

In collaboration with PwC



Accelerating Business Action on Climate Change Adaptation

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Foreword



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For years, climate change warnings have followed a similar pattern: Act now to prevent catastrophic consequences in the future. That message alone is no longer enough – there is also an urgent need to protect people and our planet today.

Climate change is no longer a far-off threat. It is here, affecting lives and livelihoods, particularly the most vulnerable in developing countries. The Earth has warmed 1.1°C above pre-industrial levels and the number of climate and weather-related disasters has increased by almost 35% since the 1990s – causing loss of life, hardship for people around the world, damaged infrastructure, disrupted supply chains and economic losses.

While efforts must continue to prevent further temperature increases by reducing greenhouse gas emissions (mitigation), this must be coupled with an equal focus on adapting to the climate realities of today (adaptation). As United Nations Secretary-General António Guterres said: “Adaptation and mitigation must be pursued with equal force and urgency.”

Effectively tackling climate change adaptation requires multistakeholder collaboration and business has a key role to play. We need more businesses to step up and work with government, international organizations and communities to adapt to the acute hazards facing the world today. This isn’t just good for society and our planet. It is good for business.

That’s why the World Economic Forum, in collaboration with PwC, has brought together a community of stakeholders from business, government, international organizations and civil society who are committed to helping address this issue. Together, we have developed a framework for action that businesses can use to shape their climate change adaptation approach. We want to create a business movement on adaptation, similar to the business response we have seen in the area of mitigation.

We welcome the launch of the Sharm-El-Sheikh Adaptation Agenda at the United Nations Climate Change Conference (COP27). This first-ever comprehensive global action plan rallies governments and non-state actors behind 30 adaptation goals for a resilient world by 2030. We hope the framework we have developed will support this agenda as governments and organizations worldwide implement it.

In this paper, we set out the business case for adaptation and present the framework and recommended actions. We also share a number of examples from leading companies and organizations that have implemented these actions. We hope the framework and examples will inspire many other organizations to take action now. The future of our planet depends on it.

Executive summary

At the United Nations Climate Change Conference (COP27) in Sharm El-Sheikh, Egypt, climate change adaptation took centre stage alongside mitigation as a global priority. Governments have traditionally driven adaptation, with international and non-governmental organizations also playing important roles.

Business engagement has been limited for various reasons, including a lack of understanding of the risks and opportunities associated with physical climate impacts. Yet businesses are crucial to moving the adaptation agenda forward. Given the accelerating impact of the changing climate experienced today, adaptation is now very much a business imperative. The business case for engaging in adaptation is threefold:

1. Climate change is impacting business performance. The near-term risk of substantial negative impacts is too large to ignore. A sample of 100 major businesses reported that the financial impacts due to physical climate risks are equal to about 10% of annual sales and 4% of their market value. In this context, adaptation simply means common-sense investments in business continuity that all companies should be making. Many are not.
2. Climate change will create a profound opportunity in many industries, especially as products and services provided by businesses will be needed to mobilize an effective response. Companies that act now to simultaneously create new value for both business and society stand to be the winners in the new climate economy.
3. The way governments, regions and cities adapt to climate change will shape the world in which a business operates. Businesses that

engage will not only have a say in shaping their future environments but will strengthen the governmental response and thereby improve their own future operating positions.

These three elements of the business case imply a set of actions that every business can take.

- **Enhance resilience:** Assess the impact of climate risk on the business and act to adapt and build resilience. Support and collaborate with value chain partners to do the same.
- **Capitalize on opportunities:** Grow the business by developing the products, services and business models that will be needed to respond to the climate crisis. Be sure to consider the mitigation co-benefits of adaptation solutions.
- **Shape collaborative outcomes:** Participate in multistakeholder efforts that promote action on adaptation. Engage with communities to build scalable, locally led adaptation solutions.

This paper provides details and examples to help business leaders in any industry drive these actions in their companies. It also outlines key enablers, such as integrating adaptation and mitigation into a single climate strategy, mainstreaming adaptation considerations into systems and processes, and making transparent climate risk-related disclosures.

This is just the beginning. The world needs a business movement on adaptation. To help catalyse this, the World Economic Forum is convening a community of leaders that will support each other to drive change, engage their stakeholders and share positive stories on how businesses can help the world adapt to climate change.



1

The current context of climate change adaptation

To date, businesses have mainly focused their climate action on reducing their carbon footprint (mitigation). Since the Paris Agreement came into force, more than 1,900 businesses worldwide have committed to ambitious science-based emission reduction targets.¹ They are employing a range of strategies to turn this ambition into action, both in their own businesses and across their value chains.

While this is positive and must continue in order to keep the goals of the Paris Agreement within reach, mitigation alone cannot reduce the impacts the planet is facing now and will be facing in the future. The Earth's temperature has risen more than 1.1°C and the impacts of this are already being felt.

Further, climate impacts are getting worse and will be more damaging in the future. Despite ambitious commitments to cut emissions, the global temperature rise is expected to reach 2.4-2.6°C by the end of the century,² with everyone feeling the impacts to some degree, particularly vulnerable communities worldwide.

If the world doesn't adapt now, the cost of adaptation will increase beyond humanity's collective capacity and more losses and damages will occur. There is an urgent need to accelerate global efforts to adapt and build resilience to climate change as some amount of global warming is already locked in. Put simply, adaptation needs as much focus as mitigation.



For too long, we have been lulled into this sense that maybe we can solve the problem – therefore we don't need to focus on adaptation. And if we focus on adaptation, that would be admitting we have failed. That is not the case.

Andrew Steer, President and Chief Executive Officer, Bezos Earth Fund

Weather, climate or water hazard-related disasters occurred every day on average over the last 50 years – **killing 115 people** and causing **\$202 million in losses daily.**³

Global economic output could decrease by **11-18% by 2050** due to climate change.⁴

The equivalent of **80 million full-time jobs** could be lost by 2030 because it is too hot to work or because workers must work at a slower pace.⁵

Adaptation is climbing up the global climate agenda

Adaptation has always been part of the global climate action agenda but has never been at the forefront. Current adaptation efforts are not sufficient to tackle the climate emergency. Initiatives are largely incremental, sector-specific and focused on containing current impacts or near-term risks as opposed to addressing the long-term impacts of changes in a region's or country's climate. Both developing and developed countries have started putting in place enabling policy and regulatory frameworks. However, a lack of prioritization of adaptation and a lack of sufficient finance have impacted the adaptation agenda's rate and scale of implementation. The United Nations Environment

Programme's *2022 Adaptation Gap Report* estimates that international adaptation finance flows to developing countries are 5-10 times below estimated needs. The gap is widening as estimates show adaptation costs will rise to \$160 billion–\$340 billion by 2030 and \$315 billion–\$565 billion by 2050.⁶

The good news is that adaptation is now growing in importance, slowly climbing up the global climate agenda over the last few years. The 26th United Nations Climate Change Conference (COP26) held in 2021 was a milestone, as progress was made on the Global Goal on Adaptation (GGA) established as part of the 2016 Paris Agreement, and countries

adopted the Glasgow Climate Pact, which aims to double adaptation finance from 2019 levels by 2025.

In 2022, at the COP27 meeting in November, the Egypt Presidency launched the Sharm-El-Sheikh Adaptation Agenda – the first-ever comprehensive global action plan rallying governments and non-state actors behind 30 adaptation goals for a resilient world by 2030. The agenda includes a target of getting 2,000 of the world's largest companies to develop actionable adaptation plans.

Individual countries are taking increased action – for example, at COP27, the United States committed to double its climate adaptation funding. Multistakeholder initiatives such as the UN-backed Race to Resilience, the Adaptation Action Coalition, the Marrakesh Partnership, the Global Commission on Adaptation, and the Global Resilience Partnership are also rallying adaptation efforts.

While these initiatives are positive, much more action is needed, fast. And business can play a vital part.

Business has a crucial role to play in climate adaptation

With its dynamic capacity to power innovation and change, business has a critical role to play in advancing global adaptation efforts. It has the ability to help scale solutions that are now deployed incrementally. And it can help look at problems in new ways and apply talent to innovate differently.

Some companies are increasingly starting to turn real attention to the need for adaptation. Two factors are largely driving this: first, the direct impact of acute or chronic climate change on revenues or costs; and second, the increased visibility and understanding of climate risks arising from risk analysis and increased disclosure. Through the disclosure process, many businesses are using climate scenario analysis and learning more about their climate risks. This will accelerate as the number of businesses required to disclose is expected to increase significantly under planned regulations in various jurisdictions.

An analysis of the Carbon Disclosure Project's (CDP) 2021 climate change questionnaire submissions from 100 major companies spanning 16 sectors⁷ found that:

While all the companies studied report that they have put in place systems and processes to assess and respond to climate change and its impact on business, not all have uniformly identified risks and opportunities:

- **87 companies** have identified physical climate impacts while **7 companies** have reported “transition” impacts, such as those resulting from changes in regulations and customer perception that stem from physical climate impacts.
- **Only 31 companies** have identified adaptation-related opportunities. By contrast, **70 companies** have identified decarbonization-related opportunities.



However, this increased focus on adaptation isn't yet happening consistently enough across the business community. And it isn't happening at scale. A number of challenges have prevented adaptation from really taking off in the business community:

- Adaptation does not have a unified ambition or mandate to act as a rallying point.
- Many businesses have not yet mainstreamed the systematic assessment of climate change risks and opportunities.
- Businesses may not have the information and resources to assess and act on the problem.⁸

- They may not recognize adaptation as a business imperative, instead viewing it as a corporate social responsibility initiative.⁹
- They may not see a return on investment or perceive it to be low.¹⁰

This context requires a deeper explanation of the role of business in adaptation. What should businesses be doing and how can they benefit by taking timely action on adaptation? What impacts would a business movement on adaptation have on wider adaptation efforts and how could it be facilitated? This white paper attempts to initiate this discussion.

2

The case for business action on climate change adaptation

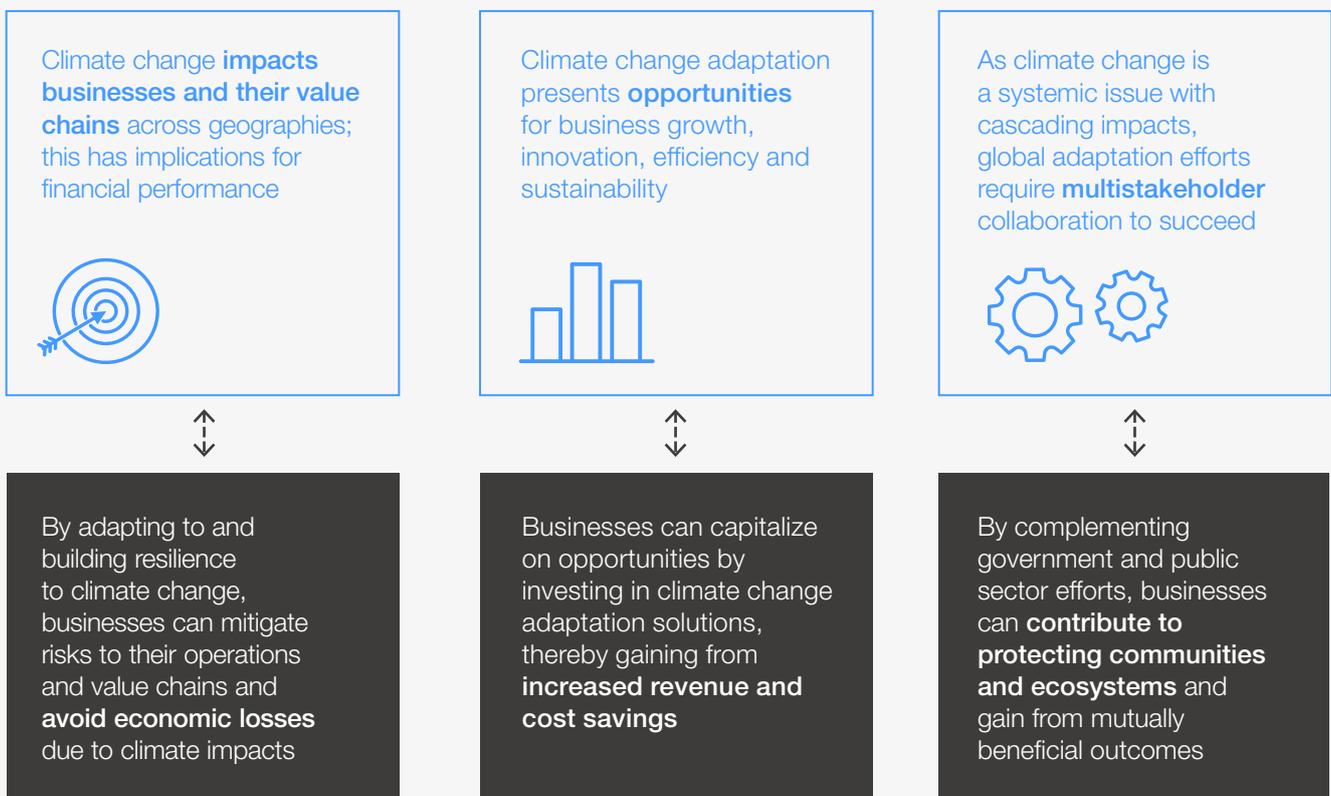
Climate change can create significant disruptions in business operations, value chains and markets. But treating it simply as a risk misses the larger picture. Climate change impacts and strategies to address them also give rise to opportunities – to innovate, grow and drive efficiency and sustainability. Changing demand patterns, the development of new kinds of assets and the evolving regulatory environment will drive businesses across sectors to rethink their offerings and actions – much like what digitalization has done over the last decade.

Given that businesses are part of an interconnected system and need a thriving society to prosper

and grow, they should look beyond risks and opportunities and contribute to building resilient ecosystems and communities. Further, as governments face the burden of increasing adaptation costs, there is a need for businesses to step in to catalyse adaptation efforts. Opportunities for public-private collaboration will emerge that could prove transformational for businesses and society alike.

Figure 1 summarizes the business case for adaptation. The following sections discuss each element in detail.

FIGURE 1 Why businesses should focus on adaptation



By investing in adaptation, companies can lead and help galvanize a system response, while protecting their business

Climate risks to business are ubiquitous, complex and costly

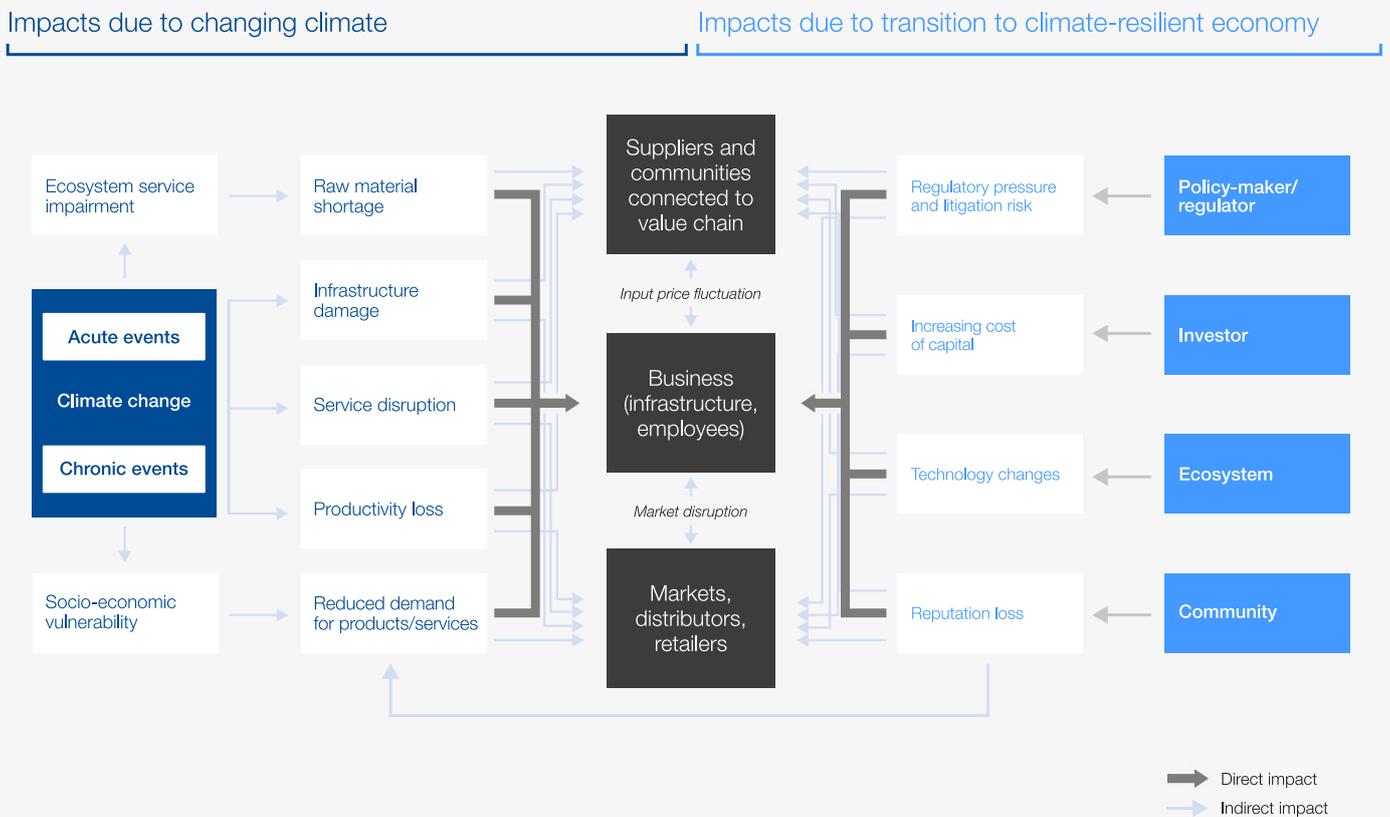
Climate change impacts are present everywhere – spanning the value chain and beyond. Sometimes these impacts are direct, disrupting operations. For example, a leading global financial institution reported that multiple extreme weather events in financial year 2021 disrupted its US and Asia operations and damaged its financial centres.¹¹

The impacts may also be indirect, resulting from business interactions with upstream and downstream value chain partners. Indirect impacts can also occur via the communities on which businesses depend for workers, raw materials or natural resources. Food and beverage companies

report that heat wave-induced impacts on crop yield and quality can disrupt the supply of raw materials and thereby reduce production capacity. Electricity generation companies report business losses due to transmission and distribution network damage caused by extreme weather events. A global travel card service provider reports that decreased travel in the wake of climate disasters could lead to possible revenue loss.

Figure 2 presents an illustration of how climate change impacts businesses and their upstream and downstream value chain.

FIGURE 2 Climate change impacts on business



In addition, climate change impacts are complex and show up differently depending on factors such as:

- **Location** – The latest evidence suggests that climate variability and extreme weather events have occurred across the majority of land regions and this will continue.¹² However, the hazards businesses are exposed to will differ based on the location. For example, a multinational investment bank with a footprint in the US stated that it will be impacted by sea

level rise as its real estate footprint is located in areas just above or at sea level. But a large electronics manufacturer with a presence in South Asia reported that it is exposed to frequent typhoons and cyclones that could possibly lead to asset damage, service disruption and workforce productivity.

- **Nature of the business** – Financial institutions are impacted through the exposure of their portfolios, whereas companies in the services sector will be affected due to impacts on

the workforce. A top insurer reports that climate disaster impacts on product pricing, reimbursement and underwriting strategies increase the amount of compensation the company has to pay. Information technology companies with large workforces report that extreme weather events can lead to higher absenteeism, reduced working hours and adverse health impacts, significantly affecting their revenues as the workforce is critical to their operations.

- **Dependence on natural resources** – A global beverage company reports that its global production could be affected by water stress and a decrease in agricultural yield. Similarly, global mining and metal companies report that climate change impacts on water resources could jeopardise operations.
- **Criticality of infrastructure, supply chain, network and services exposed to climate hazards** – A prominent aerospace company with more than 12,000 suppliers around the world reports that wildfires, tornadoes and heat waves disrupted its supply chain in 2020. A pharmaceutical company reports that while its facilities were well prepared, damage to public infrastructure due to a hurricane in 2017 resulted in business disruption.

In addition, the size of the business, its access to people, skills and resources and previous experience in dealing with climate change and natural disasters will lead to differing impact levels. Small and medium-sized enterprises (SME) are more vulnerable compared to multinational firms as many SMEs lack robust risk assessment and management systems. Also, the data-intensive and technology-driven nature of the climate risk assessment and investment needed to implement adaptation strategies make it challenging for them to identify and act on current and future climate impacts.

As a consequence of these impacts, businesses across sectors and geographies face a diverse set of risks. Climate risks can be categorized as:

- **Physical risks** stemming from extreme weather events and long-term shifts in climate patterns that cause infrastructure damage and service disruption, and
- **Transition risks** arising from changes in policy and the legal environment, technology improvements or innovation, as well as consumer preferences and the associated supply and demand for products/services. Examples of transition risks include increased coverage of coastal zone management regulations restricting coastal economic activity (regulatory risk) and requirements to transition to climate-resilient building materials (technology risk).

Climate risks can increase direct and indirect costs and capital expenditure, thereby materially affecting financial performance. Businesses may face decreased revenues due to reduced demand or production capacity due to climate impacts. They may also be exposed to decreased asset value or useful asset life, decreased access to capital, increased credit risk, and increased cost of capital/insurance.

By implementing adaptation actions to mitigate risks, businesses can avoid future economic losses and thereby reduce the implications on their financial bottom line. If done right, these actions can be some of the most cost-effective investments a business can make.¹³ In 2018, the Global Commission on Adaptation estimated that every \$1 invested in adaptation could result in \$2–10 in net economic benefits.¹⁴

BOX 1 Physical and transition risks reported by the 100 companies selected¹⁵

70 companies identified **acute physical risks** while 51 companies identified **chronic physical risks**.

The reported total financial impacts of physical risks fall in the range of **\$664 billion to \$772 billion**.

The reported **financial impacts** account for **about 10% of the annual sales** of the selected companies and **about 4% of their market value**.

These businesses also estimated the **cost of managing** these risks at **\$36 billion**.

Change in the customer profile, change in demand for products/services, legal obligations and reputation loss are identified as some of the sources of transition risks.

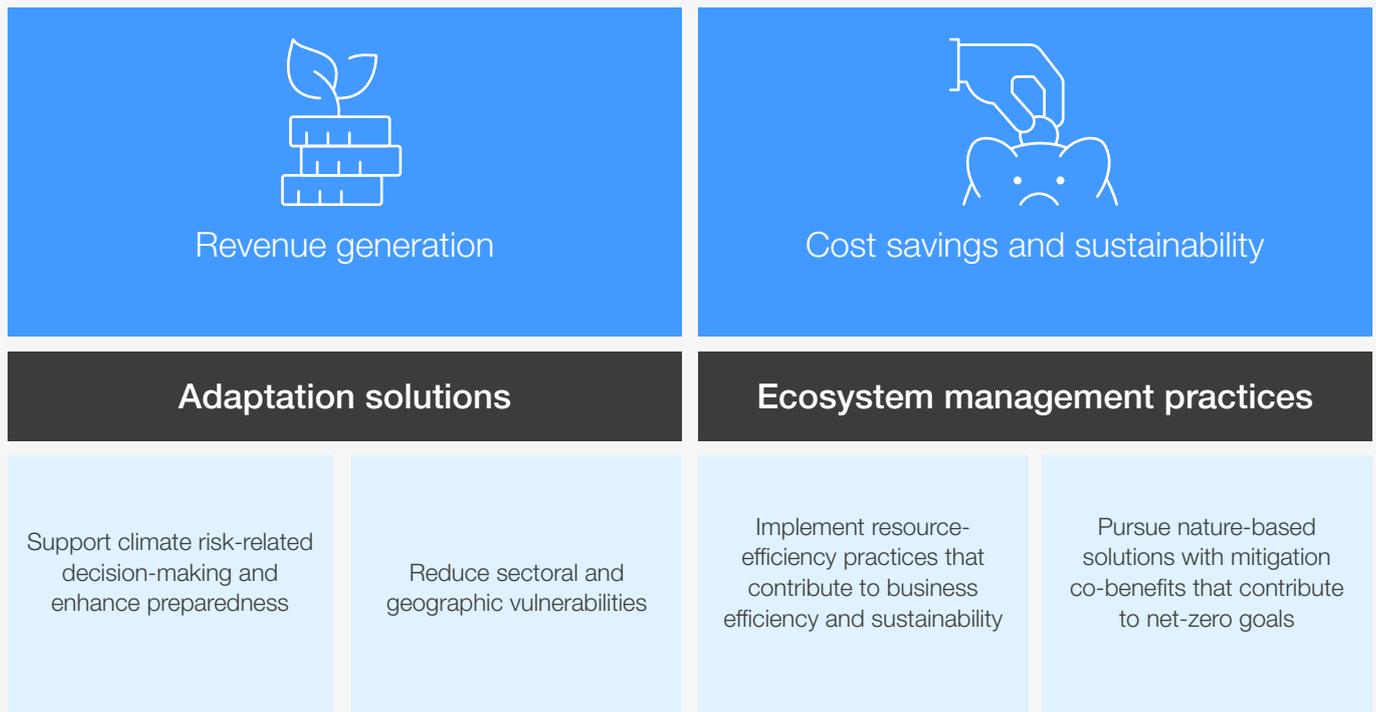
Only **2 of the 7 companies** that identified transition risks quantified the impact.

Climate change adaptation opens avenues to efficiency, growth, innovation and sustainability

Adaptation presents opportunities for businesses to expand their footprint, achieve efficiency gains, innovate for the future and enhance long-term sustainability. These opportunities can be categorized into two principal types: 1) adaptation

solutions that can generate revenue; 2) ecosystem management practices that can result in cost savings and contribute to business sustainability (Figure 3).

FIGURE 3 Adaptation opportunities for businesses



1 Adaptation solutions: Large-scale adaptation efforts by the public and private sectors are needed to protect businesses, communities and ecosystems from the impacts of climate change across rural, urban and coastal areas. This requires working together to invest in adaptation in sectors such as water, agriculture and crop production, fisheries and aquaculture, forestry and biodiversity, health and infrastructure. There is also a need to transition to a climate-resilient development model that integrates adaptation and mitigation. These adaptation efforts will generate demand for products and services and open new markets – all of which can help businesses generate revenue and achieve efficiency while contributing to the resilience of ecosystems and communities.

Adaptation solutions can be classified as:

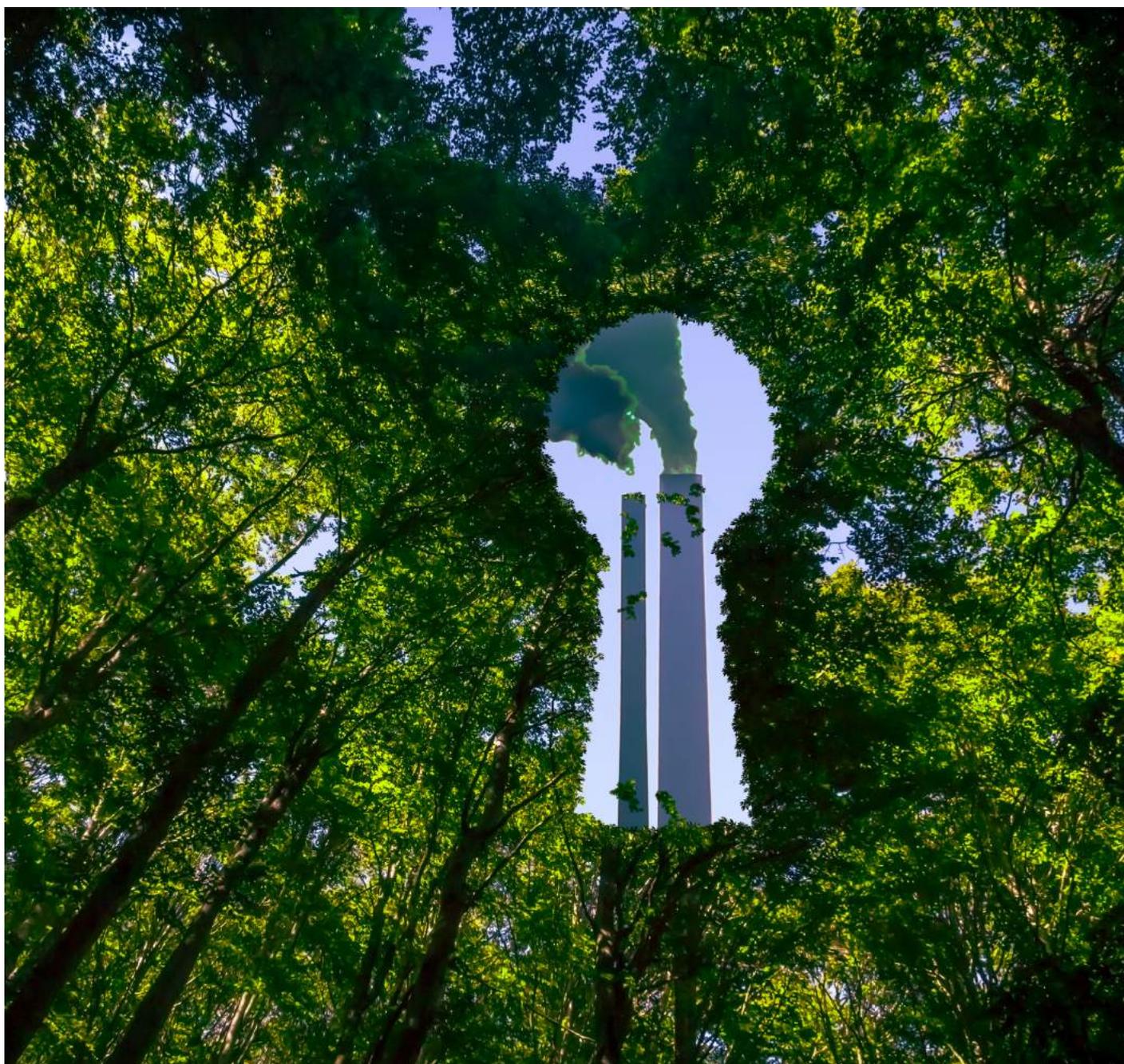
- Those supporting climate risk-related decision-making and/or enhancing the preparedness of governments, businesses and communities for climate hazards across all sectors; and
- Those reducing risk and vulnerability of high-risk sectors and communities to climate change.

Examples of solutions that support climate risk-related decision-making and/or enhance preparedness

- Climate/weather data services needed for modelling future climate change and impacts
- Software and hardware that helps generate and process climate/weather data
- Digital tools for modelling climate data, assessing climate risks, vulnerabilities and the effectiveness of adaptation interventions
- Early warning systems (EWS) that help communities prepare for extreme weather events
- Climate risk insurance products that offset climate risk and enhance the resilience of communities, businesses and countries alike

Examples of solutions that reduce sectoral and geographic vulnerabilities

- Water – water conservation structures, smart-metering
- Agriculture – new and improved seed varieties, pest and nutrient management
- Infrastructure – coastal protection and flood management structures, insulation systems, cool roofs
- Energy – battery storage, upgraded energy infrastructure solutions
- Disaster – disaster recovery, restoration and crisis management services and related products
- Forestry and biodiversity – drones, non-timber forest products



While some leading businesses are in the market with innovative adaptation solutions, most are focused on decarbonization solutions and very few are looking at adaptation solutions. While there is no clear picture yet of the size of the opportunity, rising spending on adaptation and commitments by global players to scale up adaptation finance support a likely acceleration in demand for adaptation solutions in the coming years.

2 Ecosystem management practices: Businesses can achieve cost savings by implementing ecosystem management practices (measures that conserve and restore natural resources and ecological services) across their operations and value chain. In addition to a positive impact on the financial bottom line, such actions contribute to sustainability and the net-zero transition. Actions include:

Resource efficiency and conservation measures: The efficient and sustainable extraction, use and disposal of raw materials (e.g. water, agri-produce, energy) is a good adaptation strategy that helps businesses drive efficiency and save costs. Similarly, conserving natural resources through measures such as rainwater harvesting and forest conservation also helps in adaptation and cost savings.

Examples

- Water conservation interventions in the upstream value chain or water efficiency measures within operations reduce demand and

ensure a steady supply of water even during times of water stress.

- Grid modernization by energy utilities reduces the restoration time following power outages during extreme weather events and enhances grid efficiency.

Nature-based solutions (NbS): These are solutions that complement or provide an alternative to grey infrastructure¹⁶ for adaptation. These solutions also sequester carbon, thereby contributing to achieving the net-zero goals of the business. For example, reforestation can protect against floods as well as remove carbon. Furthermore, businesses may be able to monetize NbS projects by selling credits under different carbon market mechanisms.

Examples

- Agri-businesses or businesses dependent on agriculture for raw materials can adopt regenerative agricultural practices.
- Afforestation and reforestation can help with soil moisture conservation and improve the groundwater table.
- Businesses operating in areas prone to rising sea levels and cyclones can work on mangrove protection.
- Businesses located in areas prone to urban flooding can work on wetland restoration.

BOX 2 Adaptation-related opportunities reported by the 100 companies selected¹⁷

27 of the 100 companies identified **adaptation-related opportunities**.

These companies reported:

- Actual/potential increases in revenue due to enhanced production capacity, increased demand for products and services, access to new markets and beneficial outcomes of climate change;
- Possible cost savings from resource-efficiency measures, process enhancement and sustainable sourcing.

74% of the companies that identified opportunities reported **increased revenue** from adaptation solutions to the tune of **\$186 billion to \$188 billion**.

These opportunities could be realized at a cost of **\$7 billion**.

About 96% of the revenues reported are from solutions that support climate risk-related decision-making and enhance preparedness for climate hazards.

Some of the adaptation solutions reported include digital agriculture solutions, resilient telecom network infrastructure, heating, ventilation and air conditioning (HVAC) systems, and insurance products.

30% of the companies reported **cost reductions** nearing **\$75 billion** as a result of implementing **resource efficiency and conservation measures** in their operations and value chains.

Multistakeholder efforts are needed for effective adaptation

Businesses are dependent on ecosystems, communities, infrastructure and public utilities for the inputs needed to produce goods and deliver services. The recent *Assessment Report (AR6)* from the Intergovernmental Panel on Climate Change (IPCC) reports that all these inputs face widespread and pervasive negative impacts due to climate change. As climate change is a systemic issue with cascading impacts, businesses won't be immune even if they are fully engaged in managing their risks and capitalizing on opportunities.

Governments are now hard at work formulating policies, developing adaptation projects and allocating resources to respond to these challenges. Given that these efforts will impact so many critical facets of their operations and supply chains, businesses need a seat at the table.

It is also important to acknowledge that adaptation efforts will be too expensive for governments and organizations to take on alone. Resource constraints will only become worse as risks become more acute. This will hinder adaptation efforts and diminish the ability of governments to provide the essential services needed for a functioning society. For example, building resilient infrastructure and utilities (roads, electricity, water) is traditionally seen as the responsibility of the government. In the face of climate disasters, governments may not have the capacity or agility to construct, maintain, repair or reconstruct these.

These reasons point to a greater need for public-private collaboration, as well as opportunities. Businesses can complement the efforts of the government, public sector and other stakeholders engaged in adaptation using their knowledge, expertise and resources – and there is a strong economic imperative for them to do so. As the Global Commission on Adaptation (GCA) states, climate-proofing existing and building new infrastructure will require blended public-private approaches that share the costs and benefits – with the benefits outweighing the costs by four to one.¹⁸

Businesses can also participate in multistakeholder efforts by providing expert knowledge, such as about the relationship between specific infrastructure or transport networks and economic activity. They can do this through their reach: businesses are present in all regions of the world in communities either as distributors, employers, or sponsors or implementors of community development programmes. And they can bring specialized capabilities and partnerships, in particular, to drive rapid innovation or the scaling of successful interventions. By engaging collaboratively with governments and other stakeholders, businesses can strengthen outcomes for everyone. They can contribute to saving lives and livelihoods while ensuring their continuity and future success.



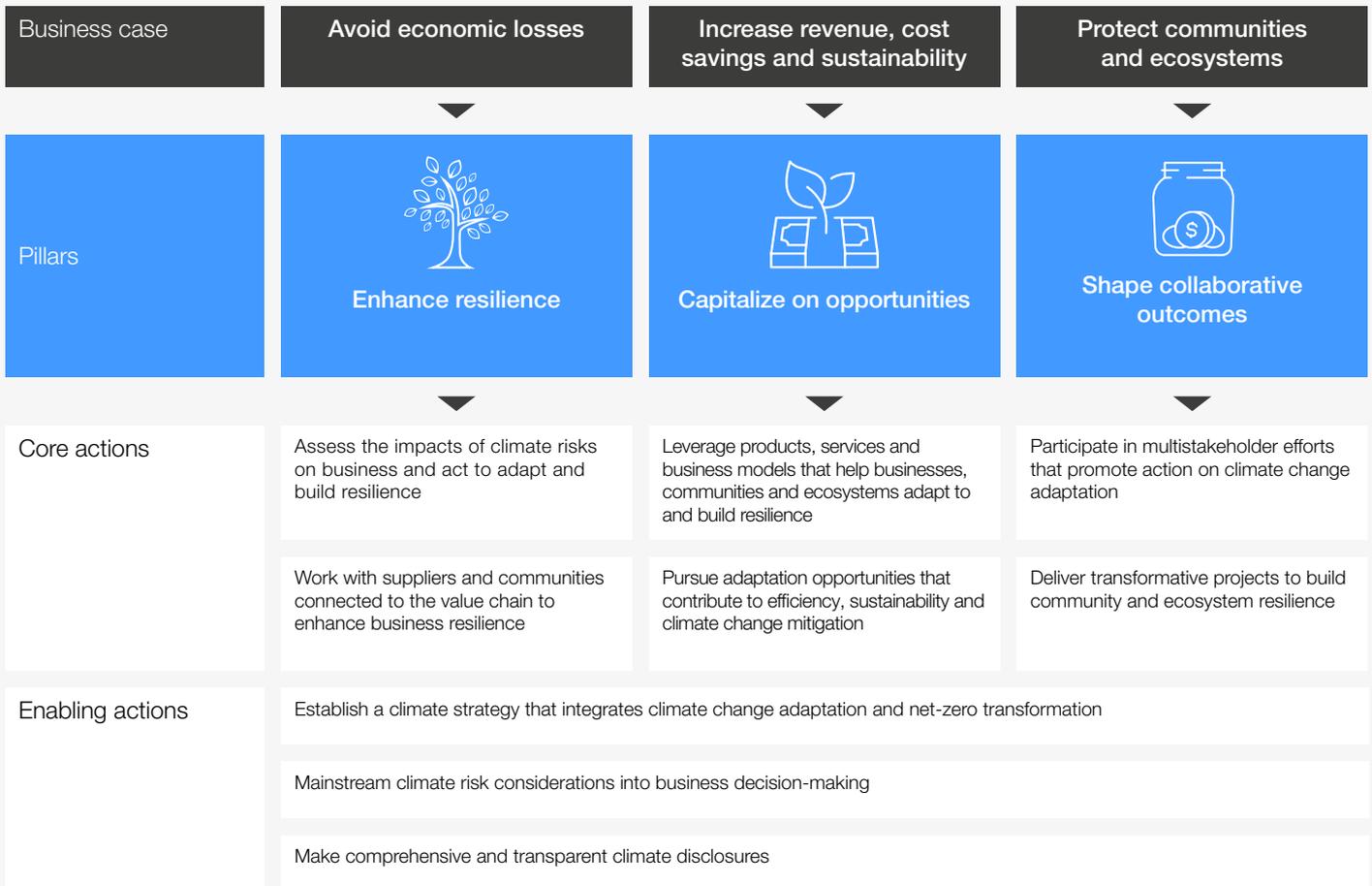
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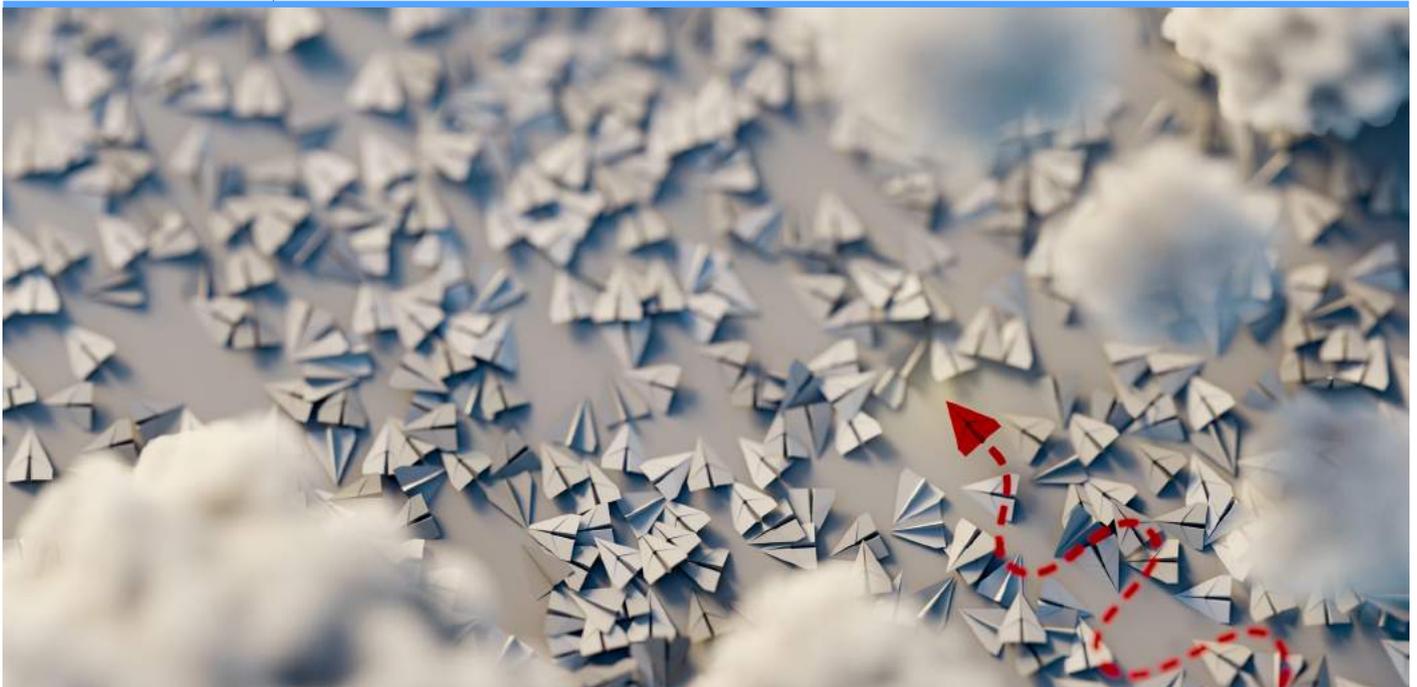
A framework for action on climate change adaptation

The pressing case for business action is clear. So how should businesses respond? This white paper presents a framework that businesses can use to develop their climate change adaptation approach (Figure 4).

Each business should evaluate the pillars and core actions that apply to their context and focus on those that are the most relevant and impactful to them. Businesses can follow the enabling actions to create a favourable business environment to implement them. They should do this by working with stakeholders whose knowledge and insights are crucial for action on adaptation.

FIGURE 4 Framework for business action on adaptation





Assess the impacts of climate risks on business and act to adapt and build resilience

Mitigate risk by adapting and building resilience to current and future climate change impacts.

Measures

- Conduct climate risk assessment of operations, including scenario analysis
- Identify adaptation and resilience measures based on the climate risk assessment
- Implement the measures, monitor progress and evaluate their effectiveness

Developing a risk-informed business resilience strategy

Nestlé, a global food and beverage company, undertook climate change risk assessments at the site, project and supplier levels. Having identified climate change as a key risk, the company used these assessments to better understand and manage climate-related risks and opportunities. It also used climate scenario analysis to better understand the impact of climate change over long time horizons. Nestlé simulated physical climate risk for the period 2025 to 2040. The analysis considered a temperature rise beyond the 1.5°C target by 2040 to analyse impacts on direct operations due to damage to facilities and production issues due to input supply shocks.

Informed by the climate risk assessment and scenario analysis, Nestlé developed a comprehensive climate strategy outlining its efforts to mitigate the physical risks of climate change to its business. The company also developed site-specific loss prevention, business continuity and water reduction strategies as measures to manage risks to facilities. It promoted sustainable sourcing, including promoting regenerative agriculture in the value chain. This climate strategy has been integrated into Nestlé's existing systems and processes, including risk management and executive compensation. It is implementing the adaptation measures identified under the strategy across all geographies and markets where the company operates.



Work with suppliers and communities connected to your value chain to enhance business resilience

Involve the larger system connected to your value chain to ensure business continuity.

Measures

- Conduct value chain climate risk assessments to identify hotspots
- Conduct community- and ecosystem-level climate risk assessments to prioritize adaptation areas
- Support value chain stakeholders with technical and management skills and financial support
- Collaborate with communities to ensure the sustainability of critical natural resources

Enhancing business resilience by supporting farmers to adapt to climate change

Mahindra & Mahindra, an agricultural machinery manufacturing business, provides free advisory, digital and precision-farming solutions to farmers through an initiative called Krish-e. These solutions are offered through physical centres or through an easy-to-use digital app available in eight local languages. The company is investing in Krish-e with the objective of protecting farmers' incomes as their ability to buy a tractor or other machinery is dependent on crop yields.

Krish-e solutions are designed keeping in mind the need to prevent detrimental climate change impacts on agricultural productivity. For example, Krish-e helps farmers transition to sustainable agricultural practices by providing

personalized support on crop planning, seed selection, nutrient management, irrigation planning, disease and pest/insect management, weed planning and other operational aspects. This can enhance productivity and thereby reduce the vulnerability of farmers to climate change. Information on extreme weather alerts, the onset of seasons, disease and insect forecasts, among others, can help farmers plan their crops in ways that help them avoid crop damage and loss.

Currently, Krish-e is actively engaging with more than 500,000 farmers. About 25,000 acres of demonstration plots have been developed with farmers and over 100 physical centres established throughout the country. The company plans to scale up this programme across India and increase outreach significantly.



Leverage products, services and business models that help businesses, communities and ecosystems adapt and build resilience to climate risks

Respond to increasing demand for products, services and business models that enhance the resilience of communities and businesses.

Measures

- Review how existing or new products and services can support adaptation
- Invest in adaptation solution research, development and innovation
- Collaborate with other businesses and stakeholders to develop new adaptation solutions and to create a system that fosters innovation and scales up solution deployment

Developing a digital twin for climate risk-informed decision-making

One Concern, a resilience analytics technology company, has built a digital twin of the United States and one of Japan, capturing the details of every piece of infrastructure in the countries, over a trillion data points. The digital twins serve as a multi-hazard platform that captures climate risk and extreme event impacts at the asset, community and portfolio levels. The platform also identifies the ripple effects of a hazard across complex networks.

The One Concern platform helps businesses visualise and analyse how climate change impacts their assets and networks.

It also allows businesses to compare resilience across assets in their own portfolio, consider external vulnerability at scale and measure themselves against industry benchmarks. Using such advanced risk analytics, businesses can make informed decisions for resilience building and modify existing valuation and risk processes to incorporate climate and natural disaster resilience. This can also help organizations reduce their emissions through precision mitigation.

The platform has helped multiple clients from the insurance, banking, commercial real estate and infrastructure industries as they engage their enterprise customers in adaptation planning.

Incentivizing climate-positive farming practices through the Agoro Carbon Alliance

Yara International, a leading global crop nutrition company, has established a global business that helps farmers earn revenue through positive climate action. The Agoro Carbon Alliance provides agronomic expertise to farmers and ranchers to implement conservation farm practices that improve soil health, build resilience to extreme weather events, enhance crop yield, protect biodiversity and improve water quality. Additionally, the transition to these agricultural practices leads to carbon sequestration in the soil.

Agoro Carbon provides support to farmers in monetizing the sequestered carbon and adding a new revenue stream to their operations. It does this by helping farmers register their farm carbon credits registered with different global carbon registries, securing buyers for credits after certification and compensating farmers for the carbon credits generated. Agoro Carbon sells carbon credits to businesses that are looking for high-quality, nature-based carbon credits with both mitigation and adaptation benefits.

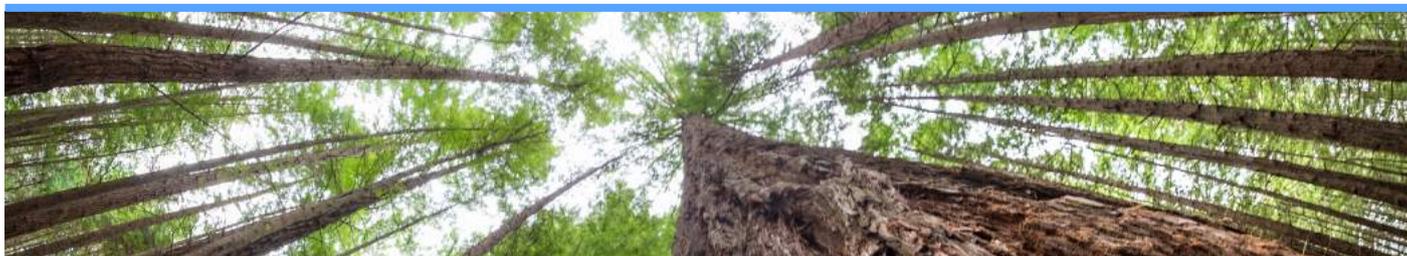
To date, Agoro Carbon has distributed more than \$12 million in payments to US farmers and ranchers and is now focusing on expanding operations in new regions.

Designing a new type of insurance for adaptation

The Swiss Re Group provides insurance solutions to help clients scale up nature-based solutions for adaptation. Swiss Re's approach is to apply insurance products to adaptation investments, leveraging both existing and innovative insurance solutions.

One example of the insurer providing cover for NbS investment is the Construction All Risks (CAR) insurance policy issued for the dyke reinforcement project implemented in the Netherlands in 2019. The Prince Hendrik Sand Dyke was at risk of failure due to rising sea levels. An NbS intervention consisting of adding 5 million cubic metres of sand and planting marram grasses was developed to reconstruct and protect the dyke from erosion. In addition to building the resilience of the dyke, this intervention enhances the local natural habitat. Swiss Re's policy protected the dredging company and stakeholders from the risks associated with the construction of the NbS – offering a payout in the event the construction was delayed or failed.

Through its underwriting nature initiative, Swiss Re has also developed a parametric insurance product to help protect the coral reef off the coast of Mexico's Yucatan Peninsula. In partnership with the Nature Conservancy and regional governments of Mexico, the insurer designed a solution that would issue payouts to a trust consisting of public and private actors that maintain reefs. To ensure the rapid disbursement of funds, payouts are triggered by wind speed measurements rather than the assessment of damage following an incident. This NbS was the world's first-ever insurance solution to protect a coral reef.



Pursue adaptation opportunities that contribute to efficiency and sustainability

Implement adaptation interventions to drive efficiency and sustainability; leverage adaptation opportunities that also contribute to the net-zero transition.

Measures

- Prioritize adaptation interventions related to natural resource conservation, resource efficiency and climate change mitigation, while developing a climate change strategy
- Explore the monetization of adaptation projects that sequester carbon under carbon market mechanisms
- Work with other businesses and communities to implement these strategies



Participate in multistakeholder efforts that promote action on climate change adaptation

Catalyse comprehensive government, stakeholder and community adaptation action by leveraging unique competencies, resources and scale.

Measures

- Engage with governments by participating in policy-making and planning processes
- Collaborate with national, regional and local governments to implement adaptation strategies
- Collaborate with industry players, community and indigenous leaders, academia and development agencies to promote action on adaptation
- Contribute insights and experiences to support global adaptation efforts

Co-financing the construction of seawalls to prepare for sea level rise

Meta, a multinational technology company based in Menlo Park, California, has joined a multistakeholder effort to secure its home community against the impacts of climate change. The Strategy to Advance Flood Protection, Ecosystems, and Recreation along the San Francisco Bay (SAFER Bay) programme will construct green and grey infrastructure to build resilience to increased flooding and sea level rise.

The initiative is a partnership between Meta, the City of Menlo Park and the Pacific Gas and Electric Company. Meta has committed to costs associated with constructing levees around its campus and neighbouring community. Its financial

contribution counts as the “local matching fund commitment” that SAFER Bay needs to unlock the maximum available grant from the Federal Emergency Management Agency (FEMA) for the project.

In addition to enhancing the resilience of Meta's campus, the project protects critical infrastructure, including one of the substations of the Pacific Gas and Electric Company and segments of state highways. The project also provides an opportunity for increased recreational access to the San Francisco Bay shoreline and enables habitat restoration work in a wildlife refuge. Further, the project protects local disadvantaged communities from debilitating interruptions in critical electricity supply and transportation access.



Deliver transformative projects to build community and ecosystem resilience

Play a role in delivering on the Global Goal on Adaptation by co-creating adaptation projects with and for communities and ecosystems that are not directly part of their value chain.

Measures

- Join initiatives that focus on adaptation, such as the Race to Resilience
- Design, invest in and implement adaptation projects with other businesses, the public sector or non-state actors
- Add a climate lens to existing community programmes to address the vulnerabilities of beneficiaries
- Provide technical and financial support to community and non-governmental organizations or others involved in adaptation

Developing a scalable partnership-based model for adaptation

Arup, a global professional services firm, collaborated with Mexico-based non-profit organizations to protect low-income communities from the impacts of heat stress aggravated by climate change. Arup leveraged its technical and strategic capabilities to provide communities with access to affordable and sustainable passive cooling strategies. Through the Arup Community Engagement Global Challenge, the company awarded \$330,000 in in-kind funding for this project. This supplemented a \$125,000 grant awarded through the Million Cool Roofs Challenge that supported the non-profits' labour, materials and equipment expenses.

Arup undertook technical studies and field measurements to study the effectiveness of passive cooling strategies, identified funding strategies to make the adoption of cool roofs financially feasible on a large scale and distributed information on the self-construction of cool roofs to homeowners through online platforms. Further, the company worked with local partners to distribute prepaid cards to families that they can use to buy cool roof materials and tools. Local partners supported these families with information and training.

A key goal of the project was to build a support network of local public and private sector partners to scale up its implementation. During the project, 20 partners were involved in pilot studies, policy assessments and knowledge dissemination. Arup has now developed a toolkit for implementing cool roofs

that individuals and organizations can use. In the long term, the goal is to influence policy-making in the country to catalyse action beyond this project.

Driving adaptation actions through climate finance

PwC India, through the PwC India Foundation (PwCIF), is funding a project that supports enhancing the resilience of communities vulnerable to climate change as part of its corporate social responsibility initiative. Gorakhpur Environment Action Group (GEAG), a non-governmental organization based in India, is implementing this project. The financial support is aimed at the development of flood resilience plans, the promotion of climate-resilient agricultural practices through farm-based interventions and farmer capacity building. Other project components include establishing a safety net for communities by enabling access to government welfare programmes and implementing an Early Weather Communication Channel.

The project supports farmers in two villages in the state of Bihar with a total population of over 40,000. The local communities in these villages belong to socio-economically disadvantaged groups and are dependent on agriculture for their livelihoods. Major parts of the agricultural land in this region are low-lying and therefore prone to frequent flooding that damages the crop and adversely impacts the socio-economic conditions of the communities living there. The implementation of this project protects the community from floods, helps farmers increase agricultural yields and enhances their social security.

Enabling actions

Businesses should implement organizational actions to create a favourable environment to enhance business resilience, capitalize on opportunities and catalyse systemic action.

Establish a climate strategy that integrates climate change adaptation and net-zero transformation

Adopt a holistic approach that looks at adaptation and net-zero transformation as integral and equally important climate strategy components and draws synergies between the two.

Key measures

- Formulate a climate policy that integrates mitigation and adaptation strategies
- Communicate the policy and strategy to all stakeholders
- Establish a governance mechanism that includes board oversight

Mainstream resilience considerations into business decision-making

Integrate climate change risks into business decision-making, establish systems and processes focusing on planning and implementing adaptation strategies, and allocate financial and human resources.

Key measures

- Integrate climate risk assessment and adaptation planning into risk management and business continuity planning
- View climate risk and adaptive capacity as criteria for new investments and when reviewing existing projects
- Assign climate action roles and responsibilities at all management levels
- Build employee skills in and knowledge of adaptation
- Link management and staff compensation to successful climate strategy implementation
- Prioritize financial resource allocation and technical expertise for successful climate strategy implementation

Make comprehensive and transparent climate disclosures

Gain the trust of investors and customers by publishing climate disclosures

Climate reporting has the potential to be a strategic lever in driving value creation and ensuring the systems, processes and information are in place to inform decision-making and deliver sustainable outcomes. Businesses operating in many geographies are already – or will be – mandated to disclose their climate risks and associated financial implications and the steps they are taking to manage them.

Key measures

- Develop climate disclosures aligned with the Task Force on Climate-related Financial Disclosures (TCFD) and other existing or emerging guidance

4

Call for action

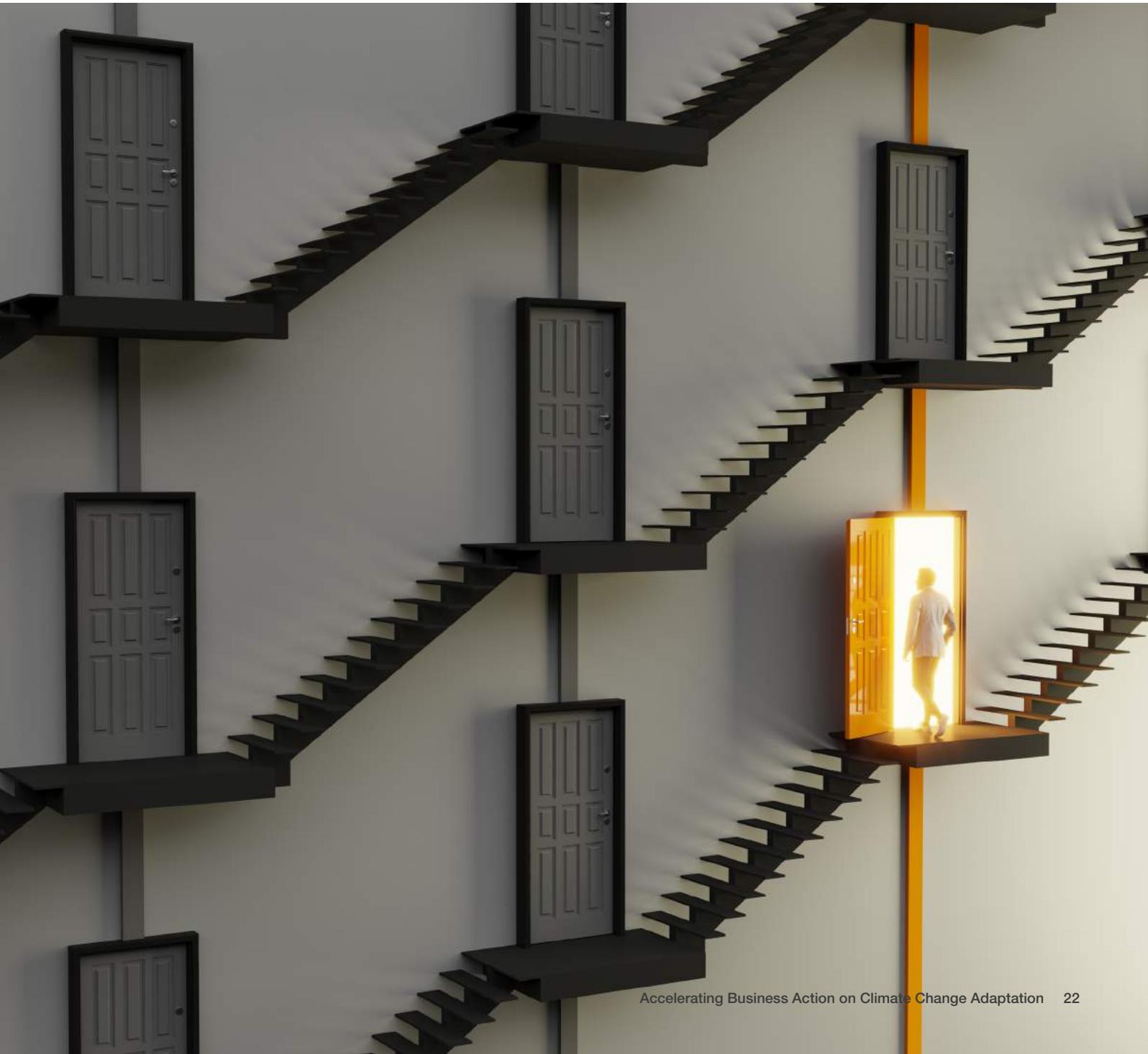
This white paper is a call for businesses spanning sectors and geographies to engage in adaptation.

The impacts of climate change are here today – and they will only get worse over time unless business acts now to curb emissions. Now is the time to integrate adaptation into overall corporate climate strategies – alongside an equal focus on mitigation:

- Use the business case to gain a better understanding of adaptation and the framework to inform your adaptation approach.
- Manage your climate risks and explore adaptation-related opportunities.

- Contribute to broader adaptation efforts aimed at making communities, ecosystems and economies more resilient.
- Join a growing community of businesses committed to taking action on adaptation.

Business needs to step up and play its part. This is not just in the interest of society and the planet. Business needs a healthy planet and thriving society to be successful and sustainable – now and over time.



Annex

To understand how businesses perceive risks and opportunities associated with adaptation, this paper reviewed the responses of 100 World Economic Forum partners to the Carbon Disclosure Project's (CDP) 2021 climate change questionnaire. The companies were selected based on three key criteria: size in terms of market capitalization, sector representation, geographic representation and data availability.

Using the World Economic Forum's classification of industries, 16 sectors (see below) were selected, ensuring diverse representation. Within each sector, those Forum partners that ranked highest in terms of market capitalization as per the 2022 Forbes Global 2000 were chosen. From this list, companies that did not participate in the 2021 CDP disclosures were removed and replaced with the next largest company within the sector that did participate. Where there were not enough companies within the sector that form part of the Forbes Global 2000 and submitted publicly available CDP responses, the selection was extended beyond the Forbes list.

The market value of the selected companies adds up to approximately \$20 trillion in 2022. For the same year, revenue totalled about \$8 trillion. These companies have a footprint on 6 continents – Asia, Africa, North America, South America, Europe and Australia. Their CDP submission covers their operations and value chains across the globe.

These 16 sectors are:

1. Advanced manufacturing
2. Aerospace
3. Agriculture, food and beverage
4. Automotive and new mobility
5. Banking, capital markets, institutional investors and private investors
6. Chemical and advanced materials
7. Digital communications
8. Energy utilities
9. Energy technologies
10. Health and healthcare
11. Information technology

12. Insurance and asset management
13. Mining and metals
14. Oil and gas (independents, majors) and oil field services
15. Retail, consumer goods and lifestyle
16. Supply chain and transportation

Information was extracted from CDP responses available on the CDP website for the questions listed below.

- Has the company assessed climate-related risks and opportunities?
- Has the company identified acute and chronic physical risks? If yes, what is the nature of the impact? What is the financial impact figure reported for the identified risks?
- Has the company identified any transition risks related to adaptation (related to current or emerging regulations, technology, legal, market and reputation)? If yes, what is the nature of the impact? What is the financial impact figure reported for the identified risks?
- Has the company identified any opportunities related to adaptation? If yes, what is the nature of the opportunities? What is the financial impact figure reported for the identified risks?

The information provided by companies with respect to the type of risk and financial impact were manually checked. Based on the textual description provided by the company, some of the responses were revised. For example, if the company incorrectly identified sea level rise as an acute physical risk, the responses were revised. Wherever generic solutions were reported as adaptation-related opportunities, those were excluded. All financial values were converted to US dollars at rates prevailing on 12 September 2022.

As this analysis is based on self-reported information by companies and there is no standard methodology for financial impact estimation, it is possible that the information reported by these companies is not fully accurate or comparable. However, the information gives an indication of the magnitude of risks and opportunities.

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