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The turning point

A Global Summary

May 2022

MAKING AN IMPACT THAT MATTERS since 1845

Foreword

The passage of time frames history—but it is the choices we make that define progress, and our humanity. Turning points can be purposeful—or imposed on us through either inertia or external forces beyond our control. Time and again, our actions, as one humanity, have demonstrated that we can solve the most daunting challenges and change for the better.

As the scientific evidence confirms our planet is at a crossroads, the power of economics, as seen in Deloitte's Turning Point series, is to point the way to collective and individual prosperity. But this path to prosperity can only be realized when we confront the hard economic truths in meeting the challenges of climate change and decarbonization. Through the analysis in these reports, we call for a change in mindset—building for opportunity not catastrophe. We recognize the needed investments in technology and people that build human and planetary prosperity, while acknowledging the inevitable questions about inequality and uncertainty that surround these choices.

The Deloitte reports highlight that inaction or insufficient action on climate change will see global economic growth, productivity, trade, and competition deteriorate. This is the new baseline for our collective economic futures. But collective action to realize a low-emissions economy will generate growth and prosperity over the coming decades.

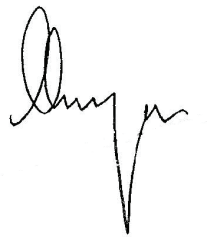
Transitions are necessary, though never easy. This truth is written into the DNA of the business community. It is this recognition by business, which is now driving the transformative shifts required to address climate change.

What this analysis also demonstrates is that, despite global differences and divisions, collective action on climate change can benefit every region of the world with meaningful gains in growth and income, and jobs for their citizens. Herein lies the power of these reports—to demonstrate the shared prosperity our choices can bring, and so to bring hope to the fight against climate change. And done well, this future holds the prospect of a more equitable and sustainable world.

Even as the world confronts war and economic uncertainty, the window to confront the climate crisis is rapidly closing. We must not lose sight of a key truth: a collective investment in addressing climate change can pay handsome dividends for the global economy.

Economics is on the side of a low-emissions future. As governments, industries, and financial markets continue to reallocate capital toward decarbonization, the world can accelerate to net-zero emissions and unlock the economic opportunity that comes with it.

This is our *Turning Point.*



Punit Renjen
Deloitte Global Chief Executive Officer

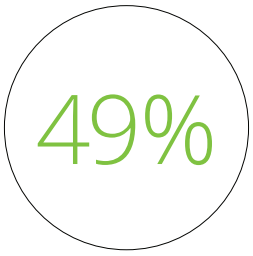

Time is up and we know it

The Intergovernmental Panel on Climate Change's (IPCC) latest report delivers the message we already know in our gut is true.[1] Time is no longer running out. It's up.

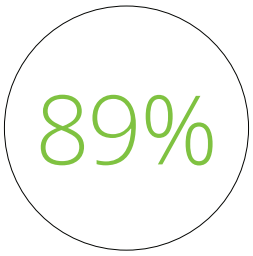
Over the past 18 months alone, there have been storms, wildfires, droughts, downpours, and floods around the globe. Regardless of where these events occurred, the result was tragically similar. People hurt and lost. Homes reduced to rubble. Infrastructure destroyed.

People are seeing and experiencing the changing environment, and global opinion polls and business surveys alike have started to reflect this growing awareness. People are aligning their spending with their values. Investors are questioning the environmental, social, and governance impact of their choices. Business leaders now recognize climate change as a planetary emergency.[3]

The need for action has never been clearer. The question before us now is: How do we pivot from awareness to action?



Deloitte's 2022 Sustainable Actions Index Survey covering 23 countries finds that nearly half of respondents (49%) reported experiencing a climate-related event—drought, wildfire, extreme heat, severe storms—in the previous six months.[2]



Eighty-nine percent of C-level executives surveyed by Deloitte agree there is a "global climate emergency." Seventy-nine percent today see the world at a tipping point for responding to climate change.[4]

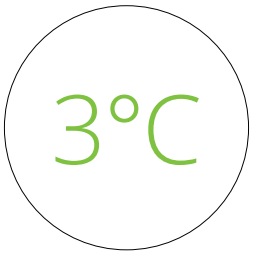
Answering that question lies partly in a better understanding of the economics of climate change. The Deloitte Economics Institute modeled region-level data from 15 geographies[5] across Asia Pacific, Europe, and the Americas to estimate how much it could cost the global economy if we aren't able to prevent global average temperatures from rising 3°C by the end of the century.

Using scenario analysis from Deloitte's Regional Climate Integrated Assessment Computable General Equilibrium Model (D.Climate), which demonstrates how climate impacts could affect economic output (GDP), employment, and industry, the researchers established a new economic baseline, one that incorporates the climate impacts the IPCC report describes. The team then compared this three-degrees-hotter world to a more hopeful scenario: a future in which the world makes a different choice—and changes.

The status quo is the costlier choice.

According to the modeling, unchecked climate change could cost the global economy US$178 trillion in net present value terms from 2021–2070. The human costs would be far greater: a lack of food and water, a loss of jobs, worsening health and well-being, and reduced standard of living.

If, on the other hand, the world acts now to rapidly achieve net-zero emissions by midcentury, the transformation of the economy could set the world up for stronger economic growth by 2070, according to Deloitte's analysis. Such a transformation could increase the size of the world economy by US$43 trillion in net present value terms from 2021–2070.[6]



Deloitte's modeling shows that unchecked climate change, where global average temperatures rise by 3°C, hinders growth in every region. Unless the world takes rapid and coordinated action, an increasingly climate-damaged economy could become the new normal.


$178 trillion
in global economic losses
Net present value terms to 2070 in Us dollars

The underlying assumptions of the Turning Point analysis

The Deloitte Economics Institute Turning Point series modeled two scenarios, from today to 2070, to compare the choices of global action and global inaction.

A

Scenario A:
Allow global greenhouse gas (GHG) emissions to rise, and the planet continues to warm: This economic path represents a future with a larger stock of global GHG emissions, where average temperatures increase by around 3°C by 2100. This scenario reflects a widely adopted set of emissions, economic, and population assumptions, referred to as SSP2 6.0.

B

Scenario B:
Decarbonize our economy by midcentury: This economic path represents a sequencing of efforts by government, businesses, and citizens—to achieve global net zero emissions by 2050. This scenario would make it possible to limit warming to close to 1.5°C well below the warming threshold of 2°C set out in the Paris Agreement.

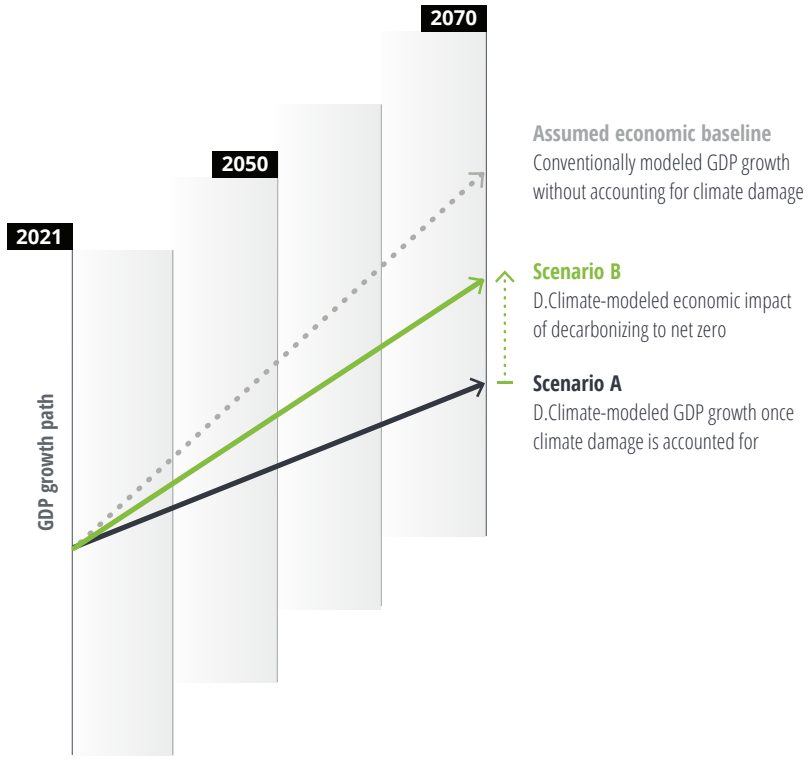
The implications of these scenarios that the Deloitte Economics Institute developed were published for Asia Pacific (August 2021), Europe (October 2021), The United States (January 2022), and South America (May 2022).

The transition to net-zero emissions would create fundamental changes to the structure of economic growth as the economy switches the energy mix from reliance on fossil fuels to renewable electricity augmented by fuel sources such as hydrogen. During the initial stage, the combined cost of the upfront investments in decarbonization coupled with the already locked-in damages of climate change would temporarily lower economic activity compared to the current emissions-intensive path.

As the economy completes the transition, however, the economic benefits of avoided climate damage and the emergence of new sources of growth and job creation would start to outweigh the costs. At this moment, called the "turning point" in this analysis, the economy would be able to grow more significantly, than if we continue on the current path (figure 1).

A net-zero future offers opportunity compared to a path of inaction

FIGURE 1. This illustration depicts the opportunity of new economic growth under a net-zero scenario



Note: Illustrative depiction of alternative levels of trends in economic growth.
Source: Deloitte Economics Institute.

Regardless of when it begins, there will be costs associated with the transition. But because climate impacts worsen with each degree of temperature rise, the greatest opportunities—both environmental and economic—are expected to occur if we achieve net-zero emissions by midcentury.

The speed and contours of the transformation will vary by region, but nearly every country and sector would gain through rapid decarbonization, the Deloitte Economics Institute's research shows. And those most exposed to the economic damages of unchecked climate change would also have the most to gain from embracing a low-emissions future.

Despite the uncertainties that come with modeling a 50-year scenario, the Turning Point results offer a compelling vision of a future within our power to create—one in which climate change has been limited, where new industries are employing former fossil-fuel workers, and where countries are exporting low-emissions goods and services for the global decarbonized economy.

Central to this analysis is the contention that climate change is not just a scenario, but the trend, and it should be accounted for in our decision-making. Despite the climate science, this hasn't been the case in most economic modeling. This means that when leaders see economic projections, they're usually looking at forecasts that don't account for the damage that unmitigated climate change will inflict. This view of the world has come up against overwhelming scientific consensus—and, increasingly, our own lived experiences. If the economic impacts of a changing climate are left out of economic baselines, the result is likely to be poor decision-making, ineffective risk management, and dangerously inadequate efforts to address the climate crisis.

Because the climate has changed, our economics, too, need to change.

Because the climate has changed, our economics, too, need to change.

If we allow climate change to go unchecked, it will ravage our global economy

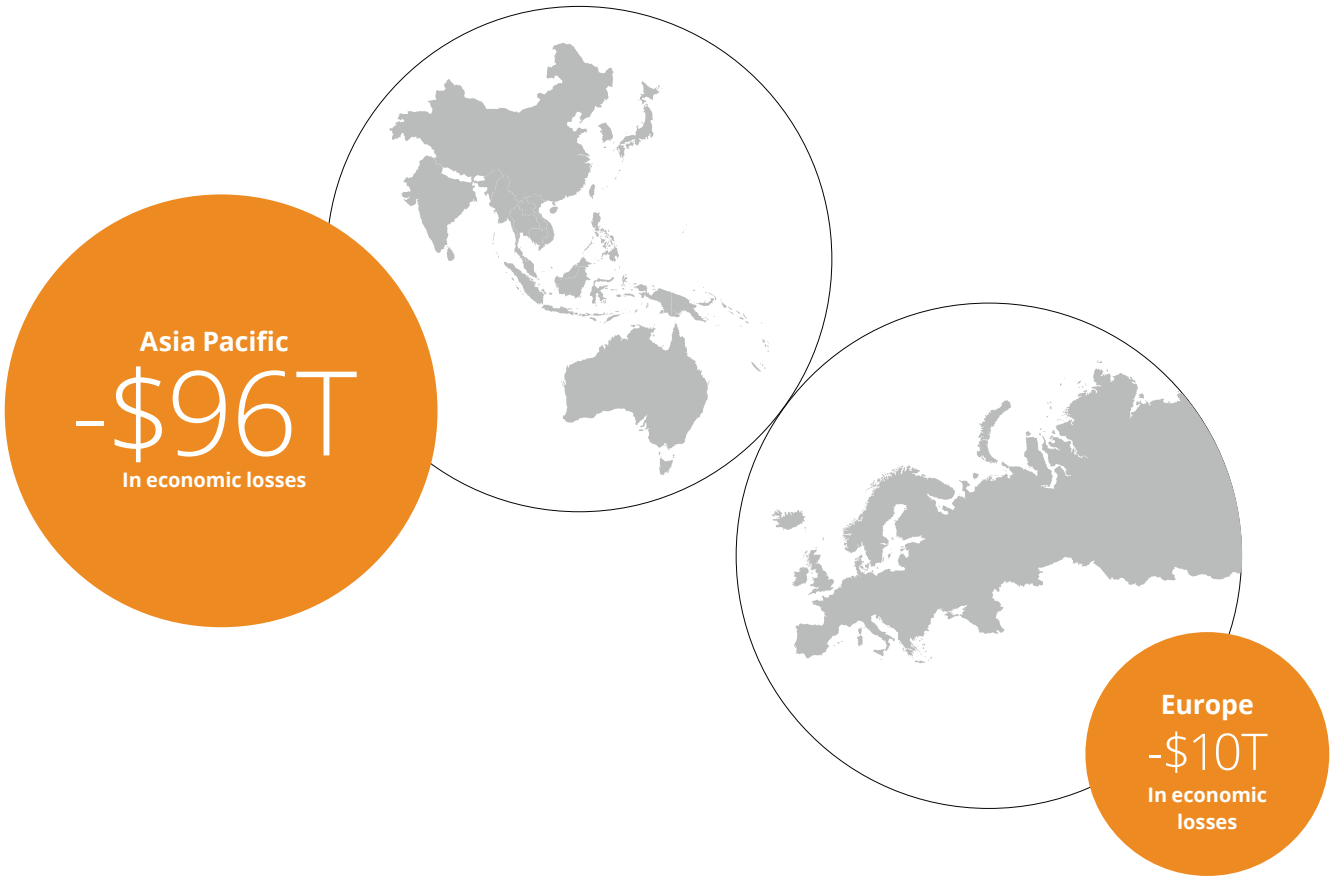
Deloitte's modeling shows that unchecked climate change, where global average temperatures rise by 3°C, hinders growth in every region. Unless the world takes rapid and coordinated action, an increasingly climate-damaged economy could become the new normal. The economic costs would likely be deep and widespread, destroying productivity and jobs.

Unchecked climate change could create US$178 trillion[7] in global economic losses (in present value terms) between now and 2070 compared to a baseline that does not account for climate change (figure 2), the analysis shows. In 2070 alone, global GDP could be 7.6% lower compared to a baseline that does not account for climate change.

Globally, these numbers portray a future in which climate change results in significant declines in productivity, job creation, standards of living, and well-being. Translated into human terms, job opportunities would dry up. Crops would fail. Health care spending would rise. People would stop traveling.

Instead of investing in new, value-adding innovations and infrastructure, our productive capital would be concentrated on repairing climate damage (figure 3).

Climate change imposes heavy costs across geographies



The Deloitte Economics Institute has not separately modeled Africa, Middle East, and the Rest of the World (figure 2). Instead, an estimate is provided that takes a long-term economic projection of each region and imposes the damage impacts of similarly modeled regions onto these projections to provide an approximation of their possible scenario outcomes.

FIGURE 2. Global economic losses associated with unchecked climate change.[1]

Region	Net present value, 2021–2070 ($ trillion)	GDP impact in 2070 ($ trillion)	GDP impact in 2070 (%)
Asia Pacific	-96	-16	-9.4
Europe	-10	-1	-1.5
Americas	-36	-4	-5.7
Total (modeled regions)	-138	-20	-6.8
Africa, Middle East, and Rest of World (estimate)[2]	-40	-5	-14.7
Global[3]	**-178**	**-25**	**-7.6**

Notes:
1. All dollar figures reported in US Dollars.
2. The rest of the world includes: Central America and a number of countries in Europe and Asia Pacific that were not separately modeled as part of those reports (roughly 1% and 2% of the GDP of those regions, respectively). The Deloitte Economics Institute has not separately modeled Africa, Middle East, and the rest of the world. Instead, an estimate is provided that takes a long-term economic projection of each region and imposes the damage impacts of similar modeled regions onto these projections to provide an approximation of their possible scenario outcomes.
3. Numbers may not sum due to rounding.
Source: Deloitte Economics Institute.

Disruptions to the physical environment would impede productivity, business continuity, and trade

The D.Climate model analyzes six pathways through which climate change affects the economy: the labor force, productive land, productivity, health and well-being, the flow of global currency (tourism/travel), and agriculture.

FIGURE 3. Economic impact associated with climate change

The climate risk to health and well-being

Climate change endangers the life of every person on Earth, universally exacerbating a host of health conditions and damaging the essential drivers of our overall health and wellness.

The medical research community now fully recognizes the human health impacts of climate change, as more than 200 medical journals released an unprecedented joint statement last September citing it as the "greatest threat" to global public health.[8]

The most apparent and associated effects of climate change originate from its impacts on the physical environment, namely extreme temperatures, poor air quality, and precipitation extremes (from droughts to severe storms). These impacts extend well past personal health to threaten food security, stable housing, secure employment, and entire community relationships.

Climate change not only contributes to a host of health issues but also exacerbates the health inequities that the health care industry has recently begun working in earnest to rectify. That's because the communities that are the most vulnerable to the effects of a changing climate tend to be those that are the least equipped to manage and recover from the physical, economic, mental, and social devastation that accompanies it.

In this sense, climate change is both an urgent environmental and social priority.

Source: Deloitte[9].

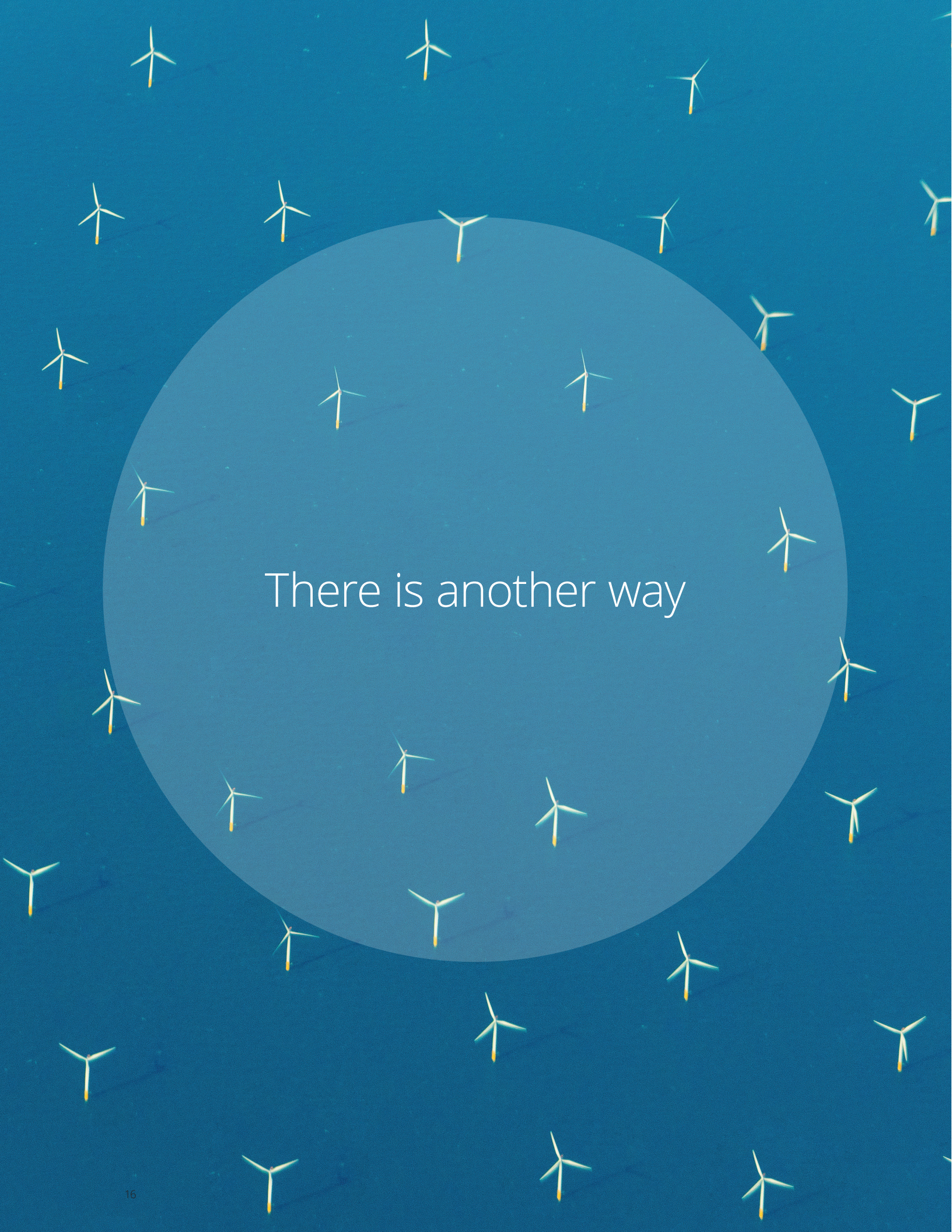

Every region will suffer,
but some worse than others

Each regional economy would be smaller if global average temperatures increase by 3°C, but the damage would not be distributed equally across geographies, the research shows.

The stakes are highest in Asia Pacific. If climate change continues unmitigated, the Asia Pacific economy is exposed to a cumulative US$96 trillion loss by 2070.[10] In 2050, 2°C of global warming could shave US$3.4 trillion from Asia Pacific's regional GDP, a figure that could grow to US$16 trillion in 2070. To put it in perspective, the 2070 loss would exceed the current value of the entire Chinese economy (US$14 trillion). In percentage terms, Asia Pacific's GDP could be 9.4% smaller in 2070 compared to a world with no climate change.

Europe faces a loss of US$10 trillion and 110 million jobs by 2070 compared to a lower-emissions world without climate damages.[11] In 2070 alone, Europe could lose US$1 trillion, and continental growth could be just 1% in the decade leading up to it. As a comparison, such a growth rate is equivalent to that in the 2010–2020 decade, which saw the ripple effects of the global financial crisis, the European debt crisis, and the COVID-19 pandemic.

In the Americas (North and South), losses are projected to reach a cumulative US$36 trillion by 2070. A US$4 trillion loss in 2070 alone could continue to grow beyond the modeled years. For the United States, the damages to 2070 are projected to reach US$14.5 trillion, a lifetime loss of nearly US$70,000 for each working American. The GDP in 2070 would be 4% lower compared to a nondamaged world—a US$1.5 trillion loss in that year alone.


There is another way

We already have many of the technologies, business models, and policy approaches today to deliver rapid decarbonization and limit global warming to as close to 1.5°C as possible by the century's end. The turning point analysis not only demonstrates how we could do it but shows that it could be good for long-term growth too.

Such a transformation could reduce the economic harm of continued warming and bring new jobs, industries, innovations, and opportunities in a decarbonized global economy.

The world economy could be larger by US$43 trillion in net present value between 2021 and 2070, compared to a climate-damaged baseline.

With global coordination and rapid action, the world can still achieve net-zero emissions by 2050 and have a chance of meeting the Paris Agreement goal to limit warming to as close to 1.5°C as possible. Such an achievement would require an industrial transformation of unprecedented speed and scale, a once-in-a-generation opportunity to reorient the global economy for more sustainable, resilient, and equitable long-term growth (figure 4).

The world economy could be larger by US$43 trillion in net present value between 2021 and 2070, compared to a climate-damaged baseline.

Decarbonization could create widespread opportunity and growth

Because each country is starting from a different point, the speed, contours, and upfront costs will vary, but by 2070, every region in the world could benefit from the investment in decarbonization, according to the analysis (figure 4).

FIGURE 4. Net economic benefits associated with limiting warming to close to 1.5°C[1]

Region	Net present value, 2021–2070 ($ trillion)	GDP impact in 2070 ($ trillion)	GDP impact in 2070 (%)
Asia Pacific	47	9	5.7
Europe[2]	-1	1	1.8
Americas[2]	-3	1	1.6
Total (modeled regions)[3]	**43**	**11**	**3.8**

Notes:
1. All dollar figures reported in US dollars.
2. For Europe and Americas, the net present value of limiting warming to close to 1.5°C is marginally negative over the period analysed. However, having both reached their turning points, continuing the modeling for a few additional years would show that this would also turn positive.
3. Numbers may not sum due to rounding.
Source: Deloitte Economics Institute.

Americas

$1Trillion

Turning Point: 2060s

Relative to the 3°C warming pathway, decarbonization across the Americas could boost regional GDP by 1.8% in the year 2070 alone. The United States could reap $885 billion of this benefit, a single dividend that exceeds the current combined annual revenues of Amazon, Alphabet, and Microsoft.

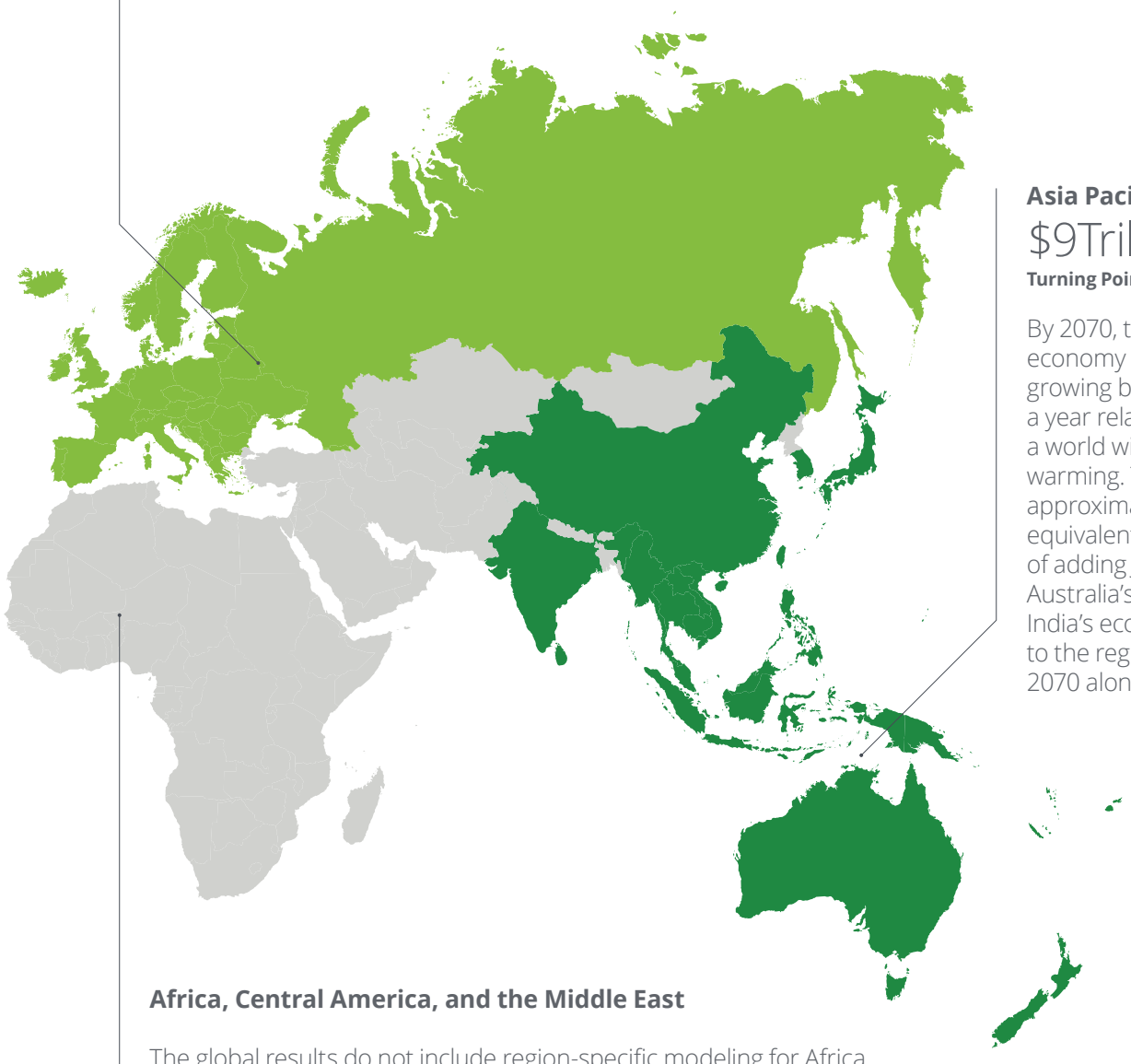
Note: Numbers may not sum due to rounding.
Source: Deloitte Economics Institute.

Europe

$1Trillion

Turning Point: 2050s

Europe can capitalize on a relatively low-cost transition to reap the benefits of becoming the world's first carbon-neutral region. Decarbonization would increase regional GDP by 1.8% in 2070 compared to the 3°C baseline, a benefit that would continue expanding in subsequent years, as the results of the industrial revolution appear.



Asia Pacific

$9Trillion

Turning Point: 2020s

By 2070, the region's economy could be growing by $9 trillion a year relative to a world with 3°C warming. This is approximately the equivalent value of adding Japan's, Australia's, and India's economies to the region in 2070 alone.

Africa, Central America, and the Middle East

The global results do not include region-specific modeling for Africa, Middle East, and the Rest of the World. These regions are not captured in the overall results due to data limitations. However, the macroeconomics of making an industrial revolution to reach net zero are the same. Economies can avoid the worst impacts and gain the greatest benefits if we act now.

Note: Numbers may not sum due to rounding.
Source: Deloitte Economics Institute.


The trick lies in the timing

To achieve this comparatively better future will require an industrial revolution over the next 50 years. And the time to act is right now. With global emissions continuing to rise over the past two decades, we have squandered the chance to decarbonize at our leisure. Given the costs associated with each tenth of a degree of temperature increase,[12] every month of delay brings greater risk and forestalls the eventual economic gains. The global economy needs to execute a rapid, coordinated, and sequenced energy and industrial transition that will play out in distinct phases.[13]

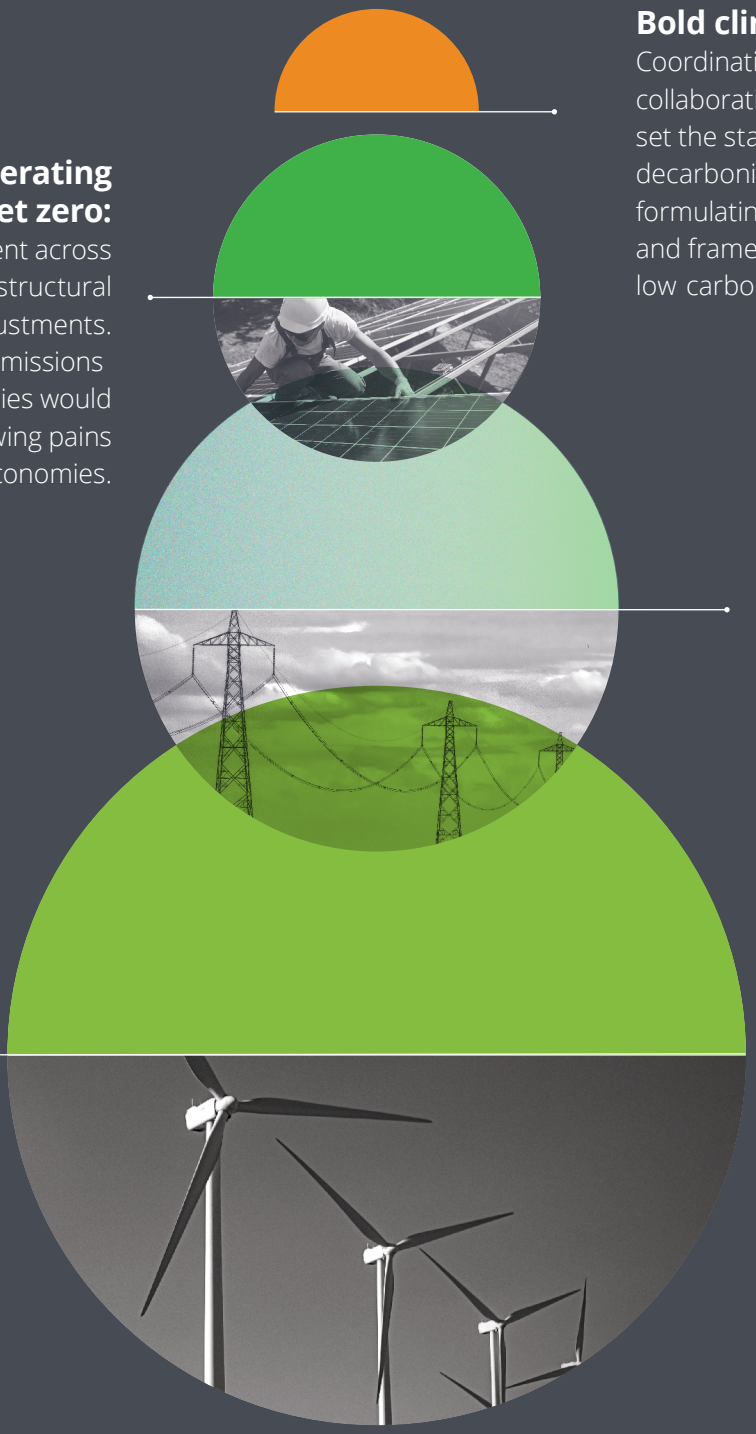
A rapid transformation of the global energy mix could lay the foundation for decarbonization across sectors and throughout the global economy. But this is just the first step. Important changes would be required in other sectors. Existing industries would be reconstituted as a series of complex, interconnected, emissions-free systems: energy, mobility, industry and manufacturing, food and land use, and negative emissions.

A coordinated transition would require governments, along with the financial services and technology sectors, to catalyze, facilitate, and accelerate progress; foster information flows across systems; and align individual incentives with collective goals. The financial industry could provide the additional capital investment to develop low-carbon solutions and nurture the infant industries that will grow with global decarbonization. Governments, meanwhile, could build the architecture for a net-zero emissions ecosystem through policy levers and regulation, and the technology sector could facilitate the transformation by applying its digital infrastructure and solutions to decarbonize systems. A diverse set of societal and economic forces also would drive the transition.

The modeling provides the contours of how that transition could play out, building on the sizable body of work that has identified the actions and sequencing needed to avoid the worst climate impacts and capitalize on the opportunity presented by decarbonization.[14] Four distinct phases of decarbonization emerge from the integrated climate and economic scenario that lay out what needs to happen and when (figures 5 and 6).

Shifting the dialogue around decarbonization opens the door for new policies and investments

FIGURE 5. Illustrative growth path during the four phases of transition



Bold climate plays:
Coordination and collaboration set the stage for decarbonization by formulating policies and frameworks for a low carbon future.

Accelerating to net zero:
Deep investment across systems instigates structural economic adjustments. The decline of emissions intensive industries would create growing pains for some economies.

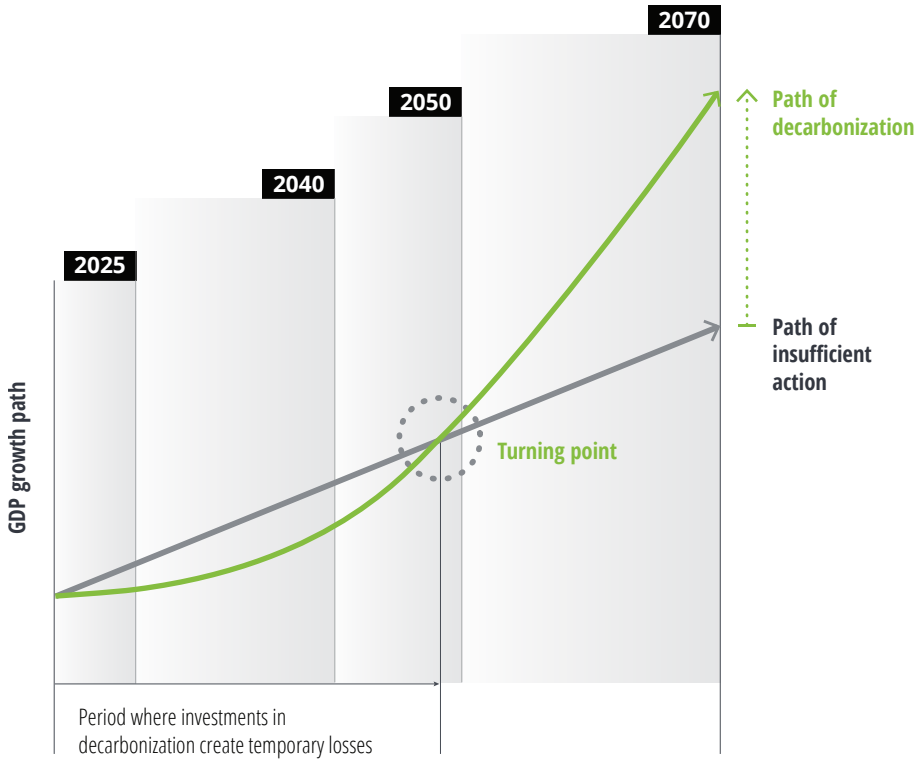
Turning point:
Investment in structural economic adjustment is almost complete. Economies would realize the dividend of the transformation and experience net positive growth.

Low-emissions future:
Interconnected, low carbon systems underpin a clean economy that would grow at an increasingly faster rate than its carbon intensive alternative.

The phases of decarbonization provide a clear structure for thinking about the opportunity. While benefits wouldn't be felt immediately and economic disruption is inevitable, delay only locks in further damages and postpones regions' arrival at the turning point.

Achieving net zero by midcentury could spur economic gains by 2070

FIGURE 6. Illustrative growth path during the four phases of transition



Note: Illustrative depiction of the level change (deviation) to economic growth due to alternative paths.
Source: Deloitte Economics Institute.

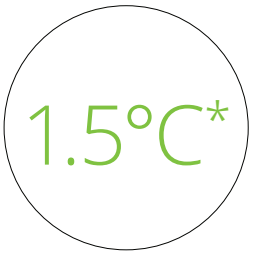

Our paths are distinct, but we
share the same destination

Achieving this transformation—an industrial revolution in just a few decades—won't be easy. Even if decarbonization occurs rapidly and collectively, the timing of the costs and benefits that come with each phase would be different for each region.

Every region needs to achieve net-zero emissions by 2050, but each will take a unique path to reaching this outcome based on its existing economic structure and carbon intensities, its exposure to climate damage, its institutional arrangements, and its economic strengths and capabilities. In Asia Pacific, for example, the region's acute exposure to climate events is why it could gain more and more rapidly from global decarbonization (5.7% GDP deviation in 2070) than Europe (1.8% GDP deviation in 2070).

Accordingly, the turning point is different for each region too. In Asia Pacific, this comes early, in the 2020s. In Europe, it wouldn't arrive until the 2050s, while in the Americas, it wouldn't arrive until the 2060s (projected as 2048 in the United States). While the transition would play out at varying speeds, all regions would reach their turning point before 2070, and these benefits could continue to grow beyond the modeled years (figure 7).

Because each country is starting from a different point, the speed, contours, and upfront costs will vary, but by 2070, every region in the world will benefit from the investment in decarbonization, according to our analysis.

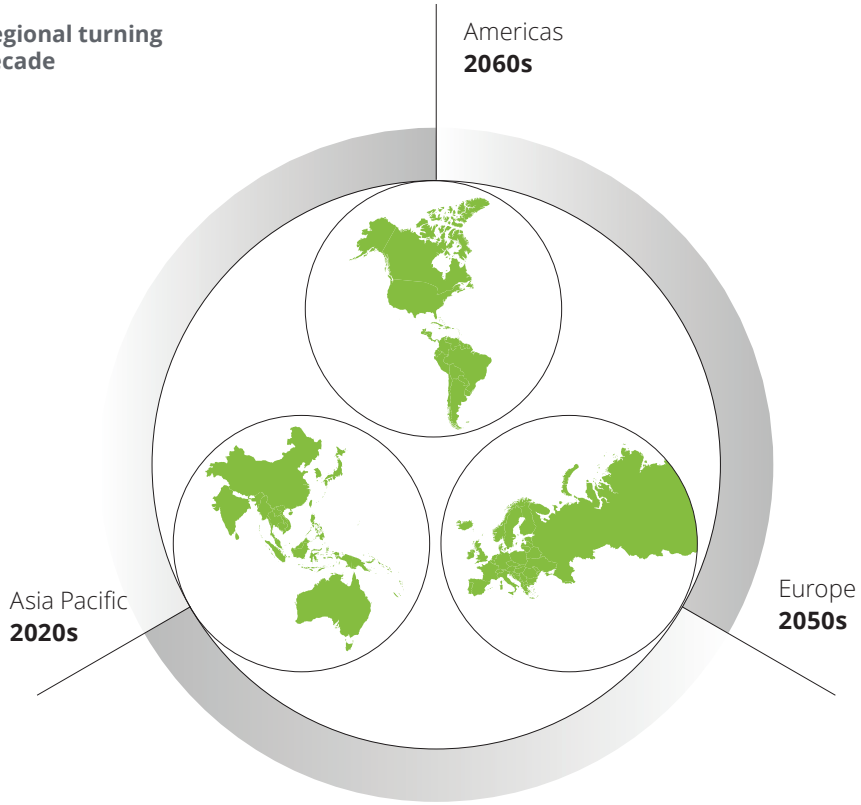


Disparate climate impacts are likely to challenge policymakers and business leaders to commit to a transition that more equitably distributes the costs (figure 1).

Changing together creates global benefits

While the transition would play out at varying speeds, all regions would reach their turning point before 2070, and these benefits could continue to grow beyond the modeled years.

FIGURE 7. Regional turning points by decade



The effects are expected to be uneven within these regions, too. In the United States, for example, the southeastern energy belt could be particularly affected by extreme temperatures as well as the labor impacts of the economic transition. In Europe, the Mediterranean countries could experience twice the GDP impacts as their northern counterparts.

These kinds of disparate impacts are likely to challenge policymakers and business leaders to commit to a transition that more equitably distributes the costs.

Source: Deloitte Economics Institute.


The change begins with
what we believe is possible

The facts of climate change are clear. The economics are clear. We cannot afford to waste another year, another month, on debating the merits of taking decisive action today versus continuing to take insufficient action.

We must instead turn our considerable resources and ingenuity to action that rapidly slashes greenhouse gas emissions, transitions our economy to a low-emissions footing, builds resiliency, and addresses the damage that is already affecting the most vulnerable in our society.

It is daunting but also a thrilling opportunity: To remake our economic system in ways that regenerate our planet and enable human flourishing and prosperity. As leaders, and as citizens, every choice, every day can speed the realization of this vision.

Will we—will you—rise to the challenge?

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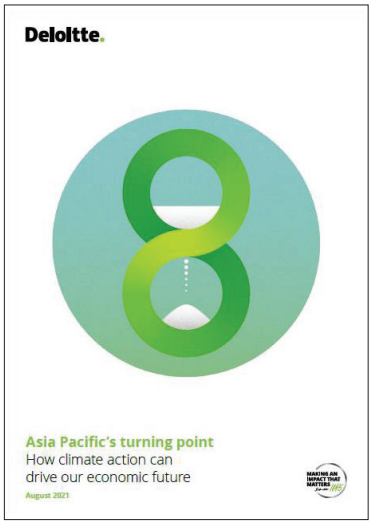

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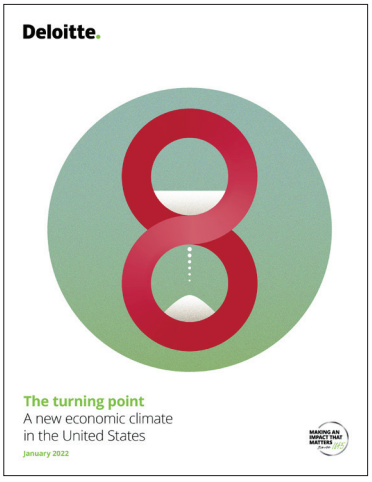

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Appendix: Modeling climate change impacts

To quantify its conclusions, the Deloitte Economics Institute modeled the economic impacts of a changing climate on long-term economic growth using the following process:

1. The model projects economic output (as measured by GDP) with emissions reflecting a combined Shared Socioeconomic Pathway (SSP)-Representative Concentration Pathway (RCP) scenario, SSP2-6.0, to the year 2100.[15] The socioeconomic pathway, SSP2, is the "middle of the road" among five broad narratives of future socioeconomic development that are conventional in climate change-modeling. The climate scenario, RCP6.0, is an emissions pathway without significant additional mitigation efforts (a baseline scenario).[16] This results in a projected emissions-intensive global economy.[17]
2. Increased atmospheric GHGs cause average global surface temperatures to continue rising above preindustrial levels. In the SSP2-6.0 baseline scenario, global average temperatures increase more than 3°C above preindustrial levels by the end of the century according to the Model for the Assessment of Greenhouse Gas Induced Climate Change (MAGICC).[18] (Note that present-day temperatures have already risen more than 1°C above preindustrial levels.)
3. Warming causes the climate to change and results in physical damage to the factors of production. The Deloitte's model includes six types of economic damage, regionalized to the climate, industry, and workforce structure of each defined geography across Asia Pacific, Europe, and the Americas. These damages capture the trend or chronic impacts of global mean surface temperature increases. The approach does not explicitly model individual acute economic shocks driven by extreme climatic events, such as natural disasters, although these are implicitly captured in an increasing trend of climate change damage.
4. The damage to the factors of production is distributed across the economy, impacting GDP. Any change in emissions (and, correspondingly, temperatures) over time results in a change to these impacts and their interactions. The economy impacts the climate, and the climate impacts the economy.
5. The key variables of time, global average temperatures, and the nature of economic output across industry structures combine to offer alternative baseline views of economic growth. Specific-scenario analysis is then conducted, referencing a baseline that includes climate change damage. Scenarios could also include policy actions that either reduce or increase emissions and global average temperatures relative to the current SSP2-6.0 baseline view.

This modeling framework involves significant research on climate and economic impacts across Asia Pacific, Europe, and the Americas, which are used as inputs for Deloitte's D.Climate model (refer to the technical appendices at deloitte.com/global-turningpoint).

Endnotes

1. Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2022: Mitigation of Climate Change*, Working Group III Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, April 4, 2022.
2. Deloitte, *The world is ready for climate action,* accessed May 2, 2022.
3. Deloitte, *Deloitte 2022 CxO sustainability report*, accessed May 2, 2022.
4. Ibid.
5. Asia Pacific includes China, Japan, South Korea, India, Southeast Asia and Taiwan, Pacific Nations, Australia, and New Zealand. Europe includes the United Kingdom, France, Germany, Italy, all other European Union countries, Belarus, Moldova, Russia, Ukraine, Iceland, Norway, Albania, Andorra, Bosnia and Herzegovina, Montenegro, North Macedonia, San Marino, Serbia, Liechtenstein, Monaco, and Switzerland. The Americas series includes the United States and South America.
6. This does not include Africa, the Middle East, and the Rest of the World, whose pathways to close to 1.5°C have not been modeled.
7. Asia Pacific includes China, Japan, South Korea, India, Southeast Asia and Taiwan, Pacific Nations, Australia, and New Zealand. Europe includes the United Kingdom, France, Germany, Italy, all other European Union countries, Belarus, Moldova, Russia, Ukraine, Iceland, Norway, Albania, Andorra, Bosnia and Herzegovina, Montenegro, North Macedonia, San Marino, Serbia, Liechtenstein, Monaco, and Switzerland. The Americas series includes the United States and South America.
8. Winston Choi-Schagrin, Medical journals call climate change the 'greatest threat to global public health,' ***New York Times***, September 7, 2021.
9. Neal Batra et al., *Why climate resilience is key to building the health care organization of the future*, Deloitte Insights, April 4, 2022.
10. At a 2% discount rate.
11. Jobs measured in FTE.
12. H. O. Pörtner et al. (eds), *Climate Change 2022: Impacts, Adaptation and Vulnerability*, Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge University Press, 2022).
13. See for example, IEA, *Net zero by 2050*, accessed May 18, 2022; Mekala Krishnan et al., *The net-zero transition: What it would cost, what it could bring*, McKinsey Global Institute, January 2022; Seb Henbest et al., *New Energy Outlook 2021*, *BloombergNEF*, 2021.

14. Ibid.
15. IPCC-adopted emission scenarios vary widely, depending on socioeconomic development and climate mitigation policy settings. SSP2-6.0 is chosen as one of the most frequently used "baseline" scenarios in the literature. It describes an intermediate baseline scenario as it carries historical social, economic, and technological trends forward and includes no specific or significant climate mitigation policy effort, making it an appropriate baseline for reference. For a more detailed description of SSP2-6.0 and the rationale for its adoption, see the technical appendix.
16. IPCC, *Climate Change 2013: The Physical Science Basis*, Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge University Press, 2013).
17. Preindustrial is defined in IPCC assessments as the multicentury period before the onset of large-scale industrial activity around 1750.
18. The associated climate data (such as annual temperature increases and atmospheric concentrations) is estimated using MAGICC as described in Meinshausen et al. (2011) and Meinshausen et al. (2020) and configured by Nicholls et al. (2021). See the technical appendix for further detail.

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A special thanks to the following individuals who provided the support to make this report possible:

Josh Appleton Miles
Mairead Davis
David O'Callaghan
Adam Davey
Hom Pant
Djauhari Pambudi
Morgan Richards
Lucy Mraz
Aneesha Singh
Karli Jeffery
Sam Marginson
William Neumann
Derek Pankratz
Blythe Aronowitz
Chaanah Crichton
Rachael Ballard
Lisa Carlton
Elizabeth Payés
Jim Slatton
Sylvia Yoon Chang
Dilip Poddar
Arpan Kumar Saha

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