



PRESERVING THE FABRIC OF LIFE

Why biodiversity loss is as urgent as
climate change

#GetTheFutureYouWant

Executive Summary

Biodiversity provides stability and resilience in the face of environmental change. Loss of biodiversity (or damage to the biosphere) threatens our very existence because it means we lose the protection a healthy ecosystem provides against climate change, disease outbreaks, and the ability to feed ourselves. With biodiversity loss, the services we take for granted from the ecosystem (e.g., the provision of food, clean water, air purification, and pollination of crops) fail. We also lose natural components with potential as new medicines and biotechnologies. Biodiversity loss is happening now.

Over half of global GDP is potentially threatened by biodiversity loss as a result of the dependence of business on nature and its services.¹ Lack of strategic action on biodiversity loss could come at a high cost for the corporate sector. At the same time, rapidly evolving regulations and standards designed to protect biodiversity are placing increasing pressure on the corporate sector.

Many executives feel they have a strong understanding of biodiversity and its impact, yet it remains low on the corporate agenda. Only 24% of those surveyed say their company has a biodiversity strategy. Many have barely

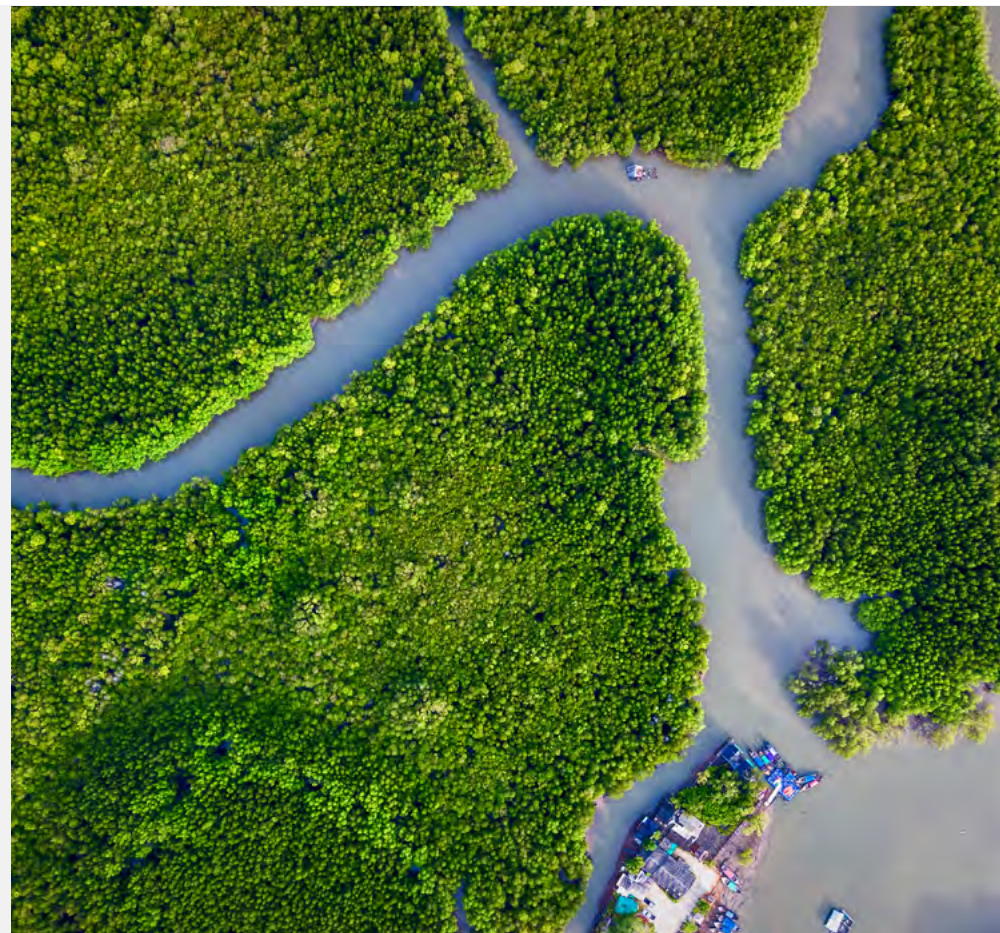
begun to assess the impact of their operations and supply chains on biodiversity. Only 16% of organizations have completed an assessment of the impact of their supply chain on biodiversity and only 20% of organizations have done the same for their operations. Most organizations put more emphasis on tackling climate change and consider biodiversity loss a medium- or long-term risk. Our research finds that corporate investment is lacking, with current global corporate investment for biodiversity preservation/restoration estimated to represent less than 5% of what is needed annually to reverse the decline.

Technology, especially artificial intelligence (AI), can play a critical role in tackling biodiversity challenges quickly. It also provides opportunities to innovate towards more sustainable products, services, and business models. Other technologies including robotics, synthetic biology, environmental DNA analysis, 3D printing, and the Internet of Things are supporting organizations in addressing biodiversity threats. Generative AI looks particularly promising in this regard. Researchers in Spain and the UK are using generative AI to analyze species coexistence patterns and thereby improve

Executive Summary

our understanding of diverse ecological habitats.² Of executives surveyed in our research, 73% agree that digital technologies will be key to their organization's biodiversity efforts. For example, Ørsted, the Danish multinational energy company, and its NGO partner the World Wide Fund for Nature Denmark have created and installed 12 3D-printed reefs. The reefs are sited between turbines at the Anholt Offshore Wind Farm in the Kattegat, a sea area that has suffered from low cod stocks. They aim to provide increased habitat for cod and improve biodiversity of the surrounding area.³

Addressing biodiversity loss is critical for our survival. If left unaddressed, the result will be catastrophic for the planet and all human life. Organizations must address biodiversity loss with the same urgency as climate change because they are interlinked. Organizations must also foster collaboration to support new solutions for biodiversity at scale, advocate for standard biodiversity measurements and disclosures, and invest in technological and data solutions to accelerate biodiversity preservation/restoration.



WHO SHOULD READ THIS REPORT AND WHY?

This report offers comprehensive insights on the importance of biodiversity, how its loss is linked with climate change and the urgency of tackling the biodiversity crisis for the corporate sector. Large organizations across industries such as agriculture and forestry, food and

beverage, construction and real estate, life sciences, consumer products and retail, mining/extraction, industrial manufacturing, among other organizations with dependencies on nature in their supply chains will find this report valuable. This report offers actionable recommendations for executives to assist them in accelerating their biodiversity journeys. It provides practical steps that senior leaders can take to begin developing a biodiversity strategy and/or to advance their current biodiversity actions. The report primarily caters to sustainability leaders across environmental management, conservation, climate change, corporate social responsibility, among other sustainability functions. Given the importance of biodiversity for many different areas of business, this report is also useful to business leaders from general management,

strategy, innovation and R&D, product design and development, sourcing and procurement, supply chain, manufacturing, finance, operations, IT, and sales and marketing.

This report is based on original findings from a comprehensive industry survey of 1,812 senior executives (director level and above) from leading organizations across 12 countries with annual revenue above \$1 billion. Approximately 50% of surveyed executives are employed within sustainability functions, while the remaining 50% come from other relevant business functions. See the research methodology at the end of the report for more details.

WHAT IS BIODIVERSITY?

Biodiversity (from “biological diversity”) is the variety of life including animals, plants, fungi, and microorganisms like bacteria that make up our natural world. They live together in ecosystems to maintain and support life on earth, and they exist in delicate balance. Biodiversity encompasses the genetic variety within each species and the variety of ecosystems that species create.⁴ Biodiversity occurs at the species, genetic, and ecosystem levels.

This diversity or variety between living things occurs at different levels and each level interacts with other levels.



Source: Capgemini

SPECIES

A species is a group of organisms that can reproduce. Species diversity is the most obvious type of biodiversity.

Biodiversity includes genetic differences within each species, for example, between varieties of crops and breeds of livestock.

GENETIC

ECOSYSTEM

Variety of ecosystems, such as those that occur in deserts, forests, wetlands, mountains, lakes, rivers, and agricultural landscapes.



WHAT CAUSES BIODIVERSITY LOSS?

There are five major factors:

- **Land- and sea-use change:** Habitat conversion (e.g., deforestation) and habitat fragmentation and degradation (e.g., construction of dams, motorways, mining) through over-intensive use of ecosystems.
- **Over-exploitation:** Overharvesting of animals, plants, and ecosystems in general (e.g., poaching, unsustainable logging, overfishing), which depletes the stocks of some species while driving others to extinction.
- **Climate change:** Shifts in temperature, precipitation, and wind flows caused by increased levels of greenhouse gases in the atmosphere.
- **Pollution:** Release of harmful substances (e.g., microplastics, heavy metals, fertilizing nutrients, chemical components of pharmaceuticals) into the environment induced by transport, industrial, and human activities.
- **Invasive species:** Plants, animals, or other non-native organisms entering or expanding their presence in a habitat. Invasive alien species transform the structure and composition of ecosystems by dominating the ecosystems and repressing/excluding native species.

WHAT LINKS BIODIVERSITY AND SUSTAINABLE DEVELOPMENT?

Biodiversity loss directly impacts human health and affects livelihoods, income, local migration, and political conflicts. The United Nations' Sustainable Development Goals (SDGs) reflect

these risks. SDG 15 focuses on protecting, restoring, and promoting sustainable use of earth's ecosystems and combatting land degradation and biodiversity loss. SDG 14 covers conserving and sustainably using our oceans, seas, and marine resources. Biodiversity has an impact on other SDGs too. For example, a third of global food production depends on a diversity of natural pollinators, which links to SDG 2, and microorganisms are important to waste management (SDG 12). There are also numerous indirect ways in which protecting biodiversity and the UN SDGs overlap; for example, by supporting food production and discovery of raw materials for new medicines, biodiversity can play a vital role in reducing poverty (SDG 1), preventing hunger (SDG 2), and improving health (SDG 3).⁵



Introduction

In 2009, a group of internationally renowned scientists identified nine processes that regulate the stability and resilience of the Earth, called “planetary boundaries.” By 2022, we had gone beyond the boundary of safety for six of the nine, increasing the risk of abrupt or irreversible environmental changes. The processes for which boundaries have been crossed are:

- climate change
- biogeochemical flows (e.g., excessive phosphorus and nitrogen pollution from fertilizer use)
- biosphere integrity (e.g., extinction rate and loss of insect pollination)
- land-system change (e.g., deforestation)
- novel entities (e.g., pollution from plastics, heavy metals, and “forever chemicals”)
- freshwater use.⁶

These nine processes are interdependent, but our focus in this report is biosphere integrity. The biosphere is closely related to biodiversity, which is generally understood as the variety and variation of life on Earth.

The biosphere acts as a core boundary, providing capacity for the planet to adjust to changes in other boundaries, such as elevated levels of ocean acidification and pollution with plastic and other man-made chemicals. If the biosphere boundary is compromised (i.e., if biodiversity decreases significantly), performance against the other boundaries gets worse too, and vice versa.⁷ Protecting biodiversity, therefore, can help play a role in slowing or preventing the crossing of the other boundaries and thus help us protect the planet.

Introduction



The biodiversity crisis is accelerating as mankind increases its footprint on nature at an unprecedented rate. As humans place increasing pressure on the planet, the balance of the ecosystems is being damaged. Human activity has put nearly one million species at risk of extinction.⁸ According to the World Wildlife Fund's 2022 Living Planet report, the planet has witnessed a 69% decline on average in global populations of mammals, fish, birds, reptiles, and amphibians since 1970.⁹ The consequences are deadly serious: more than 75% of food crops rely on animal pollination, but over 40% of known

69%

decline on average in global populations of mammals, fish, birds, reptiles, and amphibians since 1970.

Introduction

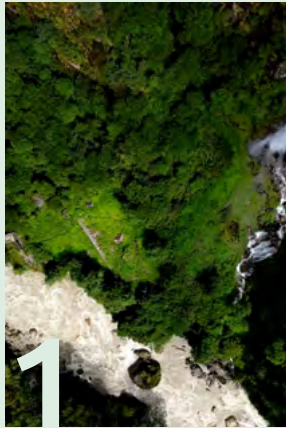
insect species have declined in past decades.¹⁰ COP 15 of the UN Convention on Biological Diversity in 2022 established global biodiversity targets for 2030, underlining the need for urgent action.

Given the urgency of the biodiversity crisis and its interconnection with climate change, this research explores the opportunities that large organizations have to combat biodiversity loss. To what extent are organizations including biodiversity in their sustainability priorities and strategies, and assessing the impact of their operations and supply chains on biodiversity? What actions are large organizations taking and what technologies are they investing in to understand, monitor, and preserve biodiversity?

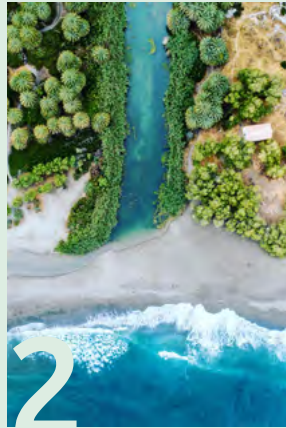
We conducted a global survey of executives covering large organizations across 12 countries: Australia, Canada, France, Germany, India, Italy, Japan, the Netherlands, Spain, Sweden, the United Kingdom, and the United States. Organizations surveyed operate across key industries, including aerospace and defense, agriculture and forestry, automotive, consumer products, construction and real estate, energy, financial services, food and beverage, mining and extraction, industrial manufacturing, life sciences, public sector and government, retail, telecom, and utilities. We also interviewed sustainability and biodiversity executives. For more details on the survey sample, please refer to the research methodology.

Introduction

This report comprises five sections:



Executives recognize the importance of biodiversity, yet few organizations have a strategy.



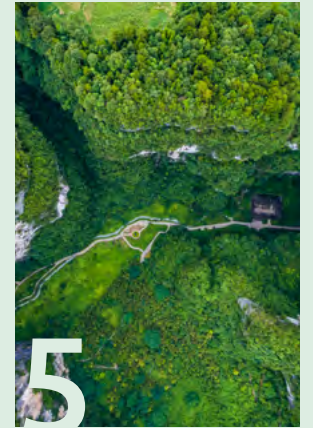
The corporate sector is underinvesting in biodiversity.



Biodiversity actions are nascent and focusing on land preservation.



AI and other technologies will help organizations tackle biodiversity loss more quickly.



Recommendations: How can organizations accelerate their biodiversity journeys?

An aerial photograph of a lush green forest. A river flows through the center, with a dam structure visible on the left side. The water is white and turbulent, suggesting rapids or a waterfall. The surrounding forest is dense and vibrant green.

01

**EXECUTIVES RECOGNIZE THE
IMPORTANCE OF BIODIVERSITY,
YET FEW ORGANIZATIONS HAVE A
STRATEGY**

Executives view biodiversity as critical to the health of the planet, yet it remains low on their agendas

Over half of global GDP is potentially threatened by biodiversity loss as a result of the dependence of business on nature and its services.¹¹ Organizations increasingly realize that loss of biodiversity and the related damage to ecosystems presents systemic risks to human well-being, sustainability goals, and economic growth and stability. However, biodiversity is often seen as secondary to other sustainability goals globally, such as mitigating climate change.

We found that awareness of biodiversity and how the term is defined (e.g., “variety of all living organisms, diversity of species, genetic variation within a species, variety of ecosystems and ecological processes”) is high (82%). However, executives do not consider biodiversity to be as important as other sustainability and climate issues. This is likely because it is rarely seen as a cause of operational inefficiencies or as directly impacting profitability, or even as a requirement of their ESG reporting. Biodiversity is also hard to evaluate as there is a lack of data and standards. However, ecosystem collapse would have disastrous impacts on profitability across all industries.

63%

of surveyed executives say biodiversity is important to their company.

“Biodiversity is one relevant part of our broader sustainability strategy, but I believe in the next two years it will become much more of a priority.”

ANGEL FRAILE

Senior Director at Endesa, a Spanish multinational electric utility company

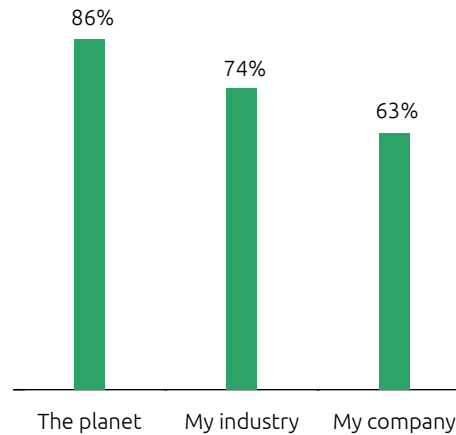
Of those surveyed, 86% say biodiversity is important to the planet, yet only 63% say it is important to their company. Only 24% of organizations have a biodiversity strategy (see Figure 1).



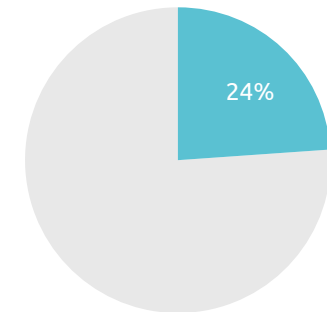
FIGURE. 1

Only a quarter of executives say their organization has a biodiversity strategy

% OF EXECUTIVES WHO SAY BIODIVERSITY IS IMPORTANT TO THE ENTITIES BELOW



% OF ORGANIZATIONS WITH A BIODIVERSITY STRATEGY



Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023, N=1,812 executives.

66%

of organizations run ad-hoc biodiversity-related initiatives and/or projects as part of a broader sustainability strategy.

This “say-do” gap spans industries and countries. With the exception of financial services (46%), more than half of executives across industries believe biodiversity is important to their company, but only a third or less of their organizations have a biodiversity strategy (see Figure 2).

Many industries have significant dependencies on nature in their supply chains and may be more at risk of disruption from biodiversity loss. According to the European Commission, industries such as agriculture and forestry, food and beverage, and construction and real estate are highly dependent on nature and contribute more than €7

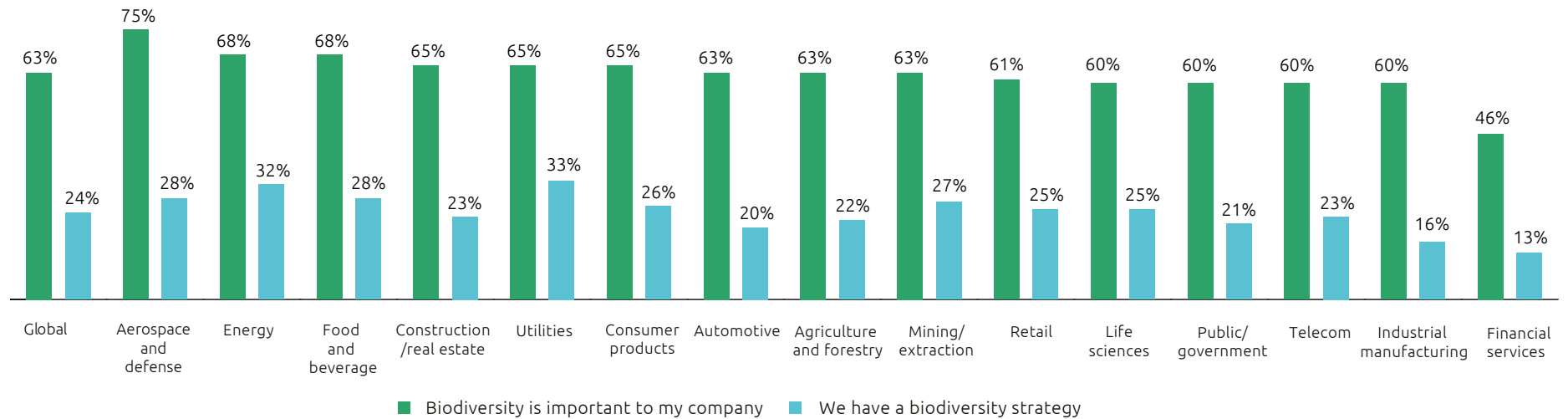
trillion to global GDP.¹² However, they still lag in defining biodiversity strategy. For example, 65% of executives from construction and real estate say biodiversity is important to their company but only 23% of their organizations have a biodiversity strategy.

With the exception of India and Italy, more than half of executives across countries believe biodiversity is important to their company, but significantly fewer have a biodiversity strategy. France leads with 75% acknowledging the importance of biodiversity and 47% having a biodiversity strategy (see Figure 2).



FIGURE. 2

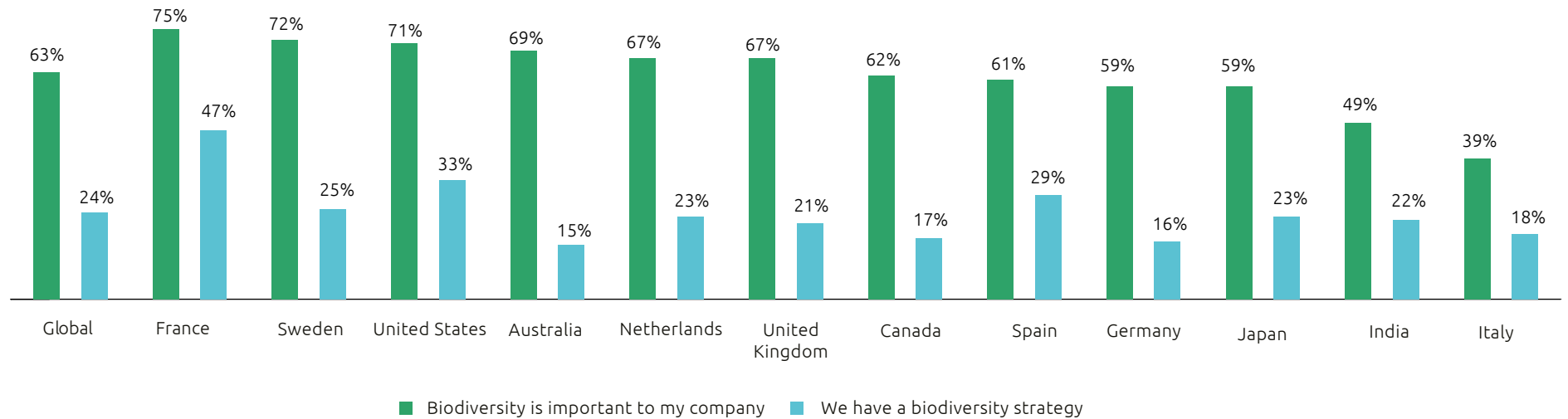
Despite saying biodiversity is important, most organizations have no biodiversity strategy

% OF EXECUTIVES WHO AGREE WITH THE STATEMENTS, BY INDUSTRY

Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023, N=1,812 executives.

FIGURE. 2

Despite saying biodiversity is important, most organizations have no biodiversity strategy

% OF EXECUTIVES WHO AGREE WITH THE STATEMENTS, BY COUNTRY

Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023, N=1,812 executives.



“Biodiversity and climate change can’t be looked at completely separately, but biodiversity measurement and assessment remains highly complex.”

CLARA KÜPPER

Project Manager Sustainable Sourcing at REWE Group, a German diversified retail and tourism co-operative group

While fewer than a third of organizations globally have a biodiversity strategy, most (66%) do run ad-hoc biodiversity-related initiatives and/or projects as part of a broader sustainability strategy. Angel Fraile, Senior Director at Endesa, a Spanish multinational electric utility company, says: *“Biodiversity is one relevant part of our broader sustainability strategy, but I believe in the next two years it will become much more of a priority.”*

Though climate change and biodiversity loss are interlinked, the immediate focus is on climate

Climate change and biodiversity loss are closely interconnected. Biodiversity is strongly linked to decarbonization goals, as tropical deforestation alone contributes an estimated 20% of annual global greenhouse gas (GHG) emissions.¹³ Continued climate change is having adverse and often irreversible impacts on ecosystems, with significant negative social, cultural, and economic consequences.

Increased GHG emissions lead to higher temperatures, altered rainfall patterns, more frequent extreme weather events, and oxygen depletion and acidification of aquatic environments, most of which adversely affect biodiversity.

Most executives surveyed (86%) say they understand the link between climate change and biodiversity, and 88% believe that preserving biodiversity helps mitigate climate change. However, concern about climate change dominates. Of those surveyed, 57% believe that customers and 56% that employees care more about climate change than biodiversity. Of the executives surveyed, 53% believe biodiversity is a lesser priority than climate change (see Figure 3).

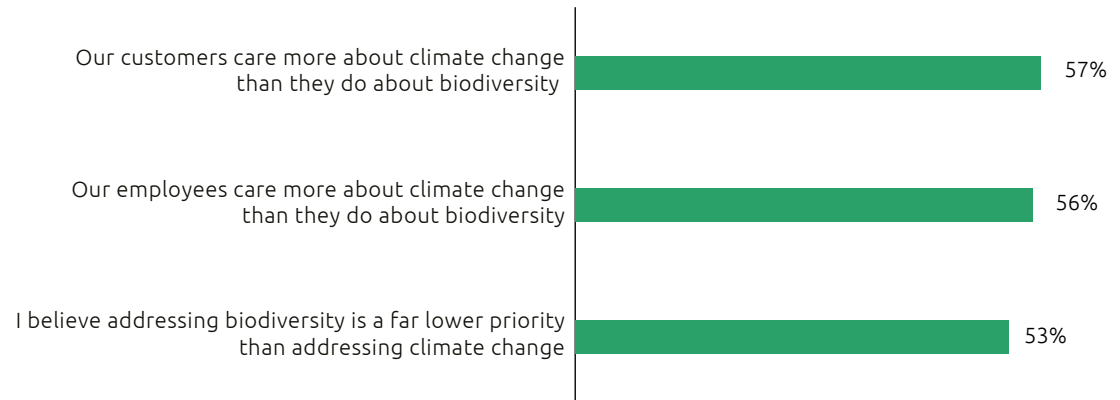
86%

of executives say they understand the link between climate change and biodiversity.

FIGURE 3

Over half of executives believe that customers and employees care more about climate than biodiversity

% OF EXECUTIVES WHO AGREE WITH THE FOLLOWING STATEMENTS



Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023, N=1,643 executives whose organizations have a biodiversity strategy or ad-hoc biodiversity initiatives.

One reason could be that it is more difficult to quantify biodiversity loss than climate change. Clara Küpper, Project Manager Sustainable Sourcing at REWE Group, a German diversified retail and tourism co-operative group, says: ***“Biodiversity and climate change can’t be looked at completely separately, but biodiversity measurement and assessment remains highly complex.”*** An executive from a global financial services company, says: ***“Carbon is easy***

to define, measure, and document. It is a clear liability on the balance sheet. In contrast, biodiversity is hard to measure and define.” Martin Brueckner, Pro Vice Chancellor, Sustainability at Murdoch University, a public university in Western Australia, says: ***“Most corporations have not directly addressed biodiversity. Instead, they focus on carbon emissions.”***



“Carbon is easy to define, measure, and document. It is a clear liability on the balance sheet. In contrast, biodiversity is hard to measure and define.”

An executive from a global financial services company

Executives consider biodiversity loss a medium- or long-term risk

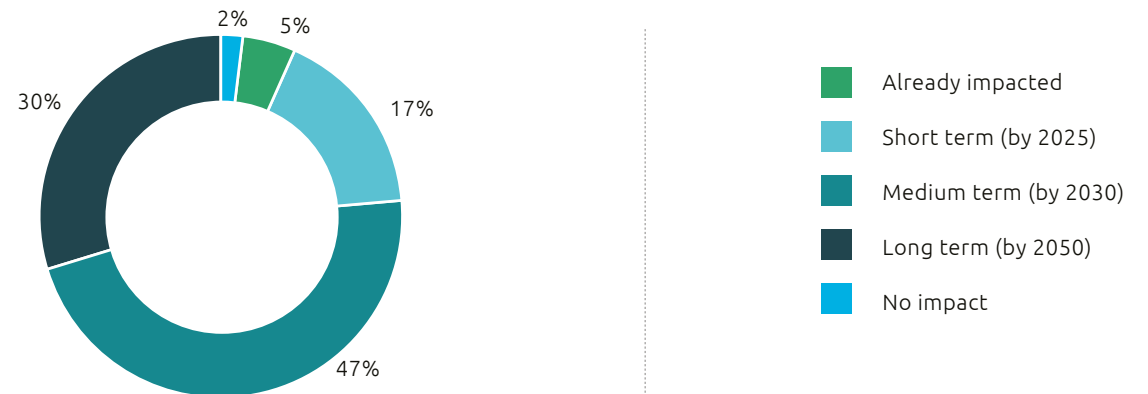
Nearly half of executives (47%) consider biodiversity loss a medium-term risk, which would affect their business by 2030, and 30% view it as a long-term risk with impact by 2050. Only 17% view it as a short-term risk (see Figure 4). Similarly, in the World Economic Forum's Global Risks Report 2023, biodiversity loss and ecosystem collapse ranked 18th among global short-term risks and 4th among long-term risks, reflecting a perceived lack of urgency on nature.¹⁴ The industry with the greatest share of executives who view biodiversity loss as a short-term risk is utilities (28%); for medium-term risk the industry is life sciences (63%).

As many executives consider biodiversity loss a medium-term risk, organizations are setting biodiversity targets to achieve by 2030. General Mills, a US multinational manufacturer and marketer of branded processed consumer foods, has committed to deploying regenerative agriculture methods across a million acres of farmland by 2030.¹⁵ Similarly, Walmart committed to protect and restore at least 50 million acres of land and one million square miles of ocean by 2030.¹⁶

FIGURE. 4

Almost half of executives see biodiversity loss as a medium-term risk

% OF ORGANIZATIONS CONSIDERING BIODIVERSITY LOSS A THREAT TO THEIR ORGANIZATION, BY TIMEFRAME



Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023, N=1,812 executives.

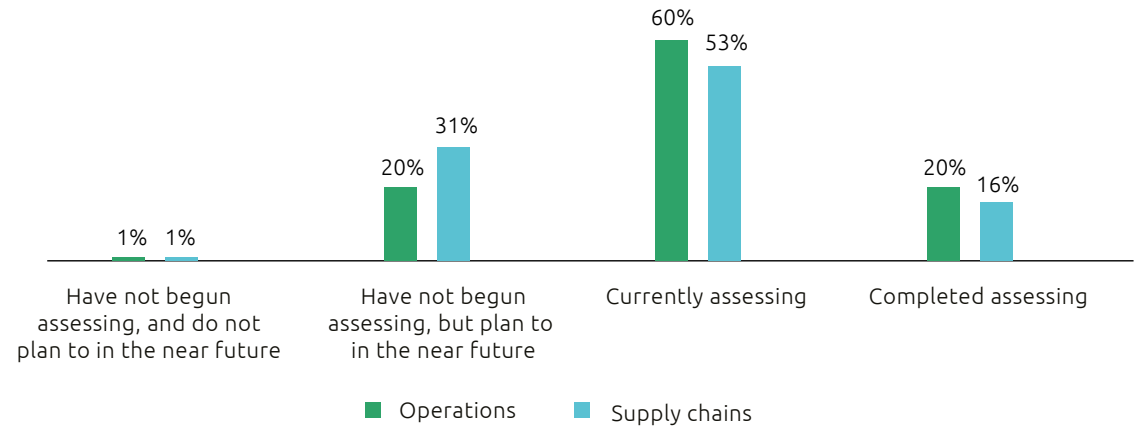
Few organizations have assessed the impact of their supply chains and operations on biodiversity

Leading organizations are championing nature-positive strategies. However, 59% of executives agree that the complexities of biodiversity make it difficult to measure and monitor, and therefore to impact assess. In our survey, only 16% of executives say their organization has completed an assessment of their supply chain impact on biodiversity and 53% are currently assessing. Similarly, only 20% of executives say their organization has assessed the impact of their operations on biodiversity while 60% are currently assessing (see Figure 5).

FIGURE. 5

Most organizations are assessing the impacts of their operations or supply chains on biodiversity

% OF EXECUTIVES WHO SAY THEIR ORGANIZATION IS ASSESSING THE IMPACT OF OPERATIONS AND SUPPLY CHAIN ON BIODIVERSITY, BY STAGE



Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023, N=1,643 executives whose organizations have a biodiversity strategy or ad-hoc biodiversity initiatives.

The consumer goods industry has the highest percentage of organizations that have already assessed the impact of their operations (26%) and the public/government sector the lowest (14%). For supply chains, retail has the highest percentage that have completed their assessment (26%) and agriculture and forestry the lowest (10%). Angel Fraile of Endesa says: *“One of the main challenges is to measure the impact of our biodiversity efforts. We will have to develop this more in depth because there is coming regulator and investor pressure to do so and to extend it to the supply chain.”*

While company-reported data on biodiversity outcomes is still rare, some industries, such as agriculture and forestry and food and beverages, are voluntarily creating KPIs to measure their impact. Celine Barral, Chief Sustainability Officer at Bonduelle, a French company producing processed vegetables, says: *“We have started to track some key indicators with our grower partners, for example, the percentage of the cultivated area which have a pollinator protection plan. This is part of the global approach of regenerative agriculture, which encompasses how we manage soil health, water usage, and of course, preservation of biodiversity.”*

Coca-Cola HBC, the bottling partner of the Coca-Cola company, has started mapping all its operations and critical commodities and suppliers. For its sustainability assessment,

the company uses a risk-based approach. Transparency and traceability of material supply chains is established through certification/verification schemes or by ensuring suppliers have robust traceability.¹⁷ Martin Brueckner of Murdoch University says: *“We measure and monitor two vulnerable species on our campus, and we have management and monitoring plans in place, including afforestation to provide food sources and breeding grounds.”* Clara Küpper of REWE Group, says: *“With the farmers in our biodiversity project, we measure specific KPIs such as the square meters of flowering areas that have been implemented, or the number of nesting aids installed.”*

Some organizations are struggling with the lack of common international standards to measure and monitor impact on biodiversity. In fact, 42% of executives in our survey said that the lack of clarity in setting targets for biodiversity is a top challenge. In October 2022, following in the footsteps of the Taskforce for Climate-related Financial Disclosures (TCFD), the Taskforce on Nature-related Financial Disclosures’ global pilot program launched with 23 member companies. Its aim is to set the tone and assist companies in measuring and curbing their impacts on nature throughout the value chain and to drive further uptake of nature-positive business strategies.

42%

of executives say that the lack of clarity in setting targets for biodiversity is a top challenge.

An aerial photograph of a tropical coastline. A river flows from the top center towards the bottom, where it meets a sandy beach and the ocean. The left bank is densely packed with palm trees, while the right bank has a mix of green trees and a small building with a red roof. The ocean waves are visible at the bottom of the frame.

02

THE CORPORATE SECTOR IS UNDERINVESTING IN BIODIVERSITY

The biodiversity financing gap is immense

The world spends approximately 2% (\$1.9 trillion) of global GDP annually on subsidies that cause biodiversity loss – for example, on fossil fuels, agriculture, timber, water, marine capture fisheries, hard rock mining, construction, and transport.¹⁸ However, it is estimated that only \$124 to \$143 billion is spent annually on biodiversity conservation globally.¹⁹ It is also estimated that the world needs to spend \$722 to \$967 billion each year over the next 10 years to reverse the decline in biodiversity by 2030. This analysis reveals a biodiversity financing gap at an average of \$711 billion or between \$598 and \$824 billion per year.²⁰ The Global Biodiversity Framework estimated a similar gap of \$700 billion per year required to protect and restore biodiversity and reduce harmful subsidies.²¹ It is important to note that this financing gap represents the total amount required from all sources, including public and private, domestic and international (e.g., governments, NGOs, financial institutions, investors), not just the corporate sector.



“There is a sizeable underinvestment in biodiversity.”

MARTIN BRUECKNER

Pro Vice Chancellor, Sustainability
at Murdoch University, a public
university in Western Australia

Corporations are investing a small amount in biodiversity

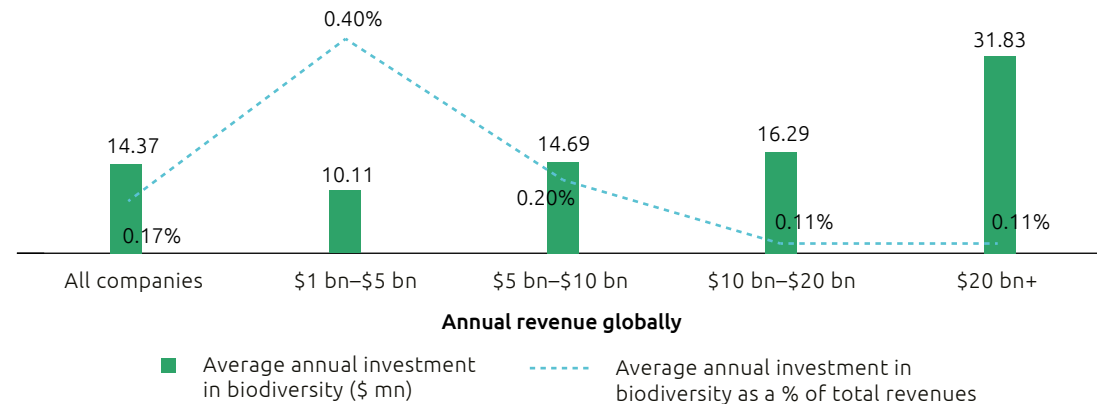
There remains a huge gap between the amount of investment required for preservation, conservation, and restoration of biodiversity and that being made. Our research reveals that, on average, organizations in our survey invest \$14.37 million into biodiversity annually, representing 0.17% of annual revenue. In comparison, according to Gartner, marketing budgets comprised 9.1% of annual revenue on average in 2023.²² While absolute investment amount trends upward by company size, biodiversity investment as a percentage of total revenue trends downward (see Figure 6).

To illustrate the underfunding: all companies in the Forbes Global 2000 have \$1 billion+ in annual revenue.²³ Applying our \$14.37 million average annual investment suggests a total corporate investment of \$28.7 billion annually among the largest organizations globally. This is only 3.5%–4.8% of the amount required, a tiny contribution to the total. As Martin Brueckner of Murdoch University notes: *“There is a sizeable underinvestment in biodiversity.”*

FIGURE. 6

Larger companies are investing a smaller share of revenue in biodiversity

ANNUAL AVERAGE INVESTMENT IN BIODIVERSITY, BY COMPANY SIZE



Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023, N=1,390 executives whose organizations have a biodiversity budget and investments.

One potential reason for the lack of investment is the sentiment that organizations do not believe it is their responsibility to help solve the biodiversity crisis. Our research reveals that over half (52%) of executives agreed it is not the role of a private company to address biodiversity, just to follow biodiversity regulation. Most of the executives surveyed from Italy (78%), Japan (75%), the Netherlands (66%), and Spain (64%) believe the same (see Figure 7).

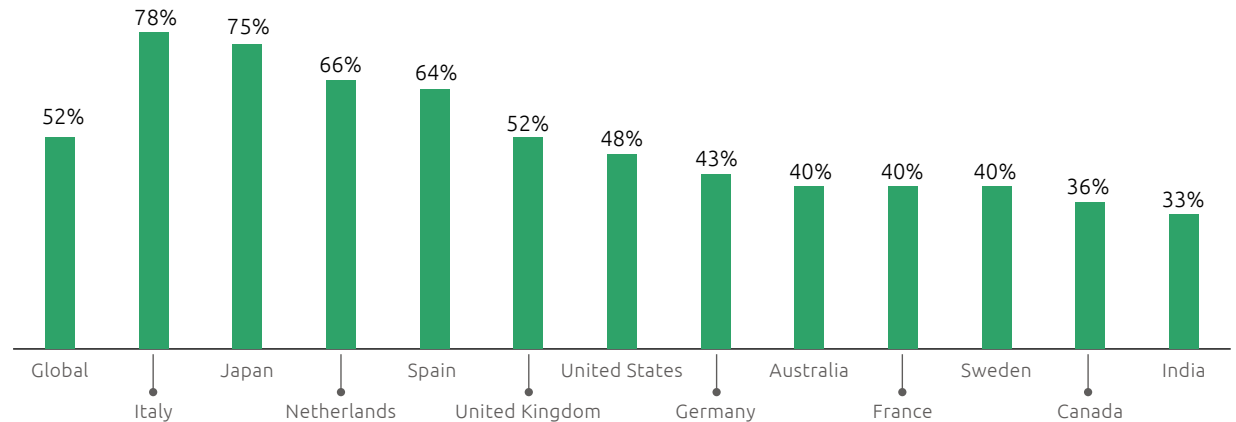
52%

of executives agreed it is not the role of a private company to address biodiversity.

FIGURE. 7

Executives believe it is not the role of a private company to address biodiversity

% OF EXECUTIVES WHO AGREE THAT IT IS NOT THE ROLE OF A PRIVATE COMPANY TO ADDRESS BIODIVERSITY, JUST TO FOLLOW BIODIVERSITY REGULATION



Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023, N=1,643 executives whose organizations have a biodiversity strategy or ad-hoc biodiversity initiatives.



Some organizations are indeed stepping up biodiversity investments and acknowledging the critical link between carbon and water, land, and air. For example:

- The L'Oréal Fund for Nature Regeneration created in 2020 is a €50 million impact investment fund combining financial performance with the creation of environmental and social value. By supporting projects to rehabilitate degraded lands, regenerate mangroves, and restore marine areas and forests, it aims to preserve or restore one million hectares of ecosystem, capture 15 million–20 million tonnes of CO₂, and create thousands of jobs by 2030.²⁴
- Apple has doubled its total commitment to advancing nature-based carbon-removal projects and recently announced a major expansion of its Restore Fund to encourage global investment to protect and restore critical ecosystems and scale natural carbon-removal solutions. The fund was launched in 2021 with a \$200 million commitment from its partners and is now set to grow with a new portfolio of carbon-removal projects.²⁵
- Unilever established its Climate & Nature Fund in 2020 to invest €1 billion over 10 years in nature regeneration. Projects include creating a deforestation-free supply chain, promoting regenerative agriculture, and transitioning to biodegradable ingredients.²⁶
- Amazon's \$100 million Right Now Climate Fund was created in 2019 to restore and conserve forests, wetlands, and grasslands globally by financing community-focused projects to mitigate the impacts of climate change, enhance biodiversity, and add green space to urban areas.²⁷
- Burberry's Regeneration Fund was launched in 2020. Its focus is the certification and training of their raw materials suppliers and the introduction of holistic regenerative land management practices to grazing and farming systems.²⁸

Less than 5%

estimated current corporate investment in biodiversity as a proportion of the total amount required to reverse the decline in biodiversity by 2030.

WHY BIODIVERSITY IS CRITICALLY IMPORTANT TO BUSINESS?

All businesses need biodiversity

All businesses depend on biodiversity and ecosystems. They may rely on nature for direct inputs like water or fibers, or on business-enabling “ecosystem services” like pollination, water regulation, and soil fertility. An estimated \$44 trillion, around half of global GDP in 2019, was dependent on nature to supply everything from food to pharmaceutical products.²⁹ The absolute bottom line is that without a functioning biosphere, there are no goods and no customers.

Biodiversity loss exposes businesses to a wide range of risks while protecting biodiversity presents opportunities

Risks include:

- **Operational** – supply chain disruption can occur as a result of biodiversity loss, resulting in resource scarcity, high or volatile prices for raw materials, and increased production costs.
- **Reputational/marketing** – brand value and market share can be affected if a business is seen to be negatively impacting the natural world.



- **Regulatory** – companies may face prosecution, lawsuits, or bans for not managing biodiversity risks,^{30,31} as well as delays and mitigation or compliance costs.
- **Financial** – as “nature-positive” businesses attract finance, others may find financing options reduced if they impact negatively on nature or have a lack of transparency around reporting.

Opportunities include:

- **Operational** – businesses can improve outcomes and build resilience by adopting circular economy approaches, regenerative agriculture, or use/development of alternative resources and raw materials.

- **Reputational/marketing** – strong consumer demand for sustainable products and services allows businesses to enhance brand value and/or differentiate their products, and demand for employers who prioritize purpose and sustainability allows companies to enhance their ability to attract and retain talent.
- **Regulatory** – efficient and sustainable use of biodiversity and ecosystem services could help businesses to reduce costs associated with environmental externalities.
- **Financial** – as well as facilitating increased financing options, “nature-positive” business practices may also increase the efficiency of assets (e.g., sustainable land management prolongs the active life of soil).

Different sectors have different relationships to biodiversity

- The agriculture and food industry is central to food security, sustainable development, and the supply of many vital ecosystem services, and industrialized agriculture also poses a threat to biodiversity.
- The energy sector has a strong impact on biodiversity through its development and usage of energy.
- The manufacturing industry has a strong dependency on biodiversity for raw materials.
- Consumer goods and retail depend highly on nature for raw materials and also have strong impacts due to the complex nature of their

supply chains which are directly linked to soil degradation, conversion of natural ecosystems, and waterway pollution.

- The pharmaceutical industry has a strong impact on biodiversity due to high water consumption, pollution, and use of inert ingredients linked with environmental degradation such as palm oil while it also has strong dependency on biodiversity for raw materials.
- There is a strong connection between financial services industry and the economy, and biodiversity and ecosystem services due to the lending, investment, and insurance businesses, which could have an indirect impact on biodiversity.



03

BIODIVERSITY ACTIONS ARE NASCENT AND FOCUSING ON LAND PRESERVATION

Organizations more commonly invest in land than freshwater or ocean habitats

Our research reveals that land preservation or restoration projects are most common (62%), with fewer freshwater (46%) and ocean (37%) projects (see Figure 8). Elaine van Ommen Kloeke, Program Manager, ARISE at the Naturalis Biodiversity Center, a national museum of natural history and a research center on biodiversity in the Netherlands, says: *“The ocean is a challenge. For example, supporting sensors in a deep-sea marine environment requires hard-to-access technology. It also is a huge opportunity.”*

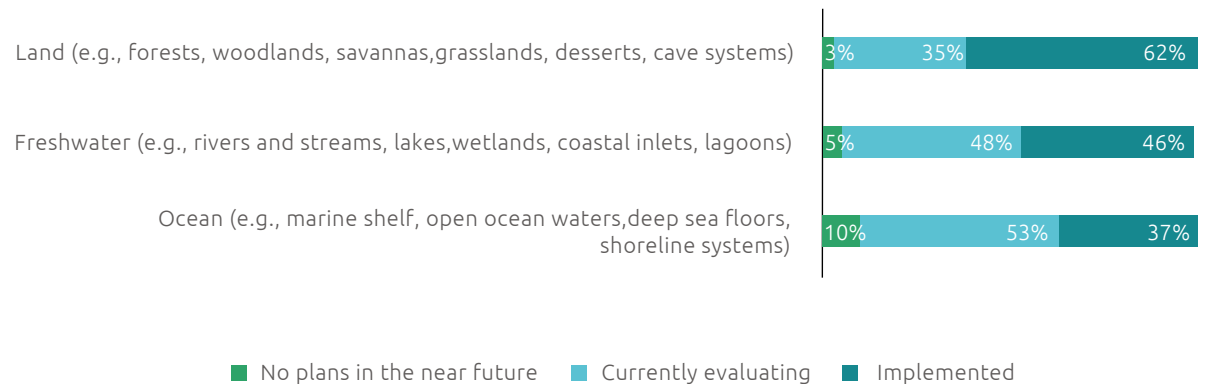
We defined preservation and restoration as follows:

- Preservation: protecting the wealth and variety of species, habitats, ecosystems, and genetic diversity on the planet; e.g., preventing the destruction of forests
- Restoration: assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed; e.g., tree planting

FIGURE. 8

Most organizations focus biodiversity efforts on land habitats

% OF EXECUTIVES WHO SAY THEIR ORGANIZATION IS CURRENTLY FOCUSING ON THESE HABITATS FOR BIODIVERSITY PRESERVATION AND/OR RESTORATION



Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023, N=1,643 executives whose organizations have a biodiversity strategy or ad-hoc biodiversity initiatives.

*Note: not all percentages sum to 100% because <1% of the sample said that they were unsure/don't know.

The most common reported biodiversity action is investing in the circular economy

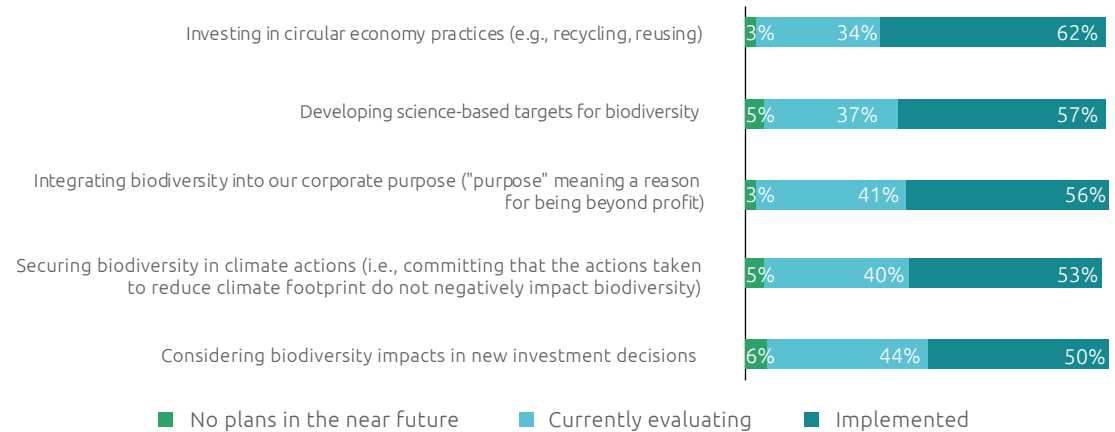
Organizational, behavioral, and cultural changes such as adopting circularity will be critical in tackling the biodiversity crisis. Of executives surveyed, 62% say their organization has implemented circular economy practices, such as recycling and reusing, in an effort to preserve biodiversity.

Half of respondents say their organization considers biodiversity when making new investment decisions (see Figure 9). Iberdrola, a Spanish multinational electric utility company, undertakes an environmental impact assessment (EIA) for each new project. The EIAs analyze alternative sites, prioritizing opportunities that avoid placing new infrastructure in protected areas or areas with a high biodiversity value. EIAs also encourage good environmental practices using a systematic approach and methodology.³²

FIGURE. 9

Six in 10 executives say they have implemented circular economy practices

% OF EXECUTIVES WHO SAY THEIR ORGANIZATION IS TAKING THESE STRATEGIC ACTIONS FOR BIODIVERSITY



Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023, N=1,643 executives whose organizations have a biodiversity strategy or ad-hoc biodiversity initiatives.

*Note: not all percentages sum to 100% because <2% of the sample said that they were unsure/don't know.

Over half of organizations are taking steps to mitigate negative impacts on land and water

Of executives surveyed, 65% say their organization has committed to reducing water usage (see Figure 10). Our research also reveals:

- 57% say their organization is reducing pesticide use on owned or managed land. Celine Barral of Bonduelle says, *“With our farmers, we agree on how to best manage the type and quantity of products needed to grow vegetables while preserving the biodiversity and the organic content of the soil.”*
- 51% say their businesses restrict development of operational sites in protected areas/areas of high biodiversity value. Diane Dowdell, Principal, Environmental Approvals at CBH Group, a grain growers’ cooperative that handles, markets, and processes grain from Western Australia, says: *“We look to buy a cleared paddock adjacent to our existing grain handling facility rather than taking another plot of land that would require clearing*



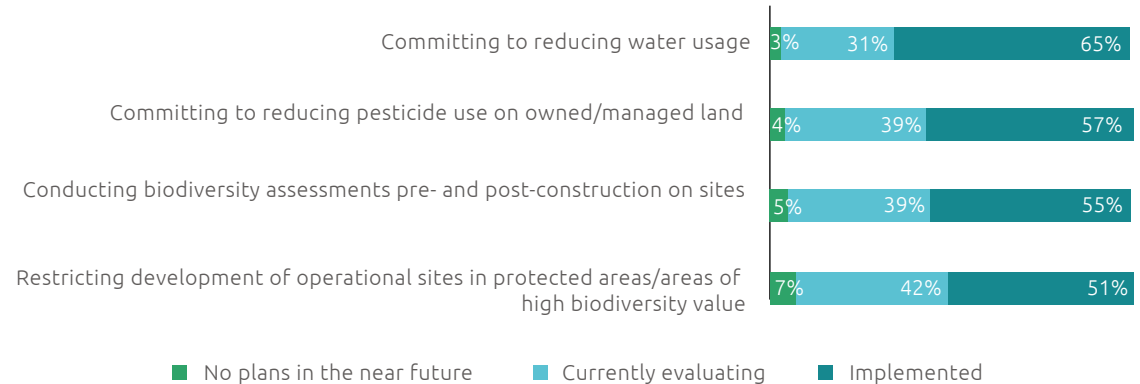
and look at the design of our facilities to avoid negative impacts to biodiversity.” Coca-Cola HBC commits that new bottling operations are not established in or next to World Heritage locations, areas which are protected by the International Union for Conservation of Nature (IUCN), UNESCO Man and the Biosphere (MAB) reserves, or in sites containing globally or nationally important biodiversity.³³

- 55% say their organizations conduct biodiversity assessments pre- and post-construction on sites. An executive from a European renewable energy provider, says: *“Before we build a new renewable energy power plant, we study the ecosystem to understand what biodiversity is present. Can we stay neutral, or can we actually improve biodiversity or at minimum mitigate any loss?”* An executive from an American real estate investment trust says: *“For specific sensitive species on newly acquired sites or sites that we are looking to expand or renovate, we have very rigorous protocols around how to protect them, for example, by delaying construction until after their nesting period.”*

FIGURE. 10

Six in 10 executives say they have committed to using less water

% OF EXECUTIVES WHO SAY THEIR ORGANIZATION IS TAKING THESE WATER AND LAND ACTIONS FOR BIODIVERSITY



Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023, N=1,643 executives whose organizations have a biodiversity strategy or ad-hoc biodiversity initiatives.

*Note: not all percentages sum to 100% because <2% of the sample said that they were unsure/don't know.

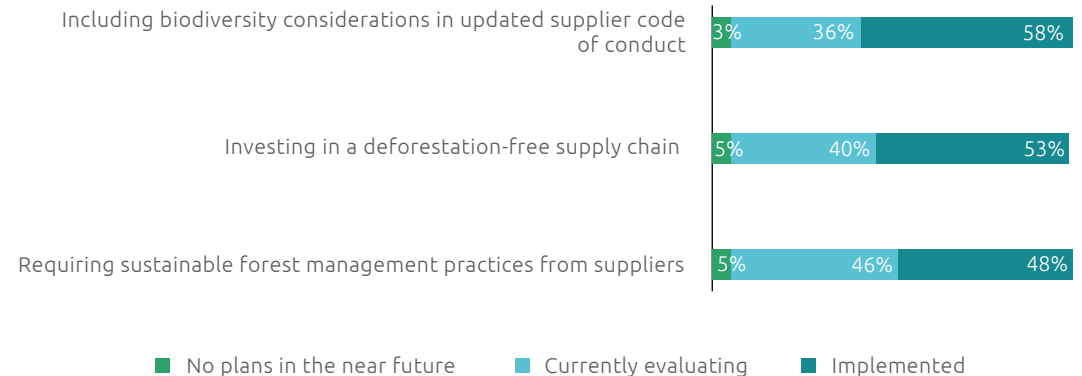
Biodiversity is becoming an integral consideration within supply chains

Of executives surveyed, 58% say their organization has updated their supplier code of conduct to include biodiversity considerations. Half say they are investing in deforestation-free supply chains and requiring sustainable forest management practices from their suppliers (see Figure 11). An executive from an industrial manufacturer, says: *“We are updating our supplier code of conduct in view of more stringent biodiversity efforts. We have also engaged a sustainability rating company for the first time this year.”*

FIGURE. 11

Over half of organizations include biodiversity in their updated supplier codes of conduct

% OF EXECUTIVES WHO SAY THEIR ORGANIZATION IS TAKING THESE SUPPLY CHAIN ACTIONS FOR BIODIVERSITY



Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023, N=1,643 executives whose organizations have a biodiversity strategy or ad-hoc biodiversity initiatives.

*Note: not all percentages sum to 100% because <2% of the sample said that they were unsure/don't know.

Jane Wardle, Sustainability Manager at CBH Group says: *“The second iteration of the EU Renewable Energy Directive has introduced new rules that consider the impact of biofuel feedstocks on biodiversity. Our ISCC certification, required for exporting biofuels to the EU market, has been revised accordingly. Therefore, we must ensure that our growers meet the standards and pass the audit. Currently, we have around 1,200 certified growers who can access the EU biofuel market, and access to this market represents a significant market share for our trading business.”*

Organizations factor in biodiversity to product design

Of executives surveyed, 59% say their organization uses renewable resources in product design and development to mitigate biodiversity loss, and 55% use life-cycle assessment methodology (LCA) to include biodiversity impact criteria for all new products and services (see Figure 12).

FIGURE. 12

Six out of 10 organizations use renewable resources in product design

% OF EXECUTIVES WHO SAY THEIR ORGANIZATION IS TAKING THESE PRODUCT DESIGN ACTIONS FOR BIODIVERSITY



Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023, N=1,643 executives whose organizations have a biodiversity strategy or ad-hoc biodiversity initiatives.

*Note: not all percentages sum to 100% because <2% of the sample said that they were unsure/don't know.

“We have one headline brand made up of all natural raw materials and medicinal plants. We are working to figure out how we might expand the use of medicinal plants as a broad category for conservation purposes.”

An executive from a multinational pharmaceutical and biotechnology company

Many companies have been shifting to natural products. An executive from a multinational pharmaceutical and biotechnology company, says: *“We have one headline brand made up of all natural raw materials and medicinal plants. We are working to figure out how we might expand the use of medicinal plants as a broad category for conservation purposes.”* L’Oréal uses approximately 1,700 raw materials from over 310 botanical species and has a target that, by 2030, 100% of biobased ingredients for formulas will be from traceable sustainable sources, with none linked to deforestation. It also aims to ensure that 95% of its ingredients will be biobased, derived from abundant minerals or circular processes.³⁴

THERE IS A SKILLS SHORTAGE IN THE BIODIVERSITY TALENT MARKET

Nearly 60% of executives globally say that their organization is facing a biodiversity skills gap, finding it difficult to recruit and hire the talent they need. Elaine van Ommen Kloeke of the Naturalis Biodiversity Center says, *"The challenging part for us is to hire technologists."*

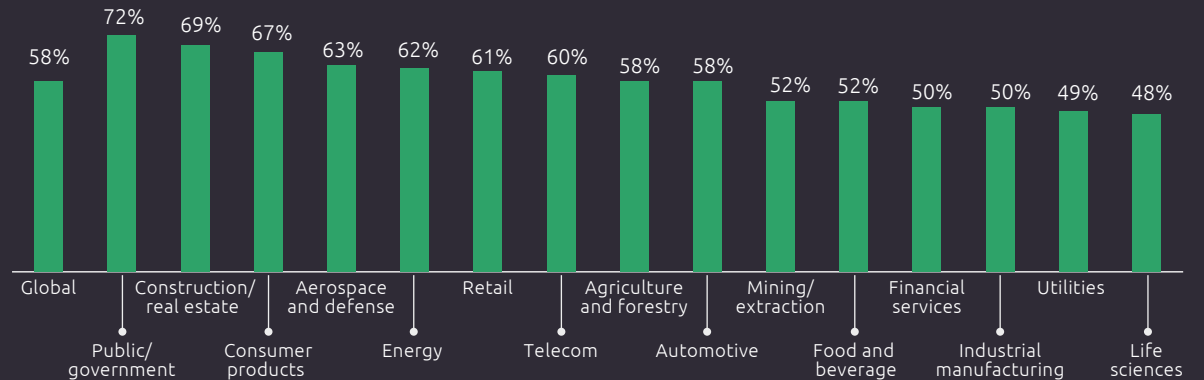
This biodiversity skills gap varies from 72% in the public/government sector to 48% in life sciences (see Figure 13). The gap is the least in life sciences. Presumably this is because the business case for biodiversity is clear in life sciences³⁵ and hence the industry may have been quicker to realize that investing in biodiversity talent and skills is good for the bottom line.

Our survey assessed the biodiversity skills/knowledge areas in greatest demand. These include animal science, climate change and biodiversity policy, and environmental/natural

FIGURE 13

Most executives globally say their organization faces a biodiversity skills gap

% OF EXECUTIVES WHO AGREE WITH THE STATEMENT, "OUR ORGANIZATION FACES A GAP IN BIODIVERSITY-RELATED SKILLS" (I.E., MY COMPANY LACKS QUALIFIED INDIVIDUALS THAT HAVE THE BIODIVERSITY SKILLS IT NEEDS), BY SECTOR



Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023, N=1,643 executives whose organizations have a biodiversity strategy or ad-hoc biodiversity initiatives.

resource management (see Figure 14). Demand for animal science skills/knowledge is greatest in the life sciences (71%) and public /government (70%) sectors.

Elaine van Ommen Kloeke of the Naturalis Biodiversity Center suggests the need to include biodiversity as a standalone topic in university curriculums: *“As sustainability often has dedicated courses; biodiversity too deserves this focus.”*

Martin Brueckner of Murdoch University agrees: *“There’s a four-year time lag between the number of biodiversity-related job roles being created and the supply of graduate talent. The challenge is to define societal and industry needs so we can be more active in meeting them.”*

Globally, 60% of executives say they are upskilling current employees on strategies to combat biodiversity loss. Organizations are also educating suppliers and partners in biodiversity skills.

Celine Barral of Bonduelle says: *“A big focus is on supporting our grower partners with training because not all of them are equipped in terms of knowledge on what they should do to improve the surrounding biodiversity and soil fertility. We work to keep learning together and put in a lot of time and energy.”*

FIGURE 14

Six in 10 executives agree that animal science is a skill in high demand

% OF EXECUTIVES WHO AGREE WITH THE STATEMENT: DEMAND FOR THIS SKILL IS HIGH IN MY ORGANIZATION TODAY



Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023, N=1,643 executives whose organizations have a biodiversity strategy or ad-hoc biodiversity initiatives.

An aerial photograph of a lush green forest. A river flows through the center, with a waterfall cascading down the right side. The forest is dense and vibrant green, with some small structures visible in the middle ground.

04

**AI AND OTHER TECHNOLOGIES
WILL HELP ORGANIZATIONS
TACKLE BIODIVERSITY LOSS MORE
QUICKLY**

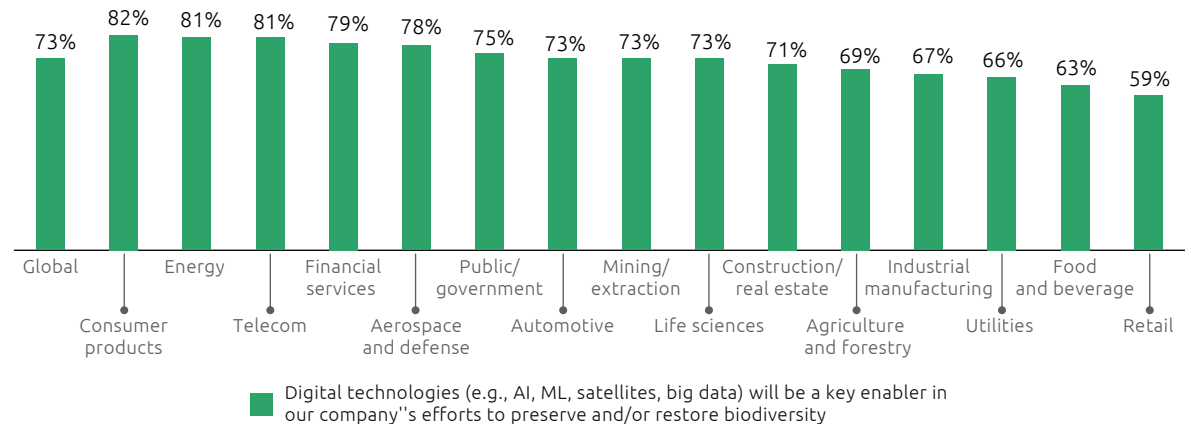
The potential for technology to mitigate biodiversity loss is massive

In recent years, governments and organizations worldwide have used various technologies to preserve biodiversity. While technology can cause habitat loss and disrupt natural systems, for example, through mining and extraction of raw materials or through laying and burying telecommunication lines, technological solutions are also proving to be critical in advancing biodiversity efforts. The majority of executives surveyed believe digital technologies can be a key enabler to reverse the biodiversity crisis (see Figure 15). This belief is fairly consistent across industries. Executives from consumer products (82%), energy (81%), and telecom (81%) agree most strongly.

FIGURE. 15

Most executives believe digital technologies will enable biodiversity preservation/restoration

% OF EXECUTIVES WHO AGREE WITH THE STATEMENT, BY INDUSTRY



Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023, N=1,643 executives whose organizations have a biodiversity strategy or ad-hoc biodiversity initiatives.

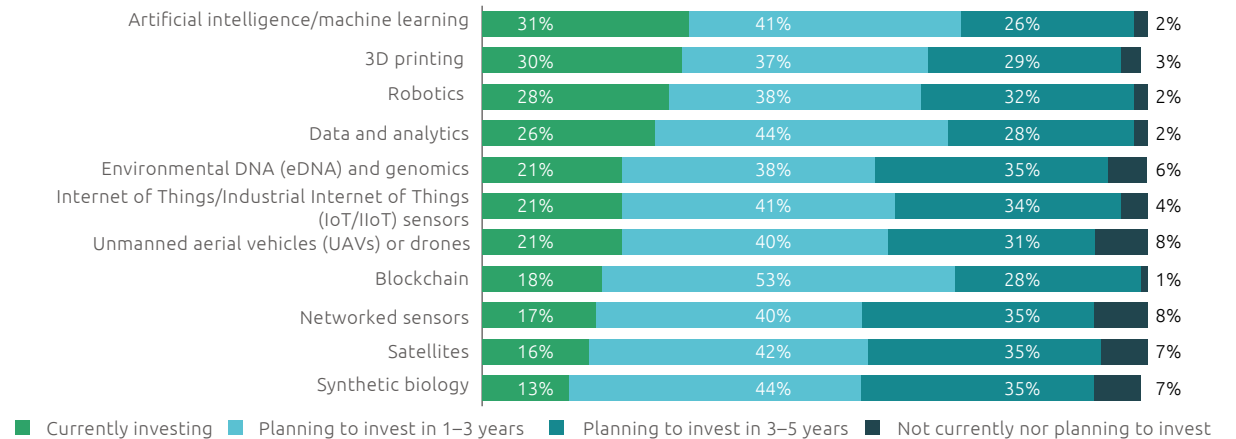
AI is the most common technology investment for biodiversity

The most common technology organizations are currently investing in for biodiversity is artificial intelligence (AI)/ machine learning (31%) followed by 3D printing (30%), and robotics (28%). Overall, less than a third of organizations surveyed are currently investing in the technologies for biodiversity included in our survey. Around 40%–50% are planning to invest in the next one to three years and a third in the next three to five years (see Figure 16). Certain technologies have greater promise within certain industries. For example, the highest investment in synthetic biology comes from life sciences organizations (17% of which are currently investing in this technology).

FIGURE. 16

Less than a third of organizations are investing in technologies for biodiversity

% OF EXECUTIVES WHO SAY THEIR ORGANIZATION IS INVESTING IN THE BELOW TECHNOLOGIES FOR BIODIVERSITY



Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023, N=1,643 executives whose organizations have a biodiversity strategy or ad-hoc biodiversity initiatives.



An executive from an industrial manufacturer says: *“We have started direct investments in drones and sensors and then satellite technology through partnerships.”* An executive from an American real estate investment trust shared that the company has a drone program to identify nesting birds and emphasized the need to ensure access to the technology to monitor the impact, which is currently a challenge: *“I would love to see an affordable technology that could confirm that we’re not impacting the land around our sites in negative ways.”*

Some organizations are developing data and analytics tools internally while others are partnering with technology providers or start-ups. Bonduelle has developed an internal integrated digital tool to manage the entire supply chain. Celine Barral of Bonduelle says: *“It is critical for us to closely monitor all the dimensions of agriculture, not only biodiversity, but both business indicators and sustainability indicators, such as quantity of fertilizer, water use, and percent of surfaces with a water management and pollinator protection plan, among others.”*

Other organizations are keen to explore innovative technologies. Elaine van Ommen Kloeke of the Naturalis Biodiversity Center says, *“eDNA allows us to monitor more species. Combining this with AI and scaling the use of these*

technologies offers a real opportunity to combat biodiversity loss.” An executive from a multinational pharmaceutical and biotechnology company says: *“As our industry moves to more natural-based products and ingredients, measuring local environmental conditions can open up a wealth of opportunity for our business.”*

40%-50%

of organizations are planning to invest in technologies for biodiversity in the next 1-3 years.



“It is critical for us to closely monitor all the dimensions of agriculture, not only biodiversity, but both business indicators and sustainability indicators, such as quantity of fertilizer, water use, and percent of surfaces with a water management and pollinator protection plan, among others.”

CELINE BARRAL

Chief Sustainability Officer at Bonduelle, a French company producing processed vegetables

AI technologies have a range of uses for biodiversity preservation

Today, the technological tools to preserve biodiversity are often distinct from the technologies used to reverse or restore biodiversity. One important use for protecting biodiversity is observation and tracing. AI solutions combined with blockchain and sensors make it easier to monitor and track various populations, including animals, birds, plants, and flora. The United States Geological Survey (USGS) implemented an automated bird detection system at a wind power facility in Wyoming and saw an 85% reduction in eagle fatalities.³⁶ Tech4Nature, a global open partnership created by the International Union for Conservation for Nature and Huawei, has created an AI-powered smart buoy to record and identify dolphin and whale calls. The data is used to produce insights on species distribution, behaviors, and migration trends and the impact of noise pollution.³⁷

AI and robotics support the tracking of species in ways that minimize interference with surrounding biodiversity. For example, robots designed as jellyfish can inspect coral reefs without damaging the ocean’s natural, fragile barrier.

They can also pick up trash in the ocean. Germany's Max Planck Institute for Intelligent Systems (MPI-IS) has created a "jellyfish-bot" designed to collect waste particles as it swims.³⁸ Satellite-based imagery and AI can also support the observation and monitoring of supply chains. For example, Procter & Gamble uses satellite and AI technology to monitor its palm oil supply chain. The real-life data this gathers helps the company with compliance and facilitates immediate interventions when required.³⁹

Synthetic biology can help reduce the impact on biodiversity

Synthetic biology, which involves the application of engineering principles to redesign natural systems, can provide synthetic alternatives to wildlife products, such as lab-grown "cultured meat," a synthetic food source that uses real animal cells grown outside of an animal and decreases reliance on carbon-intensive farming of animals. Similarly, synthetic jellyfish can be used to break down and absorb toxic chemicals from harmful spills in oceans and waterways.⁴⁰ Synthetic biology can be used to create gene-modified microorganisms to absorb polluting microbes in

soil or water, or potentially even bacterial enzymes with the ability to degrade PET-plastic, a significant pollutant.⁴¹ Another example of synthetic biology's application is in aiding conservation efforts of coral reefs. Coral bleaching can quickly destroy reefs and is the result of warmer temperatures and pollution. Research is ongoing to edit genes in corals to learn more about their ability to handle stress in the environment.⁴²

Generative AI has potential to help protect biodiversity

One example of generative AI's application to protect biodiversity is in precision agriculture, which aims to minimize the environmental impact of agricultural activities. Using data from sensors, drones, and satellites, AI systems can offer valuable guidance to farmers regarding irrigation, fertilization, and pest management and can analyze ecological data to support conservation initiatives.⁴³ Generative AI also has the potential to, for example, pinpoint ideal sites for wildlife corridors, formulate plans for safeguarded zones, and create tactics to counter poaching activity.⁴⁴ Generative AI can also support biomimicry (i.e., the

design and production of materials, structures, and systems based on biological processes) by expanding nature-inspired innovations.⁴⁵

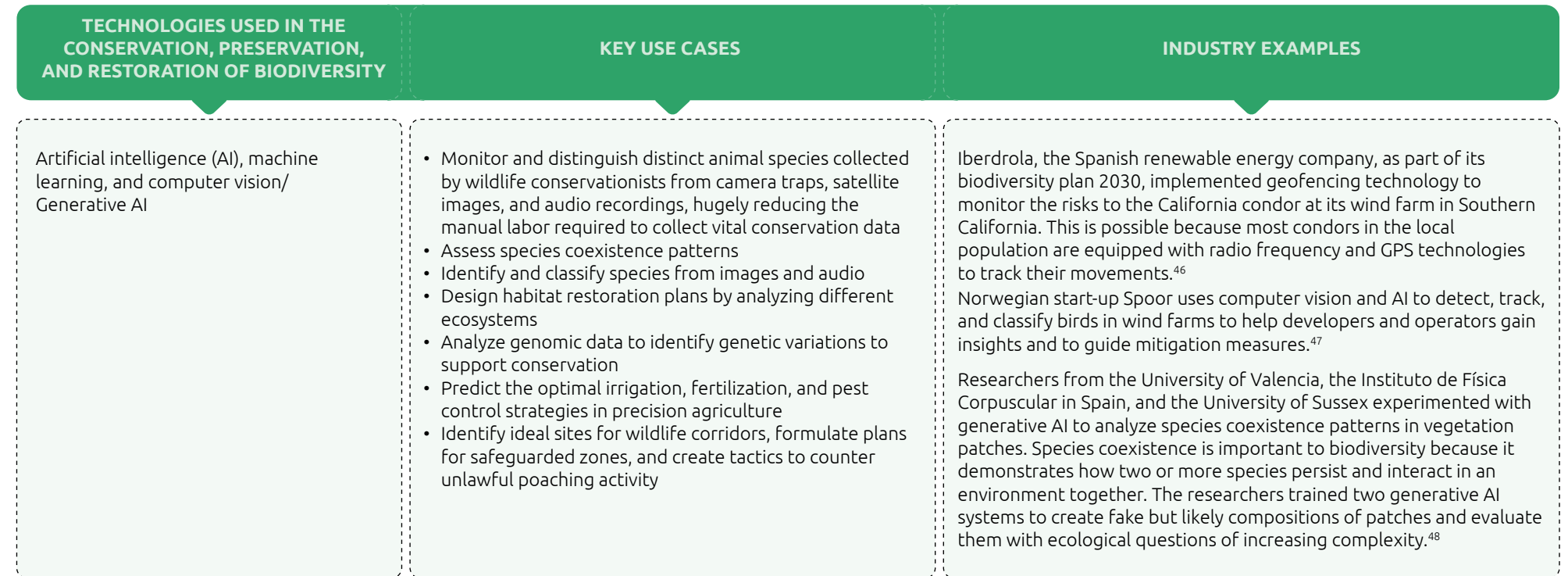
Figure 17 shows prominent use cases currently available for the technologies we included in our research.

44%

of executives say their organization is planning to invest in synthetic biology for biodiversity in the next 1-3 years.

FIGURE. 17

Technology use cases for biodiversity



TECHNOLOGIES USED IN THE CONSERVATION, PRESERVATION, AND RESTORATION OF BIODIVERSITY	KEY USE CASES	INDUSTRY EXAMPLES
Blockchain and cryptocurrency technology	<ul style="list-style-type: none"> • Create supply chain traceability tools for fish, animals, or forests 	<p>American start-up Ubiquiti has partnered with Brazil's Estate Registry Office and is using blockchain technology to clarify land ownership and stop false land claims and illegal logging.⁴⁹</p>
Data and analytics	<ul style="list-style-type: none"> • Analyze biodiversity impact across supply chains 	<p>The UN Biodiversity Lab (UNBL) launched its second edition of its spatial data analytics platform designed to support stakeholders in monitoring and understanding the impacts of biodiversity loss and recommending where action should be taken to protect, manage, and restore nature. UNBL 2.0 is a free, open-source platform that facilitates open access to spatial data that can inform environmental evidence-based decisions.⁵⁰</p>
Environmental DNA (eDNA) and genomics	<ul style="list-style-type: none"> • Collect biodiversity data and DNA quickly and easily by scanning water and soil samples 	<p>NatureMetrics, a UK-based company, has launched kits to check eDNA and indicate the range of species present in a given area.⁵¹</p> <p>The Naturalis Biodiversity Center, a national museum of natural history and a research center on biodiversity in the Netherlands, is using eDNA to track and monitor fungi species and AI combined with satellite-based imagery and audio to track flora and fauna.⁵²</p>
Internet of Things (IoT)/Industrial Internet of Things (IIoT)	<ul style="list-style-type: none"> • Monitor habitat changes, stop animal poaching, and repair broken ecosystems • Monitor species 	<p>The Scottish Government funded a study to monitor a remote area of peatland in the Western Isles. The pilot used 10 strategically placed IoT sensors to capture reliable real-time information on the water table dynamics at the degraded peatland prior to restoration.⁵³</p>

TECHNOLOGIES USED IN THE CONSERVATION, PRESERVATION, AND RESTORATION OF BIODIVERSITY	KEY USE CASES	INDUSTRY EXAMPLES
Networked sensors	<ul style="list-style-type: none"> Track and monitor animal movement or behavior and set up instant alerts about imminent threats 	<p>The UK's Network Rail Southern Region has collaborated with ZSL's Institute of Zoology and Conservation Programmes to assess and improve biodiversity performance using cutting-edge, remote monitoring technologies. Network Rail is trialing remote and automated technologies to monitor wildlife and anthropogenic activity, including innovative acoustic sensors, to evaluate proposed methods for tracking biodiversity.⁵⁴</p>
Robotics	<ul style="list-style-type: none"> Monitor environmental data over months or years without disturbing wildlife Track/eliminate invasive species through sensors or submersible robots 	<p>Researchers at West Virginia University (WVU) have developed BrambleBee, an autonomous robot inspired by bees that can pollinate bramble plants within a greenhouse environment. BrambleBee can also collect data on plants it comes into contact with to assess its future yield.⁵⁵</p>
Satellites	<ul style="list-style-type: none"> Analyze and visualize data on species within accessible habitats to identify areas where conservation practices are needed Use satellite scanning algorithms to detect and track the spread of wildfires 	<p>NASA is collaborating with partners worldwide to monitor biodiversity changes in near real time, linking satellite data to get on-the-ground measurements.⁵⁶</p>
Synthetic biology	<ul style="list-style-type: none"> Protect threatened species by providing synthetic alternatives Create plant-based meat that reduces the reliance on animal proteins 	<p>National Renewable Energy Laboratory (NREL), LanzaTech NZ Inc. (LanzaTech), Northwestern University, and Yale University have launched a synthetic biology project to create carbon-consuming</p>

TECHNOLOGIES USED IN THE CONSERVATION, PRESERVATION, AND RESTORATION OF BIODIVERSITY	KEY USE CASES	INDUSTRY EXAMPLES
Synthetic biology	<ul style="list-style-type: none"> • Create cultured /cell-based meat by growing animal cells in the lab • Modify genes of living organisms to protect against external threats (e.g., drive local extinction of invasive populations to protect endangered species) • Support biofuel production by improving existing plant-based methods and creating microbial cell factories for more efficient production 	<p>bacteria capable of producing viable industrial-scale biofuels for a circular economy.⁵⁷</p> <p>Food and drink giant PepsiCo and alternative meat manufacturer Beyond Meat have formed a joint venture to develop and produce plant-based protein snacks and beverages.⁵⁸</p>
Unmanned aerial vehicles (UAVs) or drones	<ul style="list-style-type: none"> • Create early warning systems to detect unwanted human presence in protected areas • Identify and monitor plants, flora, and animals from UAV-based imagery • Plant seeds from AI-powered drones, bringing down the cost of tree restoration efforts 	<p>Flash Forest, a Canadian tree planting start-up, will use drone technology to plant one billion trees by 2028. Drones can plant trees 10 times faster than humans. They aim to plant 40,000 trees a month, reducing the cost to 50 cents per tree, or around a fourth of the cost of other tree restoration efforts.⁵⁹</p>
3D printing	<ul style="list-style-type: none"> • Make cheap, lightweight tracking devices to fit onto animals 	<p>Ørsted, a Danish multinational energy company, with its partner the World Wide Fund for Nature Denmark, created 12 3D-printed reefs and installed them between turbines at the Anholt Offshore Wind Farm in the Kattegat, a sea area that has suffered from low cod stocks. The goal of the 3D-printed reefs is to provide increased habitat for cod and improve biodiversity.⁶⁰</p>

Source: Capgemini Research Institute analysis.

An aerial photograph of a dense, vibrant green forest. A winding path or road cuts through the trees, leading to a small, dark-colored building. The forest is thick and covers a hilly or mountainous terrain. The overall scene is lush and natural.

05

RECOMMENDATIONS: HOW CAN ORGANIZATIONS ACCELERATE THEIR BIODIVERSITY JOURNEYS?

Through our research, discussions with biodiversity experts, and experience of working on sustainability initiatives at leading companies across sectors, we recommend the following four actions to bring about positive change fast.

52%

of executives say their organization has ongoing partnerships for biodiversity.

1. Give biodiversity a strategic focus on a par with climate change

Only one quarter of organizations have a biodiversity strategy and 53% of executives surveyed believe biodiversity loss is less of a priority than climate change. In fact, ecosystem collapse (the end result of biodiversity loss) would be catastrophic for the planet and for all industries. Also, the current gradual loss of biodiversity has palpable effects on economic activity and business prospects. Biodiversity is closely interconnected with climate change and actions taken for each cause inevitably impact the other, which means both should be considered equally. Climate change is a key sustainability priority in boardrooms globally; biodiversity should be on a par, so both can be addressed jointly. The corporate sector must act with urgency on preserving and restoring biodiversity, elevating it to the top of the agenda. With the decision at COP 15 of the UN CBD, at least 30% of the world's land and sea shall be put under effective protection by 2030. Therefore, by 2030,

the goal is that the loss of biodiversity is stopped, and the trend reversed. Organizations can begin by identifying their goals for biodiversity and ensuring they are interlinked with their carbon targets. Undertaking a biodiversity impact assessment to measure business impacts on surrounding ecosystems will also be a critical early step for organizations.

2. Foster collaboration to support biodiversity solutions at scale

Over half (52%) of executives in our survey say they have ongoing partnerships for biodiversity initiatives. The most common partners among those surveyed include non-profit associations, NGOs, and academic institutions. Like climate change, biodiversity loss is a global crisis that requires effort from a wide range of stakeholders. Collaboration will be key in helping the corporate sector to identify and support new strategies for biodiversity and conservation and for sustainability more broadly.

Organizations need to collaborate with a wide range of partners such as peer companies, conservationists, academia, researchers, and the start-up community to foster a collaborative environment that enables innovation and the sharing of ideas to address biodiversity loss and to build resilience in their industries. Organizations should also increase cooperation with supply chain partners to identify biodiversity hot spots and mitigate impacts. These partnerships and alliances can also be used to accelerate adoption of innovative financing models and technological innovation to catalyze change at the required scale.

To effectively address the most pressing aspects of biodiversity loss, organizations should design programs and solutions in collaboration with governments, NGOs, and local communities. This will support in the push towards nature-positive business models. Working closely with governments and policymakers will ensure that organizations produce biodiversity solutions that are not simply good for business, but, crucially, good for the planet.





59%

of executives say biodiversity is hard to measure and monitor.

3. Define clear standards for biodiversity measurement and disclosure

Nearly six in ten (59%) of the executives in our survey say biodiversity is hard to measure and monitor. If we are to take effective action on biodiversity loss, there is a clear need for a global, universal measurement system to enable shared access to standardized data using a system similar to that of the Science-Based Targets Network (SBTN) for carbon emissions.

There is strong international momentum towards measurement and disclosure. In May 2023, SBTN released its first corporate science-based targets for nature, beginning with freshwater and land, supporting organizations to assess their environmental impacts and to set targets accordingly.⁶¹

In 2022 COP 15 of the UN Convention on Biological Diversity established long- and medium-term global biodiversity goals. The Global Biodiversity Framework (GBF) agreed to in the conference requires transnational companies and financial institutions to monitor, assess, and disclose risks and impacts

on biodiversity through their operations, portfolios, and supply and value chains. COP 15 also aims to guide the risk management and disclosure framework from the Taskforce on Nature-Related Financial Disclosures (TNFD) that is currently being developed for companies to report and act on evolving biodiversity risks.⁶² The final release of the framework is expected in September 2023, from which point companies can begin using it to report on both qualitative, process-oriented disclosures and on any quantitative metrics that are included.⁶³

A variety of new regulatory approaches are also anticipated, including strict rules on the commercial use of specific land areas, subsidy reforms, taxes and fines, implementation of science-based targets, and trade directives. Many countries and regions have already started. For example, one of the draft standards (ESRS E4) of the EU Corporate Sustainability Reporting Directive (CSRD) is specifically aimed at biodiversity and ecosystems.

Against this rapidly evolving background, the role of the corporate sector will become more clearly defined. New disclosure requirements will help companies understand their impacts on biodiversity and thereby align their business

model and operations with biodiversity protection.⁶⁴ Elaine van Ommen Kloeke of the Naturalis Biodiversity Center says: *“The EU CSRD is highlighting the biodiversity problem and putting pressure on organizations to act.”* An executive from a global financial services company, says: *“Biodiversity is quickly becoming part of a company’s social license to operate.”*

4. Invest in technological and data solutions wisely to speed up action on biodiversity loss

Technology plays a crucial and growing role in combating biodiversity loss. As Clara Küpper of REWE Group says: *“There is definitely a need for technology to tackle biodiversity issues. New technology would hopefully make it easier and less time-consuming for our suppliers and farmers to measure progress and assess impact against KPIs.”* For example, AI, machine learning, robotics, and drones, combined with remote data collection from camera traps and acoustic monitoring, have already proved a powerful tool for identifying and tracking species and even individual animals. Generative AI has significant potential to protect biodiversity through applications that support research and analysis, monitoring, and conservation. Our previous research on industry applications of generative AI reveals that the



“eDNA allows us to monitor more species. Combining this with AI and scaling the use of these technologies offers a real opportunity to combat biodiversity loss.”

ELAINE VAN OMMEN KLOEKE

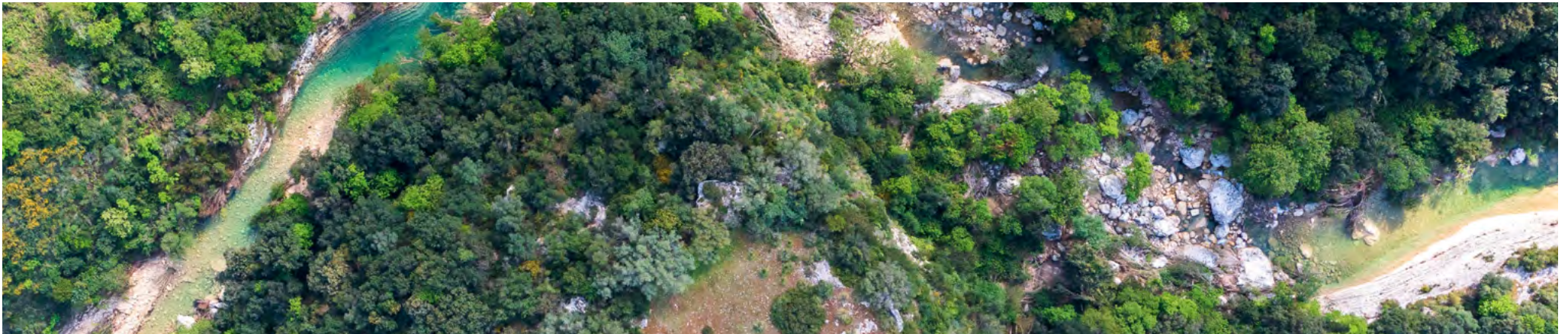
Program Manager, ARISE at the Naturalis Biodiversity Center, a national museum of natural history and a research center on biodiversity in the Netherlands

carbon footprint of training generative AI is massive, hence the need to implement and scale generative AI sustainability and mitigate its impact on climate change and biodiversity.⁶⁵ Environmental DNA sequencing can help fight illegal wildlife trade and advanced biotechnologies hold promise to improve agricultural productivity, reduce pollution from fertilizers and pesticides, and deliver biofuels that do not compete with food for land. Importantly, however, technology is not the single answer to the biodiversity crisis; organizations must work to reduce and avoid impacts to nature while restoring and offsetting impacts in parallel to investing in technological solutions. This will require behavioral and cultural changes

at organizations. This will also require investments in nature-based solutions such as rewilding (i.e., restoring land to its natural uncultivated state) or building wildlife bridges or corridors design to help animals safely cross roads.

Investing in technology for biodiversity can spur innovation and create new business opportunities. According to the World Economic Forum, protecting nature and increasing biodiversity could generate business opportunities worth \$10 trillion per year and create 400 million jobs by 2030.⁶⁶ Investing in technology solutions can lead to the creation of new products, services, and business models that cater to environmentally conscious consumers, giving these

organizations a competitive advantage. Technology and data solutions can help organizations map biodiversity risks throughout their value chains and meet regulatory requirements, while also helping to build internal accountability for science-based biodiversity targets. The bottom line is that organizations should accelerate their investment in technologies to preserve and/or restore our natural ecosystems, choosing solutions wisely so as to avoid negative effects or counterproductive impacts on biodiversity.



Conclusion

The value of biodiversity lies not just in the variety of living organisms but includes the services provided by healthy ecosystems, such as crop pollination by insects, for example. However, humans are putting increasing pressure on the planet, upsetting the balance of ecosystems, and reducing biodiversity. Biodiversity loss poses a serious and urgent threat to human well-being, sustainability goals, and economic growth and stability.

Despite this, biodiversity risks are frequently not prioritized. Many executives feel that they have a strong understanding of biodiversity and the impact it has on the planet, yet it remains low on their agenda, as very few organizations have a

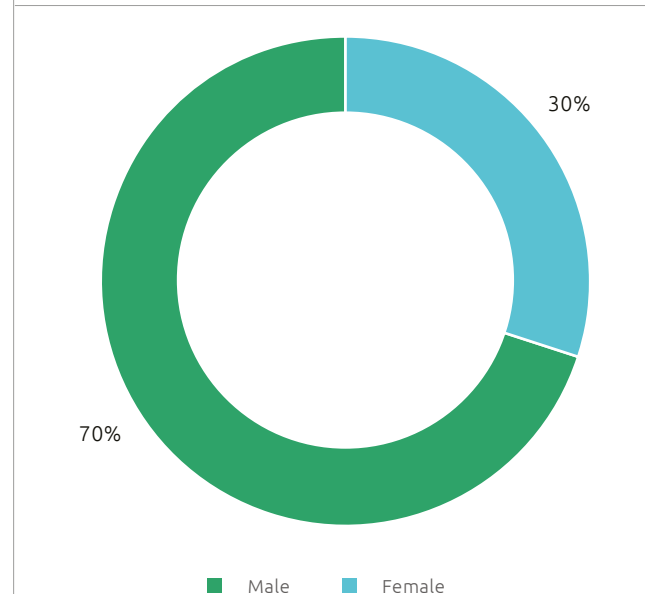
biodiversity strategy. Organizations must adopt regenerative practices to minimize their ecological footprint, restore degraded ecosystems, and support biodiversity conservation. They must also invest in technology solutions to enhance their understanding of ecosystems and enable more sustainable resource management. The impacts of the biodiversity crisis are significant and widespread, and the corporate sector must step up its investment in protecting and restoring biodiversity to help tackle this global issue with greater speed. By combining efforts with cross-industry partners, thriving ecosystems and a more biodiverse and sustainable world can be achieved.

Research methodology

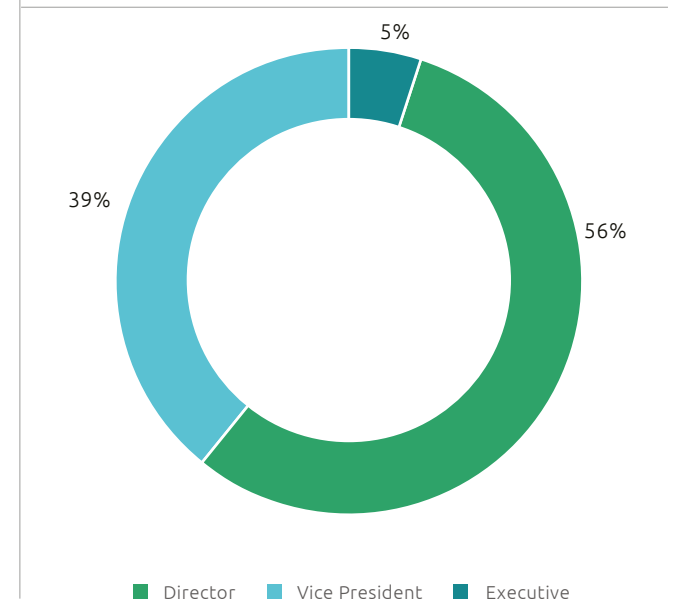
We surveyed 1,812 executives employed at organizations with more than \$1 billion in annual revenue across 12 countries in North America, Europe, and Asia-Pacific and in 15 industries. Executives surveyed were director-level and above and 50% were from sustainability functions, such as environmental management, conservation, climate change, and corporate social responsibility. Of the total sample, 1,643 executives (66%) are employed at organizations that have a biodiversity strategy or ad-hoc biodiversity initiatives. The global survey took place in May and June 2023. The distribution of executives and their organizations is provided in the following figures. In addition to the survey, we interviewed 15 biodiversity and sustainability executives and experts at large organizations globally.

The study findings reflect the views of the respondents to our online questionnaire for this research and are aimed at providing directional guidance. Please contact one of the Capgemini experts listed at the end of the report to discuss specific implications.

EXECUTIVES BY GENDER

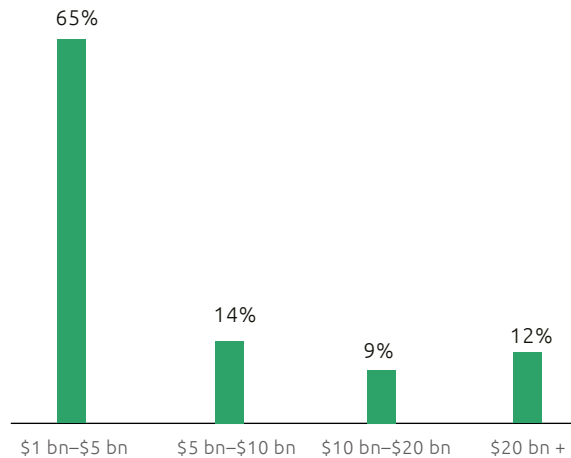


EXECUTIVES BY CURRENT JOB TITLE

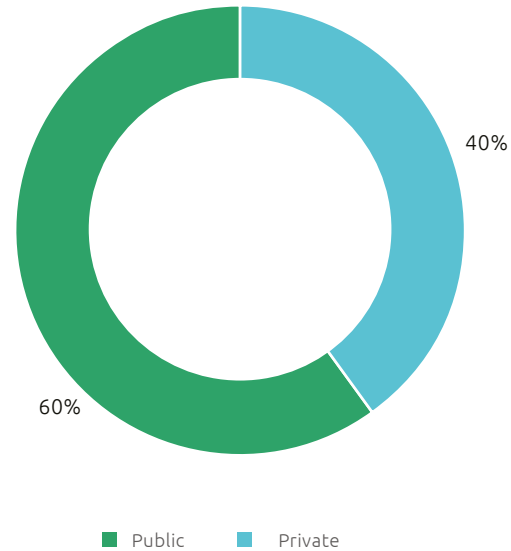


Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023; N=1,812 executives.

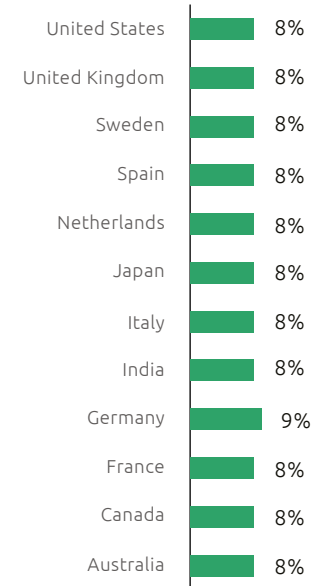
EXECUTIVES BY THEIR ORGANIZATION'S ENTERPRISE-LEVEL REVENUE, IN USD



EXECUTIVES BY WHETHER THEIR ORGANIZATION IS PUBLICLY TRADED OR PRIVATELY HELD

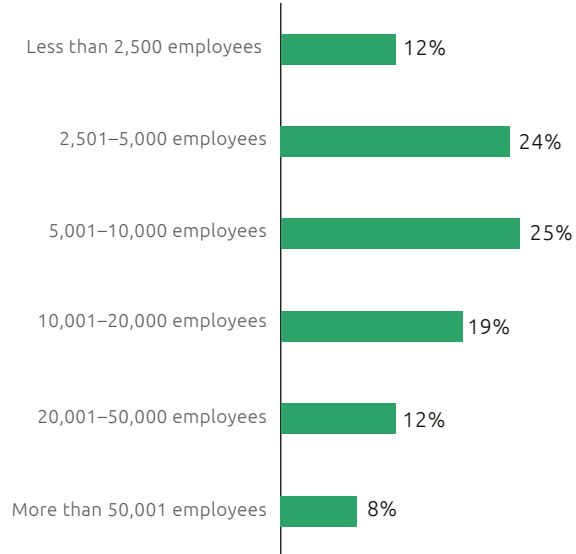


EXECUTIVES BY HEADQUARTERS OF CURRENT ORGANIZATION

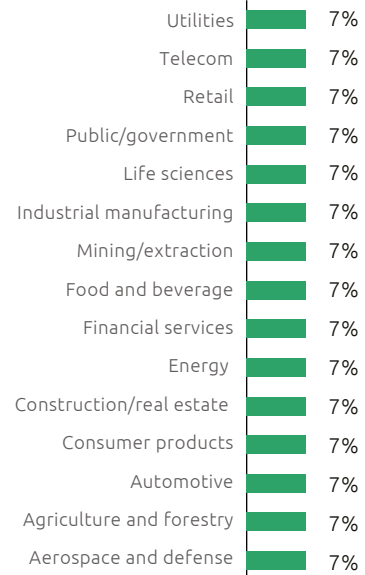


Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023; N=1,812 executives.

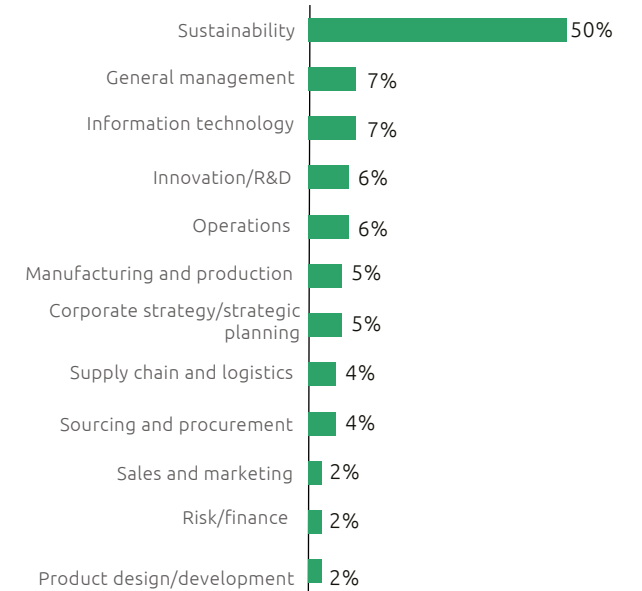
EXECUTIVES BY ORGANIZATION'S TOTAL EMPLOYEES GLOBALLY



EXECUTIVES BY INDUSTRY



EXECUTIVES BY CURRENT DEPARTMENT/FUNCTION



Source: Capgemini Research Institute, Biodiversity executive survey, May–June 2023; N=1,812 executives.

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Capgemini is committed to supporting clients in taking positive actions for biodiversity

We bring together a unique blend of capabilities, technologies, and expertise to help you achieve your biodiversity ambitions. Our unique approach focuses both on reducing and avoiding negative impacts to biodiversity and on regenerating biodiversity to maximize positive impacts. We leverage our capabilities and technologies to address all your biodiversity preservation and regeneration challenges, from commitment to sustainable achievements.

		REDUCE AND AVOID <i>Minimize negative impact</i>	REGENERATE <i>Maximize positive impact</i>
COMMIT	Biodiversity preservation strategy and new business models Awareness related to the preservation of biodiversity, definition of objectives, client commitments, and transformation methods	Reduce the biodiversity footprint	Reach a nature-positive impact
ACT	Design and operations for biodiversity Reshape products and services with nature-based solutions (Nbs) methodology and transform supply chain and operations to meet objectives	Biodiversity-friendly optimized operations	Regenerative design, biomimicry, and symbiotic operations
MONITOR AND REPORT	Data for biodiversity net gain Continuous collection, monitoring, and reporting of biodiversity-related data	Monitor harm reduction towards biodiversity	Data-driven restorative/regenerative projects

We use our capabilities to understand and protect biodiversity in a number of different ways:

Our **Tech4Positive Futures (TFPF)** brings together technology, business, and society to create and enable a better world. We are supporting four project winners this year:

- A team from NA along with an academic partner is working to **reduce bycatch**, the unintended capture of marine animals during commercial fishing operations. The team is creating a prototype for an affordable and easily available renewable-energy-lit fishing nets to stop bycatch such as sea turtles. The net will be tested extensively with global fisheries.

Learn more here: <https://www.youtube.com/watch?v=Tx565SGX8bM>

- A team in the UK is working with a social enterprise to build a data-driven solution to support **pollinator conservation**, including decoding bee behavior and encouraging rewilding.

Learn more here: <https://www.youtube.com/watch?v=BqLlf1FgyCU>

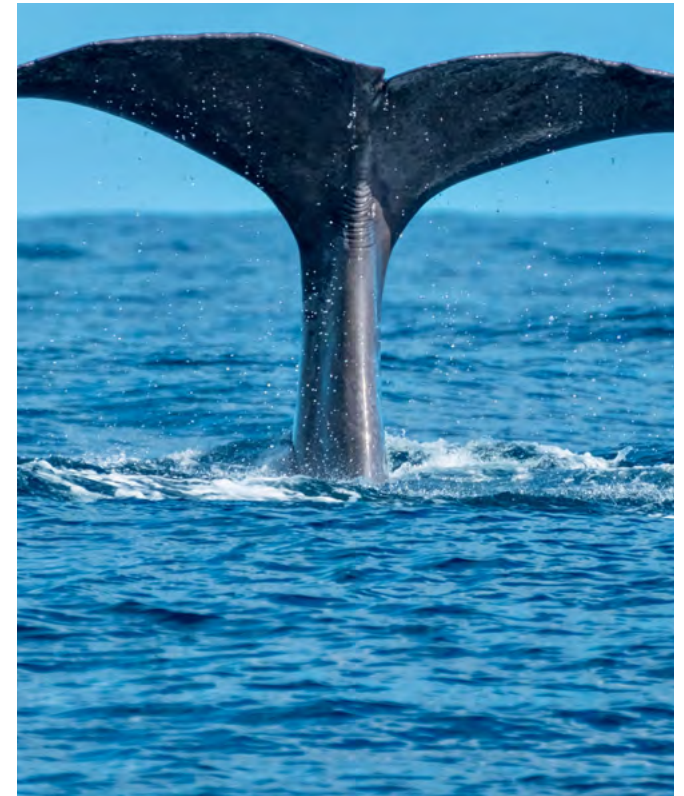
- A team in the Netherlands is helping to **promote urban forests** by building an end-to-end data solution to enable their non-profit partner to demonstrate the value of the Miyawaki Method, which is a way of creating and growing

small urban forests in very limited space, in very little time, while also generating significantly more biodiversity and capturing more CO₂ per square meter than normal forests.

- A team in our financial services practice has partnered with French social enterprise One Ocean and French social research agency Narra on a mission to **improve knowledge of marine mammals** in the Bay of Biscay. The team is creating an app to enable visitors to the ocean and beach in France to become citizen scientists. They will collect and share data to better protect marine mammals.

Our annual **Global Data Science Challenge (GDSC)** has focused on biodiversity. Open to all Capgemini employees, the global challenge is a combination of training and competition, supporting our sustainability goals.

- This year, participants are challenged to create a data and AI model that recognizes specific sounds to help **identify and monitor insect species** groups in remote habitats. Learn more here: <https://www.capgemini.com/insights/research-library/global-data-science-challenge/>
- In earlier years, participants also developed an intelligent data solution based on AI and machine learning to help **protect vulnerable sperm whales** around the world. The solution identifies sperm whales and their social structures through image processing and helps scientists track migration routes and protect the whales' natural habitat.



Learn more here: <https://www.youtube.com/watch?v=xT6zOv2d2EY>

- Participants also teamed up with the LoVe Ocean Observatory in Norway to develop an AI-based solution that more quickly reviews and analyzes large amounts of data from underwater sensors, providing new insights about the ocean environment and contributing to **marine conservation**.
Learn more here: <https://www.youtube.com/watch?v=pngNNer9RP4>

We partnered with the Nevada Chapter of The Nature Conservancy to identify indicators of landscape and ecosystem degradation in the Mojave Desert, including the use of unauthorized off-highway vehicles. We designed and delivered an AI solution to remotely detect and measure the impact of those indicators on the landscape and wildlife ecosystem.

Learn more here: <https://www.youtube.com/watch?v=ya2yQ60iAjl>

We supported the **European Space Agency** in creating the World Emission portal to raise the global standard of carbon emissions data quality and centralize global data on GHGs and atmospheric pollutants. The portal democratizes complex satellite observation data and supports more confident decision-making.

Learn more here: <https://www.capgemini.com/news/client-stories/the-european-space-agency-leverages-satellite-data-to-better-track-carbon-emissions/>



A multi-disciplinary team of colleagues developed a smartphone app that leverages data and AI to help small-scale farmers in India **increase crop yields** (e.g., sugarcane, rice) through improved efficiency and planning for the impact of climate change.

Learn more here: <https://www.youtube.com/watch?v=OKKNtCtJFd8>

Our team in Southeast Asia partnered with Heng Hiap Industries, a plastic recycling company in Malaysia, to transform a manual and fragmented recycling infrastructure to a **circular model** by building an app that lets consumers request pickups and collectors respond to requests, plan routes, and be paid digitally.

Learn more here: <https://www.capgemini.com/news/inside-stories/heng-hiap/>

Our team in Sweden partnered with Sveaskog, the public corporation that manages 14% of Swedish forests, to create a solution that combines satellite images and AI to produce detailed maps of the **highly destructive bark beetles** and trigger a quick intervention.

Learn more here: <https://www.capgemini.com/news/client-stories/sogeti-sweden-leverage-ai-to-hunt-spruce-bark-beetles/>

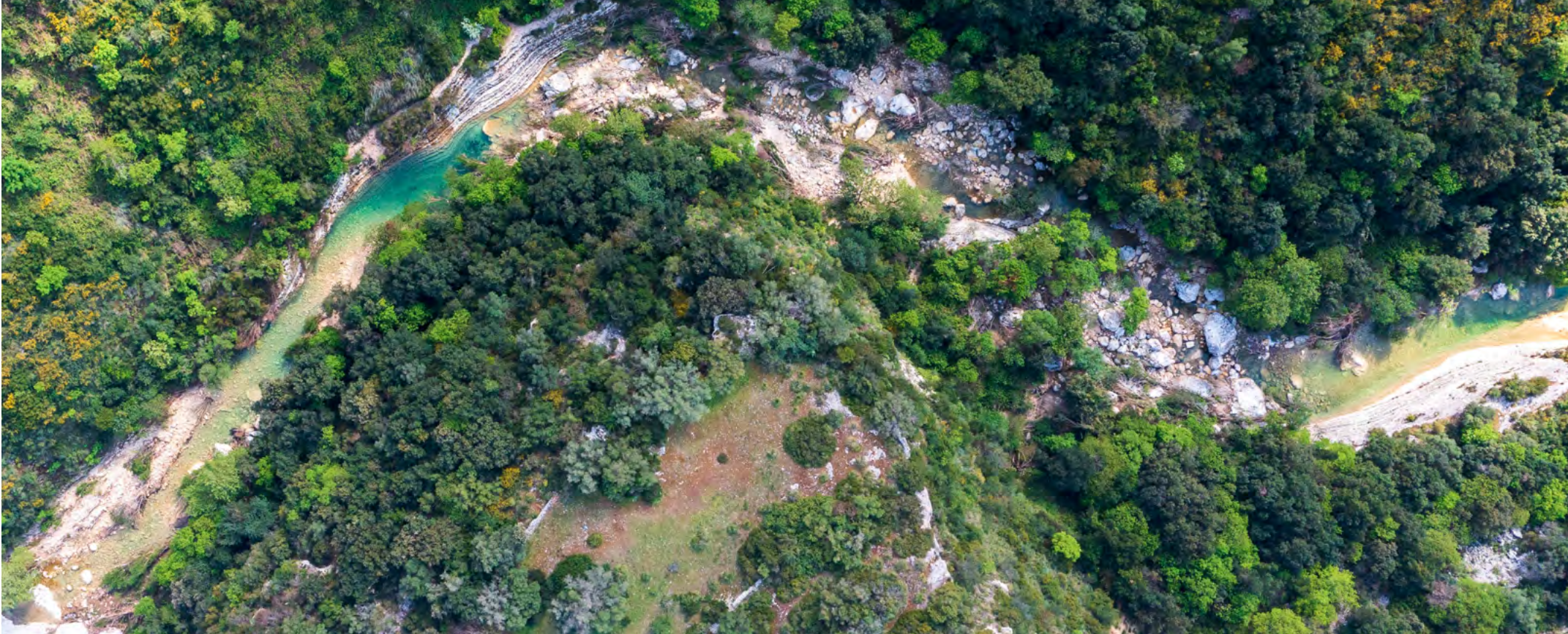
As a part of its broader supply chain engagement activities, **Breitling**, the Swiss watchmaker has worked to

fundamentally understand **how climate change and biodiversity impacts could affect local communities and operations** from which Breitling is sourcing or considering to source from. The Capgemini Invent Sustainable Futures team supported Breitling with specialist knowledge in biodiversity and catchment management so the team could better understand the local impact the extraction and manufacturing of individual commodities was having on the people and the environment. Through commodity and location-specific climate change projections, we provided insight into how localised weather and water patterns may change over time due to climate change. We brought in relevant external experts to collaborate and to develop a set of recommendations with a roadmap to begin de-risking upstream supply chain activities and help Breitling achieve its sourcing and sustainability strategies.

Another way we protect biodiversity is through our projects that support start-ups. For example, in India we supported tech start-ups in applying AI for conservation in **tracking tigers** in Telangana.

Learn more here: <https://government.economictimes.indiatimes.com/news/technology/telangana-ai-mission-capgemini-launch-mobility-ai-grand-challenge-to-foster-innovation-for-ghmc/93810918>

frog, part of Capgemini Invent, and Biomimicry 3.8 are partnering on a kickstarter approach that will enable organizations and teams to **bring science, creativity, and business together** to holistically shape products, services, and organizations that will be needed for a **regenerative future**. Nicole Hagerman Miller, Managing Director at Biomimicry 3.8, says: *“The signals are clear: business as usual is no longer working or acceptable. There is an urgent need to create a nature-positive strategy backed by meaningful action. As leaders embark on this journey, they have an incredible opportunity to learn from nature’s 3.8 billion years of research and development to get it right. The first lesson is that those businesses that will succeed will be those that start by looking holistically at biodiversity, carbon, water, soil, and human well-being as an interconnected, interdependent system. Addressing these issues in silos will only lead to increased costs and delayed positive impact.”*



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