that the businesses that are going to survive and thrive in the future are either going to invest in new technologies such as these and

work with nature, or already have a business model that they can build these nature-based solutions into, making it part and parcel of how they work.

"Replacing nature with a manufactured product is often more expensive than just conserving and managing it, for example building man-made flood defences where there used to be forests or mangroves. People who apply the circular economy approach to their business model, where they're saying 'there's no waste, we're going to reuse that, we're going to use that as our energy source, we're going to sell that product on to someone else' – the companies that think outside the box are the ones that stand to be successful."

A lot of our existing business models don't do that. She cites water companies in the UK as a good example of where things can go wrong. "Money could have been better invested in nature-based solutions that clean our water and preserve our natural flood defences, which in the long term would have been vastly more efficient and cost-effective than the corrective measures we are faced with."

Setting achievable targets

Later this year, new legislation is being introduced to ensure that any development proposal in the UK must show a 10 per cent biodiversity net gain (BNG) fostered on site. But the time frame is over 30 years and habitat creation takes decades. Enabling businesses to track and manage their environment over time is vital.

The question around KPIs is a tricky one for Hitachi's Dr Taylor. "KPIs are how corporates live and breathe, but for biodiversity it's more complicated than just saving a tonne of carbon. Keeping records of biodiversity is challenging because it is habitat and location specific and because of the timescales and complexities involved."

The TNFD does not specify a single measurement metric; it asks businesses to identify their impacts and dependencies, their governance and strategy. "It's really asking, 'what is your risk and how are you managing it?'," adds Dr Taylor, "which leads to a real discrepancy in how companies manage their impact."

That risk is already apparent for many sectors; agricultural suppliers are seeing their yields decrease year on year due to soil degradation, volatile weather, and a loss of pollinators. Other sectors are facing similar challenges.

Our reliance on nature cannot be underestimated and every business will be affected by it one way or another. Taylor's advice is simple.

"Just make a start," he says. "Your strategy doesn't have to be perfect straight away. The TNFD is a good framework to help you begin to identify areas for action. Take steps to understand the issues and risks and put plans in place where you can. This cannot just be about reducing your impact; it's about making a positive proactive impact on the environment that you will leave behind after you have done your business."

Societal transition and the role of leadership

While there is no doubt that we need to undergo a technological transition to address biodiversity and work needs to be done on measurement and valuation, we also need to undergo a societal transition too.

The Hitachi centre is beginning to look at this shift. Dr Taylor explains: "If you have a CEO who is genuinely passionate about sustainability – whether that's because they personally feel it's the right way to run a business, or because of the legacy they might leave behind – that definitely feeds through the organisation. There's clear messaging and commitment and it gets signed off by the executive team."

Dr Howe leads Imperial's MSc course in Environmental Technology. Many of the 160 students she teaches each year go on to work in business and are driven by ensuring sustainability for a better future.

Her students have gone on to start up sustainable businesses such as packaging-free cereals, edible insects and green period products.

Dr Norihiro Suzuki, Vice President and Executive Officer, CTO and GM of R&D Group at Hitachi and Professor Francisco Veloso, then Dean of the Imperial College Business School, launched the Hitachi-Imperial Centre for Decarbonisation and Natural Climate Solutions in 2022

Photo: Dan Weill

"These are the people we want to get to the top of leadership," she says. "What you have to hope is that some of these smaller companies do really well, and the larger companies take note," she adds.

Dr Howe cites Fairtrade as a good example of how small sustainable initiatives like these can grow and become mainstream. "Fairtrade was a small thing when it started but it has become huge because consumers wanted it and were prepared to pay a premium for it. It shows that if you start off small then bigger businesses will follow."

Change is also coming from shareholder resolutions or pension funds, with large investors expecting to see a biodiversity strategy. "This isn't happening because it's fluffy and nice," adds Dr Taylor. "It's because fundamentally, they know their investments are at risk."

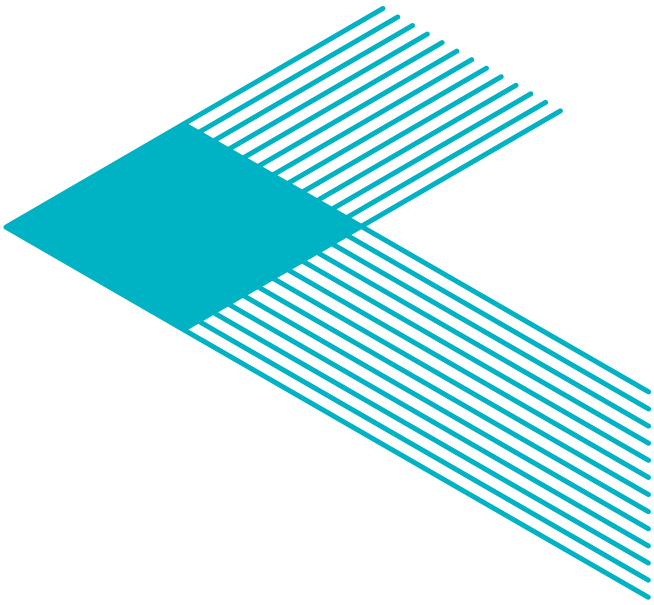
Dr Taylor adds: "We're starting to see that there's no choice; unless you can show you've got responsible sourcing in place, a net zero target and you're reporting your carbon footprint, other stakeholders will not do business with you."

The same is true of consumers. In a 2013 study conducted in the Seychelles, an area with limited water resources, Dr Howe, and her team, led by Peter Damerell, found that children participating in local wildlife clubs would take what they had learned and go home and scold their parents for not protecting their natural resources. "For example, they would pester their parents to get a water butt and also recycle," Dr Howe explains.

"We need a shared vision of the world in 2030 and to work backwards from that vision. We know where we want to be; we are working towards a shared positive future for people and nature where yes, people can make money, but we still have a functioning planet on which to make that money. You can't have one without the other, it simply doesn't work."

"If we educate our children, they will nudge the next generation up to act. In the same way, if we start with the smaller companies doing novel things, they can hopefully encourage the bigger companies to change too. Ultimately, large companies want to make money and stay in business, and if you destroy everything, there's nothing left to invest in."

With less than seven years left to meet the GBF target of 30 by 30 there is clearly much to do. But Dr Howe believes there is still time to make that genuinely transformative change.



Contact Imperial Business Partners

If you would like to know more about **Imperial Business Partners** and our futures consultancy, Imperial Tech Foresight, we'd love to begin a conversation with you.

ibp@imperial.ac.uk | **imperial.ac.uk/ibp**

Imperial Business Partners