BSR Climate Scenarios

A tool to drive resilient business strategy

Updated 2023 with NGFS Phase III Scenarios

BSR

Table of Contents

01

Introduction

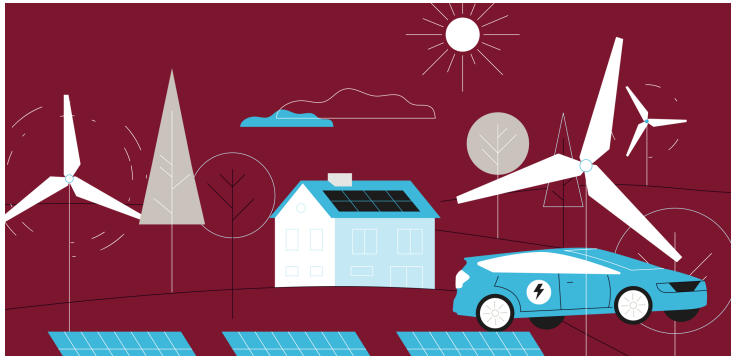
Executive Summary

Businesses are using climate scenario analysis to identify climate-related risks and opportunities, enhance strategic resilience, and respond to burgeoning climate risk disclosure requirements. To support these efforts, BSR has developed three extended climate scenario narratives built on the Network for Greening the Financial System (NGFS) climate scenario framework and corresponding datasets. BSR's scenario set provides expanded and more holistic business-relevant narratives with decade-by-decade accounts of plausible socioeconomic, political, and technological developments, grounded in the NGFS data.

The three scenarios are:

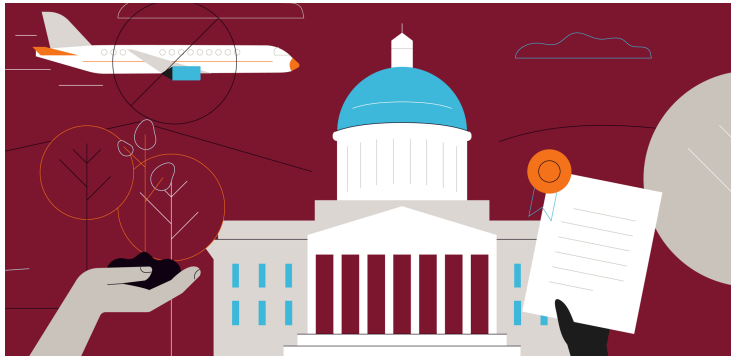
Current Policies

Only currently implemented policies (as of 2020) were preserved. Absent ambitious government or business action, emissions are on track to reach at least 3°C of warming by 2100.



Net Zero 2050

The transition to a net-zero economy required drastic and coordinated global action, particularly in the 2020s. The cost of action was high but warming peaks at 1.6°C in 2060 then declines to 1.5°C by 2100.



Delayed Transition

After a decade of inaction, a set of uncoordinated and stringent policies were adopted in the 2030s to rapidly halt greenhouse gas (GHG) emissions. This approach came at high social and economic costs but ultimately held warming to a peak of 1.8°C by 2100.

While each scenario features increasing physical risks from climate change over the next 15 years, those diverge significantly thereafter—with radically different outcomes over the long term. Ambitious climate action is able to moderate physical risk over time. However, the scenarios also make clear that delayed action significantly increases both physical and transition risks for business and society.

This document provides the extended narratives, along with more information on climate scenarios, their role in sustainability reporting, and how to best use them.

Default Variable List

The following variables are always included in BSR climate scenario analyses. The variables are for global data, unless stated otherwise. It is recommended that these variables be reviewed, as needed, for regions or countries of interest.

	Current Policies	Net Zero 2050	Delayed Transition
Global Mean Temperature	X	X	X
Greenhouse Gas Emissions	X	X	X
Energy Mix	X	X	X
Carbon Price	X	X	X
Fossil Fuel vs. Renewable Energy Investments	X	X	X
Energy Demand vs. Efficiency Investments	X		
GDP Loss from Climate Damage	X	X	X
Market Behavior (i.e., Consumption Loss)	X	X	X
Climate Damage by Region	X		
Labor Productivity Loss due to Heat Stress	X		
Government Taxes by Sector		X	X
Emissions in Hard-to-abate Sectors		X	X
Carbon Capture (CCS) Investments		X	X

02

Background Information

About Climate Scenario Analysis

The Case for Climate Scenario Analysis

Climate scenarios analysis can help organizations:

1. Identify and assess **climate-related risks and opportunities** and stress-test **business strategies** against plausible futures.

2. Enhance **strategic conversations** by challenging business-as-usual assumptions and considering novel, disruptive developments.

3. Promote **collaboration among internal stakeholders** through shared discussion of key drivers reshaping the external operating environment.

4. **Create more robust business strategies and financial planning** by identifying management actions that are robust across a wide range of plausible climate futures.

5. **Improve strategic agility by establishing indicators to monitor the changing business environment** and rehearsing responses to disruption in advance.

6. **Meet disclosure requirements** and requests from investors and other stakeholders for information on climate-related risks and opportunities, and the resilience of its business strategy.

Climate Scenario Analysis in Financial Reporting

The Task Force on Climate-Related Financial Disclosures (TCFD) recommends that companies undertake climate scenario analysis to test and disclose the resilience of their business strategy. Many jurisdictions are developing climate-related disclosure rules and standards, often in line with the TCFD recommendations.

Task Force on Climate-Related Financial Disclosures

The **TCFD recommendations** specify that disclosure of this analysis will assist investors, underwriters, insurers, and other stakeholders to better understand:

- "the degree of robustness of the organization's strategy and financial plans under different plausible future states of the world;
- how the organization may be positioning itself to take advantage of opportunities and plans to mitigate or adapt to climate-related risks; and
- how the organization is challenging itself to think strategically about longer-term climate-related risks and opportunities."

Mandatory Reporting

In their climate-related financial disclosure rule and standard, the **European Commission** prioritizes, and **the US Securities and Exchange Commission** recommends, the use of climate scenario analysis to identify and assess climate-related risks and opportunities and test the resilience of business strategies to climate change.

The Climate-Related Disclosures Standard of the **International Sustainability Standards Board** (ISSB) also includes climate scenario analysis as a key assessment tool.

NGFS Scenarios Framework

Benefits of the NGFS Scenario Framework

A range of third-party climate scenarios are publicly available. Most of these are narrowly focused, explore only transition or physical risks, and are based on assumptions not always relevant for the business community. BSR chose the Network for Greening the Financial System (NGFS) scenarios as the foundation for this set of climate scenarios for several reasons:

The scenarios were derived from multiple **reputable climate models** by the Potsdam Institute for Climate Impact Research, the University of Maryland, and the International Institute for Applied System Analysis, among others.

They were developed with reference to the TCFD recommendations and are suitable for all sectors, not just finance, to undertake climate scenario analysis in line with the recommendations.

They integrate **both physical *and* transition risks into the same set**, with shared assumptions and parameters.

They are accompanied by **substantial supporting documentation** and are regularly updated.

The NGFS approach allows for **the exploration of a broad range of temperature pathways as well as different assumptions** that better reflect the uncertainty of future conditions and guards against model bias.

Scenario analysis results using the NGFS framework represent **aggregate sectors and markets** and can be a guide to assess individual company risks.

NGFS Scenario Framework

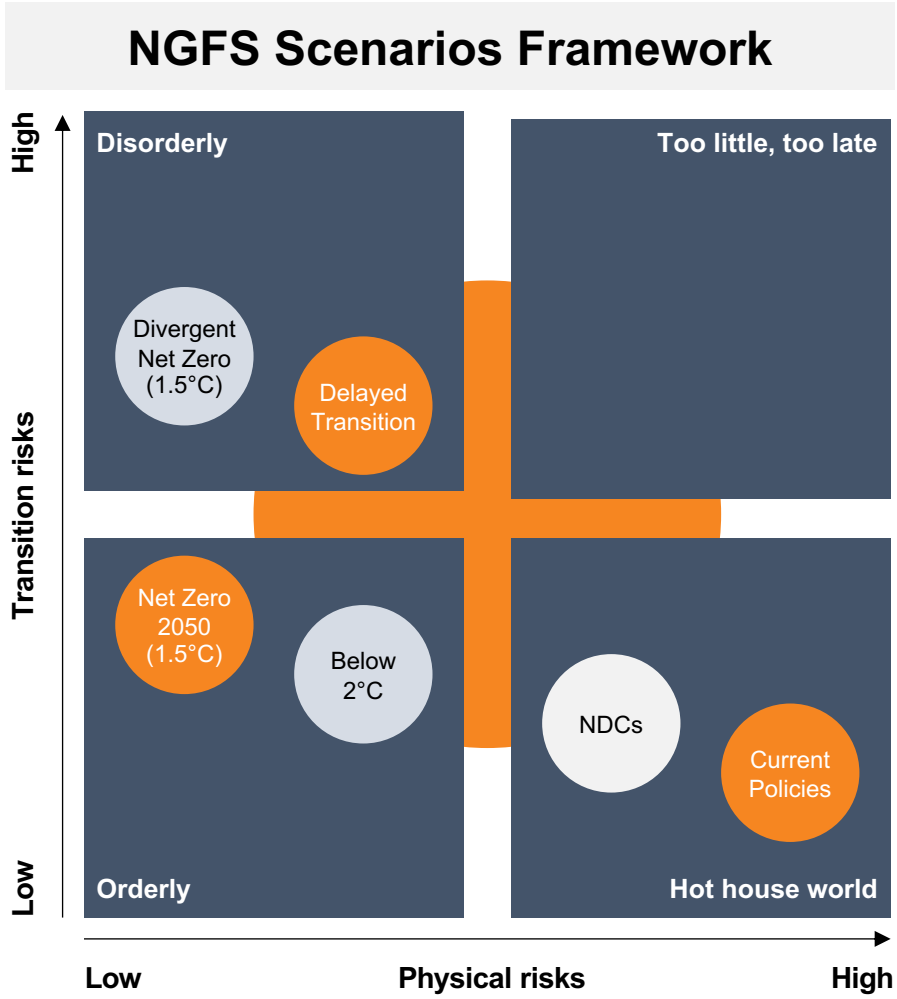
The NGFS scenarios were developed to provide a common starting point for analyzing climate risks to the economy and financial system. They represent a global, harmonized set of transition pathways, physical climate impacts, and economic indicators. The framework describes three types of climate scenarios:

- **Disorderly** scenarios explore higher transition risk due to policies being delayed or divergent across countries and sectors. Carbon prices are typically higher for a given temperature outcome.

- **Orderly** scenarios assume climate policies are introduced early and become gradually more stringent. Both physical and transition risks are relatively subdued.

- **Hot house world** scenarios assume that some climate policies are implemented in some jurisdictions, but global efforts are insufficient to halt significant global warming. Critical temperature thresholds are exceeded leading to severe physical risks and irreversible impacts like sea-level rise.

BSR has extended the narratives of one of each type of scenario: **Net Zero 2050**, **Delayed Transition**, and **Current Policies.** We have also highlighted **business-relevant data points** from the NGFS datasets that help quantify the physical and transition risks in each scenario.



Source: NGFS Climate Scenarios Database Technical Documentation V3.1 (September 2022)

Building BSR's Climate Scenario Narratives

BSR's extended scenario narratives are holistic, qualitative depictions of plausible futures that explore socioeconomic, technological, and policy considerations. Grounded in the NGFS scenario framework and accompanying data, they were designed to provide companies with a broader view of business-relevant transition and physical risks. BSR developed them using the process below:

In consultation with an interdisciplinary group of internal and external experts, **identified key topics** that would broaden the scope and increase the business relevance of the original NGFS scenarios.

Researched trends that would drive the evolution of these business-relevant topics, and brainstormed plausible pathways for each topic under each scenario, aligned with the parameters established by NGFS data.

Wrote an expanded narrative for each scenario, supplementing it with content that was drawn from NGFS supplemental documents.

Extracted data from the NGFS IIASA Scenario Explorer (Phase III) and **NGFS Climate Analytics Climate Impact Explorer**, with a particular focus on the most relevant variables for each scenario (e.g., include information on risk from high carbon pricing in scenarios where carbon price is expected to be higher).

Note: All qualitative content in this scenario set was added by BSR, while all quantitative content is derived from the NGFS datasets. Qualitative content is BSR's interpretation of how key topics might plausibly evolve across each scenario, grounded in the NGFS data and assumptions.

Building BSR's Climate Scenario Narratives | NGFS Phase III Updates

BSR's previous Climate Scenarios Analysis was based on the NGFS 2021 (Phase II) Scenarios. **BSR has updated its Climate Scenario Analysis with the latest NGFS 2022 (Phase III) scenario data** updates to maximize the scenarios' utility in supporting companies to conduct credible and streamlined climate scenario analysis. While the NGFS Scenarios will continue to evolve and become more precise, **key updates** to the latest NGFS 2022 (Phase III) Scenarios include:

Latest Data

- The NGFS scenarios have been brought up-to-date* with latest economic and climate data, model versions and policy commitments**, reflecting new country-level commitments to reach net-zero emissions made at COP26 in November 2021**

Technology Trends

- The new scenarios also reflect the **latest trends in renewable energy technologies** (e.g., solar and wind), and key **mitigation technologies**

Improved Physical Risk Modeling

- Estimates of GDP losses from chronic risks now more comprehensively **account for model uncertainty**
- For the first time, the scenarios provide an **indicative illustration of the way acute physical risks could materialize** (via stochastic shocks calibrated based on historical data and "multipliers")

Sector Specific

- Transition risks are represented with increased granularity in certain sectors, namely transport and industry

Note: * Phase III scenario data did not include implications due to the Inflation Reduction Act (IRA) or the Ukraine crisis

Source: NGFS Scenarios

Considerations When Using These Scenarios

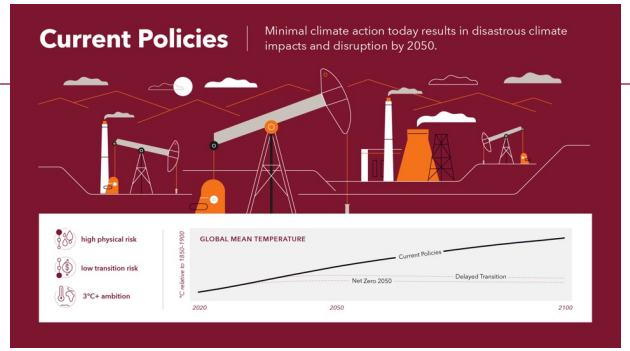
Scenarios are an important strategic tool that enable the **exploration of how multiple drivers of change may interact and converge to shape the future in different and unpredictable ways**.

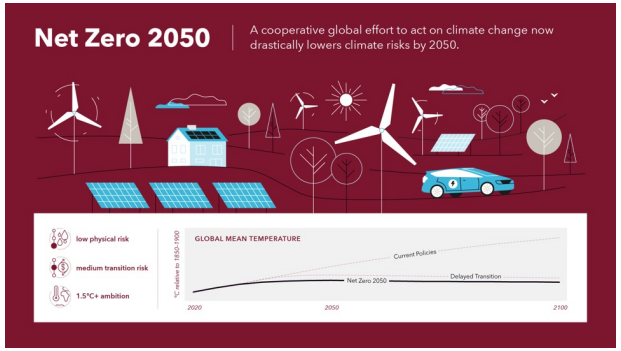
When using these scenarios, it is important to remember:

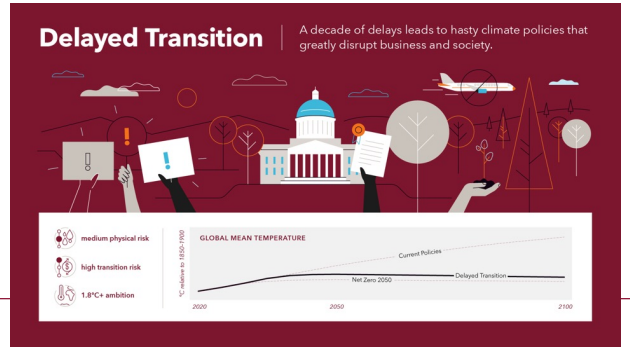
The scenarios are hypothetical constructs that depict a set of different plausible climate-related futures that will impact the operating context of business.

Although grounded in NGFS data, **the scenarios are not intended to predict** a single “most likely” future. Rather, they offer a complementary approach to forecasting, one that enables the exploration of highly uncertain future possibilities.

These scenarios use **broad descriptions to holistically describe plausible futures** based on the available climate data. **Not all topics are included in each decade** of each scenario. Instead, the scenarios highlight the defining topics and developments in each decade.







How to Use These Scenarios

Use the scenario set to test your strategy, challenge assumptions, uncover blind spots, and identify additional actions to address climate-related risks and opportunities. Resilient strategic ideas are those that work across most or all scenarios.

Taking each scenario in turn, ask:

- If this scenario were to transpire, **what would be the impacts on our business?**
- **What new challenges and opportunities would be created**, and are we prepared for these?
- **Are there any strategic moves** that we can make that would position the business to thrive across all the scenarios?

Be sure to **give equal consideration** to all three scenarios rather than trying to choose "the most likely" scenario. History is full of unlikely scenarios causing great disruption. Scenario analysis provides an important opportunity to ask "what if" questions.

Discuss the scenarios among a diverse group of internal stakeholders because no individual expert has a complete view of the emerging future.

Consider drawing from the NGFS datasets to add additional data and further contextualize and tailor the scenario narratives to your organization and industry.

Given that the scenarios take a global view**, consider the specific policy changes in your region** that may impact your operating context, and explore the regional data available in the NGFS datasets.

BSR can help your organization use these scenarios in a variety of ways, including informing strategy processes; conducting a TCFD-aligned scenario analysis; stress-testing plans, assessments, and targets; and designing more transformative and foresightful industry collaborations. For more information, please contact Ameer Azim (aazim@bsr.org)

03

Climate Scenario Narratives and Data

Climate Scenarios Overview

Climate Scenario Building – NGFS Assumptions & Characteristics

OVERALL NGFS ASSUMPTIONS

The three NGFS Scenarios have a 2050 horizon year and are differentiated by three key design choices relating to long-term policy, short-term policy, and technology availability.

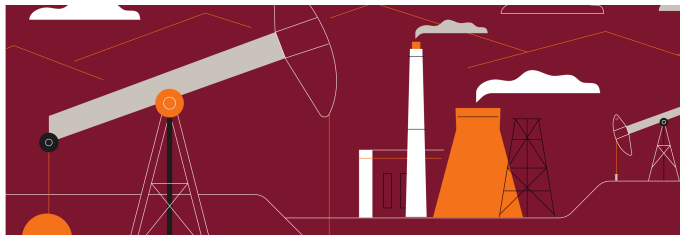
INDIVIDUAL SCENARIO ASSUMPTIONS

	CURRENT POLICIES	NET ZERO 2050	DELAYED TRANSITION
Scenario	Existing climate policies remain in place, yet there is no strengthening of ambition	Stringent climate policies and innovation, reaching global net zero GHG emissions around 2050	Climate policies are delayed, which forces a very aggressive policy response starting in 2030
Impact of transition and physical risks	**High physical risks** **Low transition risks**	**Low physical risks** **Medium transition risks**	**Medium physical risks** **High transition risks**
Policy Ambition*	• 3°C+	• 1.4°C	• 1.6°C
Policy reaction	• No additional** policy reaction	• Immediate and smooth policy reaction	• Delayed policy reaction
Technology	• Slow technology change	• Fast technology change	• Slow then fast technology change
Carbon dioxide removal	• Low use of carbon dioxide removal	• Medium/high use of carbon dioxide removal	• Low/medium use of carbon dioxide removal
Regional policy reaction	• Low regional policy variation	• Medium regional policy variation	• High variation in regional policies

**Note this is ambition above pre-industrial levels by 2100. Note this does not reflect peak warming.*
***Because NGFS's phase 3 data set was developed in 2022, this notably does not include major recent policies such as the U.S. Inflation Reduction Act.*

Scenario descriptions based on the NGFS scenarios framework as well as data from NGFS Climate Impact Explorer and NGFS IIASA Scenario Explorer.

Overview of the Three Scenario Narratives



Current Policies

2020s

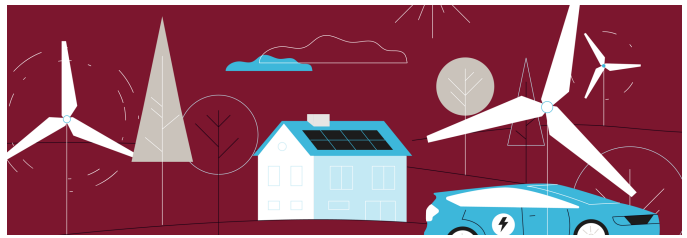
- Climate policies lacked ambition
- Limited investment in the energy system
- Physical impacts brought disruption

2030s

- Low carbon prices failed to reduce emissions
- Climate impacts continued to accelerate
- Assets became uninsurable

2040s

- Adaptation became the focus of climate action
- Inequality was exacerbated
- Climate impacts led to economic loss



Net Zero 2050

2020s

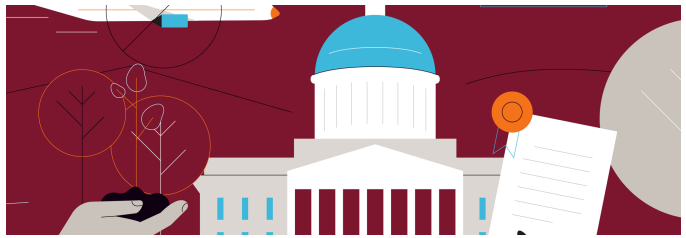
- Regulation and investment increased dramatically
- Economic activities redirected towards emissions reduction
- Early climate impacts continued to escalate

2030s

- Regional variation in policies created inequality
- Renewable energy system growth strained mineral supply chains
- Technological innovation brought new opportunities to reduce residual emissions

2040s

- Fossil fuel investments phased out
- Some manageable climate impacts remained
- Climate reparations facilitated increased equality



Delayed Transition

2020s

- Policymakers and business implemented limited climate action
- Reliance on fossil fuels continued
- Physical impacts became more severe and apparent

2030s

- Abrupt crisis response sparked action
- Businesses struggled amidst high compliance costs
- Emissions reduction was ultimately successful but turbulent

2040s

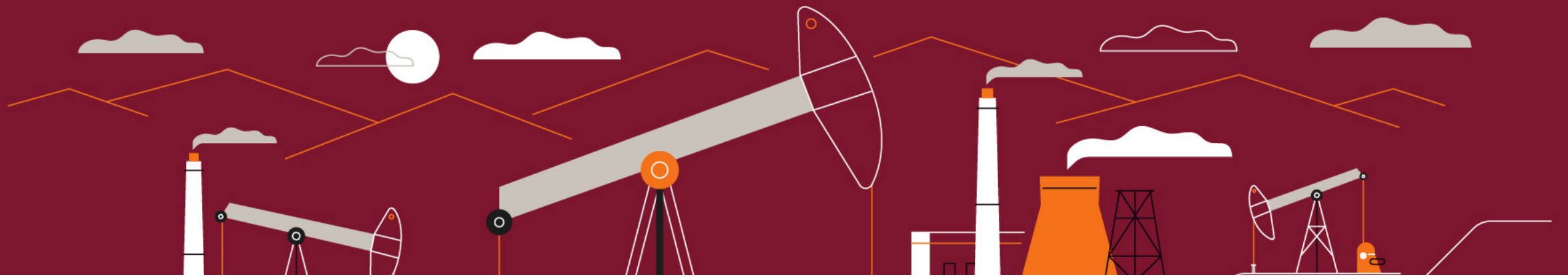
- A new low-carbon economy emerged
- Decarbonization efforts shifted to hard-to-abate sectors
- Temperatures and physical impacts stabilized

Climate Scenario Narratives

- Current Policies
- Net Zero 2050
- Delayed Transition

Current Policies

Minimal climate action today results in disastrous climate impacts and disruption by 2050.



The View from 2050 – Limited Action

Only currently implemented policies (as of 2021) were preserved. Absent ambitious government or business action, emissions grew rapidly. Warming reached 2°C by 2050 and as a result, physical climate impacts also increased in severity and frequency. The world was on track to see at least 3°C of warming by 2100. Despite this, investment in decarbonizing the global energy system remained slow, with limited investments in energy efficiency and continued exploitation of fossil fuels.

Large-scale and increasingly persistent physical changes became more disruptive, including sea-level rise, desertification, extreme weather patterns, and ecosystem collapse. Competition over resources and destabilizing inequality compounded global tensions. With society facing continuous climate disasters, global attention turned to adaptation. In many cases, the wealthy were able to invest in adaptation and related technologies, while most of the world endured challenges.

Key Scenario Assumptions

- 3°C+ policy ambition
- No policy changes—continuation of policies as of 2021
- Slow technology change
- Low use of CO_2 removal
- Low regional policy variation

Current Policies

View from 2050

Policies implemented as of 2021 were preserved, and **no additional policy action** was taken.

Without government or business action, **emissions grew rapidly.**

Physical climate impacts also increased in severity and frequency, causing economic loss, ecosystem damage, and human rights issues.

The 2020s

Policies lacked ambition

As a result of **political gridlock and economic concerns**, climate action and policies were minimal in the 2020s. Companies followed a similar trajectory, with many missing their near-term climate targets.

Limited investment in the energy system

With **geopolitical instability and high energy prices**, most governments prioritized energy security and continued to rely on fossil fuels as an energy source.

Physical impacts brought disruption

Extreme weather events affected a growing share of the global population and caused increasing **disruptions to global supply chains,** significantly impacting agricultural production, manufacturing, and transportation of goods. This disruption was exacerbated by a retreat from globalization, which occurred due to a **rise in security concerns and nationalistic ideas**.

The 2030s

Low carbon prices failed to reduce emissions

Worsening **physical impacts did not result in increased government action** to curve emissions. In 2035, **the world failed to meet its target of maintaining global temperature rise to 1.5ºC** above pre-industrial level, the recommended maximum warming to slow the worsening impacts of climate change.

Climate impacts continued to accelerate

Chronic and acute weather events became more severe and frequent across regions. Climate **impacts on ports and trade routes** led to ongoing supply chain disruptions, loss of supplier redundancy, and overall increased cost of goods.

Assets became uninsurable

With worsening weather patterns, **assets in high-risk locations were deemed uninsurable** and insurance companies restricted coverage. For businesses, this led to **significant loss in asset value**, higher rates of self-insurance, and **greater reliance on disaster relief support** from the public sector.

The 2040s

Adaptation became the focus of climate action

Climate **negotiations shifted from mitigation towards adaptation**, with historically high-emitting countries failing to assume financial responsibility for climate impacts. Most investment in adaptation took place in high-income countries, leaving the middle- and low-income countries most exposed.

Inequality was exacerbated

Vulnerable populations felt the growing pressure of **lower agricultural productivity**, extreme weather events, and **the rising cost of goods**. These impacts led to increased population displacement and, in some regions, gave rise to a **climate refugee crisis**. **Health impacts** were disproportionately felt by under-resourced communities, placing strain on public health systems.

Climate impacts led to economic loss

With **growing GDP loss and volatile markets**, operating under uncertainty was the new norm. Businesses were faced **with increasing costs of goods**, and a need for greater investment to protect their operations from extreme weather events.

The 2020s: What Defined the Decade

Climate policies lacked ambition

- As a result of **political gridlock and economic concerns**, climate action and policies were minimal in the 2020s. With few exceptions, jurisdictions reported limited progress toward their climate commitments (e.g., Nationally Determined Contributions) and most new **national targets were no longer aligned with the Paris Agreement**.
- Companies followed a similar trajectory, with many missing their near-term targets. **Global CO2 emissions remained nearly constant**, from 42.5 Gt CO_2/year in 2020 to 41.8 Gt CO_2/year in 2030, significantly failing to meet the 50% emissions reduction needed by 2030 to maintain the world on a 1.5ºC warming trajectory. **Limited government action**, which mostly focused on climate-related disclosures, meant that the **cost of regulatory compliance to business was relatively low.**

Limited investment in the energy system

- With **geopolitical instability and high energy prices**, most governments prioritized energy security and continued to rely on fossil fuels as an energy source. **Global investment in the extraction of fossil fuels increased** from US$382 billion/year in 2020 to US$550 billion/year by 2030. The **absence of meaningful climate policy** measures meant **investment in renewables was not significant** enough to propel a low-carbon energy transition.
- **Hard-to-abate sectors**, including cement and steel production, **remained carbon intensive**. The world experienced **slow technological change**, with carbon dioxide removal technologies reaching limited scale, capturing 68.9 Mt CO_2/year in 2030, or just 0.17% of global CO_2 emissions. **Most fossil fuels emissions remained unabated**. With a **lack of government incentives**, private sector investment in the energy transition was limited, business struggled to decarbonize their energy consumption, and scope 2 emissions from industry remained high.

Physical impacts brought disruption

- **Extreme weather events** affected a growing share of the global population and caused increasing **disruptions to global supply chains,** significantly impacting agricultural production, manufacturing, and transportation of goods. This disruption was exacerbated by a retreat from globalization, which occurred due to a **rise in security concerns and nationalistic ideas**. By 2030, the share of the population annually exposed to heatwaves in India grew by 10.5%, with heat stress leading to a 5% reduction in labor productivity in the country. Other countries in heat-stressed regions such as Central America, Southeast Asia, and West Africa followed similar patterns. **Tropical cyclones, river floods, and wildfires worsened in most countries.** Increasing damages from weather events **severely impacted frontline communities and led to an increase in climate migration**.
- The increase in extreme weather events **did not lead to climate mitigation policies**, and **emissions continued to rise.** With limited government action to reduce GHG emissions, **companies worked to reduce scope 3 emissions through industry collaborations and voluntary engagement with suppliers**. Investments to build resilience to recurring environmental shocks became necessary for business continuity.

Current Policies

- From 2020 to 2030, global emissions were reduced by a mere 1.6% as many nations and companies missed or weakened their climate targets.
- Global investment in fossil fuel extraction continued to increase, reaching US$550 billion/year by 2030.
- Extreme weather events and their resulting impacts—supply chain disruptions, climate migration, nationalism—all began to increase.

The 2030s: What Defined the Decade

Low carbon prices fail to reduce emissions

- Worsening **physical impacts did not result in increased government action** to curve emissions. With **a low global carbon price** of 5.8 USD per ton of CO2 in 2040, and the absence of other key financial incentives, **markets forged ahead with high-emissions projects**. In the 2030s, the world added coal power plants with an additional cumulative capacity of 88GW, with a significant share of projects located in China and India. Other sectors, including transportation, were also slow to decarbonize.
- In 2035, **the world failed to meet its target of maintaining global temperature rise to 1.5ºC** above pre-industrial level, the recommended maximum warming to slow the worsening impacts of climate change.

Climate impacts continued to accelerate

- With increasing emissions, **physical impacts continued to worsen** as annual global GDP losses spiked from US$0.5 trillion in 2030 to US$1.6 trillion in 2040**.** Climate **impacts on ports and trade routes** led to ongoing supply chain disruptions, loss of supplier redundancy, and overall increased cost of goods. **Chronic and acute weather events became more severe and frequent across regions**. For example, damage from hurricanes in the United States increased by 13% in 2040, as compared to 2015, and damage from river floods in Thailand increased by 62.3% in the 2040, as compared to 2015. Increasingly common crop failures in key agricultural regions like the Midwestern United States and an up to 10% overall reduction in yields for key commodities like maize caused the **collapse of some food supply chains**, exacerbated inequality, and led some countries to adopt **export restrictions**.
- **Offshore manufacturing hubs became a major point of vulnerability** in global supply chains, leading to companies reconsidering their sourcing strategies. Business strategies pivoted to adaptation to maintain **operating status quos**, rather than reducing emissions, often at a high cost.

Assets became uninsurable

- With increased acute weather events and uncertainty**, assets exposed to high risk of physical impacts were deemed uninsurable**. Insurance companies, experiencing an underwriting loss, increased rates, restricted coverage, or exited regions altogether. For businesses, this led to **significant loss in asset value**, higher rates of self-insurance, and **greater reliance on disaster relief support** from the public sector. Nearshoring or relocation operations to less impacted regions became common, yet costly due to increasing real estate prices.

Current Policies

- Carbon prices stayed below US$6 per ton and businesses, including fossil fuel reliant ones, continued to operate business-as-usual.
- Yearly GDP loss from climate damage increased from US$1.1 trillion in 2030 to US$2.3 trillion in 2040.
- Insurance companies dropped their coverage of many at-risk assets as physical impacts worsened.

The 2040s: What Defined the Decade

Adaptation became the focus of climate action

- Climate **negotiations shifted from mitigation towards adaptation**, with historically high-emitting countries failing to assume financial responsibility for climate impacts. By the start of the decade, the world was experiencing significant economic damage from physical impacts. The **risk of chronic physical impact was higher** in tropical and subtropical regions. **GDP losses** followed the same global pattern, particularly affecting emerging economies in Africa, the Middle East, South Asia, Southeast Asia, and Latin America, where GDP losses were 2-3 times higher than in the United States and the European Union.
- As **the world failed to adopt a coordinated approach to climate adaptation**, countries shifted attention to ad hoc, regional measures. Middle- and low-income countries saw **limited technology transfer** (e.g., drought-resistant crops, early warning systems, sea walls, etc.) and investment in adaptation, and faced worsening climate and economic shocks. Most investment in adaptation took place in high-income countries, leaving the middle- and low-income countries most exposed.

Inequality was exacerbated

- Worsening weather events, coupled with an unequal adaptation response, led to a **dramatic increase in social inequality**. Vulnerable populations felt the growing pressure of **lower agricultural productivity**, extreme weather events, and **the rising cost of goods**. These impacts led to increased population displacement and, in some regions, gave rise to a **climate refugee crisis**.
- Climate impacts also **eroded progress on social inclusion and human rights**. The elderly, those with disabilities, and low-income communities were impacted the most. **Health impacts**, driven by an increase in heatwaves and prevalence of transmissible disease, were disproportionately felt by under-resourced communities, placing strain on public health systems. Companies felt a **growing pressure to invest in their communities** to address worsening climate-related social impacts.

Climate impacts led to economic loss

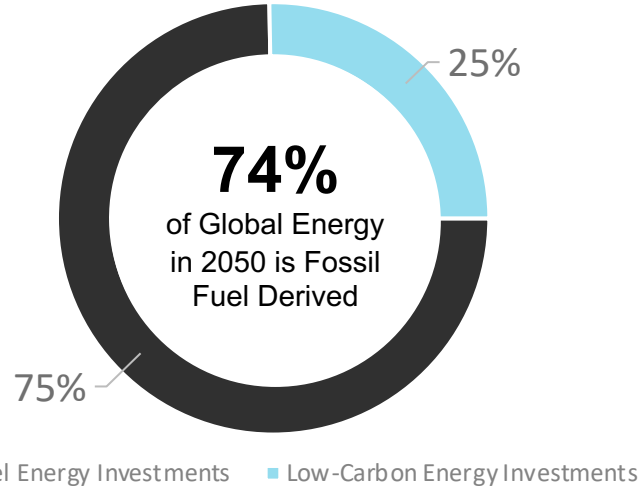
- In the 2040s, the world experienced a total GDP loss of US$14.5 trillion. With **growing GDP loss and volatile markets**, operating under uncertainty became the new norm. In addition, businesses were faced **with increasing costs of goods**, and a need for greater investment to protect their operations from extreme weather events.
- A **worsening insurability crisis** contributed to the rising cost of doing business, and with limited action to curve emissions, temperatures continue to rise, further exacerbating physical impacts. GHG emissions remained on a trajectory to reach 3°C of global temperature rise by the end of the century.

Current Policies

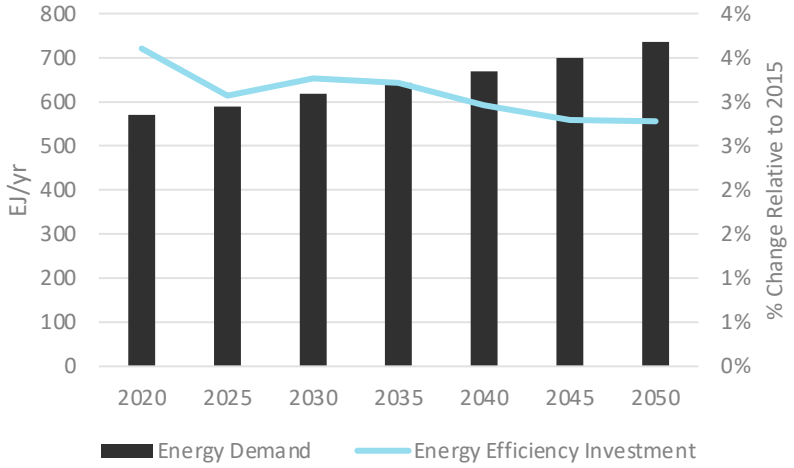
- The world experienced a total GDP loss of US$14.5 trillion to climate impacts in the decade. Emerging regions, such as Africa and SE Asia, experienced losses at 2-3x higher rates than Europe.
- Global inequality accelerated due to extreme weather events, rising prices, and a growing climate refugee crisis. Human rights progress stalled or unraveled in many regions hit the hardest.
- With 3°C of warming nearly guaranteed, businesses and communities were forced to focus on adaptation.

Current Policies

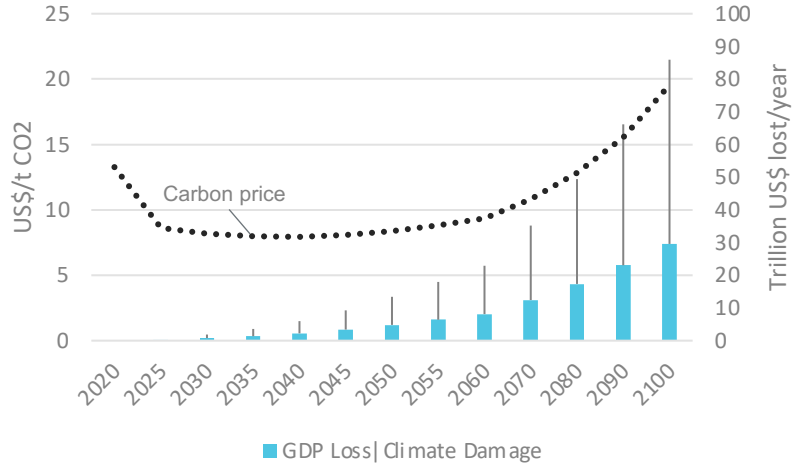
Fossil fuel investment outweighed low-carbon energy investments through 2050



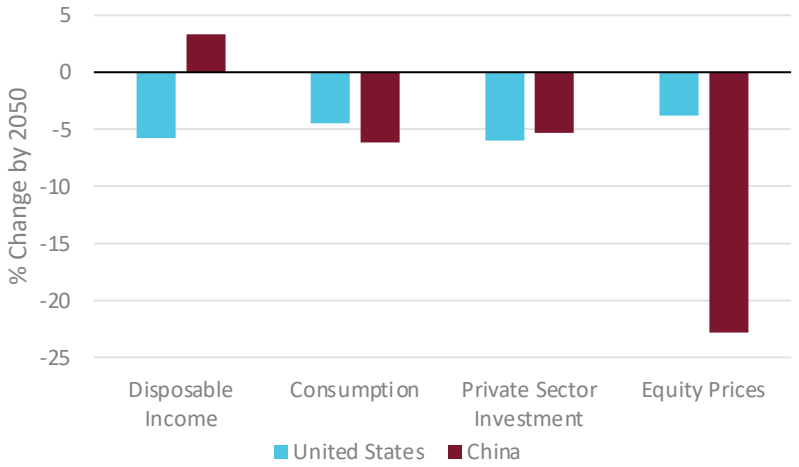
Global energy demand grew 30% due to lack of investment in energy efficiency



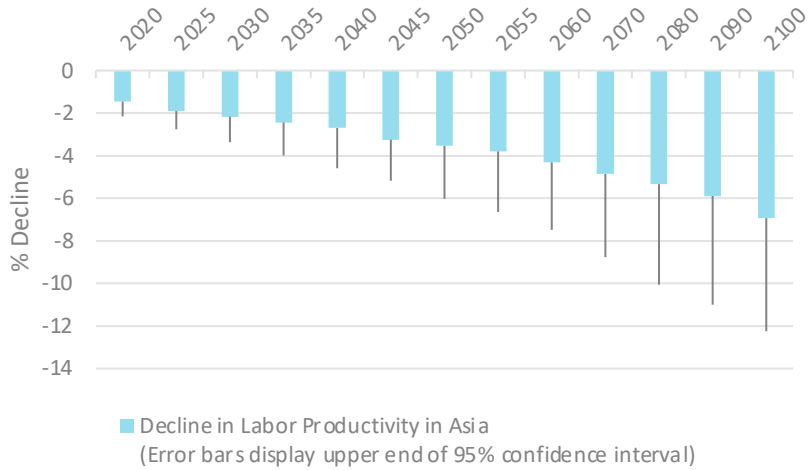
Lack of climate policy & carbon pricing led to exponential GDP loss from climate damage



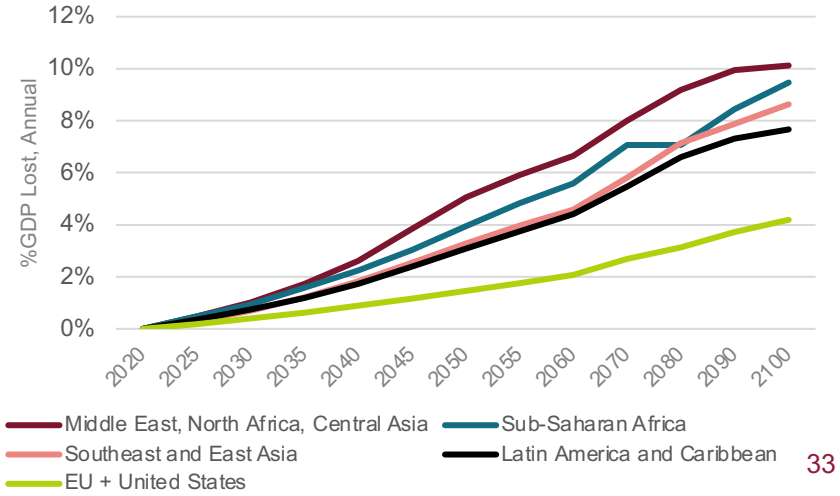
By 2050, climate impacts had notable impacts on consumer and market behavior



Heat exposure caused labor productivity to decrease as much as 10% by 2100

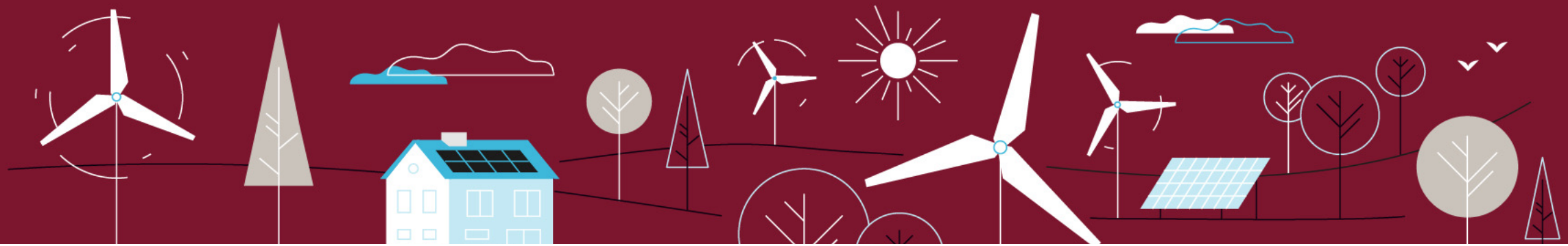


Climate damage inflicted 2-3X greater GDP loss in Asia, Africa, and Latin America than EU + US



Net Zero 2050

A cooperative global effort to act on climate change now drastically lowers climate risks by 2050.



The View from 2050 – Early and Ambitious Action

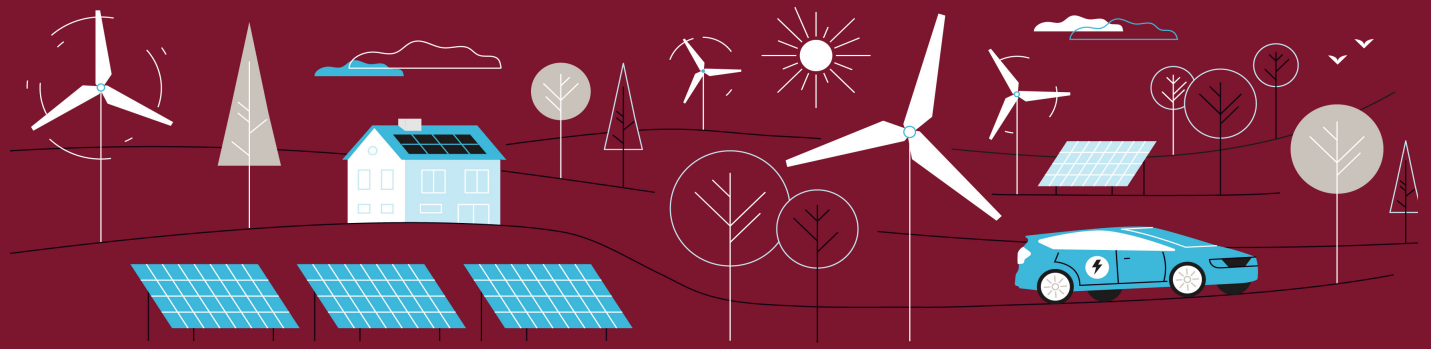
The transition to a net-zero economy by 2050 required drastic and coordinated global action from government, business, and civil society, particularly in the 2020s. Climate impacts already felt across the globe, and expected to increase, made clear the risks of inaction. However, the cost of action was high, with many industries being severely disrupted and the job market shifting.

Action was backed by a wave of green tech, including high use of carbon capture and storage, high levels of transparency (and even surveillance), and changes in global regulatory institutions. Although global temperature continued to rise in the previous three decades, swift action resulted in warming peaking at 1.6°C in 2060. With the debate on when and how to act over, climate justice, including responsibility for refugees, reskilling programs, and international climate reparations rose to the top of the agenda.

Key Scenario Assumptions

- 1.4°C policy ambition
- Immediate and smooth policy reaction
- Fast technology change
- Medium/high use of carbon dioxide removal
- Medium regional policy variation

Net Zero 2050



View from 2050

The transition to a net-zero economy required **drastic and coordinated global action** from government, business, and civil society.

The **cost of action was high**, with many industries being severely disrupted.

Swift action resulted in warming peaking at 1.6°C in 2060, minimizing the impacts of climate change.

The 2020s

Regulation and investment increased dramatically

Following recommendations from climate experts, **policymakers acted swiftly to curb carbon emissions** and reduce the long-term impacts of human-caused climate change. In this highly-regulated environment, economic impacts caused **consumer discretionary spending** to initially decline in more developed economies.

Economic activities redirected towards emissions reduction

As a response to new regulatory regimes, **private sector investments in decarbonization technologies and innovation increased** as companies acted quickly to reduce supply chain emissions.

Early climate impacts continued to escalate

Despite efforts to reduce emissions, **the frequency of extreme weather events still increased** incrementally due to past emissions, with heatwaves in Africa and Asia increasing roughly 50% from 2020 to 2030 and expected damage from hurricanes in the United States nearly doubling in the same period.

The 2030s

Regional variation in policies created inequality

Climate policies continued to escalate and ensure that businesses maintained their emissions reduction efforts. However, **climate policies and their costs were not spread evenly across the globe**. Socio-economic and equity concerns came to the forefront of climate action with low-income nations, Indigenous communities, women, and youth gaining stronger voices in climate negotiations.

Renewable energy system growth strained mineral supply chains

The technological boom of the 2020s resulted in a scarcity of key transition minerals, such as lithium for batteries. This led to temporary price increases and volatility.

Technological innovation brought new opportunities to reduce residual emissions

in the late 2030s **attention began to shift from easier to hard-to-abate sectors** such as cement, steel, and chemical production. As a result of combined efforts, **economies were able to shift back to equilibrium**. Prices for common goods and services stopped their upward trend, **consumption loss stabilized,** and disposable income leveled off or increased in most economies in the Global North.

The 2040s

Fossil fuel investments phased out

As a result of persistent climate policies, **carbon prices continued to increase**. To react, businesses **phased out the remaining use of fossil fuels** in their supply chains. Global fossil fuel investments in 2050 totaled less than US$0.42 billion, compared to US$404 billion in 2010 when global fossil fuel investments peaked.

Some manageable climate impacts remained

Although the world's efforts to reduce emissions **limited the severity of climate change**, some climate impacts were still felt across the globe. Fortunately, many of these **physical impacts stabilized at manageable levels** and **adaptation efforts** were able to mitigate most of the risk for businesses.

Climate reparations facilitated increased equality

After **emissions and global temperature stabilized**, the economic development of previously vulnerable areas was promoted through **reparation programs and international legal frameworks** that held emitters responsible for the damages caused by climate change.

The 2020s: What Defined the Decade

Regulation and investment increased dramatically

- Following recommendations from climate experts, **policymakers acted swiftly to curb carbon emissions** and reduce the long-term impacts of human-caused climate change. Alongside rising carbon prices, which reached 118 USD/ton globally in 2025, many countries introduced **legally mandated emissions reduction targets and carbon budgets**.
- Investments in low-carbon energy sources were abundant, totaling US$25 trillion in the decade. As a result, the **global renewable energy supply increased** from 5% of primary energy production in 2020 to 21% of primary energy production in 2030. Although these climate policies led to a **43% reduction in global CO2 emissions by the end of the 2020s**, they also resulted in a global **GDP loss of over US$11 trillion** in the decade.

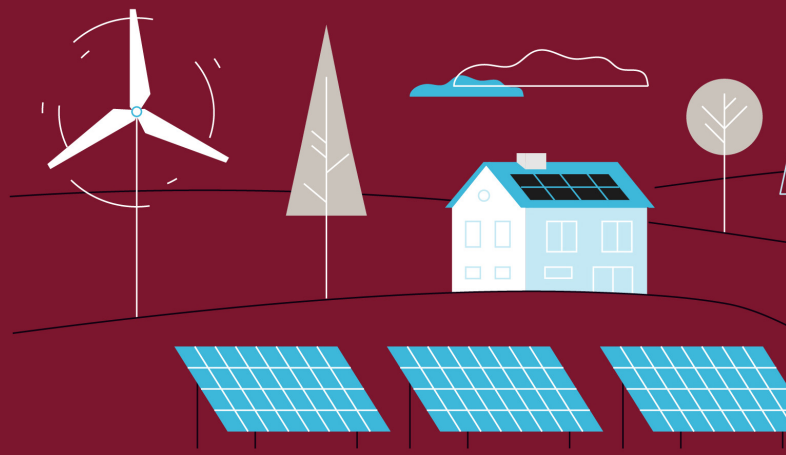
Economic activities redirected towards emissions reduction

- As a response to new regulatory regimes, **private sector investments in decarbonization technologies and innovation increased** as companies acted quickly to reduce supply chain emissions. A realignment of capital markets and a boom in venture capital investments redirected capital towards **decarbonization technologies and natural ecosystem protection**. Technological investments were focused on high-emitting industries globally, with an emphasis on **advancing efforts in the Global South** where technology investments had a greater impact.
- **Upskilling and reskilling programs were inconsistent across and within countries**, leading to high levels of unemployment in at-risk regions and for frontline communities. For example, the unemployment rate in the United States increased by an average of 0.28% per year from 2022-2030 in jobs related to the energy transition. This trend began to decrease in the following decades as renewable energy became more established; however, **mining transition minerals created new social inequities** for regions rich in lithium, copper, and iron.

Early climate impacts continued to escalate

- Despite efforts to reduce emissions, **the frequency of extreme weather events still increased** incrementally due to past emissions, with heatwaves in Africa and Asia increasing roughly 50% from 2020 to 2030 and expected damage from hurricanes in the United States nearly doubling in the same period. By 2030, **global annual GDP losses due to physical climate impacts reached nearly US$900 billion**. Targeted adaptation efforts, in addition to aggressive emissions reduction policies, began to ramp up in response to these disasters, and they were somewhat successful at combating new climate patterns.

Net Zero 2050



- Policymakers acted quickly to address climate change through high carbon prices (~US$118/ton in 2025) and mandated emissions reduction targets.
- Global investments in low-carbon energy totaled US$25 trillion in the decade and brought the percentage of the world's total energy needs met by renewables up from 5% in 2020 to 21% by 2030.
- There were still significant physical impacts from climate change, such as the rate of heat waves increasing by nearly 50% in Africa and Asia by 2030.

The 2030s: What Defined the Decade

Regional variation in policies created inequality

- Due to continued regulation and escalating climate impacts, **climate change targets for businesses were well in place** entering the 2030s. The **continued escalation of climate policies** in the decade, such as **carbon prices that nearly doubled** to US$350/ton by 2040, ensured that businesses maintained their efforts to reduce emissions. However, **climate policies and their costs were not spread evenly across the globe**. For example, the combined regions of the Middle East and Africa lost approximately 1.4% of their GDP to climate policy costs in 2030, compared to only .5% for the United States and .3% for the European Union. Despite some regional inequities, governments followed through with global climate agreements, making space for **public and private sector collaboration**.
- As emissions continued to decrease, **socioeconomic and equity concerns came to the forefront of climate action** with low-income nations, Indigenous communities, women, and youth gaining stronger voices in climate negotiations.

Renewable energy system growth strained mineral supply chains

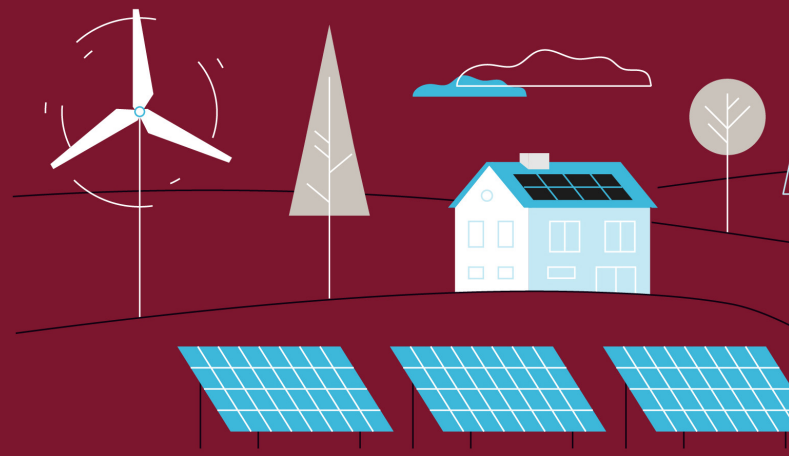
- After a decade of **aggressive renewable investments** in the 2020s, global investments in renewable energy were able to ramp down by 42% in the 2030s. However, the technological boom of the 2020s also resulted in a scarcity of key transition minerals, such as lithium for batteries. This led to temporary price increases and volatility throughout the decade. To confront the **supply challenges around transition minerals**, domestic exploration, advanced recycling methods, and new mining technologies became key competition areas for countries and industries.
- Increased extraction also posed **new environmental justice issues for vulnerable groups**, including indigenous peoples and low-wage workers. In response, many companies involved in the downstream use of these minerals **improved their human rights due diligence** to avoid reputational risks and harm to workers and communities.

Technological innovation brought new opportunities to reduce residual emissions

- While early emissions reduction efforts tackled easier-to-implement initiatives, such as electricity generation and building efficiency, in the late 2030s **attention began to shift to hard-to-abate sectors** such as cement, steel, and chemical production. For example, **massive investments into hydrogen resulted in emissions intensity reductions** for both the global steel and cement industries, with intensity for steel reducing by 50% and intensity for cement reducing by 20%. By 2040, global annual hydrogen capacity reached nearly 2000GW, compared to 715GW in 2030 and 44GW in 2020. The use of **satellites and autonomous systems to monitor and report emissions** also helped companies tackle residual emissions in complex supply chains, and improved monitoring for other impacts such as biodiversity and human rights.
- As a result of combined efforts, **economies were able to shift back to equilibrium**. Prices for common goods and services stopped their upward trend, **consumption loss stabilized,** and disposable income leveled off or increased in most economies in the Global North.

BSR

Net Zero 2050



- The policy costs to address climate change were nearly 3x higher in Middle East and Africa than the U.S. or E.U.
- The high demand for minerals needed for the transition led to supply shortages as well as human rights risks in those supply chains.
- After more than a decade of significant investment and economic losses, economies began to stabilize as price volatility decreased and disposable income stabilized or increased.

The 2040s: What Defined the Decade

Fossil fuel investments phased out

- Due to collaborative global efforts, total CO2 emissions in 2050 were equivalent to 12% of total CO2 emissions in 2020. In the 2040s, **businesses and policymakers made significant progress on their climate-positive goals** to draw down carbon through natural and technological removals, and global temperatures began to see a slight decrease. As a result of persistent climate policies, **carbon prices continued to increase**, reaching approximately US$580/ton in 2050. To react, businesses **phased out the remaining use of fossil fuels** in their supply chains. Global fossil fuel investments in 2050 totaled less than US$0.42 billion, compared to US$404 billion in 2010 when global fossil fuel investments peaked.
- Technological breakthroughs continued to help **curb residual emissions in hard-to-abate sectors**, such as in passenger aviation where CO2 emissions decreased 14% in the decade, despite a slight uptick in passenger aviation demand.

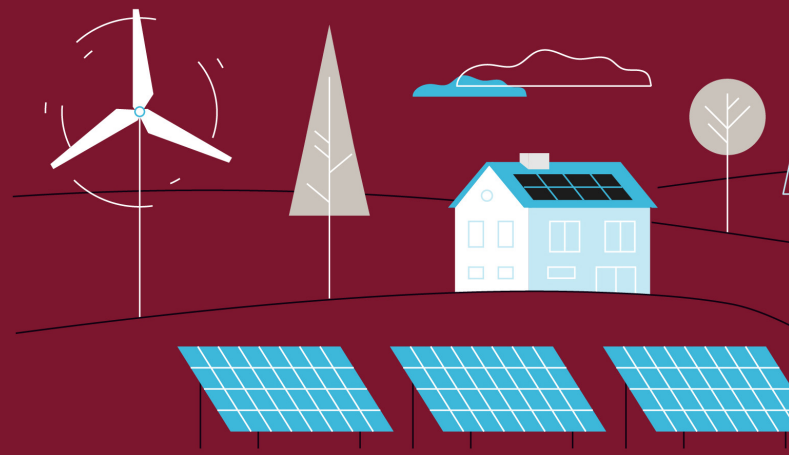
Some manageable climate impacts remained

- Although the world's efforts to reduce emissions **limited the severity of climate change**, some climate impacts were still felt across the globe. For example, the annual expected damage from river floods in China rose to 20% in 2050 compared to 2020 levels, and annual damage from hurricanes in the United States leveled off at a roughly 9% increase compared to 2020. Fortunately, many of these **physical impacts stabilized at manageable levels** and **adaptation efforts** were able to mitigate most of the risk for businesses.

Climate reparations facilitated increased equality

- After **emissions and global temperature stabilized**, the economic development of previously vulnerable and at-risk areas was promoted through **reparation programs and international legal frameworks** that held emitters responsible for the damages caused by climate change. These new international legal frameworks were supported by sophisticated techniques to scientifically attribute responsibility for climate change, which enabled legally mandated climate reparations from high-income to low-income economies for historical damages incurred. These damages included the loss of life, land, culture, and community.
- As a result of **significant reparation and adaptation strategies**, global policy costs increased by 150% over the decade. There were also growing **calls to remove all historical carbon emissions**, restore ecosystems, and reverse biodiversity loss attributed to a specific company or industry.

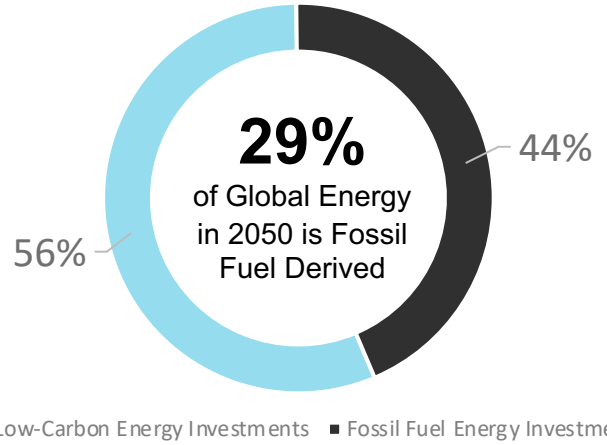
Net Zero 2050



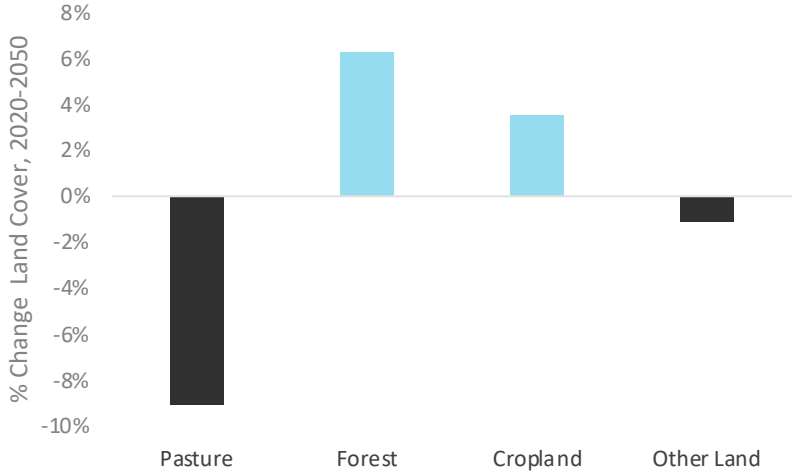
- Global CO2 emissions in 2050 were reduced to a mere 12% of 2020 levels and global temperatures began to decrease thanks to natural and technological removals.
- Physical climate impacts remained, but they stabilized at manageable levels for most countries and companies to adapt to.
- Climate reparation programs levied heavy fines against past corporations and countries responsible for the climate crisis. The redirected funds helped to stem inequality.

Net Zero 2050

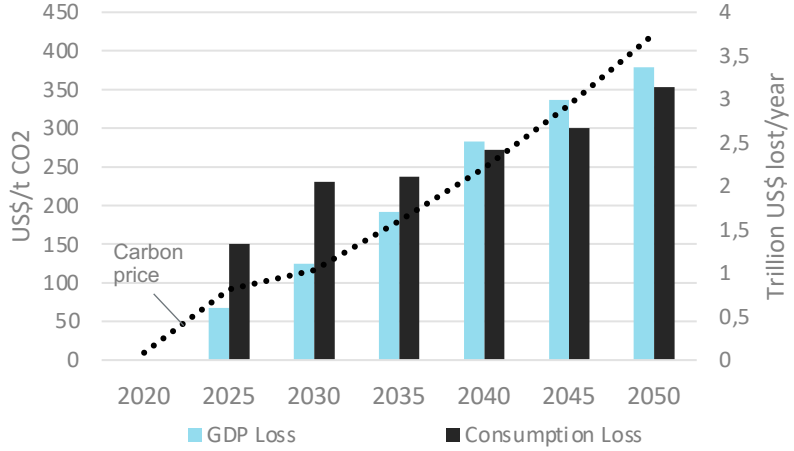
Sustained investment in renewables through 2050 helped to clean up the world's energy supply



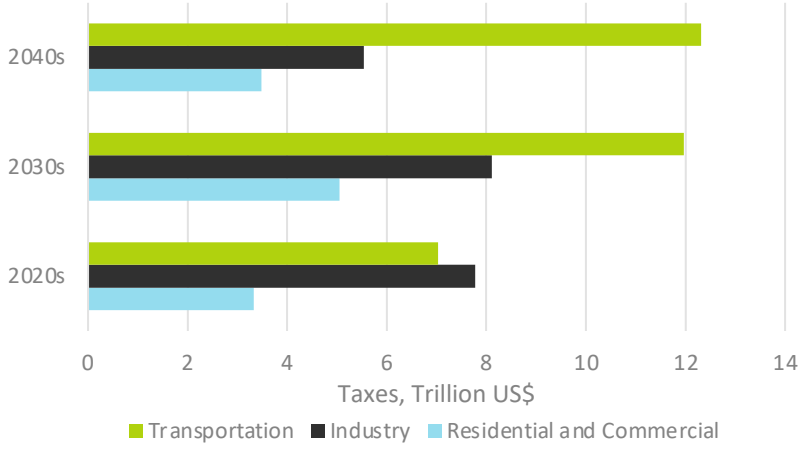
Pasture cover decreased to allow for increase in land-based carbon sinks and bioenergy cropland



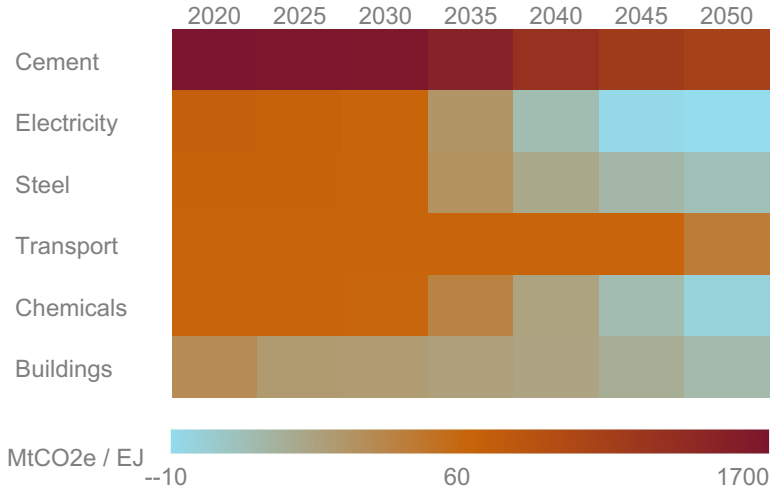
Carbon prices & policies in late 2020s caused early but steady consumption & GDP loss



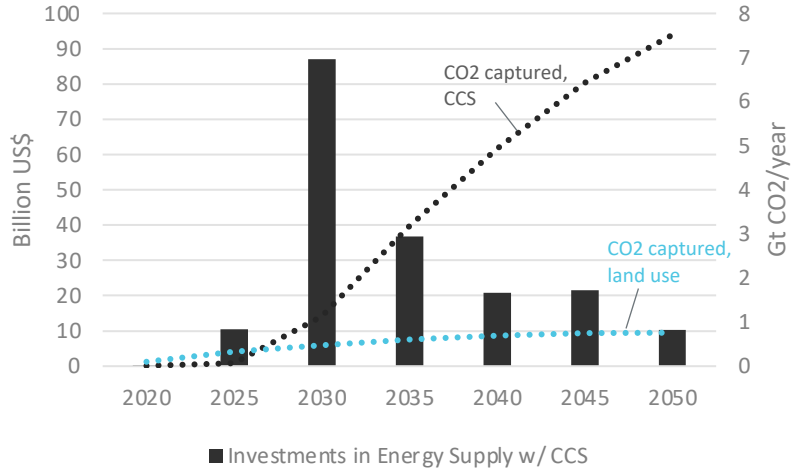
Governments heavily taxed the transportation sector to reduce emissions and support investment



Emissions reduction efforts turned to hard-to-abate sectors in the late 2030s, early 2040s.



Targeted investment in CCS in the early 2030s helped the world reach net zero



Delayed Transition

A decade of delays leads to hasty climate policies that greatly disrupt business and society.

The View from 2050 – Procrastinated, Rushed Action

A decade of inaction in the 2020s drove mounting pressure for climate action. This led to the adoption of hasty and reactionary policies in the 2030s to rapidly halt GHG emissions and make up for lost time. The disorderly approach came with high social and economic costs but ultimately led to a halving of emissions by 2040 and peak warming at 1.8°C. By mid-century, the economic cost of the transition began to stabilize, and governments were able to shift attention to investing in social programs and revitalizing sectors affected by climate policies.

The physical impacts of rising temperature led to disrupted supply chains, food insecurity, mass migration and displacement, reduced economic activity and trade, and social unrest. Companies, which had leaned heavily on voluntary commitments to climate action, were faced with legal mandates to rapidly reduce emissions within short time frames.

Key Scenario Assumptions

- 1.6°C policy ambition
- Delayed policy reaction
- Slow, then fast, technology change
- Low/medium use of CO_2 removal
- High variation in regional policies

Delayed Transition

View from 2050

A **decade of inaction** in the 2020s drove mounting pressure for climate action

This led to the adoption of **hasty and reactionary policies** in the 2030s

The **disorderly approach came with high social and economic costs** but ultimately led to a halving of emissions and peak warming at **1.8°C.**

The 2020s

Policymakers and business implemented limited climate action

Governments and businesses took **limited action to curb emissions** due to lack of political capital caused by implementation challenges, supply chain constraints, and other competing priorities for land use.

Reliance on fossil fuels continued

Fossil fuel development continued, with renewables being viewed as a secondary, less reliable, option. Companies continued to set **voluntary commitments**, but often lacked robust strategies to implement and reach their targets.

Physical impacts brought supply chain disruption

Physical impacts from climate change became more frequent and severe. Businesses experienced **supply chain disruptions** from frequent supply shortages, increasing/volatile prices, and competition for resources.

The 2030s

Abrupt crisis response sparked action

As the **social and economic impacts of acute and chronic weather events** became increasingly evident, many governments declared the climate crisis an emergency and began taking abrupt, forceful, and disruptive action to reduce emissions. **Costly policy instruments**, such as stringent carbon prices and taxes were adopted broadly but unevenly across jurisdictions.

Business struggled amidst high compliance costs

Businesses were faced with **high compliance costs** and had to **rapidly deploy costly technological innovation**, employee reskilling, and reporting mechanisms. This led to **rushed development of on-site renewable energy projects**, energy procurement, and rapid emissions reduction programs at a greater cost.

Emissions reduction was ultimately successful but turbulent

The sudden overhaul of the energy system caused **volatile energy prices and reliability issues** as grids accommodated increased renewable energy and electricity loads. The rapid push for decarbonization and implementation of “blanket” policies meant that **local contexts were often overlooked**.

The 2040s

A new low-carbon economy emerged

Climate **negotiations shifted from mitigation towards adaptation**, with historically high-emitting countries failing to assume financial responsibility for climate impacts. Most investment in adaptation took place in high-income countries, leaving the middle- and low-income countries most exposed.

Decarbonization efforts shifted to hard-to-abate sectors

Sectors that struggled to decarbonize (e.g., heavy industry, steel, cement, aviation, shipping, mining) gained greater attention, driving **investment in innovation to develop low-carbon production technologies**.

Temperatures and physical impacts stabilized

With **growing GDP loss and volatile markets**, operating under uncertainty was the new norm. Businesses were faced **with increasing costs of goods**, and a need for greater investment to protect their operations from extreme weather events. **Natural areas recovered**, leading to an increase in carbon dioxide sequestered through land-based sinks. Continued **investment in low-carbon energy and carbon removal technologies** allowed the world to reach a state of net zero emissions.

The 2020s: What Defined the Decade

Policymakers and businesses implemented limited climate action

- Governments and businesses took **limited action to curb emissions** due to lack of political capital caused by implementation challenges, supply chain constraints, and other competing priorities for land use. International congresses to advance climate action continued to take place with limited progress and impact. Countries continued to **reset national climate targets**, many of which were **not aligned with the Paris Agreement** and failed to meaningfully invest in both mitigation and adaptation measures.
- GHG emissions remained constant through the decade, and temperatures continued to rise, reaching 1.66°C above pre-industrial levels by 2030. With **growing geopolitical instability** and gas prices jumping 43% in the decade, **energy security became the focus of public policy** and climate mitigation was deprioritized.

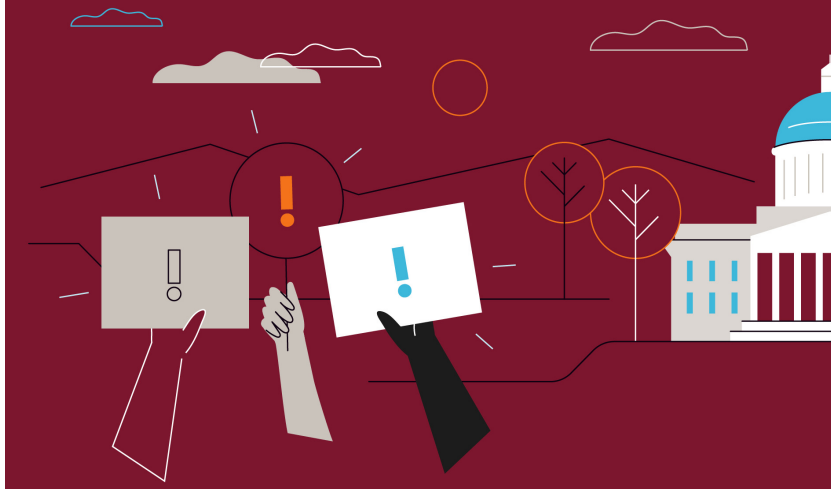
Reliance on fossil fuels continued

- Companies continued to set **voluntary commitments**, but often lacked robust strategies to implement and reach their targets. Regulations on disclosure and enforcement of corporate targets were not widely implemented. To protect their supply chains from **increasingly severe and frequent weather disruptions,** companies focused on **increasing supplier redundancy**, but failed to make significant investments to reduce Scope 3 emissions. Similarly, decarbonizing Scope 2 emissions was a challenge.
- **Fossil fuel development continued**, with renewables being viewed as a secondary, less reliable, option. From 2020 to 2030, investment in the extraction of fossil fuels grew by 45%, with investments peaking mid-decade. **Electricity grids remained carbon-intensive and underinvested**. As a result, companies and their suppliers struggled to procure renewable energy.

Physical impacts brought supply chain disruption

- In the second half of the decade, **physical impacts from climate change** became more frequent and severe. Businesses experienced **supply chain disruptions** leading to frequent supply shortages, increasing and volatile prices, and greater competition for resources. Mexico, a major manufacturing hub, experienced a 27.7% increase in damages from tropical cyclones (hurricanes) in 2025, as compared to 2015. In Australia, the percentage of the population exposed to wildfires more than doubled by 2030 compared to 2015.
- By the end of the decade, the increasingly apparent impacts of climate change on economies, the **physical and mental well-being of people**, and the viability of businesses began to galvanize corporate and popular **support for more ambitious climate action and policies**.

Delayed Transition



- Without significant climate action, global temperatures reached 1.66°C above pre-industrial levels by 2030.
- Global investments in fossil fuel extraction grew by 45% from 2020 to 2030, and the supply of renewable energy remained limited.
- Physical impacts became more apparent and disruptive, such as in Mexico where tropical cyclone damage increased by nearly 28% by 2025.

The 2030s: What Defined the Decade

Abrupt crisis response sparked action

- By the start of the 2030s, the toll of **worsening weather events** on populations was evident. In India, the share of the population exposed to heatwaves grew to 12.8% in 2035, up from just 4.1% in 2015. As the **social and economic impacts of acute and chronic weather events** became increasingly evident, many governments declared the climate crisis an emergency and began taking abrupt, forceful, and disruptive action to reduce emissions. **Costly policy instruments**, such as stringent carbon prices and taxes were adopted broadly but unevenly across jurisdictions. These policies caused the **price of carbon globally to jump over 3500%** during the decade, from US$5.89/ton in 2030 up to US$213.44/ton by 2040.
- However, the application of policies varied across the globe. Some countries most affected by physical impacts focused on **adaptation instead of mitigation**, and other countries that prioritized development, such as China and those in the Middle East and North Africa, continued to invest in fossil fuels, resulting in a **fragmentation of the global regulatory landscape**.

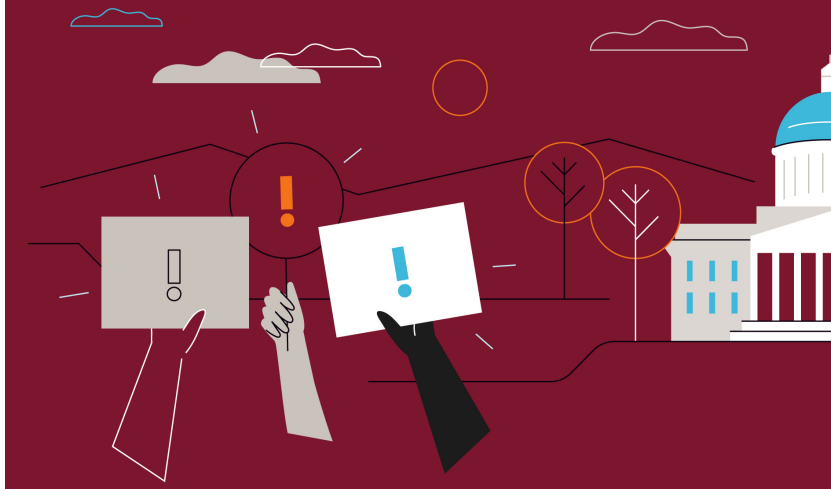
Business struggled amidst high compliance costs

- Businesses were faced with **high compliance costs** and had to **rapidly deploy costly technological innovation**, employee reskilling, and reporting mechanisms. Most sectors were impacted by legal mandates to halve emissions by 2040 and fully decarbonize by 2050, despite the fragmented nature of global policies. This led to **rushed development of on-site renewable energy projects**, energy procurement, and rapid emissions reduction programs at a greater cost. Barriers to renewable energy deployment in some jurisdictions led to **reshoring and nearshoring of operations**. To offset emissions, companies and governments invested heavily in **carbon capture and storage**, with total investments rising more than 100-fold to US$59.2 billion by the end of the decade.

Emissions reduction was ultimately successful but turbulent

- By the end of the decade, **global emissions had dropped** 53% compared to 2030 levels. To accomplish this drastic reduction, electricity produced by coal dropped from 1,667GW in 2030 to a mere 44GW in 2040. The sudden overhaul of the energy system caused **volatile energy prices and reliability issues** as grids transitioned to accommodate increased renewable energy and electricity loads. The cost of climate policies, coupled with macro-economic damages from continuing physical impacts, led to a **global GDP loss** of US$717 billion in 2030 alone, which ramped up to a total of US$34.2 trillion for the entire decade.
- The rapid push for decarbonization and implementation of “blanket” policies meant that **local contexts were often overlooked**. Initiatives led by local communities and grassroots organizations became fragmented and focused on **community resilience**. In response, businesses focused their effort attention on **climate justice efforts for disproportionately affected and vulnerable communities** via investment in frontline communities.

Delayed Transition



- Abrupt and aggressive climate policies, such as carbon prices that skyrocketed to US$213/ton defined the decade.
- Many businesses struggled to deal with the numerous issues brought by the hasty transition, including high prices, unreliable energy supplies, and high regional variation in policies.
- By 2040, the combined physical damages from climate change and high policy costs totaled US$34.2 trillion in GDP losses for the decade.

The 2040s: What Defined the Decade

A new low-carbon economy emerged

- Governments continued to expand climate policies into the 2040s, but with an **increased focus on climate adaptation**. Increasingly stringent government policies caused carbon prices to rise an additional 50% in the first half of the decade, reaching nearly US$417/ton by 2045.
- Achieving a **just transition** (i.e., an economic transition that is fair, inclusive, and equitable to those that it concerns) became the focus of economic recovery programs. Public incentives drove **investment in low-carbon industries** in regions that experienced greater job loss, creating new economic opportunities and worker reskilling programs. Increased **public pressure and stringent regulations** to maintain a downward trend in emissions and ensure a just transition, resulted in a **heightened degree of monitoring and accountability** for high-emitting economic sectors and national governments.

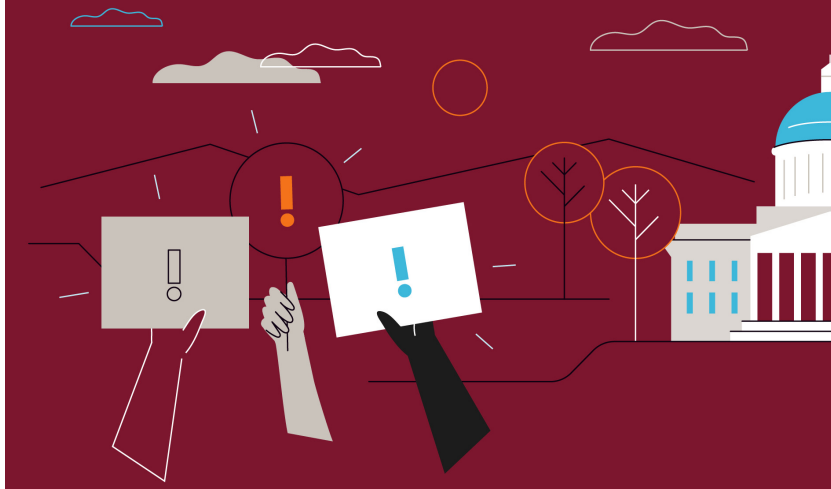
Decarbonization efforts shifted to harder-to-abate sectors

- Following a rapid transition to a low-carbon economy, **many sectors once again experienced greater steadiness** as costs for key inputs like freight and electricity began to stabilize and fall. However, companies continued to invest in new technologies **as increasing resilience became instrumental** for businesses across markets. After intensive investment in the low-carbon energy supply system in the 2030s, investment in low-carbon energy, including at the extraction and conversion stages, became less of a priority and leveled off in the 2040s.
- Sectors that struggled to decarbonize (e.g., heavy industry, steel, cement, aviation, shipping, mining) gained greater attention, driving **investment in innovation to develop low-carbon production technologies**. For example, the use of hydrogen in industrial sectors increased nearly five-fold from 2030 to 2050, in part due to a nearly 300% spike in hydrogen energy supply investments in the late 2030s. The development of new, lower-carbon forms of production, combined with the use of carbon capture and sequestration (CCS) technologies, led to a **stabilization in steel and cement production**, which had faced significantly reduced demand in the 2030s and 2040s to curb emissions. Although carbon removal technologies were still costly, companies invested in them to address residual emissions and meet their climate targets.

Temperatures and physical impacts stabilized

- Due to climate action and a decrease in emissions, **temperatures began to level off around 1.8°C** above pre-industrial levels and extreme weather events began to stabilize. **Natural areas recovered**, leading to an increase in carbon dioxide sequestered through land-based sinks. Continued **investment in low-carbon energy and carbon removal technologies** allowed the world to reach a state of net zero emissions. **Localized adaptation responses** allowed some populations and industries to gradually build resilience to acute and chronic weather events, but not without the continued spending on the hardening of existing infrastructure.

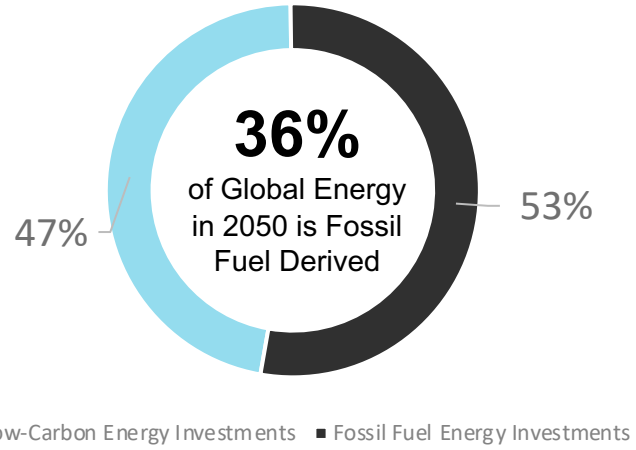
Delayed Transition



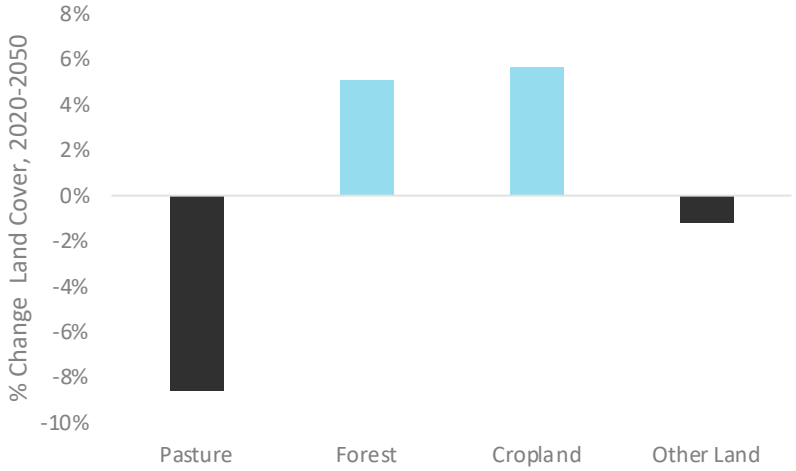
- After many regions and industries were heavily disrupted in the 2030s, achieving a just transition became the focus of economic recovery programs.
- Industrial hydrogen use grew nearly five-fold from 2030 and 2050, and enabled sectors such as cement and steel to stabilize their emissions.
- Global temperatures began to level off around 1.8°C above pre-industrial levels. Extreme weather events remained, but were largely adaptable.

Delayed Transition

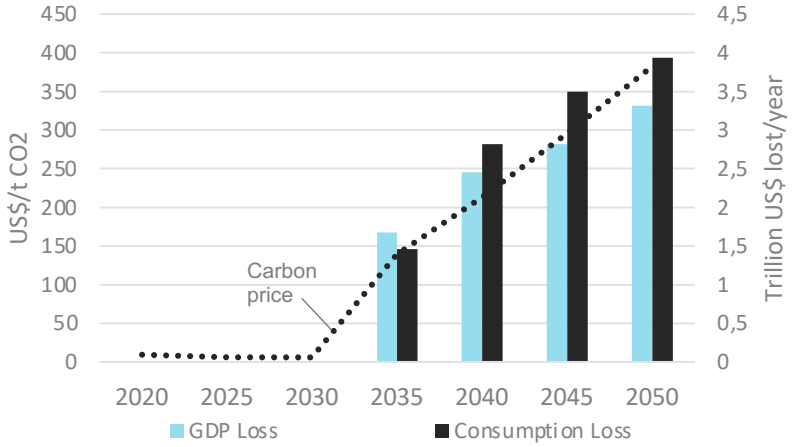
Sustained investment in renewables through 2050 helps to clean up the world's energy supply



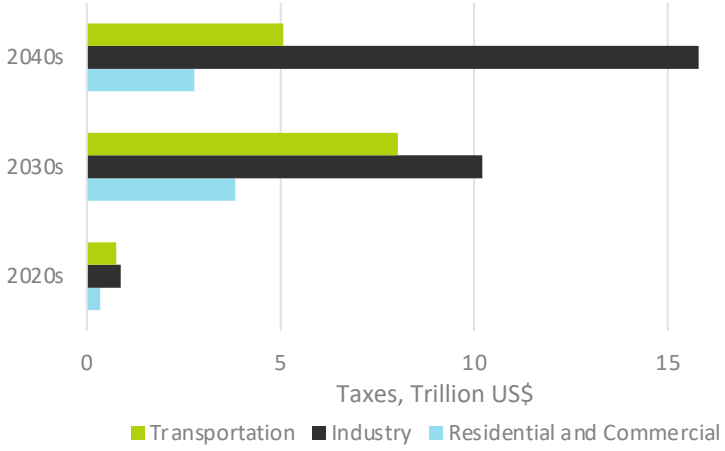
Pasture cover decreased to allow for increase in land-based carbon sinks and bioenergy cropland



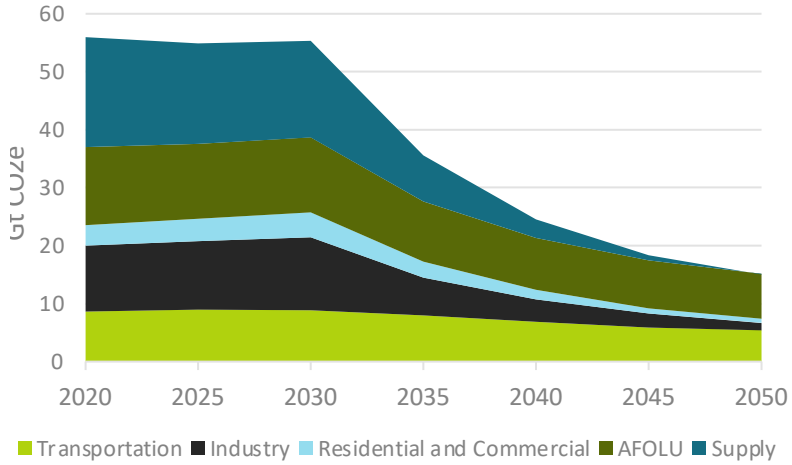
Aggressive carbon prices and policies in the 2030s caused rapid decline in GDP and total consumption



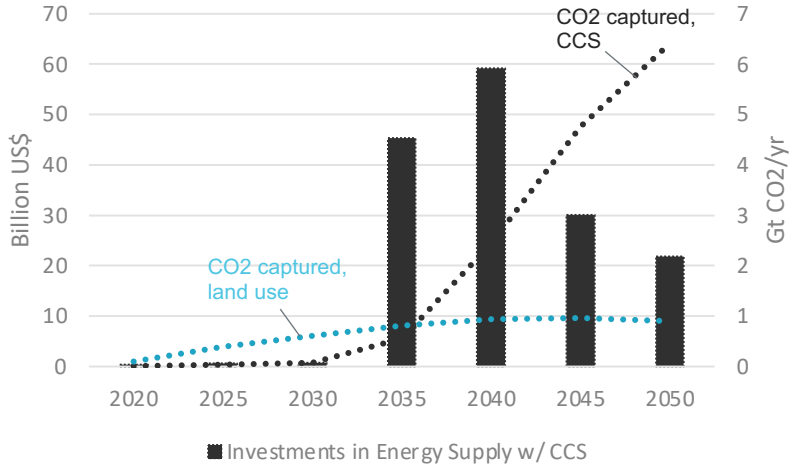
Governments levied heavy taxes on industry to rapidly reduce emissions and support spending



Heavy emissions reductions starting in 2030 were required by industrial and energy supply sectors



Intensive and prolonged CCS investment from the 2030s-2040s was required to reduce emissions



04

Conclusion

Updates to the NGFS Scenarios Coming in 2024 and Beyond

The NGFS Climate Scenarios are regularly updated and made available as a public good. A new version was recently updated in November 2023, and BSR will continue to monitor and improve its scenarios for business-use as well.

Latest NGFS Scenario Updates

- NGFS launched its latest phase IV scenarios in November 2023. Significant updates include:
  - Inclusion of recent climate policies such as the U.S. Inflation Reduction Act (IRA), the EU Fit for 55, and other **policies and country-level commitments enacted through March 2023**
  - Impact of energy crisis **and war in Ukraine**
  - Updated **trends and projections for technologies**, such as decreased capital costs for solar panels
  - **Lower projections for carbon capture and storage**; removal of direct air carbon capture from all scenarios
  - Addition of **heatwaves and droughts to physical impact models** and calculations

NGFS Plans for Future Updates

- Although NGFS announced that Phase V will not be released in 2024 and is now on a 2-year release cycle (with minimal annual updates), its future plans for updating its scenarios include:
  - New **short-term scenarios** and better calibration of variables to match probable short-term scenarios
  - **New economic sectors** and more granular data for those sectors
  - **Enhancing physical risk damage models** to include even more physical risks

How BSR Will Update its Scenarios

- As NGFS releases updates to its scenarios, BSR will update its own scenario analysis offering and tools to **include the latest data from NGFS**. Phase IV results will be incorporated into BSR's climate scenarios offering in 2024.
- BSR will include a new fourth scenario, "**Fragmented World.**"
- BSR also plans to increase the focus of our scenarios and associated narratives on **climate justice** and **nature** impacts in 2024.

Sources: NGFS Scenarios for central banks and supervisors: Phase IV. (November 2023).

Next Steps for Business and Climate Scenario Analysis

While scenario analysis has long been a business tool used to stress-test strategy in a rapidly changing world, the TCFD recommendations have made climate scenario analysis a key recommendation for business. Using BSR's set of climate scenario narratives, BSR works with member companies by tailoring the scenarios to a company-specific context and running cross functional strategy workshops.

Identifying Risks and Opportunities

- In collaboration with the member company through a series of discussions and workshops, BSR's climate scenario narratives and the relevant variables will be used to **brainstorm and identify the most relevant risks and opportunities** for the member.

Integrating with Business Strategy

- Once the risks and opportunities are identified, these can then be synthesized into **implications for the entire business and its strategy**.
- The top identified risks should also be incorporated into the company's existing enterprise risk management (**ERM)** taxonomy and process.

Reporting

- Once completed, the findings from the climate scenario analysis—including risks, opportunities, and strategies—can be incorporated into the company's **TCFD-aligned and/or CDP report**.

05

Appendix

Glossary

Key Terms and Definitions

Term	Definition	Source
Acute physical impacts (also see chronic physical impacts)	Physical impacts from climate change that are event-driven and generally short-term in nature, such as floods, tropical cyclones, or extreme heat waves.	EPA
Biodiversity	Biodiversity (amalgamation of biological diversity) refers to the variety of life found in a specific place—including genetic diversity, species diversity, and ecosystem diversity. Biodiversity loss occurs when species and/or genetic diversity are lost to impacts such as habitat destruction and climate change. This loss of biodiversity has negative ramifications for the overall health and resilience of ecosystems.	Smithsonian
Carbon capture and storage	A collection of technologies aimed at combating climate change by capturing carbon emissions from fossil fuel combustion, industrial processes, and other energy production practices that emit carbon (such as biofuels), and then storing the captured carbon (typically underground).	MIT Climate
Carbon price	A market-based approach to emissions reduction that puts a price on carbon emissions, such as through carbon taxes or emissions trading schemes (ETS).	UCS USA
Chronic physical impacts (also see acute physical impacts)	Physical impacts from climate change that are related to longer-term shifts in climate patterns, such as sustained higher temperatures, increased ranges for diseases, sea level rise, or changing precipitation patterns.	EPA
Climate adaptation	Actions taken to adapt processes or structures to moderate the potential damages from climate change.	UNFCC
Climate justice	A term and movement that attempts to address the fact that climate change will have more severe impacts on underprivileged populations, despite that these are the same populations that have often contributed the least to causing climate change.	Yale
Climate mitigation	Efforts to reduce or prevent the emissions of greenhouse gases.	UNEP

Key Terms and Definitions (cont.)

Term	Definition	Source
Climate-related opportunity (also see climate risk)	The potential positive impacts of climate change on an organization. These often refer to additional benefits that may result from an organization taking steps to address climate change. Examples include cost savings or increased energy security that result from long-term renewable energy procurement plans, or increased sales from the development of new products and services aimed at addressing climate change.	TCFD
Climate resilience	The capacity of a system to withstand, respond, and recover from the impacts of climate change.	U.S. Climate Resilience Toolkit
Climate risk (also see climate-related opportunity)	The potential negative impacts of climate change on an organization. This includes both physical risks that result from climate change, such as extreme weather events, and the transition risks that result from the transition to a lower-carbon global economy, such as carbon prices.	TCFD
Consumption loss	A policy cost of climate change associated with decreased overall economic consumption.	NGFS
Energy transition	The transition in the global energy sector away from fossil fuels as the primary energy source and toward renewable or low-carbon forms of primary energy, such as solar, wind, and nuclear.	ENEL
Kyoto gases	A collection of six greenhouse gases that predominantly contribute to climate change and were established as part of the Kyoto Protocol in 1992. The collection of gases includes carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and the so-called F-gases(hydrofluorocarbons and perfluorocarbons) and sulphur hexafluoride (SF6).	UNFCC
Fugitive emissions	Often unintentional emissions of greenhouse gases from leaks, evaporative processes, or windblown processes.	California Air Resources Board
Green hydrogen	Hydrogen produced by electrolysis where the original energy to power the electrolysis process is derived from renewables, as opposed to grey hydrogen (natural gas powered) and blue hydrogen (natural gas powered with carbon capture).	World Economic Forum

Key Terms and Definitions (cont.)

Term	Definition	Source
Hard-to-abate sectors	Sectors, such as cement, steel, and aviation, that are carbon intensive and currently have few, if any, viable low-emission solutions available.	IRENA
Just transition	Transitioning to a low-carbon economy to meet climate targets in a way that is as fair and inclusive as possible to everyone concerned, creating decent work opportunities, and leaving no one behind.	ILO
Nationally Determined Contributions (NDCs)	Countries' self-defined national climate pledges that detail how they will contribute to the Paris Agreement through actions to mitigate their emissions and adapt to climate change. As established by the Paris Agreement, signatories are required to update their NDCs every 5 years.	UNDP
Net Zero	A state of balance where all of humanity's greenhouse gas emissions (inclusive of all Kyoto gases) are balanced by its greenhouse gas removals. In reference to the Science-Based Target Initiative, net zero also requires organizations to achieve at least a 90% reduction in greenhouse gas emissions by no later than 2050.	SBTi
Paris Agreement	A legally binding international treaty to address climate change established at the UN's Climate Change Conference (COP21) in Paris in 2015. The overarching goal of the treaty was to hold global temperature change well below 2°C above pre-industrial levels and pursue efforts to limit temperature change below 1.5°C above pre-industrial levels.	UNFCC
Physical risks (also see transitional risks)	Climate risks related to the physical impacts of climate change, such as extreme heat tropical cyclones. Includes both chronic and acute physical risks.	EPA
Policy costs	The costs associated with enacting climate policies, such as decreased consumer spending and unemployment.	NGFS
Primary energy	The final source of energy before it was transformed or exploited. Typical primary energy sources include fossil fuels, renewables, and nuclear. NGFS commonly also mentions final energy, which refers to the final form that an energy source is converted to before being utilized. Typical final energy types include electricity, gasoline, and hydrogen.	EIA

Key Terms and Definitions (cont.)

Term	Definition	Source
Residual emissions	Emissions that remain after efforts (typically referring to very substantial efforts) have been made to reduce emissions. Residual emissions typically remain because reducing them is economically or technologically unfeasible.	Nature Journal
TCFD	The Taskforce on Climate-related Financial Disclosures is a voluntary framework for companies and other organizations to use to report on their climate performance, risks, and opportunities.	TCFD
Technology transfer	The transfer of knowledge, experience, and equipment for mitigating and adapting to climate change between different stakeholders. This has historically referred to the transfer of technologies from developed countries to developing countries but also encompasses the need for indigenous knowledge and solutions to be adopted and transferred to existing power structures that have ignored the value of their knowledge.	IPCC
Transitional risks (also see physical risks)	Climate risks related to the transition to a lower-carbon economy, such as carbon prices or job loss.	EPA
Transition minerals	Minerals such as cobalt, copper, lithium, and nickel that are essential to technologies (e.g., solar panels, wind turbines, and electric vehicles) that are crucial to the world's transition to a low-carbon economy.	Resource Governance

Acknowledgements

Acknowledgements

The BSR climate scenarios were developed by Ameer Azim, Maria Troya, Victoria Woolner, Taylor Black, and Travis Osland.

We thank all reviewers who contributed to the development of the BSR climate scenarios:

At BSR, Nina Hatch, Charlene Collinson, Deborah Gallagher, **Giulio Berruti**, **Jacob Park**, Cliodhnagh Conlon, **Eileen Gallagher**, Paul Holdredge, **Beth Richmond, Michael Rohwer, Berkley Rothmeier**, Ricki Berkenfeld, **Cameron Steagall**, and David Wei.

We also thank the NGFS Secretariat, Climate Analytics, and others involved in the development of NGFS climate scenarios.

The BSR climate scenarios were made possible with funding from Bloomberg Philanthropies.

BSR and NGFS Resources

- Additional information on BSR's work can be found on the Climate Scenarios' dedicated **website**.
- For more information on climate scenario analysis, see BSR's blog **here**.
- If you would like BSR to support your organization in conducting climate scenario analysis, please contact Ameer Azim (aazim@bsr.org)

BSR's work on Climate Change and Futures Thinking

- BSR catalyzes business action on Climate Change by helping companies to reduce their **GHG** emissions and build resilience to climate impacts.
- Through the Sustainable Futures Lab, BSR explores emerging issues at the nexus of business and sustainability.

- The NGFS Climate Scenarios Portal hosts information on the six scenarios developed by the Network.
- A full list of relevant NGFS Climate Scenario documentation and resources can be found at the Data & Resources subsite.

Data Portals

- The NGFS IIASA Scenario Explorer is a web-based user interface that provides visualizations and display of the transition scenarios time series data.
- The NGFS CA Climate Impact Explorer is a web-based user interface that provides visualizations and display of the physical scenarios time series data.

Licensed Use of NGFS Scenario Data

The climate scenario narratives in this document are Adapted Material based on the Licensed Material (Climate Scenarios and respective transition and physical data) developed by the Network for Greening the Financial System (NGFS).

The narratives in this document are based on the second set of NGFS climate scenarios, released in June 2021.

BSR has modified the Licensed Material developed by the NGFS to produce the climate scenarios narratives in this document.

All quantitative information (i.e., data) included in this document are part of the NGFS Scenarios. Transition data is part of the NGFS IIASA Scenario Explorer (release 2.2). Unless indicated, all other material, including the climate scenario narratives, were adapted by BSR.

NGFS materials are licensed under the Public License of the Network for Greening the Financial System. The NGFS has not endorsed the climate scenarios developed by BSR or their use.

Physical Impact Data

Physical impact data included in this document belongs to the NGFS CA Climate Impact Explorer, developed by Climate Analytics, with data from ISIMIP and CLIMADA.

About BSR

Business Transformation for a Just and Sustainable World

BSR is a sustainable business network and consultancy focused on creating a world in which all people can thrive on a healthy planet.

With offices in Asia, Europe, and North America, BSR provides its 300+ member companies with insight, advice, and collaborative initiatives to help them see a changing world more clearly, create long-term value, and scale impact.

Check out our About BSR video >>

1
Mission

30+
Years of experience

300+
Member Companies

200+
Global Staff

6
Focus Areas

20+
Collaborative Initiatives

11
Locations

Copenhagen
Guangzhou
Hong Kong
London
New York
Paris
San Francisco
Shanghai
Singapore
Tokyo
Washington, D.C.

The BSR Difference

Focus on Impact

We create holistic business solutions that offer the biggest opportunities for meaningful change, not just with your company, but also by working with value chain partners, markets, policymakers, and systems.

Seeing the Connections

We make connections between issues, and between your business and the wider social context. This global mindset informs our effort to provide you with holistic strategies which consider impacts on a diverse range of stakeholders.

A Diverse Team of Experts

Our passionate, committed team of sustainability leaders is comprised of people from diverse backgrounds, and experience working in companies, NGOs, academia, government, and consulting. This array of talent enables us to provide the expertise and insight to help companies navigate the critical sustainability issues they face.

Focus on Action

We provide honest advice and insight that translates your ambitions into credible action. We articulate the strategic business value of our recommendations, while still emphasizing the importance of values. Our guidance will always look for opportunities to collaborate, to support public policy solutions, and encourage transparency and accountability.

Check out BSR's Our People video >>




Focus Areas and Industries

We offer thought leadership, strategic advice, and opportunities to collaborate on the world's most important sustainability issues

Focus Areas

Climate Change

We work with companies to deliver 1.5°C-aligned climate goals, transform their value chains, manage climate risks, and advance climate justice.

Equity, Inclusion, and Justice

We help companies to build a more equitable world through socially just business practices. Using an equity-first approach, we help increase access to opportunity across the business ecosystem.

Human Rights

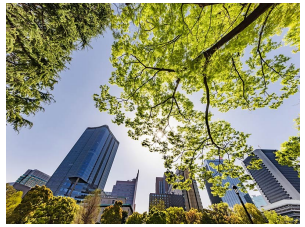
We help companies to navigate the increasingly complex global human rights landscape, prepare to comply with emerging legislation, and partner across their value chains to address the systemic causes of human rights abuses.

Nature

We help companies identify and address their Nature impacts and dependencies and develop ambitious strategies and solutions to address risks and opportunities, both in their own operations as well as throughout the value chain.

Supply Chain Sustainability

We work with supply chain, sourcing, and procurement functions at any tier to develop holistic, sustainable sourcing approaches tailored to your value chain's specific contexts, challenges and opportunities.



Sustainability Management

We support business transformation to meet existing and emerging sustainability challenges, by providing strategies, tools and roadmaps that anticipate risks and capture opportunities on ESG issues.

Industries

- Consumer Products
- Energy and Extractives
- Financial Services
- Food, Beverage, and Agriculture
- Healthcare
- Industrials and Utilities
- Technology
- Media and Entertainment
- Transport and Logistics
- Travel and Tourism

Disclaimer

The conclusions presented in this document represent BSR's best professional judgment, based upon the information available and conditions existing as of the date of the review. In performing its assignment, BSR relies upon publicly available information, information provided by member companies, and information provided by third parties. Accordingly, the conclusions in this document are valid only to the extent that the information provided or available to BSR was accurate and complete, and the strength and accuracy of the conclusions may be impacted by facts, data, and context to which BSR was not privy. As such, the facts or conclusions referenced in this document should not be considered an audit, certification, or any form of qualification. This document does not constitute and cannot be relied upon as legal advice of any sort and cannot be considered an exhaustive review of legal or regulatory compliance. BSR makes no representations or warranties, express or implied, about the business or its operations. BSR maintains a policy of not acting as a representative of its membership, nor does it endorse specific policies or standards. The views expressed in this document do not reflect those of BSR member companies.

Thank You

BSR™ is a sustainable business network and consultancy focused on creating a world in which all people can thrive on a healthy planet. With offices in Asia, Europe, and North America, BSR provides its 300+ member companies with insight, advice, and collaborative initiatives to help them see a changing world more clearly, create long-term value, and scale impact.

www.bsr.org

BSR®