AtkinsRéalis

NATURAL RESILIENCE

Engineering a better future for our planet and its people

Introduction

We all need to act to help the world deal with the twin crises of climate change and nature loss.

Sharing our latest thought leadership, AtkinsRéalis explores the role of resilience in the changes we need to make across the globe to deliver against the goals and targets set out by the United Nations in the 'Biodiversity Plan for life on Earth'.

Across the world, AtkinsRéalis are helping our clients assess their dependencies and impacts on nature, adapt to new regulations and engage with new opportunities.

Take inspiration from the case studies where we show how a positive difference can be made on the ground, benefiting the natural world and local communities.

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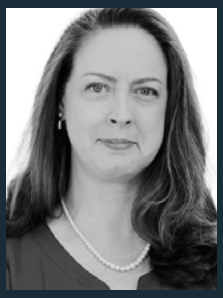
Contributors



Maria Honeycutt, PhD, CFM

National Director for All-Hazards Resilience, and Resilience Global Practice Leader

Dr. Honeycutt is AtkinsRéalis' National Director for All-Hazards Resilience and its Resilience Global Practice Leader, aligning and enhancing resilience services across the firm's planning, design, construction, and asset management portfolios. Prior to rejoining AtkinsRéalis in 2022, she spent 14 years with the U.S. National Oceanic and Atmospheric Administration's Office for Coastal Management focused on national flood policy and integrating best-available science into new federal flood standards. From 2019-2022, she was the White House's Assistant Director for Resilience S&T. There she led the development of a novel framework for identifying and aligning investments toward societal dimensions of resilience.

Claire Wansbury MA MSc FCIEEM FLS CEcol CEnv CMLI

AtkinsRéalis Fellow and Technical Director, Biodiversity

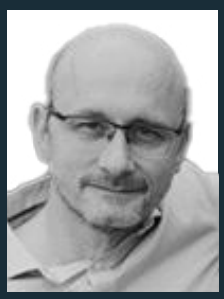
Claire Wansbury is AtkinsRéalis' global authority on biodiversity and nature. She is an award-winning ecologist with over thirty years' experience. A Fellow of both the Chartered Institute of Ecology and Environmental Management (CIEEM) and the Linnean Society, Claire's numerous awards include CIEEM's member of the year award for 2020 and the Society for the Environment's Environmental Professional of the Year 2023.

Claire is one of the UK's leading experts in Biodiversity Net Gain, and a key player driving forward best practice. She is the co-editor of the ICE's Manual of Blue Green Infrastructure. A particular area of expertise for Claire is Natural Capital and Ecosystem Services.

Claudia Valencia MSc

Global Minerals & Metals Sustainability Strategy Lead, Peru

Claudia is the Global Sustainability Strategy Lead for AtkinsRéalis' Minerals & Metals Sector. She has over 15 years of experience, working in sustainability and biodiversity management for development projects mainly in Peru and the LATAM region. She has participated and led numerous biological studies, environmental assessments, EIAs, management plans, working mostly for the mining, O&G and energy sectors. She is passionate about biodiversity conservation and helping projects become more sustainable.



Steven Wade PhD MSc BA FRGS

AtkinsRéalis Fellow and Technical Director, Climate Resilience

Steven Wade BA (Hons) MSc PhD FRGS is AtkinsRéalis Global Fellow for Applied Climate Science and Technical Director on Climate Resilience. He has 30 years' experience in climate change risk assessment, climate resilience and climate finance, providing advice in the water, agriculture, energy and transport sectors globally. Steven led the team that delivered the UK Climate Change Risk Assessment in 2012 and has worked extensively on climate risks in more than 20 countries, particularly across Asia and Sub-Saharan Africa. Recent work has including assessments of risks to food security, heatwave risks and development of more resilient water supplies.

Victoria Gilbey BSc MSc MCIEEM CEnv

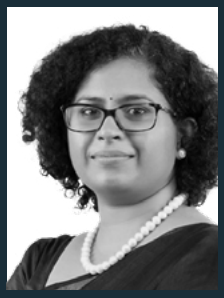
Associate Director

Victoria is an Associate Director in Ecology with AtkinsRéalis, a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and a Chartered Environmentalist. Victoria's area of expertise are large infrastructure schemes, supporting clients through optioneering, planning and construction phases. Victoria is passionate about working collaboratively to design nature positive solutions which tackle difficult aims such as habitat connectivity, climate resilience and the need for providing public access alongside wildlife-rich habitats. She has recently won awards for good ecological design (Cockcrow Green Bridge, Good Road Design 2023) and Environmental Sustainability (M25 J10, Highways Awards 2024).

Luke Gorman
BSc FCIEEM CEcol

Professional Head of Ecology & Acoustics, Technical Director

Luke is the Professional Head of Discipline for the award-winning AtkinsRéalis Ecology & Acoustics Practice. He is a Fellow of the Chartered Institute of Ecology and Environmental Management and a Chartered Ecologist with a track record of identifying innovative solutions to our clients' most complex challenges. Luke is passionate about global collaboration to challenge the status quo, developing game-changing survey and mitigation techniques, and expanding AtkinsRéalis' technical ability to ensure fantastic outcomes for our projects, our clients, and our planet.



Monika Nair
B.Arch, MLA, CMLI, FLI

AtkinsRéalis Fellow and Technical Director, Engineering Net Zero

Monika is an Architect and Chartered Landscape Architect with extensive experience in urban development projects in the UK, India, Middle East. She is AtkinsRéalis Fellow for Landscape Architecture and Associate Director for AtkinsRéalis Engineering Net Zero.

She leads strategic initiatives towards adaptation, mitigation and climate resilience. She is a proponent of Landscape Urbanism in her professional contributions of urban and regional scale. She is currently researching nature-based solutions in bringing resilience at a community scale.

Monika is a Fellow of the Landscape Institute, UK and is also actively involved in the development of the Landscape profession in India.

Francis Heil
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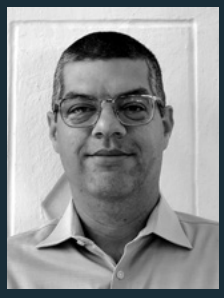
Associate Director, Climate Change & Resilience

Francis is a Chartered Engineer with 15 years' experience in climate change advisory and strategic planning for governments, cities, infrastructure companies, international financial institutions, non-profits, and the private sector across the world.

Francis is a climate resilience expert advisor to the European Investment Bank, Asian Development Bank, and British Red Cross, and is part of the Executive Committee for the London Climate Ready Partnership.

He leads AtkinsRéalis' advisory services related to climate-related financial disclosure (TCFD), and supported development of the Taskforce for Nature-related Financial Disclosures (TNFD)'s guidance on metrics for the infrastructure sector.



Shayne Paynter
PhD PE PG

Fellow and Senior Technical Director, Water Resources

Shayne Paynter holds a PhD in hydrologic statistics and is a licensed geologist and engineer in multiple US states. He serves as the US Water Resources Technical Director. His passion is nature-based solutions that support infrastructure and incorporate multiple benefits for flooding, water quality, ecology, habitat, recreation, resiliency and sustainability.

Foreword

Maria Honeycutt, PhD, CFM, National Director for All-Hazards Resilience, and Resilience Global Practice Leader

As global leaders gather in Cali, Colombia for COP16 on biodiversity,

AtkinsRéalis continues to focus on the role of resilience in the Kunming-Montreal Global Biodiversity Framework – or the 'biodiversity plan for life on Earth', as described by the United Nations.

Resilience is key to any plan for the future of life on Earth. But what exactly do we mean by resilience?

In a climate and engineering context, we usually refer to resilience from a human perspective: how nature can be utilised to support the creation of resilient communities and economies in the face of natural hazards – particularly those exacerbated by climate change.

In contrast, when we consider the devastating nature loss happening all around us, we tend to frame resilience in terms of nature for nature's sake: how nature itself can be supported to become more resilient to habitat loss and climate change.

Both perspectives are equally valid, and critically, interconnected. The resilience of human society depends – to a very large extent – on the resilience of nature.

This magazine explores various interpretations of, and approaches to, resilience, and considers our complex relationship with nature, setting the stage for a new resilience mindset.

We discuss the success of nature-based solutions in Florida, and a trailblazing initiative to address the barriers to their implementation more widely. We look at the complex ecosystems of Peru to consider nature's inherent resilience, and explore how we can harness the power of nature to create the best outcomes. We discuss how, following nature's lead, perhaps we can achieve a nature-positive future and move from a time of nature loss to a time of nature recovery.

We examine two case studies: one celebrating innovative green bridge design to restore ancient habitats and protect rare populations, and another highlighting huge biodiversity gains generated from re-wilding obsolete pits at a working quarry.

Looking more closely through the human lens, we consider the intersectionality of climate change adaptation, and the importance of vulnerability for establishing where resilience is needed most, and in what form.

We examine the fascinating concept of sacred groves in India, and explore how a cultural and spiritual imperative to protect nature might be applied in different contexts.

These articles demonstrate a real appetite for redefining our relationship with nature and restoring a balance of power – something that will clearly be mutually beneficial for the planet and its people.

Connected to this is an emerging sense that we need to 'give back' to nature by somehow restoring it to a former state. The examples we cover – using ancient land management techniques, re-wilding, retrofitting grey infrastructure and leaving nature to its own devices – all point to a sense of going back to a time when nature thrived.

But looking back will not point us in the direction of a nature-positive future. We can't go back. The world has changed, and will continue to change.

Precisely because physical landscapes, habitats, ecosystems and species will inevitably change over time, in order to build lasting resilience, we must preserve the value of nature throughout time.

A resilience mindset will help maintain a value framework that, in spite of physical changes, maintains and enhances natural systems while supporting the critical functions that facilitate physical, social and cultural benefits for human society.

It does this by acknowledging the power of the natural world, and its inherent transformation. It works in partnership with nature and establishes a reciprocal and respectful relationship that evokes a genuine responsibility towards conservation for nature's sake, and for the sake of our communities.

By studying nature more closely, we can predict its changes over time, and use this information to design innovative, sustainable and effective interventions. By considering people and the intersectionality of human resilience, we can continually assess vulnerability to address social inequality and work towards climate justice.

Successful implementation of a resilience mindset requires anticipation and acceptance of a turbulent future, and the application of innovative and proactive solutions that align with the characteristics of that future. By restoring the resilience of nature in this way, we can help ensure that its vital functions for the health and prosperity of humankind persist, as the world continues to change.

Stepping up the transition

To a nature-positive future

Claire Wansbury, AtkinsRéalisFellow and Technical Director, Biodiversity

Nature and resilience

As humans seek to undo the damage they have imposed on nature throughout recent history, it's becoming increasingly clear that nature itself is the most effective partner we have in the face of spiralling environmental crises. Whether it's building resilience against extreme weather events or boosting biodiversity in urban areas, if we look to nature, it seems we will find the answer.

With a rise in the prevalence of nature-based solutions, we're learning more about what nature is capable of, and by interacting with it in different ways, our relationship with nature – and how we utilise it – is becoming increasingly nuanced. The ways in which we interact with nature to build resilience can broadly be divided into two distinct concepts.

Nature-based solutions,

such as rain gardens, leaky dams, tree planting or peatland restoration, are reasonably familiar. They **solve challenges through working with nature** and make **human lives more resilient** to the forces of nature, as well as self-imposed challenges, such as climate change.

Nature positive,

on the other hand, is a less well-known concept, referring to the **transition from a period of nature loss to a future of nature recovery.** It makes **nature more resilient** to the damage done by humans.

The two concepts are interconnected, and as part of a holistic, multi-benefit approach to nature-based solutions, we should all be looking for opportunities to work towards a nature-positive future.

The time is now

Biodiversity loss is not slowing; it's intensifying.

We no longer live in a time where it's OK to say we will minimise our negative impact on nature. The Living Planet Report 2024 highlights a 73% average decline in wildlife populations between 1970-2020. It warns that our world is reaching a dangerous tipping point, that could be sudden, irreversible and catastrophic for people and nature.

A decline in nature doesn't just affect wildlife – it affects the resilience of many aspects of human life: **ecosystem services, health and wellbeing, food production, and our economy.**

The Green Finance Institute estimates that damage to the natural environment is already slowing the UK economy, and predicts an estimated 12% reduction to GDP in the years ahead. To put it into context, that level of harm is more than the hit to the UK's GDP from the global financial crisis in 2008, or from Covid-19 in 2020. It's clear we need to act now and begin to reverse the damage caused. It's time to make tracks towards a nature-positive transition and start moving (quickly) from a time of global nature loss to a period of global nature recovery.

Making the transition

We're on an incredibly steep learning curve. It seems as if the world is only just reaching an acceptable degree of carbon literacy – and we've been talking about the climate crisis for decades. When it comes to biodiversity, and particularly nature-positive, there's a lot of catching up to do.

While the two challenges of climate change and nature loss go hand in hand, how we tackle them is considerably different.

With climate change, we are trying to avoid and reduce harm. When it comes to nature, too much harm has already been done. That's why we're not talking about avoiding or reducing; we're talking about restoration – moving from a period of degradation into a time of regeneration and renewal, with the aim of achieving a nature-positive future.

Carbon reduction is hugely challenging, but is still more straightforward than nature restoration. With carbon, where offsetting is required for residual carbon footprints, businesses can buy credits that will reduce carbon in another location, and that reduces carbon emissions overall. With nature, this approach doesn't work. Nature and loss of nature is inextricably linked to place. We cannot offset the loss of nature on a project site by improving biodiversity in another part of the world. The specific ecosystems and species that are being harmed by that particular project aren't going to benefit from gains to other ecosystems and species, and the communities that have experienced reduced access to greenspace or ecosystem services aren't either.

It's clear that massive action is needed to move in the direction of a nature-positive future, and it will take time to get right. But with time not on our side, it's imperative we identify opportunities for quick-win, no-regrets actions that we can get on with in the meantime. And if we can raise awareness throughout the sector and motivate project teams to champion a nature-positive approach in everything they do, **that's a really good starting point.**

Putting nature back in charge:

Harnessing the natural resilience of ecosystems for biodiversity recovery

Claudia Valencia, Global Minerals & Metals Sustainability Strategy Lead, Peru

When we consider the resilience of ecosystems in planning, we generally think of it as something we must encourage, build or create; something to impose on nature.

But if we stop to look at nature and study the behaviour of ecosystems, we begin to see how incredibly resilient nature is – without any human intervention.

Across Latin America, and in particular, Peru, where I am based, nature's powerful capacity to withstand and overcome stresses is increasingly evident. As we head into the apex of a biodiversity emergency, it's become clear to be that we need to harness this capacity, and put nature back in charge of its own recovery..

Where we've been going wrong

As the biodiversity emergency manifests, it's become standard practice to build significant physical interventions into development plans in order to demonstrate an intention for the rehabilitation of ecosystems and biodiversity gains.

It's also pretty common to see rehabilitation and revegetation interventions fail. In places where natural ecosystems thrive, planted species may grow successfully to begin with, but they often die out within a year. In their place, we often find that the area has successfully rewilded – naturally – without (and often in spite of) intervention.

The planning process seems to have completely overlooked the natural resilience of ecosystems. This is due, in part, to a lack of understanding of how ecosystems work and how they react to stresses and disruptions. Where a certain approach has been successful in one area, we tend to suppose this will work elsewhere. For example, in the UK, there is often nowhere nearby from which species can recolonise, and more intensive re-introduction or reforestation is therefore necessary. It's easy to fall into the trap of assuming that the same issue applies everywhere.

Off-the-shelf approaches to restoring ecosystems may work in the relatively simple – and more thoroughly studied – ecosystems of North America and Europe, for example. But in the more complex ecosystems of Peru and much the southern hemisphere, little, if anything, is known about the behaviour of many local and endemic species. In these highly biodiverse contexts, projects requiring rehabilitation are often surrounded by natural ecosystems that are readily available to support natural regeneration – something that is often overlooked in planning.

Understanding the challenge

Once the inherent resilience of nature has been recognised and acknowledged, it will guide us to the right solutions. For this we need knowledge. Without knowing how specific species will react to the particular stresses of a given project, we simply cannot know the best course of action to re-establish ecosystems post-development.

Implementation of a nature-led approach requires us to build an understanding of the ecosystem surrounding a project. By conducting relatively simple and small-scale studies at each site (rather than relying off-the-shelf solutions tested elsewhere) we can determine how the natural resilience of that specific ecosystem behaves under a range of controlled circumstances.

Biodiversity recovery needs to become an established step in the very early stages of a project. This will enable teams to assign the time and resource to undertake appropriate studies and generate data to demonstrate the impact of various approaches.

By turning our attention to studying the workings of individual ecosystems, we can understand the challenges they face and their unique strengths, to unlock natural resilience. This nuanced and targeted approach supports nature to heal itself, leading to better biodiversity outcomes.

Sometimes, less is more

When working on a pipeline installation in Peru's complex highland wetlands ecosystem, AtkinsRéalis ecologists identified powerful natural resilience. Their post-development recommendation was simply: the provision of a constant water supply. That was all this ecosystem needed to thrive.

Once we understand an ecosystem, we can understand what needs to be done in that particular place in order for that particular ecosystem to bounce back and thrive after disruption or stress. Sometimes that will require more invasive interventions – and more money. But, more often than not, we find that a simple approach – such as providing water – is all that is needed. Anything else is not only surplus to requirement: it could potentially do more harm than good. Planting (sometimes unknowingly) the wrong species, brings with it a risk of invasive species or attracting invasive species that can actually reduce biodiversity.

Instead of putting money into elaborate solutions, we need to channel resources into understanding ecosystems, biodiversity and natural resilience. Rather than trying to outsmart nature, we need to learn from it.

Crown Farm Quarry

How industry and nature can work hand-in-hand for a resilient future

Luke Gorman, Professional Head of Ecology & Acoustics,
Technical Director, Infrastructure, United Kingdom

Initially brought in to support a planning application for the extraction of sand, AtkinsRéalis has now been working with Tarmac on its Crown Farm Quarry site for more than 20 years. We continue to support them with staged restoration of the site, through a range of habitat enhancement measures and rewilding techniques.

Tarmac has consistently gone over and above what is required for planning permissions, and the team's evident passion for the natural world has resulted in an exemplary model of how an active quarry can exist hand-in-hand with thriving rehabilitation projects on site. The interventions at Tarmac Crown Farm Quarry demonstrate a long-term commitment to improving biodiversity, building resilience, and connecting people with nature.

Over the past 20 years as extraction sites have been quarried and then become obsolete, the site has been transformed, with blossoming biodiversity and soaring ecological value. Restored areas are attracting more diverse species than were originally present and are becoming a last stronghold for some species that would otherwise be extinct in the county.

Waterbodies created by mineral extraction have been left to establish naturally, and additional ponds have been created specifically to boost biodiversity. This approach has led to a huge increase in great crested newts and grass snakes at the site – both of which are considered to be regionally important populations.

Seeding and planting has led to a marked increase in the presence of pollinators, such as solitary bees and specialist grassland butterflies; and with over 700 on site, orchids have flourished. We're seeing a wide variety of bird and bat species foraging on the new habitats created, and on active quarry sites, a number of vertical sand faces are being left undisturbed to provide a nesting habitat for sand martins – a protected species.

The measures being taken at Tarmac Crown Farm Quarry are obviously creating a welcome explosion in biodiversity, building resilience among resident species – many of which are rare or protected – and bolstering the resilience of ecosystem services.

As an extension of its commitment to biodiversity, in 2019, Tarmac handed over a restored and rewilded area of the quarry to Cheshire Wildlife Trust in a pioneering partnership between industry and nature. Cheshire Wildlife Trust now manages this part of the site as a nature reserve, with an educational facility on site. It welcomes local school children to sessions where they learn about nature, and how they can play a part in preserving habitats – and building resilience – for the future.

The ongoing and long-term success at Tarmac Crown Farm Quarry demonstrates how a commitment to the restoration and enhancement of habitats can be realised by making small but meaningful adjustments to the management of post-industrial land. As well as boosting biodiversity and creating safe havens where species can thrive, Tarmac is building an important educational legacy to ensure its good work is continued across the community. The crucial partnership with Cheshire Wildlife Trust has set a precedent for how industry can unite with conservation groups to build more a resilient future together.

Do we all have a moral obligation to nature?

Learning from sacred groves in India

Monika Nair, AtkinsRéalis Fellow and Associate Director, Engineering Net Zero

What are sacred groves?

Sacred groves are forest fragments of varying sizes, which act as hotspots for biodiversity in rural and urban settings. They are an excellent example of biodiversity conservation through social forestry, with communities maintaining, protecting and preserving them as part of entrenched cultural practice .

Across swathes of the Indian subcontinent, sacred groves have existed for generations – with some communities maintaining the same patch of land for hundreds of years. From small forested areas to hills, streams or even a single ancient tree, these spaces can be very small, but hold much gravity. The ritual of looking after these special pieces of land is part of a collective sense of responsibility for conservation and a deep commitment to nature, rooted in religious belief.

In the predominantly Hindu culture of India, it is believed that humankind depends on nature for its survival, and as such, nature should be respected, revered and even worshipped. In fact, it is a moral obligation of Hinduism to worship nature, as an expression of gratitude.

Why are sacred groves important?

The cultural context of sacred groves and the tradition of their communal preservation – while grounded in religious beliefs – is also tied up with a historical need to maintain ecosystem services for local communities.

Sacred groves continue to present multiple benefits to the natural world and to humans. As population growth and rapid development ravage biodiversity, sacred groves have become a last refuge for many threatened and rare species in India. They boost climate resilience, bolstering flood defences, reducing heat island effects and acting as carbon sequesters.

They can contribute to cleaner air and replenish water tables to improve water quality in rural areas. This has the combined effect of better health and wellbeing, and greater quality of life for the communities that are so invested in the upkeep of these spaces.

How can we scale sacred groves?

The power of nature on this small scale is evident, with sacred groves successfully boosting biodiversity and building resilience locally. But how can we scale this concept to have a global impact?

Because they are typically small, stakeholder-driven projects tailored to local biophysical, socio-economic, political and cultural conditions, the concept of sacred groves is not easily replicated. With each different setting, specific adjustments need to be made, and scaling requires nuanced knowledge of the original context and success factors.

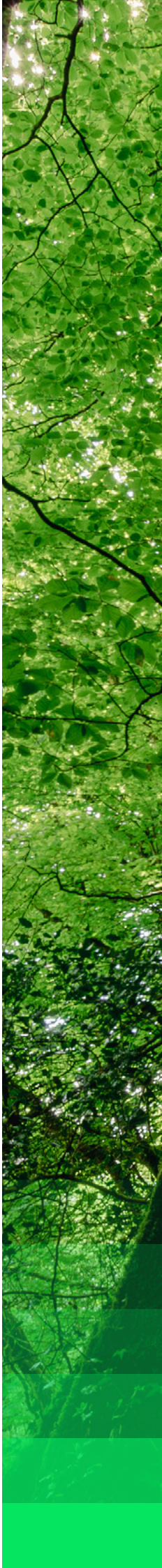
There are three approaches to scaling:

Scaling out replicates a solution in a similar context with minor adjustments.

Scaling up applies where the approach needs to be substantially adapted.

Scaling deep tackles the predominant socio-economic drivers of biodiversity loss and landscape degradation. It may include changes in values, policies and institutions.

Scaling deep is the option with the most potential for change. But it's also the option that requires the most change. How can we apply the entrenched cultural practice of sacred groves to other cultures?



Making it work

As an international community, we're facing multiple environmental crises. In order to harness the power of nature to tackle these crises, we need to revive a reciprocal relationship with nature and learn from those championing sacred groves throughout India.

Any grassroots initiative such as this requires buy-in from members the community, and we need to adapt the concept, in each case, to be culture-specific as well as climate-specific.

'Sacred groves' could implemented elsewhere using relatively simple mechanisms, such as introducing social forestry reserves as part of neighbourhood planning. The local community would be incentivised by design to maintain the land – perhaps homes would overlook the space, or residents would walk through it to get to amenities. In return, they would receive multiple benefits from the natural capital created, such as flood resilience or opportunities for recreation.

Despite evidence of sacred groves in Greek, Roman and Celtic cultures throughout history, the concept is alien in most western cultures today. And as India continues to modernise and develop at pace, younger generations are moving towards a more secular lifestyle, often dismissing long-held traditions and cultural practices as old fashioned or superstitious.

It is unrealistic to expect other cultures to simply adopt practices from other places, without relevant incentives. But, whatever your cultural identity or religious background, the fundamental truth that humankind relies on nature for its survival is universal. Ultimately, we all have a moral obligation to protect and preserve nature for the good of humanity.

at pace, younger generations are moving towards a more secular lifestyle, often dismissing long-held traditions and cultural practices as old fashioned or superstitious.

It is unrealistic to expect future generations and secular cultures to worship nature in the same way that traditional Hinduism promotes. But, whatever religion you practice – of if you have no religion – and whatever your cultural identity, the fundamental truth that humankind relies on nature for its survival is universal. Ultimately, we all have a moral obligation to protect and preserve nature for the good of humanity.

Building Climate Change Resilience

Through an intersectional approach to climate change adaptation

Francis Heil, Associate Director, Climate Change & Resilience

Steven Wade, AtkinsRéalis Fellow and Technical Director, Climate Resilience

Inequality and intersectionality

While there's no doubt climate change is a universal challenge affecting us all, it certainly does not affect us all equally. We know marginalised and poor communities are more vulnerable to environmental hazards, and in an increasingly unequal world, climate change is widening the gap; exacerbating existing inequalities and creating new ones.

As we enter a new era of climate change adaptation that focuses on nature-based and sustainable solutions for long-term resilience, it's an important opportunity to incorporate climate justice as part of a new approach.

Current and future climate risks are not evenly spread across a geographical area. While the hazard may be the consistent across the area, it's the socio-economic context affecting exposure and vulnerability that will determine the real impact of that hazard on individuals and communities.

This can be understood through an intersectional approach to climate change adaptation.

The term 'intersectionality' has its roots in black feminist activism, articulating the cumulative impact of multiple forms of discrimination and disadvantage. It is now used more broadly, and in the context of climate risk, intersectionality can be used to refer to the multiple, complex and interconnected factors that contribute to a community's vulnerability to environmental hazards.

Vulnerability factors

Climate change is affecting different parts of the world in different ways, but many vulnerability factors are common.

In Edinburgh UK, AtkinsRéalis worked with the British Red Cross to identify vulnerability factors to be considered in climate adaptation planning[1] . In relation to flooding, we found that people with existing health conditions and mobility issues, as well as older people, may find it more difficult to evacuate, and are less likely to be able to take precautions before a flood event. Migrant communities where English is not the first language were also more vulnerable, as they may have issues accessing flood warnings, or not know how to take action. Housing in areas with low green infrastructure and basement flats is more vulnerable to surface water flooding, and those in social or rented housing are more vulnerable because they have less agency to adapt their home.

As part of a vulnerability mapping project with Oxfordshire County Council in the UK, we also found that the same communities, with high indices of multiple deprivation, were the most vulnerable to both extreme heat and flooding.[2]

Some 8000km across the world, in Bangladesh, in addition to devastating flooding, average temperatures have risen sharply since 2000, and are projected to continue rising. In June 2023, Bangladesh experienced its longest heatwave, with temperatures exceeding 40°C in many cities.

Without adaptation, extreme heat will increase mortality, limit productivity and economic growth. In denser urban areas, smaller, high-rise offices are at greater risk of overheating, affecting health and productivity in cities across Bangladesh and other developing countries. Those working outside as construction workers, street-food sellers, or rikshaw operators, for example, are at higher risk of heat-related health issues and loss of productivity; as are pregnant and menopausal women. Analysis by AtkinsRéalis suggests a 5.6 – 7.5% increase in mortality, and a 1.6%-2.3% reduction in urban GDP for 'medium' and 'high' climate scenarios in Bangladesh by the 2050s.

1. Red Cross Article
2. Director of Public Health Annual Report

A people-centred approach

While disparate regions face contrasting climate challenges, wherever we are in the world, and whatever environmental hazards present themselves, the intersectionality of vulnerability is a common thread. By looking beyond infrastructure and landscape, and focusing on people, we have found a common approach to this universal challenge. Identifying the most vulnerable and examining the factors that make them vulnerable, enables us to design targeted nature-based and engineered solutions, and build business cases to attract investment and deliver resilience and enhance biodiversity.

Resilient, nature positive design must be multifaceted in order to address multiple risks, recognise opportunities, and generate multi-benefits. We should utilise everything in our toolbox to tackle the climate crisis and biodiversity loss while addressing inequality; integrating mapping data from climate models and satellite data with global opensource data and local socio-economic data. We also need to consider what complementary interventions could help the most vulnerable, such as adaptations to the built environment, awareness raising, practical healthcare interventions, and advocating for enhanced labour laws, so people aren't forced to work in extreme heat, for example.

In order to build climate resilience in line with climate justice, the two must be considered in parallel through a people-centred and intersectional approach that identifies, targets and protects the most vulnerable in society.

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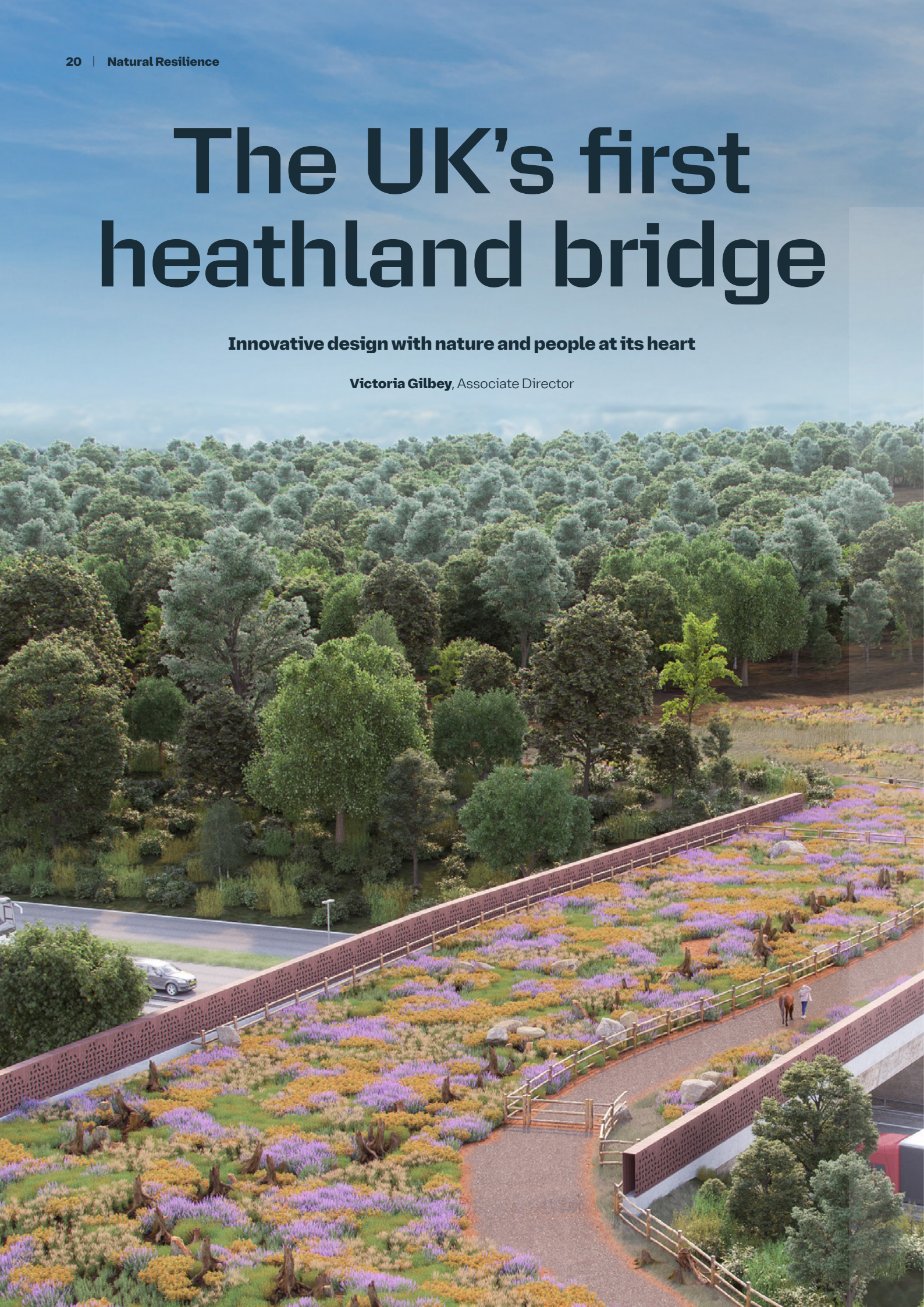
The UK's first heathland bridge

Innovative design with nature and people at its heart

Victoria Gilbey, Associate Director



At junction 10 of the M25 in southeast England

Cockcrow Bridge will provide a dedicated route for pedestrians, cyclists and equestrians, as well as occasional vehicle access. It will also be the UK's first green bridge to support heathland habitats.

Ockham and Wisley Commons, on either side of the bridge, are both key areas for nature, supporting some of the UK's rarest habitat – lowland heath. Surrey is a stronghold for lowland heath in the UK, but over 85% has been lost in the last 200 years (Surrey Wildlife Trust, 2024). Much now exists in small isolated patches, and a great deal of work is underway to reconnect these areas.

Cockcrow Bridge will do just that, reconnecting areas of lowland heath to make the local landscape, and specialist wildlife like the sand lizard (which can only be found in Ockham Common currently) more resilient to climate change.

The heathland connection at Cockcrow will facilitate the creation of a 3km long corridor of existing and restored lowland heath. This will achieve connectivity at a landscape-scale for specialist wildlife, and benefit a range of wildlife species by reducing mortality from road traffic collisions, enabling species expansion and increasing breeding opportunities, as well as vital genetic mixing of isolated populations.

An innovative and sustainable approach has been taken to create soft landscaping on the bridge, and to achieve continuity of the surrounding landscape for pedestrians, cyclists and equestrians. Cut 'turfs' will be lifted from the adjacent commons – a historic practice in the area, once used to provide fuel and building materials. This creates bare ground, which is a vital habitat for specialist heathland invertebrates and plants, and helps create age variation in vegetation by encouraging new growth. This approach enables the green bridge to be populated without any reliance on nursery-grown plants or seeds that can pose biosecurity risks, and lead to a decrease in local genetic diversity. It allows the natural mosaic of plants, root systems and seed banks to be moved with the turf, along with a proportion of the associated soil fungi and fauna, supporting the natural establishment of heathland vegetation on the bridge.

Lowland heath needs active management, and the design will allow cattle from Wisley Common to graze the bridge and the slopes of its embankment on the western side. This management approach will help create habitat complexity and ecological niches, especially for the small animals and invertebrates the bridge is designed to support.

The innovative design of Cockcrow Bridge demonstrates the potential of green bridges to deliver benefits to protected landscapes, rare habitats and specialist wildlife species. It is hoped the knowledge gained from our experience at Cockcrow will help those starting out on their green bridge journeys and inspire others to contribute to a nature-positive future by making our precious habitat areas better-connected.

Why not?

Breaking down the barriers to nature-based solutions

Shayne Paynter, AtkinsRéalis Fellow and Senior Technical Director, Water Resources

Described by President Joe Biden as, **"one of the most destructive hurricanes of the century"**, Hurricane Milton left more than two million homes and businesses in Florida without power.

Heavy rainfall and 8m waves contributed to severe flooding and 14 lives were lost. Following on the tail of Hurricane Helene – and 224 deaths – just a few weeks earlier, the intensity and frequency of extreme weather events is a wake-up call for authorities, and is triggering fresh interest in alternative approaches to stormwater management, including nature-based solutions.

But despite universal agreement on their compelling benefits, many nature-based solutions across the US still fail to get off the ground.

Barriers to nature-based solutions

Following the construction of a 16km-long causeway in the 1930s, tidal circulation in Old Tampa Bay was essentially blocked, reducing water quality, wiping out seagrass populations and devastating wildlife.

AtkinsRéalis has been working with the Florida Department of Transportation (FDOT) on a pioneering project to manage stormwater across the large Tampa Bay watershed using nature-based solutions. In order to offset stormwater pollution from nearby road construction, a section of the problematic causeway bridge was opened up, reintroducing natural circulation; and habitats for a wide variety of flora and fauna were restored, creating multiple benefits for the wider bay area.

In the end, this did substantially more than simply offset any negative impact.

It improved water quality, generated an ecological uplift through the creation of mangrove and wetland habitats, and provided the local community with opportunities for recreation.

It created the potential for 121 hectares of new seagrass and enabled the establishment of a seagrass credit bank for future projects.

In light of this project's success, the client questioned why this type of approach wasn't being adopted more widely. In response, FDOT and AtkinsRéalis identified six key barriers to the implementation of nature-based solutions:

1. With few examples of success and a culture of risk-aversion, there is insufficient confidence in their effectiveness.
2. A lack of established quantification methods for environmental benefits in the US means it can be difficult to demonstrate value.
3. They rely on partnerships, and require the cooperation of multiple stakeholders.
4. Lack of expertise in non-traditional funding is problematic, as is cost-sharing between stakeholders.
5. Liaison with government departments can be challenging.
6. Long permitting times can impact established timelines.

A roadmap for the acceleration of nature-based solutions

Based on the success at Old Tampa Bay and other nature-based solutions, FDOT and AtkinsRéalis developed the Watershed Approach to Evaluate Regional Stormwater Solutions (WATERSS). The resulting guidelines respond directly to the barriers identified, and provide an adaptable framework to support planning, project development, design, construction and operations.

WATERSS focuses on three key themes:

Roles and responsibilities

In addition to well-defined teams, WATERSS stresses the importance of roles and responsibilities to ensure a smooth process. It suggests appointing a District Champion as a point of liaison for coordination and advocacy, and to foster productive relationships between project partners by maintaining two-way communication throughout the project.

Collaboration, communication and engagement

In recognition of the number of stakeholders involved in nature-based solutions, and the complexity of relationships, WATERSS sets out clear methods of engagement. It recommends that expectations and deliverables are written into the project schedule, and sets out when consultations or meetings with relevant stakeholders should take place.

Importance of data

The Environmental Screening Tool utilises a GIS database gathering information relating to numerous considerations, including topographical data, soils information, Essential Fish Habitat (EFH) and Total Maximum Daily Loads (TMDLs). This is combined with data from pertinent historical records, permits and studies, to generate an analysis of the project requirements.

Through a set of detailed measures based on these key themes, WATERSS ensures the right people are involved at the right time, that relationships and partnerships are nurtured and maintained, and that high-quality data is used to evaluate risk, provide accountability and drive decision making. Ultimately, it tackles the six key barriers to implementation identified during our project in Tampa Bay.

Having clear state-wide guidelines abates nervousness and risk-aversion by providing a step-by-step process, that if followed, will achieve the most effective – and cost-effective – stormwater management solutions for a given area. WATERSS gives definition to what is possible by providing tools, tables and checklists to identify constraints and variables. By showing how to tie the complexities together and focus the broad lens of nature-based solutions, WATERSS is building the confidence that's needed to accelerate the implementation of nature-based solutions in Florida and beyond.

ENGINEERING WITH NATURE

We are part of nature, not separate from it

Global Drivers For Working With Nature

At AtkinsRéalis we support our clients by creating a symbiotic relationship across two mutually-beneficial concepts, to benefit people and the natural world. These concepts are driving change for investors, our clients and their projects:

Nature-Based Solutions

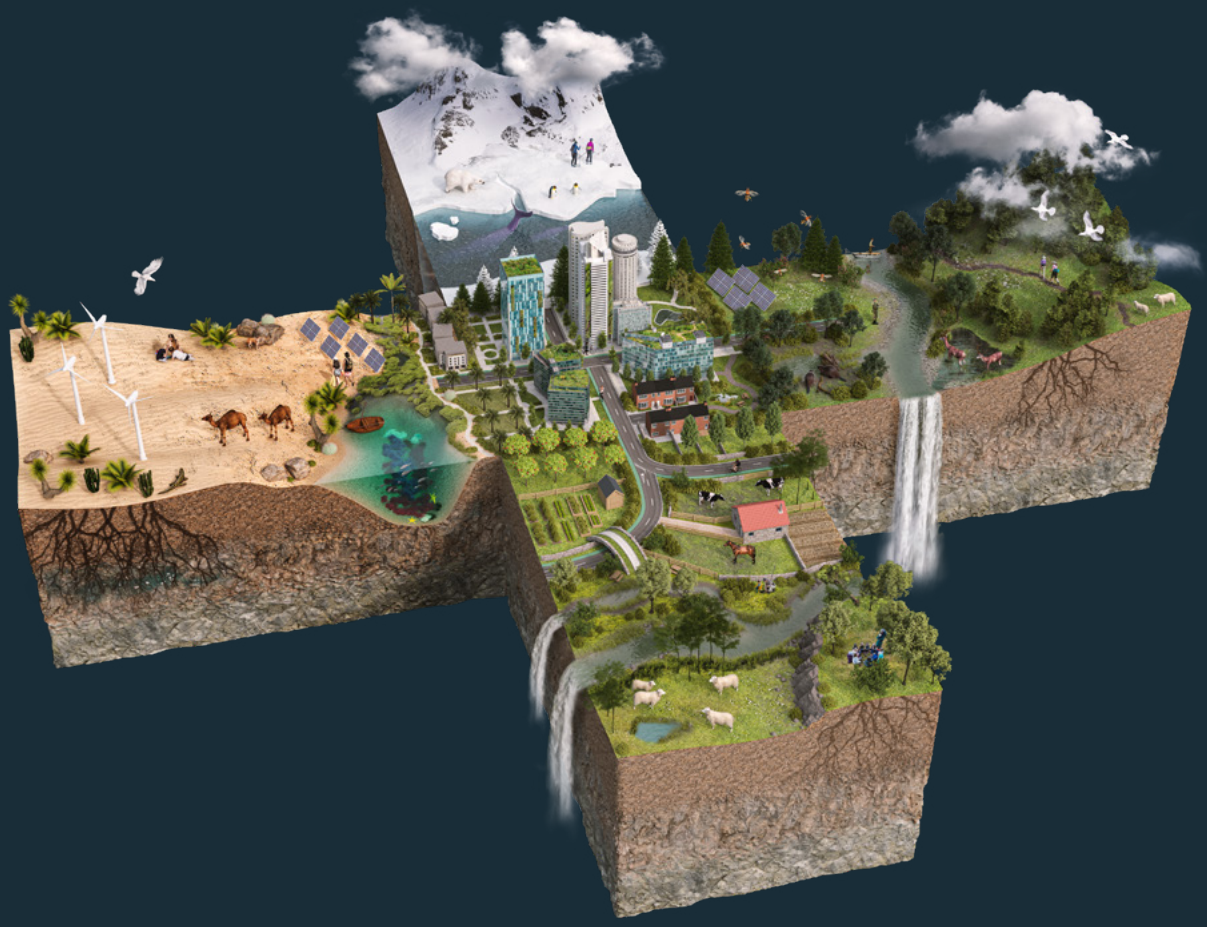
Solving challenges for projects and society through working with nature.

Nature-Positive Solutions

Organisations and projects supporting the global transition from nature loss to nature recovery.

Capabilities

How AtkinsRéalis Supports our Clients



We can support you in delivering thriving places for people and nature through an array of nature-based solutions and nature-positive approaches:

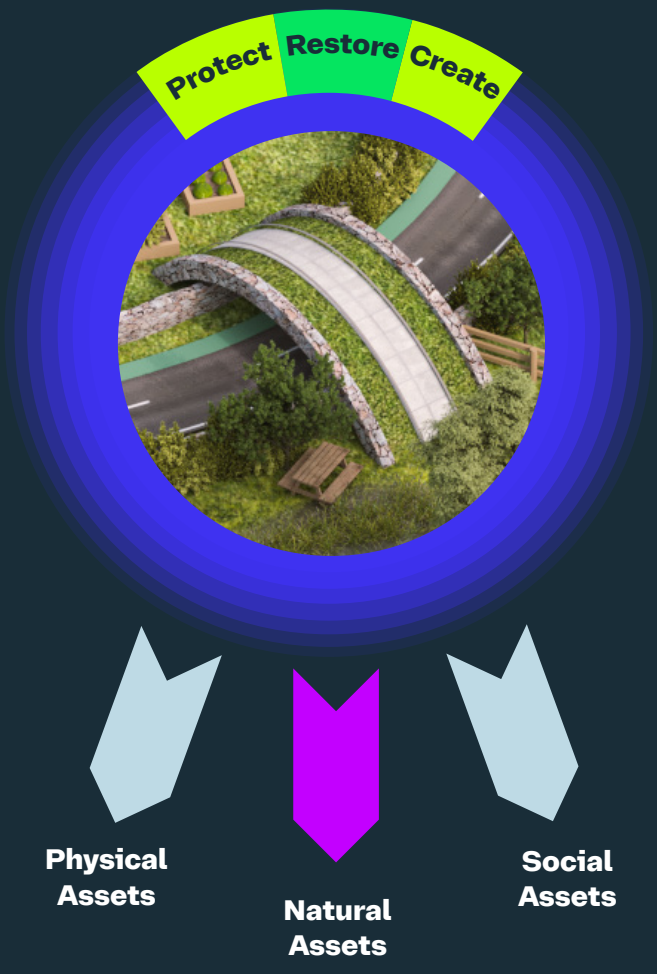
- Terrestrial, Aquatic and Marine Ecology
- Nature-Based Carbon Removal, Low-Carbon Optioneering and Climate Change Adaptation
- Blue-Green Infrastructure Strategy and Design
- Hazard and Risk Assessments
- Natural Flood Management
- Project Design, Planning, Environmental Assessment and Consenting
- Water Resources and Quality Modelling
- Corporate Climate Net Zero and Nature-Positive Strategy Support
- Innovative Ecological Project Mitigation including Mitigation Hierarchy and Offsetting
- Biodiversity Net Gain and Environmental Net Gain
- Natural Capital Valuation and Business Cases
- Sustainable Finance
- Nature-Related Financial Disclosure
- Social Value Identification and Tracking

Our Working With Nature Digital Toolkit:

- Natural Capital Studio
- Sustainable Drainage Systems Studio
- Natural Flood Management Studio
- Biodiversity Net Gain Studio
- Green Finance Studio
- City Simulator

Nature - Based Solutions

Nature - Positive Interventions



Primary Benefit through enhancing resilience of these assets

Added Value through also benefitting these assets

AtkinsRéalis

We believe good design positively transforms people's lives

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