

WORLD
VIEW



GLOBAL
CENTER ON
ADAPTATION

State and Trends in Adaptation Report 2020

**Building Forward Better from
Covid-19: Accelerating Action
on Climate Adaptation**

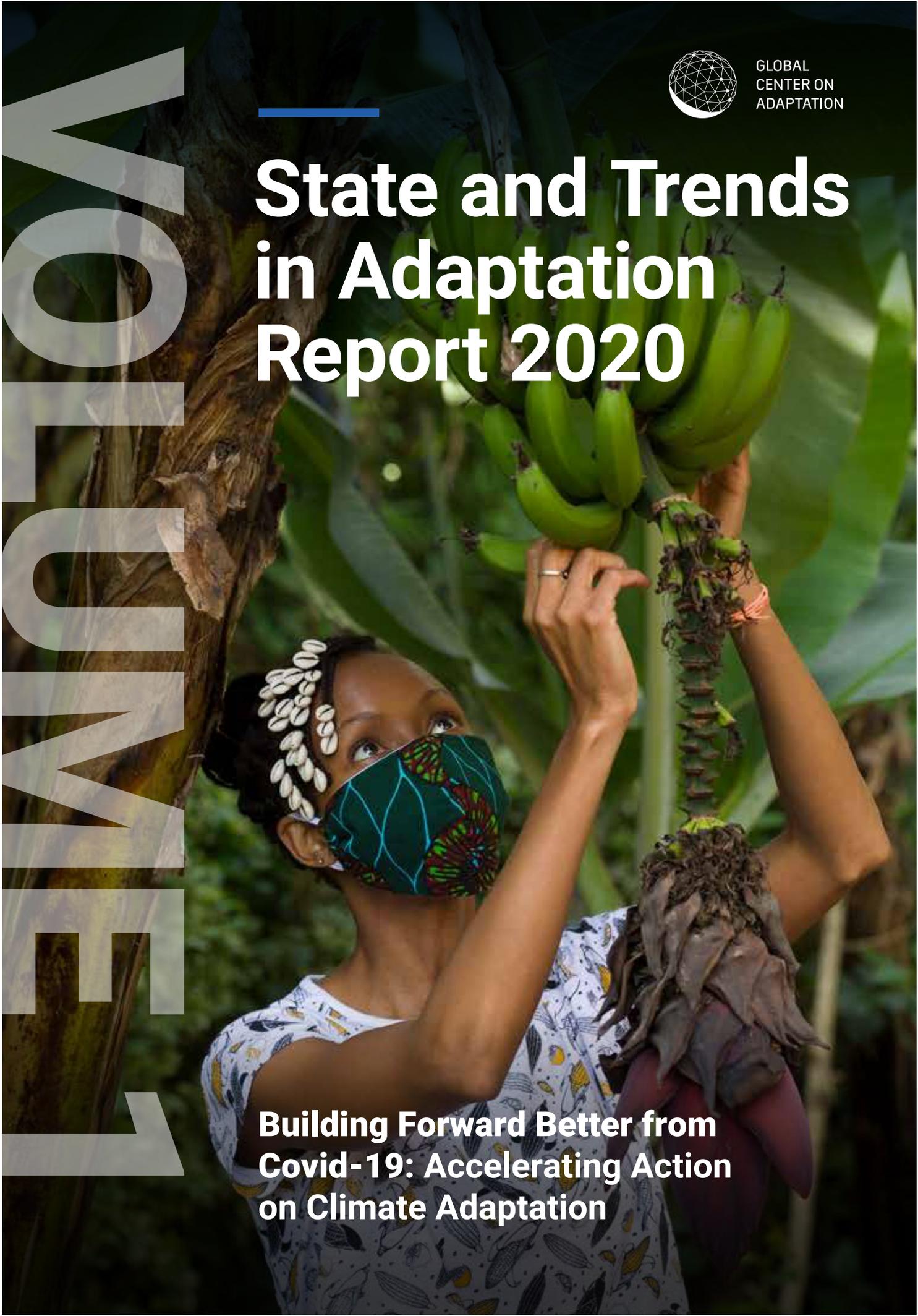




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Cover image: Kenyan woman wearing a homemade mask for protection against Covid-19. Surgical masks are in short supply. Picture: Alex MacNaughton/Alamy

Workers wear masks for protection against the coronavirus (Covid-19) in the rice fields of Ninh Binh, Vietnam



Picture: ELLENA KIKI/Alamy

An opportunity to recover better

Investing in climate adaptation is the best response to our triple health, economic, and climate crises

2021 begins with renewed hope. With vaccines to stem a deadly pandemic. With an unprecedented global effort to repair the economic damage. And with renewed faith in science and the power of collective action to find solutions to global problems.

We need to hold fast to this spirit of collaboration as we confront an existential threat even bigger than Covid-19: climate change. In 2020, climate impacts continued to multiply, even as funding for climate action adaptation—already vastly short of what is needed—was cut back. Extreme weather events including floods and hurricanes compounded the challenges of responding to the pandemic, proving that our health, economic, and climate emergencies are inextricably linked.

This means we have an opportunity to build more sustainable economic recoveries, and strengthen resilience to future shocks, by dramatically scaling up investment in climate adaptation. We need a five- to ten-fold increase in adaptation finance to better manage our scarce water resources, to climate-proof our food production, to protect our power and transport systems from floods, wildfires, and other extreme weather events. We need it to build more livable cities and protect island nations and coastal communities from the impacts of rising sea levels and ever fiercer and more frequent storms, cyclones, and hurricanes.

But time is against us. Our planet is warming. Parts of it may soon become uninhabitable unless we double down our efforts to curb greenhouse gas emissions and help millions of people adapt to their changing environment. We must deliver a breakthrough on adaptation to protect the world—and especially the most vulnerable people and countries—from climate impacts. And we must accelerate funding and progress, starting right now.

The Global Center on Adaptation is therefore delighted to present its State and Trends in Adaptation 2020 report, the first in a series that will assess progress on climate adaptation and provide guidance and recommendations on best practice in adapting to the effects of a changing climate and building resilience to climate shocks. The report highlights the many successful adaptation initiatives with the potential to be scaled up and replicated. It also flags key policy, skills and finance gaps that must be addressed if adaptation is to be effective and reach those who need it the most.

We hope this report helps inform the way forward on one of the most complex challenges of our lifetimes. The world has a golden opportunity to recover better by accelerating adaptation—and we must seize it.

Patrick Verkooijen

Chief Executive
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Ban Ki-moon

8th Secretary-General
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Accelerating pandemic recoveries with climate adaptation

The 'new normal': a world of multiple systemic shocks

Covid-19 has ushered in an era of multiple, intersecting systemic shocks, and one of its casualties has been our capacity to adapt and respond to escalating climate risks. Investment in climate adaptation fell in 2020, even as more than 50 million people were affected by a record number of floods, droughts, wildfires and storms¹. The pandemic is eroding recent progress in building climate resilience, leaving countries and communities more vulnerable to future shocks. We must make up for lost ground and lost time by accelerating action on climate adaptation and resilience. Climate change did not stop because of Covid-19, and neither should the urgent task of preparing humanity to live with the multiple effects of a warming planet.



Picture: ZUMA Press Inc/Alamy

Extreme climate events compounded the challenges of responding to the pandemic in 2020. Evacuating populations from the path of cyclones, hurricanes and wildfires, for example, became far more dangerous with the threat of contagion. Covid-19 and climate disasters intersected to create a set of cascading risks, highlighting the interconnected nature of the impact of systemic shocks and the importance of a coordinated global and local response.

The investment case for climate adaptation

The world has already forgone US\$ trillions² of economic growth due to Covid-19. As governments begin spending trillions of dollars to recover from the pandemic, the world has a once-in-a-lifetime opportunity to build a more resilient, climate-smart future by integrating climate adaptation into their response and recovery plans.

“

If the virus is a shared global challenge, so too should be the need to build resilience against future shocks. Emerging and developing countries are the least prepared for the arrival of Covid-19, just as they are most vulnerable to the effects of climate change

Ban Ki-moon

8th Secretary-General of the United Nations and
Co-Chair of the Global Center on Adaptation

“

If we fail to include fairness and equity in how we adapt to a warming planet, we risk pushing millions more people into poverty. And we know how that story ends—with more conflict, migration, and instability. We have a choice—we can delay and pay, or plan and prosper

Patrick Verkooijen

CEO, Global Center on Adaptation

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Covid-19 poses threats and opportunities for the climate adaptation and resilience agenda. It is a threat because funding for climate adaptation is at risk as governments and Development Finance Institutions (DFIs) concentrate on the immediate health and economic emergencies. It is also an opportunity because climate adaptation could significantly strengthen post-Covid recovery plans.

The Global Commission on Adaptation's flagship 2019 report, *Adapt Now*³, established that investing US\$ 1.8 trillion in just five areas—early-warning systems, climate-resilient infrastructure, improved dryland agriculture crop production, global mangrove protection, and water security—could generate US\$ 7.1 trillion in total net benefits.

And yet, only a fraction of the post-Covid spending plans announced so far is going to build climate resilience. A review of domestic stimulus plans⁴ found that 'dirty' measures—those that increase carbon emissions—outnumber 'green' initiatives by four-to-one. We must address this imbalance before it is too late, or miss out on the trillions of dollars in potential growth and prosperity that high-return investments in climate adaptation can bring.

Climate adaptation serves not just to address physical risks in their own right—but to protect broader economic, social and financial systems that have been weakened by the pandemic. That is why, in a world with competing priorities, building resilience to climate impacts should become a vital component of response and recovery efforts. Successful adaptation will be instrumental in creating a more sustainable, bio-diverse, healthier, and fairer world, in which we all live within the limits of the resources of the planet.

A widening finance gap

Funding for climate adaptation, which averaged US\$ 30 billion a year in 2017-18⁵, remains far short of what is needed. Global funding would need to increase ten-fold, to US\$ 300



Floods in
Jakarta, 2020

Picture: SOPA Images Limited/Alamy

billion a year, to meet the UN Environment Programme's estimates of what is needed to respond to escalating climate risks⁶. It is also vital that this funding is tracked, and utilization measured, in a way that ensures it is reaching vulnerable communities.

Nevertheless, the finance gap for climate adaptation is at risk of widening in future years because of the fiscal drain on resources resulting from the pandemic. Developing countries are especially vulnerable as they bear a disproportionate weight of climate disasters, while their fiscal space is more limited, their credit ratings more at risk, and their borrowing capacity more constrained.

UN Secretary-General António Guterres has called for a 'breakthrough' in adaptation to protect the world and the most vulnerable from climate impacts, including a step change in funding for climate adaptation and an acceleration of progress toward the Sustainable Development Goals (SDGs), which are designed to strengthen adaptive capacity. The UNFCCC 26th Conference of the Parties (COP26) in November 2021 will be an opportunity to scale up the world's response. The stakes could not be higher.

Building forward better

This Global Center on Adaptation (GCA) report on State and Trends in Adaptation examines in detail the intertwined effects of the pandemic and climate change, and analyzes how these affect the prospects and ability of countries to recover better. In particular, the report highlights how smart adaptation strategies can contribute to better health outcomes, environmental benefits, and economic recoveries, and strengthen resilience against future systemic shocks.

This report examines the progress we have made so far, the bright spots in international collaboration and scalable solutions, the specific regional challenges that remain, and suggests key actions to chart the way forward to a climate-safe future for all. A second edition of the report series, scheduled to coincide with COP26, will focus on Africa and the critical adaptation needs of the continent. Future reports will have special themes exploring lessons learnt from practice, and new developments in adaptation and resilience. As new climate impacts inevitably emerge and intensify, we aim to identify fresh strategies and solutions for adapting to climate change. The report series is closely linked with the associated online platform, the State and Trends in Adaptation Knowledge Exchange (adaptationexchange.org).

1 The state of climate adaptation: are we making progress?

Until the outbreak of Covid-19, our knowledge and preparedness for climate impacts were improving, although funding fell short of what was required. The pandemic has set back progress by several years.

Yet there are reasons for optimism. Numerous reports and scientific studies have deepened our **understanding** of climate-change risks and their impacts. On **planning**, the World Bank, European Environment Agency and others have contributed frameworks for designing strategies for climate adaptation, and for monitoring, reporting and evaluating National Adaptation Plans (NAPs).

NAPs aim to build adaptive capacity and resilience by integrating climate adaptation across all levels of government planning, with multi-year budgets to match. To date, 125 out of 154 developing countries are taking steps to develop NAPs, while 20 countries have submitted full plans. At the 2020 Climate Ambition Summit, 20 countries came forward with fresh plans for adaptation and resilience.

A further reason for optimism is that lessons can be learnt from good practices, including on scaling adaptation, as numerous examples around the world, from Bangladesh and Ethiopia to Norway and the Netherlands, show.

Big unknowns remain, but can be resolved. Determined, collective action informed by knowledge co-creation and exchange can deepen our understanding on adaptation's challenges and opportunities, improve planning, marshal greater financial resources for adaptation, and devise ways to measure progress. These are vital elements that should be in place before implementation.



Concrete water storage,
Turkmenistan

Picture: UNDP Turkmenistan

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Adaptation is everybody's business

More participants must become engaged to achieve a breakthrough in the scale and pace of adaptation, particularly those in the private sector. The world's pension funds manage US\$ 32 trillion dollars in assets⁷, putting them in a unique position to move the needle on climate adaptation.

There are many opportunities for private companies to reduce climate risks to their business operations, as well as to invest in adaptation in vulnerable regions in a sustainable and profitable manner. National and local companies, as well as global entities, all have a responsibility to explore new ways of working together with vulnerable communities.

A newly developed tracking tool—the Climate Cooperative Initiatives Database (C-CID)⁸—is helping to identify non-state and sub-national actors engaged in a wide range of adaptation partnerships and multi-party initiatives, including private-sector involvement⁹. It shows that:

- One-fifth of Fortune 500 companies are engaged in long-term adaptation initiatives¹⁰
- Non-state actors, such as cities, are co-operating more closely on multi-country adaptation initiatives, including transboundary water basins that support water, energy, and food security
- Progress at company and sectoral levels is also visible.

2 Closing the funding gap

Global investment in adaptation has increased slowly but steadily in recent years, from US\$ 22 billion in 2015-16 to US\$ 30 billion in 2017-18¹¹. However, **adaptation funding needs to increase five- to ten-fold** to meet the needs in developing countries alone, estimated at between US\$ 140 and US\$ 300 billion per year by 2030¹². In particular, the private sector must become more engaged. Private-sector funding for adaptation accounted for less than US\$ 500 million a year of the US\$ 30 billion in annual adaptation finance tracked in 2017-18¹³.

More state and multilateral expenditure will not close the funding gap for adaptation. To meet current and future needs, **local financial markets** in developing countries must be deepened to unlock domestic funds for adaptation and resilience—and in the process, achieve greater financial self-reliance and resilience.

New dedicated financial products such as climate resilience bonds could help climate-stressed countries tap institutional finance. Blended finance could also help de-risk private-sector investment in new technologies and climate-adaptive solutions. Lastly, a number of countries are exploring innovative financing instruments—such as debt-for-climate swaps—to increase their access to climate finance without increasing their sovereign debt.



3 The impact of Covid-19

Covid has dealt a blow to climate action as to so many other aspects of our lives. Research by the Climate Policy Initiative (CPI) for the GCA indicates that finance for climate adaptation is likely to have suffered a single-digit percentage fall in 2020¹⁴ as DFIs prioritized rescue packages that supported countries' immediate efforts to mitigate health impacts and the economic downturn.

Developing countries face an increasingly steep funding gap for climate adaptation because so much focus has rightly been given to emergency spending, compounded by a decline in tax revenues and global trade. Countries now face dual risks to their sovereign credit ratings: limited fiscal space and increasing awareness of climate impacts, both of which affect their borrowing capacity amid growing debt distress due to Covid-19.

Furthermore, the threat of contagion put a brake on the implementation of many adaptation projects as construction work came to a halt under economic lockdowns, and supply-chain disruptions meant that, in many cases, inputs such as seeds, tools and technical assistance could not be delivered in a timely fashion.

On the plus side, knowledge-sharing received a big boost from the rapid uptake of free online communication tools.

4 Economic stimulus plans: an opportunity to integrate climate adaptation

To date, domestic post-Covid recovery plans are not focused on addressing climate risks. G20 countries have so far pledged US\$ 12.1 trillion to recover from the social, health and economic impacts of Covid-19. Only a fraction is going to build climate resilience. This is a missed opportunity. A review of domestic stimulus plans¹⁵ found that 'dirty' measures—those that increase carbon emissions—outnumber 'green' initiatives by four-to-one. Such measures will have long-term legacy impacts and determine the path of development for years. Within the existing green stimulus, measures to strengthen climate resilience are being under-prioritized, with most climate-related measures focused on emissions reductions.

Governments must put climate adaptation at the heart of their recovery plans.

The GCA has identified opportunities for increasing adaptation investment in Covid-19 recovery efforts. Triple wins for the economy, health, and climate exist in water and sanitation, agriculture, and infrastructure, including nature-based solutions, as powerful job creators.

Key financial instruments for mobilizing adaptation finance include:

- I. **Covid-19 response facilities** and bonds that mainstream climate risk consideration
- II. **Liquidity support** that incorporates climate risk
- III. **Reduced insurance premium payments** for climate risk insurance schemes in developing countries
- IV. **Debt relief** to free fiscal space to address climate risk
- V. **Public-private partnerships** to address climate risks¹⁶

There are also opportunities for **cross-sectoral strategic interventions**, including strengthening or developing NAPs, implementing policies to encourage resilient development, investing in local resilience efforts and supporting city and sub-national policymakers, and building on jobs-generating government programs.



Fighting brush fires

Picture: Manny Chavez/iStock

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5 Regional actions in climate adaptation

Climate change is global, but its effects are local. Impacts differ between and within regions. Even locally, some communities are more vulnerable than others. But in every region, there are strategies, processes, and solutions that have the potential to be scaled up and replicated elsewhere, with important lessons for all.

In **Sub-Saharan Africa**, food security will continue to be the overriding challenge and priority for climate action. A rise in average temperatures of 2°C by the middle of the century is estimated to reduce agriculture yields by up to 20 percent. Important sub-regional differences exist, with increasing rainfall and malaria risks in East Africa, increasing water stress and decreasing agricultural growing periods in North Africa, severe flood risks in coastal settlements in West Africa, and increased food insecurity, malaria risks and water stress in Southern Africa.

The least food-secure region in the world faces a triple whammy of the pandemic, extreme weather disasters such as droughts and floods, and weather-related effects such as locust swarms—all set against rising demand from a growing population. Across the region, hunger and malnourishment are on the rise after decades of progress, but funding to climate-proof agriculture and food supply chains is at risk as countries concentrate their limited fiscal resources on the immediate health and economic emergencies. Furthermore, access to international finance and aid flows may also take a hit from deep economic contractions and fiscal constraints in donor countries.

African nations have the opportunity to fully incorporate climate risks into their planning processes as they close the gap on large infrastructure projects, access to services, and transformative adaptation programs for food security, including irrigation systems, drought-resistant crops, and making crop insurance more widely affordable and available. With the youngest population in the world, Africa needs to find ways to unlock the power of its youth for adaptation for innovative adaptation solutions, including through digital technologies.

Cassava farming in Africa



Picture: golero/iStock

Similarly, private-sector actors must seize the business opportunities in climate adaptation, from the digitalization of agricultural services to building climate-resilient infrastructure for the continent's fast-growing cities. An encouraging set of sustainable adaptation initiatives are already in place across the continent, demonstrating good strategies for driving the resilience of Africa's farmers and citizens to climate change. In addition, new financial instruments are being developed and offer Africa an opportunity to enhance the resilience and connectivity of its infrastructure, linking rural and urban areas, supporting regional and national exchange and providing small loans on special terms to help farmers recover after a disaster.



Picture: Derick Hudson/iStock



Pictures: ajriya/iStock

In **Europe and Central Asia**, three of the most urgent climate risks include: extreme rainfall, with the aggravated threat of flooding; rising sea levels, which threaten some of the largest coastal cities and ports; and water scarcity and desertification, which will become severe in parts of Southern Europe and Central Asia. Europe's more vulnerable citizens—such as the elderly, children, and people with chronic health problems or disabilities—are in addition particularly susceptible to the rising frequency and severity of heatwaves.

The region has the opportunity to accelerate innovation that strengthens resilience and reduces economic uncertainty. While adaptation planning is improving, increased funding that also leverages private investment can help accelerate transformative adaptation action. To promote the latter, the EU is developing a climate-adaptation taxonomy of sustainable economic activities. The taxonomy aims to direct investments to climate-resilient innovation, products, activities and services. Adoption of a new EU adaptation strategy is expected soon. The EU plays a large role in international development and climate funding, and can use this leadership position to mobilize more funding for adaptation in developing nations.

East Asia and the Pacific, home to about one-quarter of the global population, experiences some of the most severe storms, cyclones and floods worldwide. As a result, the region suffers the highest rate of extreme weather displacement in the world, with millions forced to leave their homes each year. Its low-lying coastal cities and Pacific islands are especially vulnerable to flooding, storm surges and rising sea levels. Climate change is making the region vulnerable on multiple fronts, with direct impacts on food and water security, soil productivity, ecosystems, coastal and marine resources, and health. The region's rich biodiversity is particularly vulnerable to the changing climate.

The region's progress in adaptation allows it to deepen actions to address multiple intersecting climate risks and incorporate them much earlier in infrastructure planning. Nature-based solutions ranging from mangroves to 'sponge cities,' along with technological innovation, must be part of the solution. In addition, governments in the region need to consider integrating disaster-linked social protection into national financing and insurance strategies. As an example, the Philippines, in South-east Asia, has developed an innovative climate adaptation and disaster resilience fund that combines private investment with disaster risk financing and insurance¹⁷. Many countries have introduced catastrophe insurance and sectoral insurance products. Further deepening of regional and sub-regional co-operation to foster knowledge-sharing and mobilize financial flows should be part of the regional adaptation actions.

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Picture: Farid_Ahmed/iStock



Picture: SOPA Images Limited/Alamy

South Asia was the region most affected by extreme weather disasters between 1999 and 2018, according to the Global Climate Risk Index. Fiercer and more frequent cyclones, changing monsoon and weather patterns, rapid increases in heatwaves, sea-level rise, and more are impacting almost every aspect of life in the region. The World Bank estimates, under some scenarios, that climate change will reduce living standards in Bangladesh, India, Pakistan and Sri Lanka, driving 62 million people in South Asia into extreme poverty by 2030. Climate-change effects in the Himalayas are also striking. Glaciers have been retreating, yet hundreds of millions of people depend on the glacier-fed Indus and Brahmaputra river basins for freshwater resources. Reduction in water availability could significantly reduce the amount of food that can be produced in these river basins.

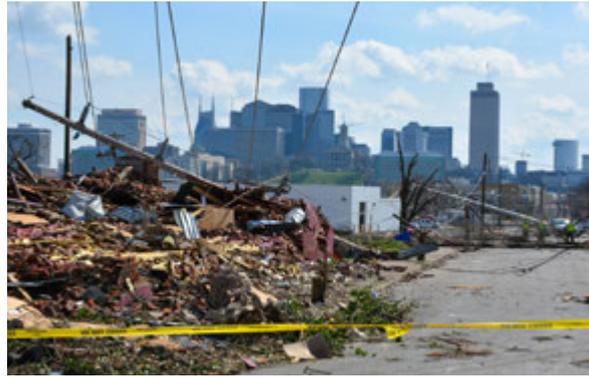
The large interventions of South Asia countries in adaptation, disaster risk reduction, and locally-led actions allow the scaling of them across the region and globally. The region needs large-scale water management reform and stronger co-operation between countries to address water security for adaptation. Combining nature-based solutions with infrastructure investments at scale can drive adaptation that enhances development and supports nature. With so many large coastal cities and small islands in danger from climate change, the Covid-19 recovery programs can mobilize private-sector investment in adaptation and support green infrastructure at scale for enhanced resilience.

In **Latin America and the Caribbean**, climate events pose the greatest threat to development progress in the region. Almost five million people are estimated to have been plunged into poverty in 2020 by the Covid pandemic, and climate change could drive up to 17 million people from their homes by 2050. Among the greatest climate risks to the region are severe and more frequent droughts, leading to crop failure, economic losses, migration from rural areas, and water scarcity; fiercer and more frequent hurricanes, which cause billions of dollars in damages every year and set back economic and social development; and wildfires, which affect much of South America and devastated Brazil's Pantanal—the world's largest wetlands—in 2020.

To help alleviate inequality, Latin America and the Caribbean can use Covid-19 recovery programs to create jobs and reduce climate risks of vulnerable populations. While adaptation investments are taking place and new innovations are being developed, there is an urgent need for stronger private-sector engagement and to accelerate the joint development of nature-based solutions and resilient infrastructure. Greater market transparency on climate risks and adopting disclosure frameworks will spur financial markets toward greater action on adaptation. Transformative adaptation initiatives to restore damaged ecosystems, conserve water, and build resilient and inclusive urban infrastructure are required.



Picture: JudyDillon/iStock



Picture: Robin Zeigler/iStock

A future of acute water scarcity in the **Middle East and North Africa** affects every aspect of life, from the viability of agriculture to the availability of water for human consumption and industry. About 60 percent of the region's population lives in areas of high water stress, compared to the global average of 35 percent. Furthermore, two-thirds of the MENA's freshwater resources cross one or more international boundaries, making regional co-operation on water management essential to guarantee peace and security in a region with many conflicts.

Water must be at the heart of an integrated approach given its implications for climate security, water, energy and food security, rural livelihoods and economic development. Transformative adaptation strategies and investment plans to raise agricultural productivity and increase water efficiency in cities and rural areas are needed.

The region must secure more climate finance resources. It needs to get better at costing adaptation needs, increasing open access to more and better climate data, and identifying bankable projects to leverage private-sector participation in adaptation. Innovative finance structures are also needed. One such innovative mechanism is the Climate/SDGs Debt Swap Mechanism (DSM) initiative launched by the Economic and Social Commission for Western Asia (ESCWA) for Arab States in 2020. The initiative aims to accelerate action toward climate-resilient development and in particular the need for more adaptation and concessional climate finance to achieve the 2030 Agenda for Sustainable Development and Paris Agreement commitments.

North America may be home to one of the most economically advanced regions of the world, but it is also one of the most climate-vulnerable, featuring large coastal cities, Arctic areas, and swathes of agricultural and forest lands. In the **United States**, extreme weather-related losses have increased by 450 percent since 1980 to US\$ 810 billion in 2010-19. Puerto Rico alone has endured an average of 5 percent GDP loss per year for the past two decades as a result of hurricane damage and other climate impacts. Recent National Climate Assessments have highlighted the rising frequency and intensity of wildfires in the Northwest, extreme precipitation, flooding and heat in the Northern Great Plains and the Midwest, extreme droughts in the Southwest, and increased hurricane intensity and damage in the South, Southeast, and the Caribbean. **Canada's** geography creates specific challenges. Its extraordinary range of environments are being seriously affected by climate impacts including permafrost thaw, wildfires, extreme heat, flooding, and infectious disease. In addition, as the country with the longest coastline in the world, bordering three oceans, Canada is especially exposed to sea-level rise.

As the U.S. mobilizes to repair and upgrade its infrastructure, including transport and water networks, it has the opportunity for transformative adaptation. Canada can deepen the coordination across different levels of government and all stakeholders to accelerate climate adaptation of its economy and infrastructure. For both countries, financial regulators can make climate-related financial disclosures mandatory as a step toward incorporating climate risk into corporate decision-making. Supporting vulnerable populations, including minorities and indigenous peoples, against the worst impacts of climate change is a priority.

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6 Tracking adaptation trends

This report presents, as much as possible, information on current and projected climate risks and vulnerabilities. Insufficient data, difficulty of establishing a baseline against which progress can be matched, and, very importantly, the lack of a single metric or small set of indicators to monitor adaptation, are important limitations to presenting recent past trends and possible projections. Adaptation specialists have resorted to using a highly diverse series of proxies linked to progress in climate adaptation and resilience.

Recognizing that a search for a universally agreed single metric for adaptation is not meaningful, we need to develop an agreed core set of indicators to track the effectiveness of adaptation and resilience outcomes over time. These indicators must have at least five characteristics:

- They should cover the three dimensions of understanding, planning, and financing, and measure progress toward transformative adaptation.
- They should be able to track progress by state and non-state actors.
- They need to allow a better understanding of what works best for adaptation action, and what cost-effective programs to scale up.
- They need to be flexible to allow cost-effective data collection in developing countries.
- These indicators and data collection need to go hand-in-hand with research efforts to better understand climate impacts, adaptive capacities, and the deep uncertainty at smaller geographical scales.

GCA will work with many other partners on building consensus on indicators, data collection initiatives, state and non-state actor reporting, and disaggregated understanding of climate risks. Future editions of the State and Trends in Adaptation report will build on this process to strengthen the presentation on adaptation and resilience trends.

7 Conclusion and key policy recommendations:

Climate adaptation should become a key element of post-Covid recovery plans to both enhance the impact and reach of public and private investment and build resilience to future shocks.

To integrate climate adaptation into mainstream economic planning, and scale up adaptation initiatives, we need to strengthen three key areas: understanding, planning and finance.

a. Strengthening understanding of climate adaptation

I. Measuring progress: With the exception of financial outlays, measuring progress on climate adaptation is complicated. Whereas one clear metric exists for mitigation—the emission of greenhouse gases—climate adaptation has many variables. Measuring the impact of adaptation remains a work in progress. We need to develop a universally agreed set of metrics for adaptation to track the effectiveness of adaptation outcomes over time. These metrics will allow better understanding of progress by state and non-state actors.

II. Better, open-access climate data collection needs to improve and the data should be widely shared and understood, both within and between countries, to assess climate-change impacts, inform action on adaptation and pursue resilience at scale.

III. Understanding what works: We need to learn fast from successful adaptation practices carried out at the local, regional, and national level. We then need to share these rapidly, and adapt them to diverse local circumstances. Faster translation of scientific findings into operational action will also help.

IV. Understanding at small geographical scales: Building adaptation and resilience at a local level requires a deeper understanding of climate risks, vulnerabilities, and deep uncertainty at that scale.

b. Strengthening planning for climate adaptation

I. Governments must prioritize adaptation interventions in post-Covid recovery plans

with approaches that can improve the health, economic stability, and climate resilience of communities. A clear screening process for evaluating and prioritizing adaptation interventions will help achieve this goal.

II. Policies and subsidies that increase climate vulnerability need to be reformulated,

notably in response to the fiscal pressures brought on by Covid-19. Doing so can be especially beneficial for highly indebted countries that are dealing with the pandemic and are severely constrained in being able to make fresh investments in adaptation. For them, fixing expensive policies and subsidies detrimental to climate resilience can be an effective short-term win. Some examples include addressing land-use planning, climate-responsive safety nets, agricultural subsidies to promote climate-smart agriculture, and incentives for private-sector engagement in adaptation investments.

III. Government planning needs to embed climate science and risks across all departments and policies. A 360° approach is needed because climate change impacts food security, transport, energy, and water systems. It affects housing stock and other infrastructure and is already influencing population migration from places that are becoming uninhabitable.

IV. Stronger governance and technical institutions are required to better assess climate challenges and plan transformational adaptation and resilience programs, including at the city and sub-national levels. Stronger institutions can incentivize and collaborate with public-private-community partnerships for better and faster adaptation actions.

V. NAPs and other adaptation planning tools need to be scaled up, replicated and adapted globally and at sub-national level. More NDCs need to incorporate adaptation.

c. Strengthening finance for climate adaptation

I. Mobilizing new sources of finance for adaptation:

There is a five- to ten-fold gap between the financial resources currently devoted to climate adaptation (approximately €30 billion a year) and the adaptation needs in developing countries, estimated at up to €300 billion a year. Enhanced public commitments, more private-sector investment, and new financial instruments are needed to help vulnerable communities withstand climate, health, and other threats.

II. New financial instruments targeted at climate action include: climate resilience bonds, climate resilience debt swaps and debt relief initiatives to free up fiscal space for adaptation; and new public-private partnerships that invest in climate-proofing economic activities from agriculture to urban water systems.

III. Climate-proofing the global financial system:

Huge sums of capital remain exposed to the physical impacts of climate change. More work is needed to help financial institutions price and disclose these risks in order for funds to flow to climate-safe investments. This will also be helped by better systems to identify and appraise viable resilient investments and resilient asset classes.

IV. Private-sector funding for adaptation can also be increased with better integration of physical climate risks into financial decisions. This will be helped by standardized taxonomies that define sustainable and resilient investments, the mandatory disclosure of climate risks within businesses, and increased awareness of the economic benefits and opportunities in climate adaptation.

V. Targeted delivery and tracking: Better tracking systems are required to ensure climate-adaptation funds reach those who need them the most. Greater capacity of local vulnerable communities to access these funds, and new tools such as adaptation micro-finance and micro-insurance, are needed to change these

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trends. Stronger institutional capacity of vulnerable countries to better frame NAPs and adaptation projects could help redress this funding imbalance.

VI. Increase public financing for international adaptation efforts. Donor countries can play a large role in adaptation and resilience through development assistance. These funds can be used to spur mobilization of domestic resources, as well as leverage private-sector funding.

In addition to understanding, planning and financing for adaptation, we need to move swiftly to make up the ground lost to the pandemic by implementing transformative programs without delay. Building forward better in the face of growing climate impacts will require:

- **Forging urgent consensus among key policy actors** to reset pandemic recovery efforts immediately in order to place adaptation and resilience front and center of strategy—both at budgetary level and with practical, on-the-ground implementation.
- **Strong, coordinated political leadership** at global, regional, national, and sub-national levels. This is critical for successful adaptation.
- **Leadership from private businesses and investors.** Turbo-charging private-sector adaptation initiatives will be just as important as government-level action in achieving breakthroughs on the scale—and on the timeline—required.
- **The engagement of new actors**, including women and youth, to obtain the 'buy-in' of communities and ensure the long-term success of adaptation interventions.
- **The bold use of new financial instruments** to help vulnerable countries and regions address pandemic-induced economic challenges and meet their Sustainable Development Goals (SDGs).





Aftermath of Typhoon Vamco, Rizal province, Philippines, November 2020

Picture: REUTERS/Alamy

- **Closer linkage and leverage of adaptation and SDG programs.** Countries falling behind on SDGs may consider incorporating adaptation into the planning and provision of basic infrastructure services, such as water and sanitation, electricity, housing, transportation, and flood protection.
- **Leveraging adaptation and biodiversity programs.** Nature-based adaptation solutions must be an integral part of the solution. These programs would also support the UN Convention on Biodiversity's target to protect 30 percent of the planet by 2030.
- **Open access to more and better climate data.** The capacity to access, process, and understand all Big Data sources of climate risk information is essential to better frame action on adaptation and resilience at scale, opening up new possibilities for all stakeholders.
- **Open and participatory approaches.** Adaptation solutions cannot be designed and implemented by central governments alone. Adaptation is everybody's business. By including fairness and equity in adaptation actions, we can help prevent millions more people being pushed into poverty.

Climate adaptation and resilience will be one of the key determinants of global political, social, and economic stability in coming years. This is an inflection point—a historic moment of choice—and we must view 2021 as a moment of global solidarity for action. There is no true global recovery unless this includes all countries and all peoples.

How we collectively choose to emerge from this crisis will also be our legacy to future generations, and to the planet. We must choose wisely and boldly—and do so now.

STATE OF ADAPTATION

Adaptation and why it matters

KEY POINTS

Climate-change impacts are growing, and with them the need for a breakthrough on adaptation: Even if emission-reduction efforts succeed and the world meets the goal of holding average temperature increases to well below 2°C and limited to 1.5°C, there are some changes already locked into planetary systems that will have unavoidable consequences. The latter include hotter days, fiercer fires, bigger storms, rising and more acidic seas, shifting crop patterns, and the spread of tropical diseases into uplands and formerly temperate zones, among others.

Recent progress on adaptation has slowed: Positive momentum created by the Global Commission on Adaptation and publication in 2019 of the Commission's Adapt Now report—which made the case for 'three revolutions' to accelerate the pace and ambition of adaptation—has been set back by Covid-19.

There are reasons for optimism: One is that lessons can be learnt from good practices, including on scaling adaptation, as numerous examples around the world (Bangladesh, Ethiopia, the Netherlands, Norway) show. Another is that there have been several promising new initiatives in 2020. At the recent Climate Ambition Summit, 20 countries came forward with fresh plans for adaptation and resilience.

Big unknowns remain, but can be resolved: Determined, collective action and knowledge co-creation can deepen our understanding on adaptation's challenges and opportunities, improve planning, marshal greater financial resources for adaptation, and devise ways to measure progress.

Post-Covid recovery programs are a unique opportunity to scale up adaptation: Economic recoveries will be more effective with climate adaptation built in and a step change is required in the financing of adaptation.



Picture: Roschetzky/iStockPhoto/iStock

“

None of us can escape the consequences of climate change. None of us can turn a blind eye to what is happening right now, and what will happen in the future. All of us have a responsibility to tackle the causes of climate change and adapt to its impacts. All of us—together

Mark Rutte

Prime Minister of the Netherlands

According to the United Nations¹, the year 2020 was on track to have been one of the three warmest years on record. Arctic sea ice was at its lowest ever extent, permafrost was melting rapidly and releasing methane, and the North Atlantic hurricane season registered more than double its long-term average number of events.

Over the past decade, the number of climate-related disasters has risen from 500 to 700 per year. More than 50 million people were affected in 2020 by floods, droughts, and storms—with the Covid-19 pandemic delivering a double blow². Floods and storms are responsible for almost three-quarters of climate disasters, but heatwaves are becoming more intense and widespread. Severe flooding and landslides in China were particularly intense, with more than 2.2 million people evacuated from their homes and surroundings in July. The largest desert locust outbreak in 25 years across the Horn

of Africa left one million people food insecure, with 81,000 hectares of cropland damaged in Ethiopia alone. Record wildfires raged across the U.S.³ and Australia where, on top of human fatalities, the WWF found that three billion animals were affected across 18.5 million scorched hectares. Three-quarters of the almost 700 million people living in poverty rely on agriculture and natural resources to survive. For these people, erratic weather, limited water sources and increased competition for resources have heightened vulnerabilities, and are now a matter of life and death⁴.

These numbers tell a story of increasing climate change and impacts: chronic water shortages, plummeting agricultural yields, rising sea levels, flooding, mass population displacement, and damage to productive infrastructure. Much of this is disproportionately affecting the most vulnerable, often the world's poorest and those affected by inequalities.

STATE OF ADAPTATION

They also show that no matter how effective our efforts at climate-change mitigation—that is, on reducing our dependence on fossil fuels and our carbon emissions—we still need to adjust our way of living to the dramatic changes to our physical world that are happening right now.

That is why adaptation—the process of adjustment to actual or expected climate and its effects—is so important. It is why a farmer in Zimbabwe uses a new variety of maize that is more resistant to drought, why low-lying atoll nations like the Marshall Islands are planting mangroves to protect coastal areas, and why an urban planner in Colombia paints roofs white to deflect dangerous heat from sunlight.

Recent progress on adaptation

Action on adaptation has long lagged behind progress on mitigation (Figure 1). It tends to be limited, localized, and often successful on those terms. But what is happening is not on a scale sufficient to match the climate-change challenge as a whole.

ADAPTATION DEFINITIONS

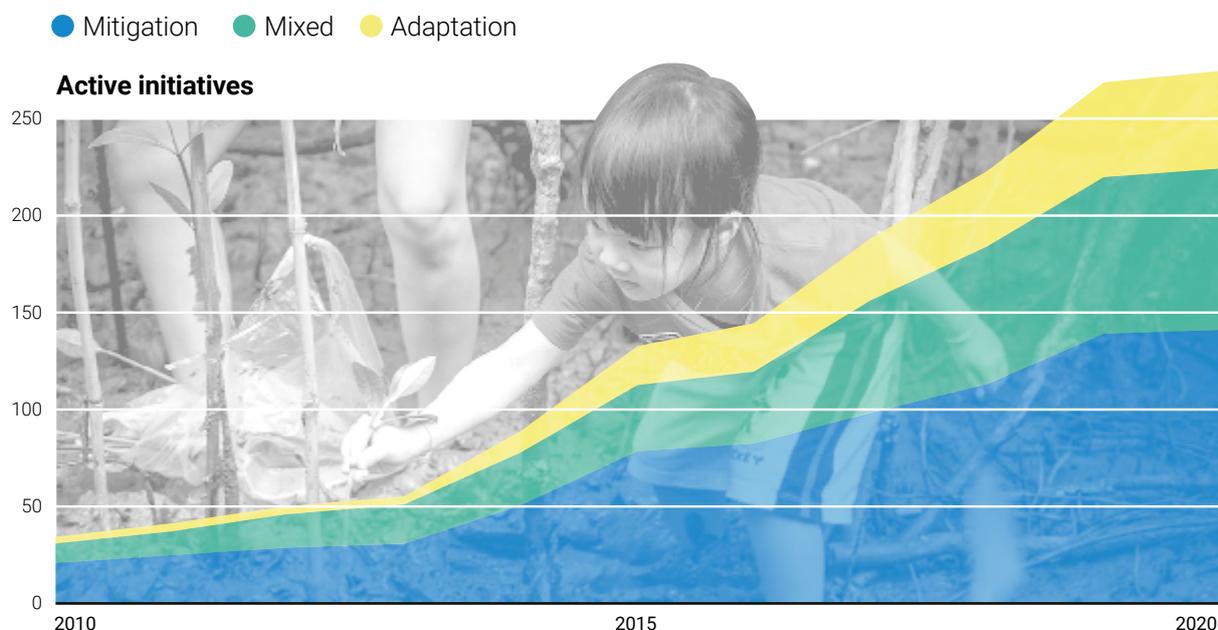
In this report, we use the terms ‘adaptation’ and ‘resilience’ as defined by the Intergovernmental Panel on Climate Change (IPCC)⁵.

Adaptation: The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate harm or exploit beneficial opportunities. In natural systems, human intervention may facilitate adjustment to expected climate and its effects.

Resilience: The ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions.

FIGURE 1 HOW CLIMATE ACTION INITIATIVES HAVE GROWN SINCE 2010

Adaptation has lagged behind mitigation



International co-operative initiatives recorded with UNEP-DTU Partnership’s Climate Initiative Platform (CIP), UNFCCC’s Global Climate Action Platform (GCAP), and initiatives launched at recent climate summits, as gathered by Chan et al. 2020.⁶

Picture: iStock

In September 2019, the Global Commission on Adaptation—led by former UN Secretary-General Ban Ki-moon, Bill Gates, Co-Chair of the Bill & Melinda Gates Foundation, and Kristalina Georgieva, Managing Director of the International Monetary Fund, and convened by over 20 countries—made a landmark call for global action for adaptation in a report entitled Adapt Now.

The report laid out the stakes starkly. Without adaptation, climate change may depress growth in agriculture yields by up to 30 percent by 2050; the number of people who may lack sufficient water, at least one month per year, will soar from 3.6 billion in 2019 to more than five billion by 2050; and rising seas and greater storm surges could force hundreds of millions of people in coastal cities from their homes.

Adapt Now proposed ‘three revolutions’ to accelerate the pace and ambition of adaptation in:

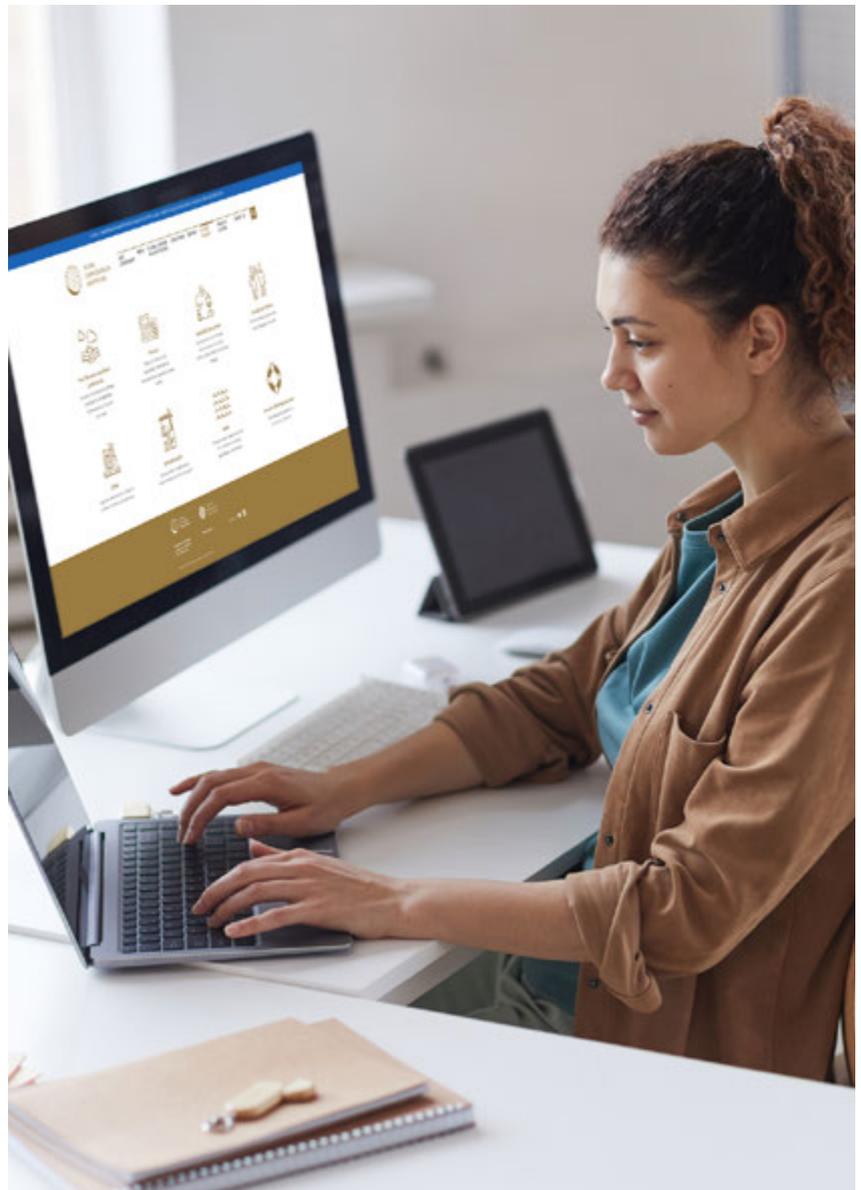
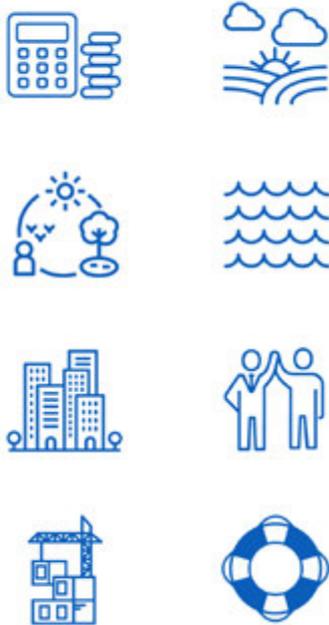
Understanding: To ensure that the risks are fully understood and reflected in the decisions that public and private actors make.

Planning: To improve policy and investment decisions and how we implement solutions.

Finance: To mobilize the funds and resources necessary to accelerate adaptation.

The Commission identified a set of eight ‘action tracks’ to mobilize action on adaptation: finance and investment; food security and agriculture; nature-based solutions; water; cities; locally-led action; infrastructure; and preventing disasters.

Momentum had started to build on these initiatives.



Picture: iStock

STATE OF ADAPTATION

On **understanding**, numerous reports and scientific research in 2020 showed that climate-change impacts are occurring faster and with more intensity than expected. For example, a study in the journal *Nature* showed that 48 percent of the world's land area, 52 percent of the global population, and 46 percent of global assets will be at risk of flooding by 2100, in the absence of adaptation measures⁷. The International Federation of Red Cross and Red Crescent Societies (IFRC) found in a November 2020 report that, over the past decade, 83 percent of all disasters were caused by extreme weather and climate-related events such as floods, storms, and heatwaves⁸. Together, these disasters killed more than 410,000 people and affected an incredible 1.7 billion people. Yet there is still limited progress on understanding

what works best for adaptation, and how to translate that knowledge into replication and scaling-up processes across the world.

On **planning**, the World Bank in 2020 published a new framework for designing strategies for climate adaptation⁹. The same year, the European Environment Agency published a report on the monitoring, reporting, and evaluation (MRE) of national adaptation policies that as well as bringing together the lessons learnt—at the national level—dealt with the implications of emerging reporting requirements from relevant EU policies to improve evaluation at EU level¹⁰. In the U.S., California published an update to its Adaptation Planning Guide, which was first released in 2012 and is designed to support local government,

LOCALIZED EFFORTS HAVE BEEN EFFECTIVE

The Room for the River (Rftr) initiative in the Netherlands, which launched in 2007, is an example of how advances in policy, regulatory and institutional innovation have enabled multi-stakeholder co-operation for action coordinated across national, regional, and local levels. The scheme's aim is to manage higher water levels in rivers by lowering the levels of flood plains, creating water buffers, relocating levees, increasing the depth of side channels, and the construction of flood bypasses. It consists of over 30 projects that were completed at the end of 2018. An adaptive management approach taken by the program has created a learning process for continued improvement in implementation, relying on a spirit of collaboration rather than extended negotiations between stakeholders¹⁷.

The ClimDev Africa Fund has deployed US\$ 28 million to develop early-warning applications and provide digital information to aid seasonal agriculture planning in Ethiopia, Senegal, Liberia, Sierra Leone, Mozambique, Malawi, Zimbabwe, Tanzania, and Madagascar.



regional organizations, and climate-collaborative groups to integrate best practices and current science into their adaptation planning efforts¹¹.

And on **financing**, international financial institutions, the Green Climate Fund and others were already putting more resources into adaptation. Global investment in adaptation has increased slowly but steadily in recent years, from US\$ 22 billion a year in 2015-16 to US\$ 30 billion in 2017-18, according to the CPI Global Landscape of Climate Finance¹². In 2019, data from multilateral development banks show flows of US\$ 13.9 billion in climate adaptation finance to low and middle-income countries, up from US\$ 12.9 billion in 2018^{13 14}. Many of these investments are for resilient infrastructure, which broadly speaking has a 4:1 return on investment.

A further boost came in September 2019, when the U.K. and Egypt, together with coalition partners Bangladesh, Malawi, the Netherlands, and St Lucia, supported by the United Nations Development Programme, launched a Call for Action on Adaptation and Resilience¹⁵. The call, endorsed by 118 countries and 86 organizations and institutions as of September 2020, set a new bar for ambition on adaptation and resilience.

Despite these actions and increase in funding, finance flows are still not getting to where they are needed most, and fall short of estimated needs given escalating climate risks: the estimated needs in developing countries alone will be between US\$ 140 and US\$ 300 billion per year by 2030¹⁶.



Floods in Deventer, Netherlands, 2018

Picture: Kloeg008/iStock

The African Development Bank is building on ClimDev and related initiatives to harness digital technologies and data-driven innovations to increase efficiency in agricultural value chains. The opportunity to scale these up through inclusive public-private-sector collaborative models can bring enormous benefits for food security in Sub-Saharan Africa¹⁸.

India is taking an innovative approach to experimental new models of climate adaptation by establishing six small-scale Adaptation Fund projects in diverse regions of the country across different sectors. The regions include the north-western Himalayas, Rajasthan in the west, the central Madhya Pradesh region, and the eastern and southern coasts. The interventions range from mangrove restoration and fish farms to the establishment of weather kiosks, and use of short-duration crops that mature in 70 days to adapt to late sowing conditions. Instead of pursuing one large national project, the approach is breaking ground in adaptation by piloting diverse models. Furthermore, the projects establish new networks and share knowledge learnt across the country. The projects are designed from their inception to reach more vulnerable communities and produce models that can be replicated¹⁹.

STATE OF ADAPTATION

NON-STATE ACTORS STARTING TO ENGAGE—AND SEEING SOME RESULTS —BUT MORE IS NEEDED

Much of the conversation about adaptation policy can seem top-down and focused on national government work. But there is an increasingly rich and varied set of initiatives and work being carried out by non-state actors, including the private sector, which is developing a more robust understanding of climate risks and their impacts (see Figure 2).

CDP²⁰ is a not-for-profit that runs the global disclosure system for investors, companies, cities and regions to manage their environmental impacts. It has been doing this for the past 20 years and also works with sub-national governments.

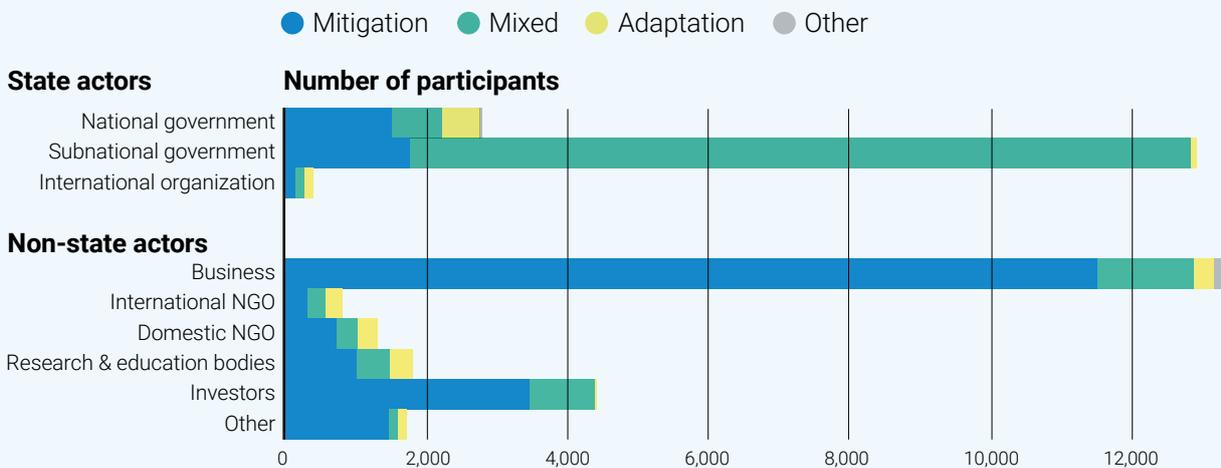
In 2019, the organization asked companies how they were disclosing climate-related information in line with the Task Force on Climate-related Financial Disclosures (TCFD). In one set of findings, CDP found that 84 percent of companies have board-level oversight of climate-related risks and opportunities; 42 percent use climate-related scenario analysis to review the resilience of their business strategy; and 84 percent integrate climate-related risks into company-wide management processes²¹.

In another set of findings²², out of the 6,707 companies responding to the CDP's disclosure enquiry, 53 percent reported substantive climate-related risks that could have financial or strategic impact. Most (54 percent) identified both transition risks (such as changes in regulations or technologies) and physical risks (such as floods, droughts, or heat), while 21 percent identified only physical risks. The latter category included many companies in sectors facing high climate risks in their operations and supply chains: infrastructure, agriculture, apparel, and food and beverage.

Natural disasters are at the extreme end of climate risks, yet they are increasingly central to any analysis of corporate climate risk, not least because they can seriously affect whole industries and their competitiveness²³. For example, the 2011 floods in Thailand caused economic losses of about US\$ 46.5 billion, with the country's manufacturing sector (chiefly automotive, electronics, and machinery) shouldering 70 percent. Export losses alone amounted to US\$ 7.9 billion²⁴. Similarly, the 2015 floods in south India caused substantial losses in the automotive industry²⁵.

FIGURE 2 DIVISION OF LABOR

Non-state actor initiatives on adaptation are significant



SOURCE: CHAN ET AL. 2020

CDP also analyzed a sample focusing on the 500 largest companies by market capitalization. As many as 82 percent identified substantive climate risks. At the same time, 225 companies out of 366 that participated reported potential climate-related opportunities valued at over US\$ 2.1 trillion. New solutions for adaptation ranked third in opportunity areas identified, involving an estimated US\$ 236 billion in needs.

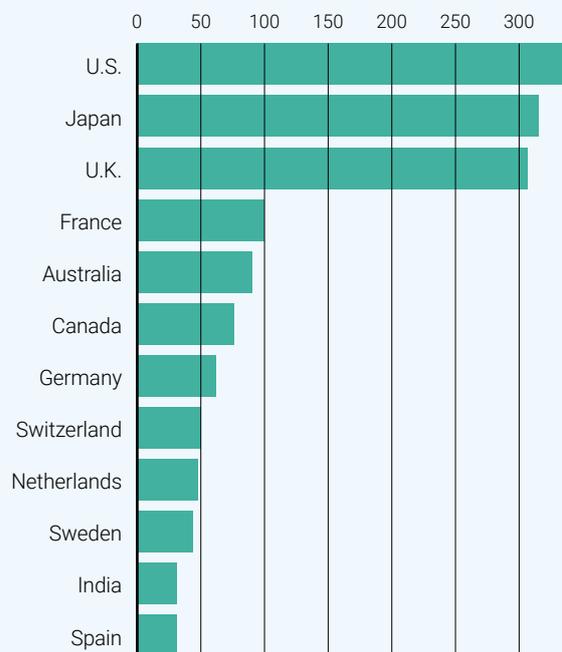
European companies reported the highest potential financial implications, with transition risks at US\$ 420 billion, and physical risks at US\$ 240 billion. By contrast, companies headquartered in the U.S. only reported a potential financial impact of over US\$ 110 billion. This relatively low estimate of physical risk is somewhat surprising given actual levels of climate-related damages. MunichRe²⁶ has indicated that 2017 was the year with the highest disaster-related insured losses on record at US\$ 135 billion worldwide. Of these losses, half were in the U.S., compared to the long-term average of 32 percent up until 2016.

As the UN's Adaptation Private Sector Initiative (PSI) puts it, there are many climate-adaptation opportunities for private companies, such as climate risk-reduction measures in their physical operations, climate-proofing the supply chain, and profitable adaptation measures in vulnerable regions²⁷. These could include building flood dikes to increase land value for real estate, selling drought-resistant seeds, and selling digital weather information services.

Indeed, recent years have seen a rapid expansion of climate partnerships by business and civil-society organizations and sub-national actors (such as cities and regions). Thanks to the efforts of UNFCCC and UNEP, these partnerships are logged in platforms such as the UNFCCC's Global Climate Action Platform and the UNEP-DTU Partnership's Climate Initiatives Platform (see Figure 1, page 18).

A newly developed tracking tool—the Climate Cooperative Initiatives Database (C-CID)²⁸—has been used over the last few years to track the performance of these initiatives. The C-CID uses a new methodology

FIGURE 3 COMPANIES AND INVESTORS PARTICIPATING IN ADAPTATION INITIATIVES
By country



SOURCE: SOURCE: CHAN ET AL. 2020, IN CO-OPERATION WITH OSCAR WIDERBERG AND CORNELIA FAST AT VRIJE UNIVERSITEIT AMSTERDAM

that allows comparison across a wide range of partnerships with diverse goals and work programs²⁹.

C-CID analysis shows that there are an increasing number of initiatives with a combined focus on mitigation and adaptation. This is a welcome development as most investment programs have tended to concentrate on one or the other. The C-CID reviewed almost 300 multi-country climate initiatives in mitigation and adaptation. Some of these involve large membership organizations, like the Global Covenant of Mayors for Climate and Energy, with more than 10,000 members; the UN Principles for Responsible Investment, with approximately 2,700 members; and the Climate Ambition Alliance, with close to 1,800 members. Another finding was the unprecedented number of actors of all types, including businesses, investors, cities and regions, and non-profit organizations, that are participating in co-operative climate initiatives. Most of these actors are involved in initiatives that mainly focus on mitigation, or equally on adaptation and mitigation.

STATE OF ADAPTATION

The impact of Covid-19

The world has already forgone US\$ trillions³⁰ of economic growth due to Covid-19, and the pandemic struck climate action generally as governments shifted their focus to the immediate health and economic emergencies.

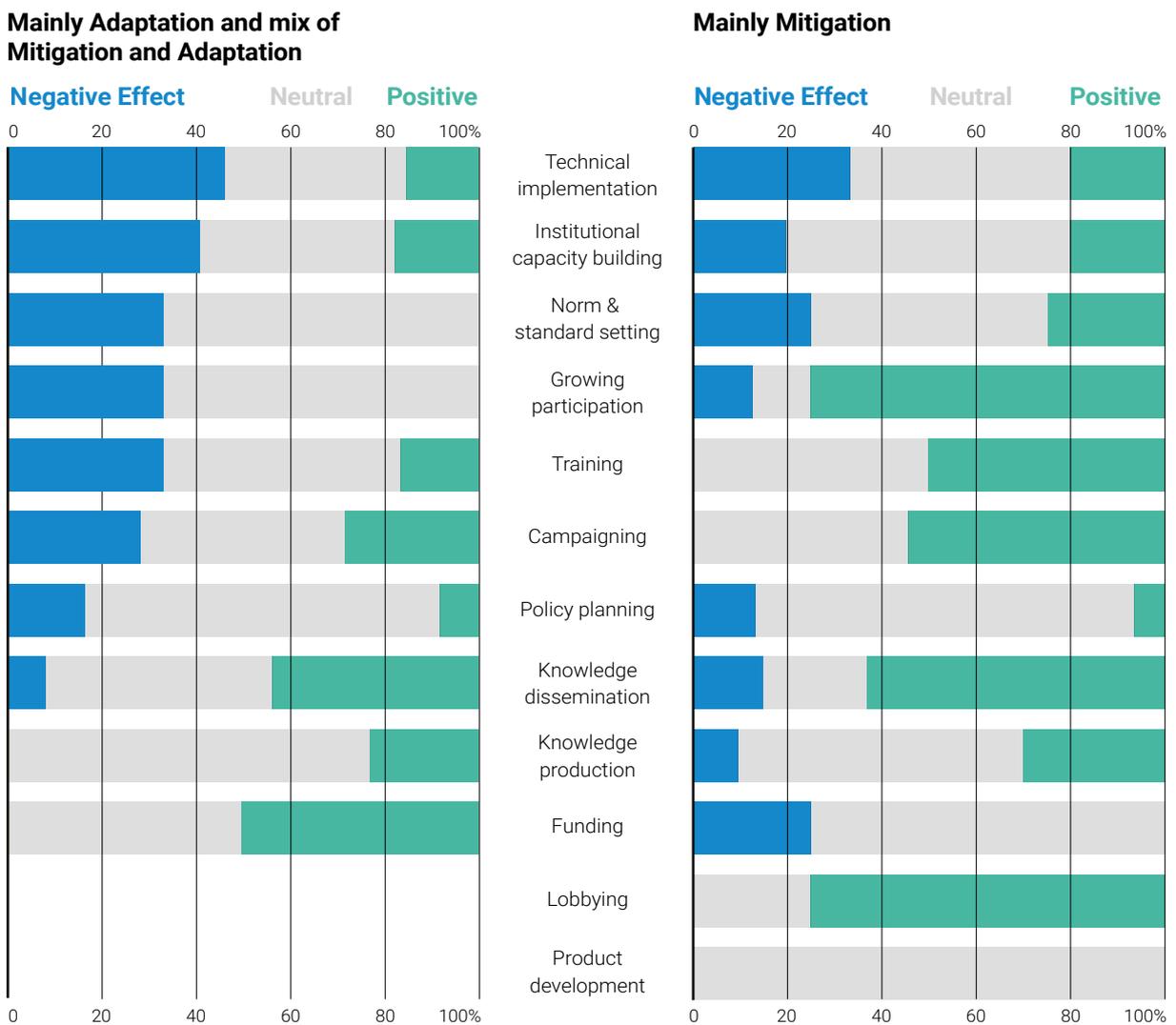
The first impact has come from the structure of governments' massive green stimulus packages. Measures to strengthen climate resilience are being passed over, with most climate-related measures focused on emissions reductions³¹. The C-CID in November observed that Covid-19 had resulted in a 'notably deeper performance dip' for initiatives on adaptation (solely, or combined with mitigation),

compared with those that mainly focus on mitigation. It also warned that many of the pandemic's effects on adaptation may only manifest themselves later. Many budgets for adaptation initiatives have been allocated for multiple years, and the financial implications may only become apparent with time.

The recovery plans announced so far largely overlook the opportunity of investing in climate adaptation to help communities recover better from the ravages of Covid-19, as well as prepare them for future challenges. This points to a funding misallocation and mismatch, for which we propose solutions in Finance section.

FIGURE 4 THE IMPACT OF COVID-19 ON ADAPTATION AND MITIGATION INITIATIVES

Share of positive or negative communications from initiatives based on function



SOURCE: CHAN ET AL. 2020

Food distribution in Lagos, Nigeria, 2020



Picture: Adeyinka Yusuf/iStock

ACTION ON COVID-19 RESPONSES AND FINANCING

The unprecedented pandemic crisis has required massive mobilization of financial resources. Many institutions have tried to keep the balance between climate financing and Covid pandemic response to leverage resources and maximize multiple benefits. Some examples are presented below.

The **African Development Bank (AfDB)** in April 2020 announced a Covid-19 Response Facility, with capacity to provide up to US\$ 10 billion to African governments and businesses³². The AfDB immediately developed guidelines for mainstreaming climate actions and risk considerations into projects financed through this facility.

The **World Bank Group** announced, as part of the Climate Ambition Summit, an increase in commitments to climate financing from the previous target of 28 percent by 2020 to 35 percent average co-benefits target. This new target will be part of its Second Climate Change Action Plan (2021-25). As part of this commitment, the World Bank will work to achieve 50 percent of this financing for adaptation and resilience³³.

The **African Risk Capacity (ARC)** is a risk-pooling mechanism formed in 2013 that offers African countries insurance covering natural disasters. Because Covid-19 has limited the fiscal capacity of many African member countries, the German government provided €19.5 million in one-off funding for ARC premium payments, and the KfW Development Bank implemented Covid-19 support through the ARC to nine countries³⁴.

The **Caribbean Catastrophe Risk Insurance Facility (CCRIF)** is a company operating in the Caribbean and Central America that provides parametric insurance. CCRIF was capitalized by several governments in North America and Europe, the European Union, the World Bank, the Caribbean Development Bank, and through membership fees paid by participating governments. In the middle of the Covid-19 crisis, CCRIF paid \$10.7 million to Nicaragua for damages caused by Tropical Cyclone Eta. CCRIF member governments received support from development partners (including the EU and Canada) to cover portions of their insurance costs for the 2020-22 policy years³⁵.

STATE OF ADAPTATION

Poor long-term scorecard on proxies for adaptation progress

Measuring progress on climate-change adaptation is complicated³⁶. Whereas a clear metric exists for mitigation—the emission of greenhouse gases—adaptation has many variables. Measuring the impact of adaptation remains a work in progress. It is nonetheless possible to pull together a broad picture of the current status of adaptation in three key areas:

1 National adaptation (progress: slow). We can see how far countries have progressed in formulating and implementing National Adaptation Plans (NAPs), established under the Cancun Adaptation Framework in 2010 to develop strategies for medium and long-term adaptation. In November 2020, the UN Framework Convention on Climate Change (UNFCCC) published a report showing that 125 of the 154 developing countries had taken steps to formulate and implement NAPs, 55 of which were being supported by the Green Climate Fund (GCF)³⁷. Twenty countries had completed preparation of their first NAPs, the latest of which was Suriname, in June 2020. Of those 20 countries, 11 had submitted a total of 23 proposals to the GCF for implementing priority projects identified in their NAPs. Countries are using other documents, such as National Adaptation Programmes of Action (NAPAs), of which 51 have been prepared, and enhanced Nationally Determined Contributions (NDCs) that include adaptation, among others. The UN Environment Programme recently noted that most countries have at least one adaptation policy instrument in place, but qualitatively planning efforts are generally not yet adequate for, nor effective in, achieving desired adaptation objectives³⁸.

2 Disaster risk management (progress: moderate). The Sendai Framework for Disaster Risk Reduction, which was the first major agreement of the post-2015 development agenda, aims to reduce existing and prevent new disaster risk through clear targets and priorities. It is based on seven global targets to be achieved by 2030³⁹. As of April 2020, only 85 countries—slightly over 40 percent—reported that they had national disaster risk-reduction strategies aligned, to some extent, to the Sendai Framework, with six countries reporting fully aligned national strategies. However, on four of the seven Sendai targets, including reduction in disaster mortality and reduction in direct economic losses, countries were falling back.





A queue for water in Lalibela Ethiopia, 2020

Picture: Rudolf Ernst/iStock

3 Sustainable Development Goals (progress: slow). Direct links and synergies exist between adaptation and SDGs when sustainable development promotes livelihood security and thereby enhances the adaptive capacities of vulnerable communities and households⁴⁰. Besides broad enabling synergies, several SDGs are linked directly with adaptation focus areas, including an SDG on climate action and the SDG of zero hunger, which explicitly promotes strengthening adaptive capacity; the sustainable cities SDG that aims to reduce the impacts of disasters, including climate-related; and the health SDG. Climate adaptation is closely linked to the water SDG.

Water stress is a measure of the amount of fresh water extracted from various sources, against the total fresh water available, and is a critical indicator of the ability of communities, cities, farmers, and industries to respond to a changing climate. A high level of water stress would indicate a reduced ability to deal with drought, for example. The level of water stress varies widely across regions and even within countries. Northern Africa and Central and Southern Asia have levels above 70 percent⁴¹. Globally, 23 countries have water stress levels above 70 percent, of which 12 are in the Middle East and North Africa (MENA) region^{42 43}. A review of SDG reporting shows that the situation is not improving. Furthermore, 60 percent of the 172 countries reporting are unlikely to reach the target of integrated water-resources management by 2030⁴⁴. Without fundamental progress, it will not be possible for the various stakeholders who are co-dependent on the water resources in a country to adapt to a rapidly-changing climate.

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FOOD SECURITY IN AFRICA

Food security in Africa is the most urgent climate-adaptation and development challenge the world faces in 2021. Africa has the highest global prevalence of undernutrition. It is worse today than it was five years ago, when undernourishment across the continent started to rise after decades of fall⁴⁵. Since 2015, 24 million people have fallen out of the food security bracket. More than half of Africa's population—674 million people—suffered from food insecurity last year, meaning they didn't have the resources to reliably access nutritious food⁴⁶.

The main reasons for this hunger crisis include persistent poverty, a high reliance on below-potential agriculture for livelihoods and food security, local conflicts, and climate change, including more frequent extreme weather events such as torrential rainfall, flood and drought. These weather events have major impacts on food security and nutrition.

For example, the 2014-16 El Niño was one of the most intense and widespread of the past 100 years. Over 10 million people in Ethiopia, 4.7 million in Somalia, and close to 40 million people in the Southern Africa region were food insecure in 2016-17⁴⁷. After each drought, calorie availability has been estimated to fall by 3.7 percent in Kenya, 3.3 percent in Ethiopia, and 1.9 percent in Somalia⁴⁸. Livestock also suffer in droughts. The 2010-11 Eastern Africa drought caused about 60 percent of cattle to die in Ethiopia and Kenya. As many owners sell their animals during a drought, the price of a cow in northern Kenya dropped from US\$ 220 to US\$ 30⁴⁹. Floods can have equally devastating impacts. Widespread flooding in southern Mozambique in 2000 killed 350,000 head of livestock and destroyed the boats of around half the country's 6,000 fishermen, part of the US\$ 3 billion (20 percent of GDP) in losses⁵⁰.



A Somali girl attempts to fend off a swarm of desert locusts from grazing land

Picture: REUTERS/Alamy

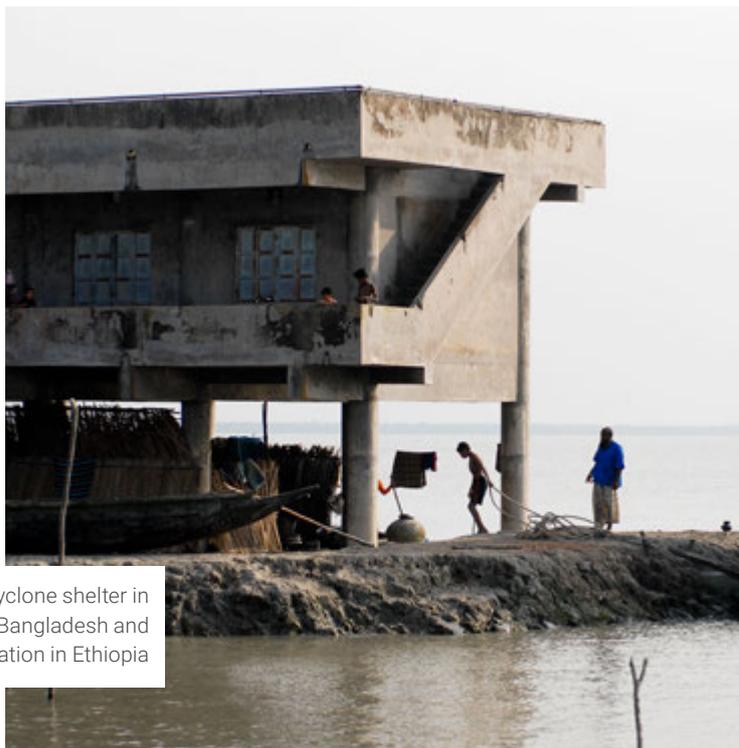
Unusually heavy rains due to cyclones in Yemen, combined with a longer than normal monsoon season in 2019, gave rise in 2020 to the worst desert locust outbreak in 70 years, contributing to the devastation of crops in Eastern Africa, and impacting nearly 5 million people^{51 52}. The locust crisis continued fueled by the floods in northern Somalia brought by Cyclone Gati in November 2020, which displaced thousands of pastoralists, and risks leading to new swarms.

In the long term, climate impacts are expected to decrease agricultural outputs by up to 30 percent by 2050, while global food demand will likely increase by 50 percent in the same timescale. In Africa, demand for food is expected to more than double by 2050⁵³. So unless production and yields increase dramatically, Africa and the world are unlikely to meet the Sustainable Development Goal to eliminate hunger by 2030.

The Covid-19 pandemic burst onto this already fragile scenario by dramatically increasing poverty and food insecurity. The number of people suffering from extreme hunger by the end of 2020 was expected to have doubled to 265 million⁵⁴ as a result of economic lockdowns, closed borders, supply-chain disruptions, and lower remittances from family members working in cities or abroad. Millions now risk starvation.

The triple crisis of climate impacts, desert locust, and Covid-19 are amplifying the weaknesses of the food production systems in Sub-Saharan Africa. The growing hunger and undernourishment in the continent is the worst adaptation challenge the world is facing in 2021.

STATE OF ADAPTATION



Cyclone shelter in Bangladesh and irrigation in Ethiopia

Picture: Joerg Boethling/Alamy



Picture: GAFSP

Adaptation at scale is possible

In spite of overall slow progress, there are reasons for optimism about the way forward. One is that adaptation at scale is possible. Here are some examples of how this has been demonstrated around the world—a thorough overview of progress across world regions and for individual countries is provided in the regional overview section.

Bangladesh is one of the most vulnerable countries to the impacts of climate change and has a long, tragic history with cyclones. Its story is also one of resilience, from the Great Bhola Cyclone in 1970 that claimed over 300,000 lives to Cyclone Fani in 2019, with a much-reduced toll of 17 deaths. In 2009, Bangladesh was the first country in the world to create a national program to determine how it would adapt to a changing climate. Today, with more accurate weather forecasting that feeds into an extensive community-based warning system, and with a strong network of cyclone shelters and drills, the evacuation of 1.6 million people before Cyclone Fani hit in April 2019 showed how adaptation at scale pays.

Ethiopia's Productive Safety Net Program (PSNP) has been one of the largest social protection

schemes in Sub-Saharan Africa since 2005. During the 2016 El Niño-influenced drought, PSNP was extended to temporarily cover 18.5 million people—20 percent of the population—to avoid a famine and protect them from falling into poverty. The PSNP cash-for-work program supports interventions in landscape restoration, irrigation, and agroforestry, all measures intended to strengthen adaptation to climate change⁵⁵.

The floods of 1953 were disastrous for the south-west of the **Netherlands**. Afterwards, the government introduced a series of flood prevention and coastal management measures known as the Delta Programme. With no less an ambition than making the country climate-proof, the program brings together central government, provincial and municipal authorities, water authorities, civil-society organizations, and the business community. It is based on the Delta Act, which sets out funding and provides for a clear governance structure⁵⁶.

In 2020, the length of the rainy season across most of southern **China** reached its highest level in 20 years, in many places lasting nearly twice as



Picture: wonry/iStock



Environmental protection at a construction site in Jinan, China and a public water fountain in Paris

Picture: pablorborca/iStock

long as average. However, far fewer lives were lost, compared with catastrophic floods at similar levels in 1998, when more than 4,000 people died and 7 million homes were destroyed. That is in large part due to the introduction after 1998 of a new approach focused on environmental restoration, in addition to relying solely on engineering solutions. The restoration of close to 300,000 hectares of flood plains, together with reforestation has increased flood-retention capacity and improved biodiversity. The Sponge City initiative, launched in 2015, has been expanded to 30 pilot cities. The goal is for 80 percent of urban areas covered under the project to absorb and reuse at least 70 percent of rainwater by 2030.

After the 2003 heatwave that killed more than 15,000 people in **France**, the country has developed a strong program of climate-adaptation action. In 2004, a 'heat tax' was set up to fund schemes to protect older citizens with a heat alert system. This Plan Canicule is a multi-pronged approach of coordinated advance warning to the public, led by city authorities and Météo France. The program also provides reusable water bottles to homeless people and a check-in

system for vulnerable people. The Plan Canicule has been extended from June to mid-September in response to the warming climate⁵⁷.

Climate insurance was identified as a key priority for action at the G7 Summit in 2015. Four initiatives collectively demonstrate large-scale engagement in disaster risk insurance. **Germany's** InsuResilience' program, launched in 2017, aims to increase the resilience of poor and vulnerable households to extreme weather events by making affordable climate risk insurance products available⁵⁸. A second initiative, the African Risk Capacity (ARC), is a specialized agency of the **African Union**, established to help African governments strengthen their disaster risk management systems, and access rapid and predictable financing when disaster strikes⁵⁹. A third initiative, supported by the **U.K.**, provides crop insurance for farmers as part of climate-resilient agriculture programs. Finally, the **World Bank's** Disaster Risk Financing and Insurance Program supports governments with a gamut of financial protection strategies, including sovereign disaster risk financing, agricultural insurance, property catastrophe risk insurance, and scalable social protection programs⁶⁰.

STATE OF ADAPTATION

Promising initiatives emerged in 2020

A further reason for optimism is that there were several promising new initiatives in 2020. At the recent Climate Ambition Summit, an online event held on December 12, 20 countries came forward with fresh plans for adaptation and resilience⁶¹. France pledged €1.5 billion for adaptation in a total package for climate funding of €6 billion, while Nepal committed to introducing climate resilience adaptation plans in all its 753 local levels by 2030. Malawi, meanwhile, laid out its ambition to restore 4.5 million hectares of forest landscapes by 2030.

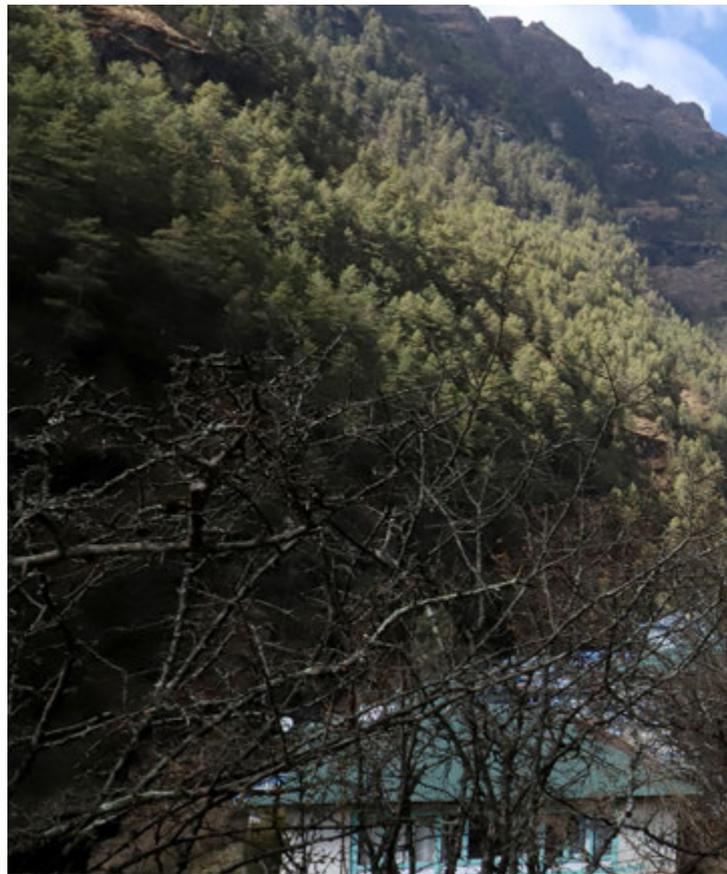
The same event saw the launch of a campaign to catalyze global ambition for climate resilience, called Race For Resilience. Led by the UNFCCC High Level Climate Action Champions, the campaign will catalyze non-state actors to build the resilience of four billion people from vulnerable groups and communities by 2030⁶². The campaign will focus on helping frontline communities build resilience and adapt to the impacts of climate change, such as extreme heat, drought, flooding, and sea-level rise. Participants are to share a clear plan by COP26 in 2021.

The road ahead

Understanding

In spite of the growing number of adaptation initiatives, it has been hard to measure aggregate performance compared with mitigation initiatives. Lacking a base measure—such as the tons of emission of carbon dioxide equivalents used to gauge mitigation success—adaptation specialists have resorted to using a highly diverse series of proxies believed to be indicators of adaptation progress. Recognizing that a search for a universally agreed single metric for adaptation is not meaningful, we need to develop an agreed core set of indicators to track the effectiveness of adaptation outcomes over time. GCA will build on outcome-based approaches, with many other partners⁶³.

The key climate risks at sub-national levels still need better understanding. As attested by the Africa Adaptation Initiative, large gaps remain. This is a substantial barrier for informing prioritization and planning, and for mobilizing targeted finance.



Planning

We also need to speed up how we embed our understanding of climate science and risks into government planning. Ongoing adaptation initiatives coupled with enhanced NDCs and related efforts are an entry point for transformative adaptation planning that is inter-sectoral with long-term targets. National-level adaptation planning needs to take into consideration sub-national and local adaptation priorities and link available and anticipated financial resources to the identified adaptation actions. Governments need to plan ahead with fresh tools to help them prioritize adaptation investments among competing priorities. Public-private-civil society coalitions are needed to make informed decisions on these priorities.

Finance

Covid-19 has transformed the economic landscape and poses both threats and opportunities for the climate-adaptation finance agenda. Climate-adaptation finance flows are at risk of falling sharply in the coming years, given shifts in public spending toward immediate relief and potential for fiscal constriction. Loss of growth and revenues due to



Flood early-warning siren, Nepal

Picture: UNDP

the recent global economic slowdown, conflicts and crises in some parts of the world, weak public finance management in many developing countries, and the adverse economic impact of the Covid-19 pandemic have contracted the fiscal space in most countries at a time when demand for financing climate actions and the SDGs is high.

New financial tools are needed to fund the adaptation that gets planned. At the same time, there needs to be more transparency about climate risks in the financial sector—in particular the insurance industry that is so heavily engaged in underwriting climate-related risks. The more transparency there is about climate risks—through greater disclosure, for instance—the better equipped investors and regulators will be to make informed decisions on adaptation.

Finally, financial instruments must be inclusive. Urgent scaling up of climate-adapted safety nets, micro-credit and micro-insurance schemes, are needed to protect the poorest and most vulnerable, and smaller business, including those in the informal economy.

Recovery programs are an opportunity for a breakthrough

Given the accelerating pace of climate change, incremental progress on climate adaptation is no longer enough. Transformative changes that involve significant alterations to systems and practices are now needed. In the words of UN Secretary-General António Guterres: ‘We must deliver a breakthrough on adaptation to protect the world—and especially the most vulnerable people and countries—from climate impacts.’⁶⁴

Recovery programs present a unique opportunity to catch up and trigger this breakthrough, with a step change required in the financing of adaptation in particular, given that it represents only 5 percent of climate finance currently.

Adaptation has not achieved the scale that is so desperately needed. The world must move rapidly to large-scale, preventive, and systemic adaptation as an urgent priority. As UN Secretary-General Guterres has said: ‘We are in a race against time to adapt to a rapidly changing climate. Adaptation must not be the forgotten component of climate action.’



Seizing the opportunity to build a more resilient recovery

KEY POINTS

Securing a climate-resilient recovery is in peril.

For 2020, we expect a single-digit percentage point decrease in adaptation finance as countries prioritize emergency health measures and short-term economic stimulus in response to the Covid-19 pandemic. In coming years, adaptation finance could suffer further from fiscal pressures and Covid-related disruptions to project planning and implementation.

Covid-19 impact. Developing countries face a steep funding gap for adaptation, given the fall in tax and trade revenues, and the need to devote resources to health and economic emergencies. Some countries now face risks to their sovereign credit rating, affecting their borrowing capacity amid growing debt distress due to Covid-19, further impacting their ability to invest in climate adaptation.

Embedding climate adaptation in post-Covid recovery plans

will significantly enhance their short and long-term effectiveness by strengthening resilience to future shocks. At present, however, adaptation initiatives are under-represented and funding remains insufficient. Building awareness and fostering capacity within finance ministries is crucial.

Climate-proofing the global financial system

to align investments with low-emissions development goals is progressing well. However, huge sums of capital remain exposed to the physical impacts of climate change. More work is needed to help financial institutions price and disclose these risks.



Picture: Sisoje/iStock

“

The world is about to deploy enormous, gigantic fiscal stimulus and we can do it in a way that we tackle both crises at the same time. If our world is to come out of this crisis more resilient, we must do everything in our power to make it a green recovery

Kristalina Georgieva
Managing Director,
International Monetary Fund

A step change in mobilization efforts for adaptation. Enhanced public commitments and new financial instruments are needed to encourage private investment in climate adaptation and to help vulnerable communities withstand climate, health and other threats.

Targeted delivery and tracking. Better tracking systems are needed to ensure climate adaptation funds reach those who need it the most.

Robust policies that provide systemic directives for climate adaptation are crucial to enabling the environment for more and better adaptation initiatives.

The Adapt Now report identified the urgent need to mobilize funds for climate adaptation. Yet the trillions of dollars pledged so far to recover from the Covid-19 pandemic represent both an opportunity and a potential threat. The amount—US\$ 12.1 trillion to date in G20 recovery packages—is an opportunity because climate adaptation has the potential to significantly enhance the effectiveness of economic recovery plans. Adaptation finance has never been more important as climate shocks are happening now—intersecting with and exacerbating impacts of Covid-19—meaning that building resilience to climate impacts will be critical to response and recovery efforts.

FINANCE

Dollar for dollar, climate adaptation earns higher returns than traditional investments, delivering benefits worth between two and 10 times the original cost. This is because of its capacity to deliver a ‘triple dividend’: reducing the vulnerability to future losses from climate shocks; fostering significant gains, including greater productivity and innovation; and creating more value for society, as well as benefits to natural ecosystems.

At the same time, if not spent wisely, the huge sums being showered on post-pandemic stimulus plans may come at the expense of climate action as countries prioritize ‘shovel ready’ interventions for health and economic recovery that fail to consider the looming climate crisis. Faced with bigger public debt burdens due to emergency spending and lower tax revenues, some G20 nations are already cutting overseas aid. The financial market turmoil that followed the coronavirus outbreak has raised significant barriers for many climate-vulnerable and indebted countries in accessing international credit markets.

For 2020, we expect a single-digit percentage point decrease in adaptation finance across regions, with a potentially larger decline in coming years. Development Finance Institutions (DFIs), the source of most adaptation finance, are shifting priorities as countries focus on short-term stimulus and emergency health measures. Where flows are not already substantially lower, this may be due in part to the fact that some lending was already pledged. In the coming years, however, countries will have less fiscal leeway to deal with climate and other systemic shocks if the available sources and instruments for borrowing and investing remain unchanged. That is why it is fundamental to leverage innovative financial tools and business models that incentivize and facilitate investment in climate adaptation.

Thus far, only a fraction of the funds in the recovery packages approved include climate-friendly components. A report for the Global Center on Adaptation (GCA) by the Climate Policy Initiative (CPI) has highlighted that ‘dirty’ measures—those that increase carbon

The Financing revolution must work closely with the Understanding revolution



emissions—outnumber ‘green’ initiatives by four-to-one. Moreover, within the existing green stimulus, measures to strengthen climate resilience are under-represented, with most climate-related measures focused on emissions reductions¹. The oil and gas industry stands to receive more than US\$ 250 billion from G20 governments², which is more than half the public stimulus money committed to the energy sector. And in 14 of the 17 countries analyzed by the Finance for Biodiversity Initiative³, post-Covid spending will on balance do more damage to nature than good. It is imperative that governments review their stimulus plans now to include climate adaptive initiatives that can multiply the potential benefits of these unprecedented fiscal outlays.

Retrofit existing assets

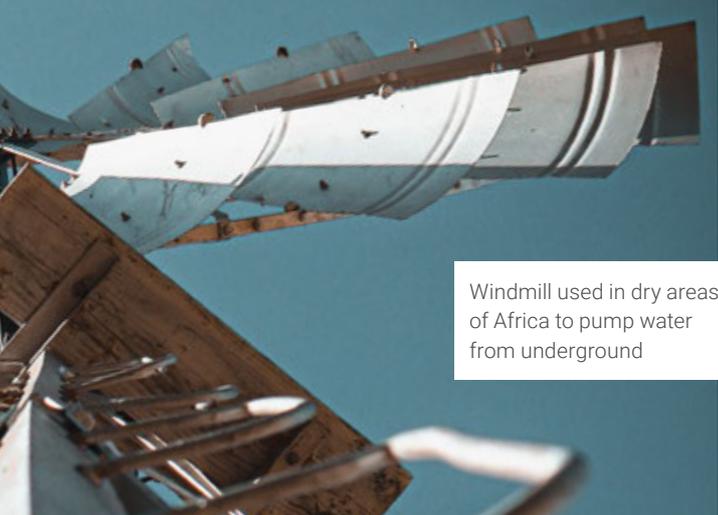
All new assets climate adapted and resilient

New climate risk reduction (e.g. flood management, water storage, nature-based solutions)

Insurance

CAT Bonds

etc.



Windmill used in dry areas of Africa to pump water from underground

Picture: Luke Rauby/iStock

The climate adaptation opportunity for economic recovery

Some countries are taking important steps to embed climate adaptation strategies in their recovery plans, notably South Korea, France, and Germany. Their economic recovery programs include investment in climate-resilient infrastructure, restoration of terrestrial, marine and urban ecosystems, and improved water management.

Germany has committed €150 million to adaptation measures by supporting the general operations of the existing German Adaptation Strategy for Climate Change (DAS) funding program and helping social institutions (hospitals, nursing homes, daycare centers) to adapt to the worsening consequences of climate change, such as heatwaves.

South Korea has focused adaptation flows on the restoration of terrestrial, marine and urban ecosystems, led by comprehensive diagnoses of Korean cities' climate risks and vulnerabilities. Another component of the recovery budget is allocated to the improvement and refurbishment of water management systems and sewage treatment plants.

France has committed close to €1 billion to a range of adaptation sectors, including the water supply network, infrastructure, and sewage treatment, and climate resilience of the electrical grid.

In the midst of a global labor market crisis, India, Finland, Ireland, and New Zealand have identified the job creation potential of nature-based projects⁴ and have all launched job-intensive initiatives aimed at the restoration of ecosystem services^{5,6}.

In spite of these examples, a majority of the recovery plans analyzed by the CPI for the GCA largely overlook the opportunity of investing in climate adaptation to help communities recover better from the ravages of Covid-19, as well as prepare them for future challenges. These include other pandemics as well as climate change.

Governments must be prepared to put climate adaptation at the heart of their recovery plans. Building resilience to climate impacts should be integrated into every aspect of the global recovery.

This approach need not restrict or subvert other priorities. The GCA has highlighted opportunities for triple wins in health and sanitation, agriculture and infrastructure, including through a focus on nature-based solutions as a powerful job creator. To support governments in capturing these opportunities, public development banks and other multilateral institutions have a huge role to play. Climate-sensitive Covid-response facilities, enhanced risk pooling, debt relief, and new climate resilience bonds are some of the instruments that must be rolled out⁷. Building back better involves enhanced understanding of the interconnected nature of systemic risks, and preparing to manage them in a holistic approach.

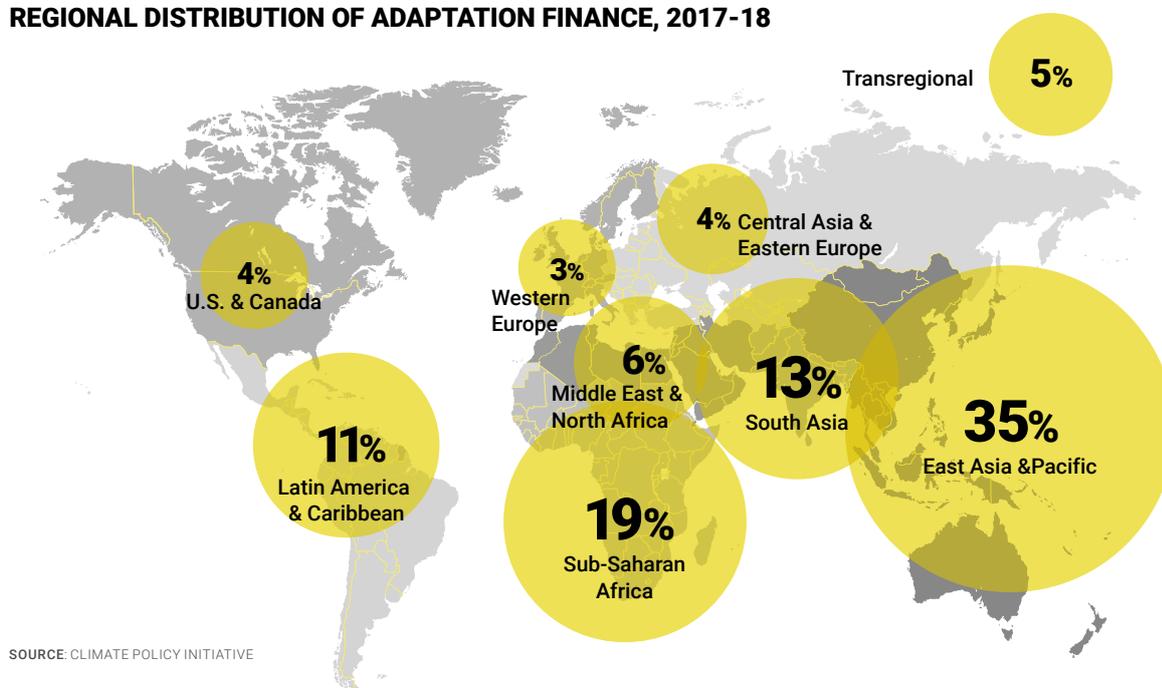
FINANCE

SECTORIAL DISTRIBUTION OF ADAPTATION FINANCE, 2017-18



Pictures: iStock

REGIONAL DISTRIBUTION OF ADAPTATION FINANCE, 2017-18



SOURCE: CLIMATE POLICY INITIATIVE

Still falling short of need

Finance is critical to accelerating climate adaptation. Although global investment in adaptation has increased slowly but steadily in recent years, from US\$ 22 billion in 2015-16 to US\$ 30 billion in 2017-18, a five- to ten-fold increase in adaptation funding is needed given escalating climate risks. According to the UN Environment Programme, total adaptation investment needs to be between US\$ 140 billion and US\$ 300 billion a year by 2030⁹, and higher still in the following decades.

Climate adaptation is not only historically underfunded; it is also under-represented in the broader field of climate action. Estimates from the CPI, which tracks domestic public and private investment and international funding for climate action, suggest that adaptation captures only 5 percent of global spending on climate action⁹. Its findings are consistent with OECD reporting on Climate Finance Provided and Mobilised by Developed Countries¹⁰, which estimates that in 2018, adaptation represented only 21 percent of climate flows from developed countries to the developing world.

As UN Secretary-General António Guterres noted recently¹¹, adaptation must not be the forgotten component of climate action. He called for all donors and multilateral and national development banks to commit to increase the share of adaptation and resilience finance to at least 50 percent of their climate finance support before COP26.

Enabling the environment for adaptation

Robust policies that provide systemic directives for climate adaptation are crucial to enabling the environment for more and better adaptation initiatives. When coordinated, the efforts from different stakeholders to lever climate resiliency provide catalytical incentives that push additional adaptation action.

A report for the GCA by the CPI¹² emphasizes that, especially given significant flows of finance to recovery efforts, governments must have policies in place to allocate resources in ways that also reduce climate risks. Such policies could include, for example, mainstreaming climate risk into national development plans, introduction of climate-proofing standards for infrastructure¹³ and strategic investment in research and development of resilient technologies¹⁴.

In the long-term, well-structured systemic policies provide the adequate governance to turn triple wins—for investors, society, and the environment—into the standard outcomes of all investments.

Mismatched flows and recipients

According to the GCA's recent analysis, funds for adaptation are broadly distributed across three sectors: water and wastewater management (US\$ 9.8 billion); agriculture and land use (US\$ 6.9 billion); and disaster risk management (US\$ 6.3 billion). But these funds do not always go to the most climate-vulnerable regions. East Asia and the Pacific received almost double the adaptation finance (35 percent of the total) as Africa (19 percent), and almost three times as much as Latin America and the Caribbean (11 percent). The Middle East and North Africa, the most water-stressed region in the world, received just 6 percent of funds for climate adaptation in 2018-19. This mismatch between financial flows and the vulnerability of different

regions should be addressed in greater detail when designing policy support, ensuring that physical climate risks are integrated into fiscal and financial decision-making¹⁵.

Getting the private sector involved

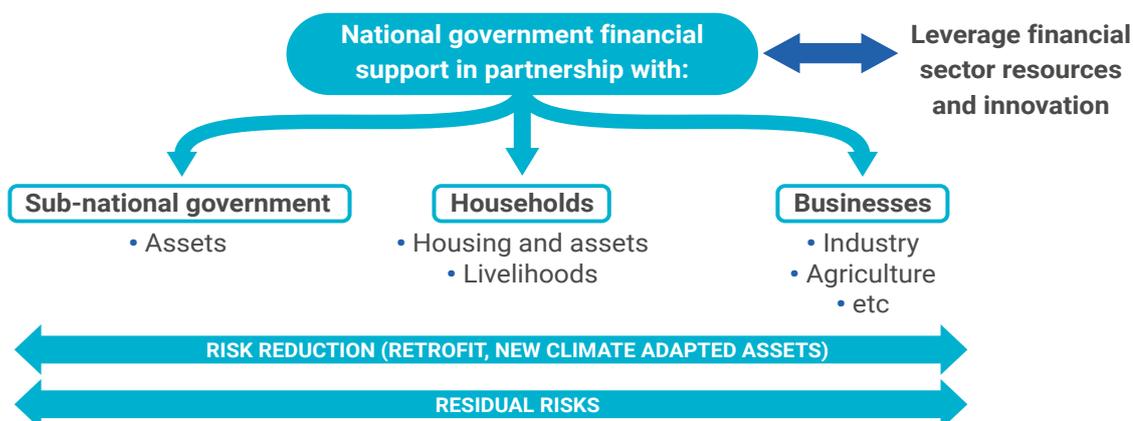
Private sources accounted for less than US\$ 500 million of the US\$ 30 billion in annual adaptation finance tracked in 2017-18¹⁶. Furthermore, just 3 percent of private finance mobilized under the Paris Agreement goal in 2018 went toward adaptation ends, with over 95 percent going toward mitigation¹⁷. While there are gaps in the global data, the low figure indicates that the private sector—businesses and financial institutions alike—is failing to respond to the climate risks in their midst.

A number of reasons may account for this low level of engagement. First, assessing and pricing climate risk is a daunting challenge for most businesses. In effect, entrepreneurs and financiers are being asked to estimate the likelihood of various climate scenarios and their implications for physical and transition risks at firm and project levels. Private entities are starting to address these challenges. The Coalition for Climate Resilient Investments (CCRI), launched in 2019, has brought together major investors, consultancies and rating agencies representing over US\$ 10 trillion in assets under management, to develop tools to better assess and price physical risk. But the private sector needs help, particularly from governments and global standards agencies in developing standardized taxonomies for sustainable and resilient investments.

Second, the private sector is not obliged to disclose physical climate risks at present—making what is out of sight, out of mind. Here, there is progress on common approaches for making risks public under the Task Force for Climate-related Financial Disclosures¹⁸. However, the focus so far has predominantly been on companies' carbon footprints, and the associated 'transition risk,' rather than the pressing issue of how climate disasters are affecting supply chains and investment portfolios. More work is needed to help companies understand and report on how climate impacts will directly affect their business, including through initiatives such as the Physical Risks and Resilience Commitment¹⁹.

FINANCE

Financing for adaptation and resilience is everybody's business, not only national governments



Multi-layer financial strategy for climate disasters



Adapted from 'Colombia: Policy strategy for public financial management of natural disaster risk', The World Bank (2016)

Mainstreaming physical climate risks into economic and financial decision-making, by better pricing and disclosure of those risks, will ensure a substantive transformation of the financial system toward a resilient growth pathway. One option to hasten the progress of this financial mainstreaming would be to tie government support for financial institutions and businesses to climate-risk assessment and disclosure. Canada is leading the way, with bailouts for large companies associated with the Covid-19 crisis being made contingent upon climate disclosures. The role of financial regulators is crucial in this respect. The Network for Greening the Financial System²⁰ represents a group of central banks from around the world who are issuing guidance on how to manage climate risk in the financial sector. Leading institutions such as the European Central Bank want all banks to disclose data on their climate-related risks and exposures as a matter of course. In the light of Covid-19,

governments should carefully consider regulating to formally require these risk-reporting measures, as a means to avoid further economic crises down the line.

The trend to financial disclosure is strengthening. In 2020, two major central banks publicly acknowledged the importance of climate change to financial and economic stability. For the first time, the U.S. Federal Reserve warned about the potential for abrupt changes in asset values in response to a warming planet, called for increased transparency through improved measurement and more standardized disclosures, and urged that quantitative implications of those risks are appropriately assessed and addressed²¹. In 2020, the Reserve Bank of India (RBI) flagged concerns about the impact of climate change, in terms of volatile rainfall intensity, increase in extreme events and rising temperature, having implications for the outlook of India's agriculture²².



Picture: ZU_09/iStock

NEW FINANCIAL INSTRUMENTS FOR ADAPTATION

CLIMATE RESILIENCE BONDS

The market for green bonds is growing. From US\$ 37 billion in 2014, it was expected²³ to reach US\$ 350 billion in 2020. To date, however, adaptation-related bonds represent only a fraction of this new market.

Climate resilience bonds are a sub-set of green bonds that seek to raise capital for adaptation interventions. They improve the ability of assets and systems to persist, adapt and/or transform against the impacts of climate change in a timely, efficient and fair manner. They help reduce climate risks and unlock broader development benefits.

The European Bank for Reconstruction and Development (EBRD) launched the first dedicated climate resilience bond in September 2019, raising US\$ 700 million to invest in climate resilience projects²⁴ in urban infrastructure, agriculture and ecosystems, and to fund adaptation in businesses and commercial operations. The five-year bond attracted demand from 40 investors in 15 countries.

In the context of Covid-19 and the looming debt challenges many countries will face, debt instruments such as green bonds—including climate resilience bonds—may, in certain cases, offer a much-needed way to leverage short and medium-term private finance for resilience aims.

The GCA, European Bank for Reconstruction and Development (EBRD) and Climate Bonds Development (EBRD) and Climate Bonds Initiative (CBI) are partnering to overcome these barriers through research and engagement, building the tools and generating momentum among interested parties to enhance the climate resilience bond market and unlock this new potential channel for financing adaptation.

Covid-19 response facility that mainstreams climate risk considerations:

The African Development Bank (AfDB) put in place a Covid-19 rapid response facility as soon as the pandemic broke out—raising a US\$ 3 billion Fight Covid-19 Social Bond with a three-year maturity in March 2020—the largest dollar-denominated social bond ever launched in international capital markets. In April 2020, the AfDB announced a Covid-19 Response Facility to provide up to US\$ 10 billion to African governments and the private sector.

FINANCE

The bank immediately developed guidelines for mainstreaming climate, including climate-related risk, into projects financed through those efforts. AfDB has also developed targets to ensure that operations are climate informed and trackable as climate finance.

Deepening local financial markets

Supporting developing countries in maintaining climate ambition in the context of Covid-19 is more important than ever. Yet finance ministers in developing nations are keenly aware that overseas development aid and funds for climate adaptation may suffer in the aftermath of the pandemic. As a result, many are determined to deepen local capital markets and mobilize domestic finance for adaptation. Here are some of the ways this is being done.

Blended finance: This aims to use philanthropic and public funds—typically provided through development finance institutions (DFIs)—to de-risk private investment in new markets, technologies and practices. This co-financing model uses public resources to leverage much larger private financial flows to scale up investments in adaptation, through a risk-sharing mechanism between public and private sectors. Recent examples of blended finance to deepen local financial markets and strengthen resilience include:

- The Africa and Asian Resilience Disaster Insurance Scheme (ARDIS)²⁵ aims to be the largest non-governmental climate insurance program for smallholder farmers—especially women—and their families living below the poverty line. The insurance scheme will provide small loans on special terms to help farmers recover after a disaster. Up to four million beneficiaries are anticipated in the six countries in Africa and Asia where the scheme will be available: Kenya, Malawi, Mali, Zambia, Cambodia, and Myanmar. It is hoped that the sustainable funding mechanism will make disaster-recovery lending scalable. ARDIS was launched by the Vision Fund and is co-funded by KfW's InsuResilience Investment Fund and the U.K.'s Department for International Development (which has since been folded into the country's foreign service), while the initial design-stage grants came from the Rockefeller Foundation and FMO, the Dutch development bank.
- The Global Agriculture and Food Security Program (GAFSP) Private Sector Window, managed by the International Finance Corporation (IFC)²⁶, has leveraged private investment of \$8 per \$1 of public investment across food supply chains. To date, the fund has supported 61 agribusiness and projects in 27 countries, deploying approximately US\$ 332 million.



Seychelles debt-swap example: In 2018, the Seychelles government developed a debt-for-nature swap for US\$ 27 million in sovereign debt in partnership with the Nature Conservancy, Global Environment Facility, and the United Nations Development Programme. The swap was structured to invest in climate resilience, fishery management, and conservation²⁸.



Picture: PJPhoto69/iStock

Climate-related debt swaps: Innovative finance structures are required to enable developing countries to continue investing in resilient, post-Covid recoveries without increasing their sovereign debt burdens. One such innovative mechanism is the ‘debt-for-climate swaps’²⁷ initiative, in which there is a partial cancellation of debt by the creditor government, transformation of the remaining debt into local currency, and direction of the proceeds toward investment in climate action.

Such debt-for-climate swaps can provide debt-relief solutions for developing countries coupled with financial support for their climate-related objectives. There are no restrictions regarding debt swaps on ODA claims. However, the adoption of the Paris Club debt conversion clause in 1991 imposes some constraints on the implementation of debt swaps²⁹. Some bilateral creditors such as Germany have their own specific guidelines for debt swaps. Technical assistance is required to design these instruments as well as to ensure a high-quality pipeline of bankable climate investments that can be capitalized in the form of credible assets.

Several Small Island Developing States (SIDS) have indicated to the Green Climate Fund³⁰ their intention to request technical support to explore

debt-for-climate swaps. For instance, the Economic Commission for Latin America and the Caribbean (ECLAC) Debt for Climate Adaptation Swap proposal calls for donors to use pledged resources from the Green Climate Fund to finance a gradual write-down of 100 percent of the multilateral debt stock of Caribbean SIDS that are held by various multilateral institutions, as well as the bilateral debt stock of member states³¹. The initiative also seeks to establish a Caribbean Resilience Fund (CRF) to which the debtors should agree to make annual payment of an amount equal to the discounted debt service payments³². ECLAC has highlighted that this CRF is needed to fund broad-based and systemic investments in climate resilience projects and thus should be capitalized from all possible sources, including swaps and contributions from donors and development partners.

Debt-for-climate swaps can also support efforts to finance adaptation in middle-income countries that face external liquidity challenges, suffer high debt burdens, and spend a significant share of their revenues on servicing debt interest payments in external currency. Responding to this need, the Economic and Social Commission for Western Asia (ESCWA) launched the Climate/SDGs Debt Swap Mechanism (DSM) initiative for Arab States in 2020.³³ The initiative aims to accelerate action toward climate resilient development, in particular the need for more adaptation and concessional climate finance, to achieve the 2030 Agenda for Sustainable Development and Paris Agreement commitments.

Nature performance bonds have also been proposed by Finance for Biodiversity³⁴. These bonds would offer the issuer reductions in coupon payments and principal adjustment in return for the achievement of nature-based outcomes, such as restoring wetlands, protecting forests from encroachment, and reducing threats to wildlife and plant species. Such environmental protection initiatives, if designed well, also have the potential of enhancing climate adaptation by, for example, significantly diminishing the risk of flooding in both urban and rural areas.

FINANCE

Reaching the most vulnerable

Studies conducted by the International Institute for Environment and Development (IIED) and others suggest that fewer than 10 percent of funds committed under different global climate-financing windows actually reaches the most vulnerable communities in climate-stressed countries.

Climate adaptation funders—donor governments, multilateral or national development banks, and private-sector institutions—must put greater effort into tracking and reporting on how much of their funding is reaching the poorest and most vulnerable communities.

Given that these funds are intended to help local communities adapt to the effects of climate change, it is essential that local communities have agency to determine and direct the use of adaptation funds. It is also important to engage local communities to maximize the opportunities arising from adaptation actions. A more participatory, bottom-up approach,

with the engagement of local governments and local people, would increase both the ‘buy-in’ and success rates of climate adaptation projects.

Local engagement with beneficiaries and private-sector entities—specifically micro-finance institutions and small and medium-sized enterprises (SMEs)—is also vital to building local-level capacity to access and manage climate finance resources.

The Global Commission on Adaptation has launched its locally-led Adaptation Action Track to support Community Based Adaptation (CBA). To enhance local skills, the CBA will develop a system of monitoring, evaluation and learning. By giving vulnerable communities the skills to identify climate adaptation needs, and design and manage their own projects, it is hoped that their adaptive capacity will grow and their resilience improve over the long term.



Pictures: Greenpeace



Recommendations to close the funding gap and make it more effective

Funds must reach the communities they are intended to help. This requires greater vigilance and tracking from climate adaptation financiers.

Funding for climate adaptation needs to increase five- to ten-fold—to an estimated US\$ 140 billion to US\$ 300 billion a year by 2030³⁵—to meet the growing needs of vulnerable communities on our warming planet.

Deeper local financial markets can unlock funds for adaptation, particularly in the context of Covid-19 and the likelihood of higher debt burdens and reduced overseas aid. As a result, many developing nations are seeking to tap domestic private-sector investment for climate adaptation.

International coordination on debt relief is needed to ease the impact of Covid-19 on sovereign debt burdens and liberate resources for climate adaptation.

New dedicated financial products such as climate resilience bonds could help climate-stressed countries tap institutional finance. A number of countries are exploring innovative financing instruments—such as debt-for-climate swaps—to increase their access to climate finance without increasing their sovereign debt. Blended finance could also help de-risk private-sector investment in new technologies and climate-adaptive solutions.

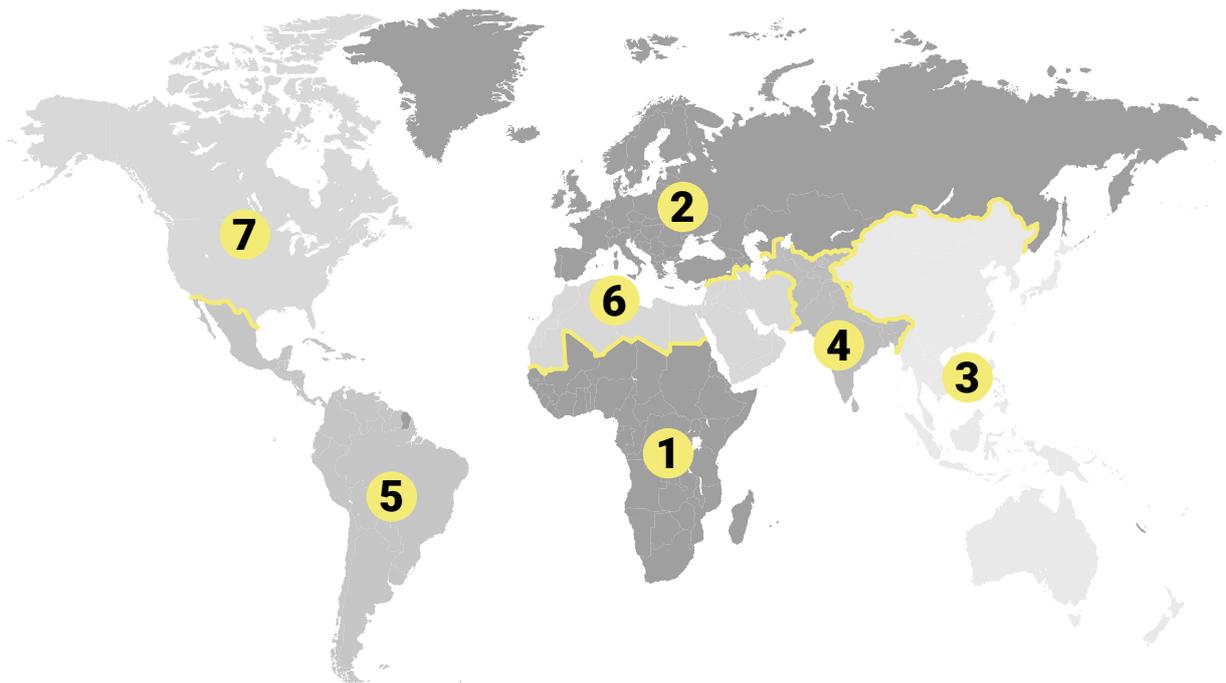
The role of regulators and financial authorities is critical for developing frameworks to measure climate risk and the benefits of adaptation.

Together, these initiatives will help shift financial flows toward a climate-resilient future, and enable developing countries to catalyze much needed private finance to scale up climate action in the wake of Covid-19.



Pictures: Kimberly Parent/GAFSP

Global challenge, local impact: Climate adaptation at the regional level





Picture: AleksandarGeorgiev/iStock

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Climate change is global, but its effects are local. Impacts differ between and within regions. Even locally, some communities are more vulnerable than others. This section looks at how countries and different geographical regions are responding to specific climate adaptation needs; the progress they are making and the challenges that lie ahead. In every region, there are strategies, processes, and solutions that have the potential of being scaled up and replicated elsewhere, with important lessons for all.



Sub-Saharan Africa

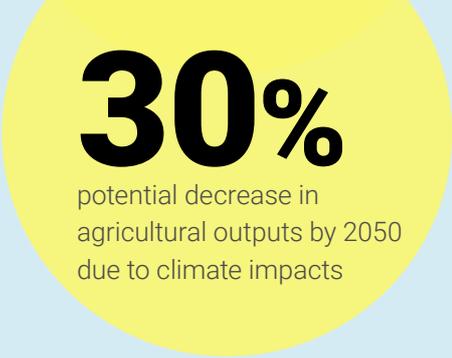
Strengthening food security will continue to be a priority as the region experiences disproportionate effects from climate change and extreme weather

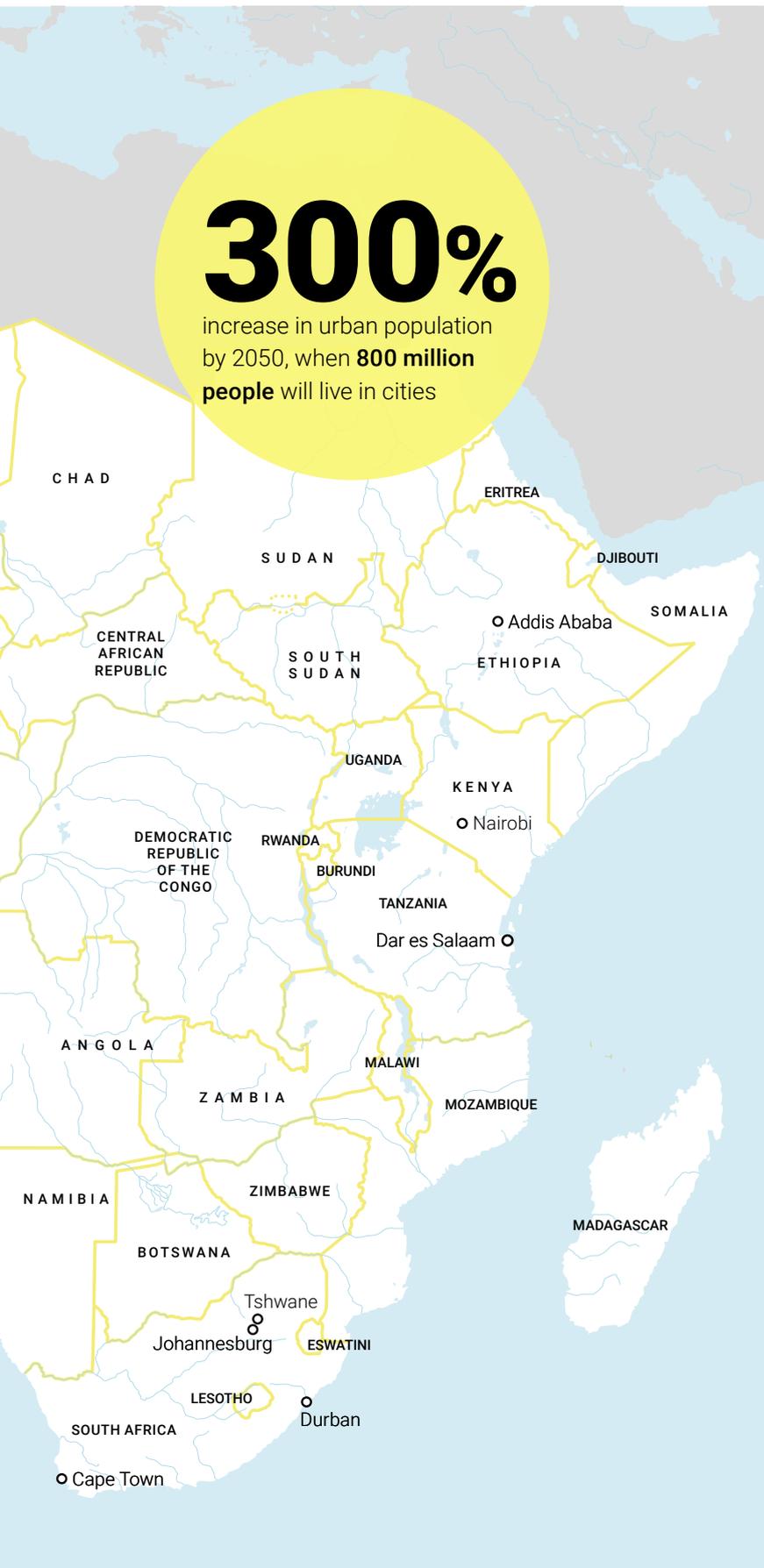
African countries should improve their ability to incorporate climate risks into planning and financing major infrastructure, agriculture, and other resilience-related investments

New financial instruments offer an opportunity to enhance Africa's infrastructure resilience and connectivity, linking rural and urban areas, and supporting regional and national exchange

African countries are increasingly seeing the benefit of increased partnerships and collaboration in their adaptation efforts

With the youngest population in the world, Africa needs to find ways to unlock the power of its youth for adaptation





“

It is time to devote more resources to Africa to expand its fiscal space to secure lives during the Covid-19 pandemic and for safeguarding the environment, on which all lives today and the future depend, by enhancing climate adaptation

Akinwumi Adesina

President of the African Development Bank

Context and Key Climate Impacts **Protecting agriculture from climate shocks**

Over half of Africa's total population experiences food insecurity. The growing number of extreme climate events, from droughts and new crop diseases to floods and unpredictable growing seasons, continues to threaten Africa's ability to feed itself.

The impact of climate change on agriculture is already being felt and is set to become increasingly severe. A rise in average temperatures of 2°C by the middle of the century is projected to reduce expected yields by up to 20 percent. Important sub-regional differences exist, with increasing rainfall and malaria risks in East Africa, increasing water stress and decreasing agricultural growing periods in North Africa, severe flood risks in coastal settlements in West Africa, and increased food insecurity, malaria risks, and water stress in Southern Africa¹.

REGIONAL OVERVIEW: SUB-SAHARAN AFRICA

The scale of the challenge is also highlighted by statistics showing that in many regions of Africa, up to 70 percent of smallholder farmers are only 'hanging on' (making almost no changes in their farming systems, living close to or below the poverty line)². Climate change is set to exacerbate this trend. For example, the number of record-setting dry months increased by nearly 50 percent in Africa between 1980 and 2013³. These climate shocks are felt in many forms: changes in seasonality, heavy storms and excessive rainfall, flooding, droughts and extreme heat events. Other risks, some made worse by climate variability, include plant and animal pests and diseases, and price fluctuations of agricultural inputs and products.

Agriculture dominates economic life in many African countries, accounting for between 30 to 40 percent of GDP, and is the leading source of jobs for over two-thirds of Africa's population⁴. This means that the impact of climate change on agriculture has far-reaching consequences for African economies as a whole.

The pandemic's effect

The situation has been worsened by Covid-19 which, according to the World Bank, will cause Africa's first recession in 25 years and push 40 million people into extreme poverty⁵. Africa's GDP losses could be as much as US\$ 500 billion and economic growth will be slowed for years to come.

Meanwhile, several extreme climate events have coincided with the pandemic, further jeopardizing public health work: swarms of desert locusts have damaged crops and pastures, crippling communities in the Greater Horn of Africa; extreme high water levels were recorded in Lake Victoria; and parts of the Democratic Republic of Congo have flooded⁶.

The 2020 State of Food Security and Nutrition in the World (SOFI) report, published by the Food and Agriculture Organization (FAO), predicts that up to 132 million more people worldwide will be affected by hunger this year because of Covid-19. Around 1.6 billion informal workers are at risk of losing their livelihoods and 95 million others, mostly in Sub-Saharan Africa, will be living in



Picture: SilvaPinto1985/iStock

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The real impact of the coronavirus crisis on climate will ultimately depend on the choices we make in how we recover. Meeting the Paris Agreement’s goals for mitigation and adaptation must be central to this effort to ensure we reduce the likelihood of future pandemics

Ali Bongo Ondimba

President of Gabon and African Union
Champion of the African Adaptation Initiative



Addis Ababa, Ethiopia: a band of Gospel musicians came together with an initiative called Sharing Food to the Needy in the midst of Covid-19

Picture: AMANUEL SILESHI/iStock

extreme poverty by the end of the year⁷. All these challenges are factors in Africa’s status as the region with the highest food insecurity and undernutrition (21 percent in 2019)⁸. Climate-resilient systems are key to addressing food and nutrition security. They include implementing early-warning systems for extreme climatic events, and adopting climate-smart, sustainable agriculture practices, such as crop diversification and agro-forestry.

Dryland areas are vulnerable

Although Africa is responsible for a mere 5 percent of global emissions, the effect of aggregated climate impacts on the continent could decrease its GDP by up to 30 percent by 2050⁹. The impact of a 1°C temperature rise has been severe enough, but warming of 3°C or 4°C would be disastrous. Extreme heat would increase the risk of severe

drought, particularly in Southern Africa, while the whole continent would see more crop failures, reduced yields, and flooding.

Dryland areas are especially vulnerable to weather-induced shocks because their fragile ecology already limits agricultural potential. In these areas, the land has been degraded, deforested, eroded and its nutrients depleted over time, increasing its sensitivity to weather-induced shocks and reducing the resilience of rural populations and ecosystems. These dryland areas in Africa will only expand and shift as the result of climate change. In the worst-case scenario, climate change will expand these drylands, according to the World Bank, by up to 20 percent by 2030¹⁰. Some might even become incapable of sustaining livestock production and intensive agriculture, further increasing food insecurity.

REGIONAL OVERVIEW: SUB-SAHARAN AFRICA

Increasing urbanization

The African continent continues to urbanize, modernize and develop. The continent's urban population is projected to treble by 2050, by which time 800 million people—or 60 percent of the population—will live in cities. Expanding cities will demand more transport, housing, water, drainage, and energy. Integrating rural and urban areas via resilient and effective infrastructure is critical to supporting food supply, economic activity, and regional development¹¹. This urbanization process can bring enormous economic development opportunities due to agglomeration effects if the process is managed well.

But climate change is a critical risk to that opportunity and Africa's growing cities will be increasingly exposed to climate shocks. About half of the African settlements with between one and five million inhabitants are located in low-elevation coastal zones. The density in these zones is much higher than inland, and the projections indicate further concentration. For example, Senegal had 20 percent of the population living in such zones, but is projected to have about 50 percent by 2060¹².

Unplanned urbanization also exacerbates inequalities. Over half of Africa's urban population lives in slums, in cities that are already heavily populated: Lagos has 17 million inhabitants, Johannesburg 13.4 million, and Kinshasa 13.3 million¹³. Low-income communities in these cities are generally the most vulnerable to climate disasters. Many urban slums are located in the most marginal, hazardous or least desirable parts of the city, such as low-lying areas, steep hills, next to railroad tracks, industrial zones or solid waste facilities. Designing appropriate adaptation and resilience programs and infrastructure in these cities must include and be led by the local communities.

To avoid locking cities into an irreversible pattern of vulnerability to rising sea levels, floods and other shocks, climate resilience will need to be factored and built into the design and development not just of cities themselves, but also of the wider range of urban infrastructure that is instrumental to their growth and sustainability, including water supply, drainage, and transport. A water-resilient city is one that can ensure consistent, adequate and high-quality water services, in spite of stresses.

Water stresses

Too much water, or too little, can induce water stress. Floods threaten people's livelihoods and health, and droughts undermine water security. By 2025, nearly 230 million Africans will be facing water scarcity¹⁴.

There are important differences within the region. East Africa faces increasing rainfall, while North Africa is particularly threatened by water shortages. West Africa's coastal settlements face severe flood risk, while Southern Africa is threatened by water stress¹⁵.

The continent's key adaptations must focus on food and water security, and promoting the development of livable cities that offer the services inhabitants need. Urban green and blue infrastructure—such as constructed wetlands or urban forests—can be part of nature-based solutions (NBS) providing opportunities to build resilient water and urban systems¹⁶.

Africa must keep making progress on its development priorities. Adaptation to a rapidly changing climate needs to be integrated as part of the continent's progress toward the SDGs, to avoid periodic significant losses and reversals due to climate disasters. Strong cross-sectoral programs looking at the nexus of water, food, and energy through an adaptation lens are integral to Africa's development¹⁷.



Picture: helovi/iStock



Key Actors and Best Practices

Recognizing the importance of adaptation to both individual countries and the region as a whole, the African Union launched the Africa Adaptation Initiative in 2015. African countries are recognizing the need for collaboration, through partnerships such as the Climate Commissions of the African Union and the African Climate Policy Centre^{18 19}. The African Union is leading the pan-African Great Green Wall (GGW) initiative, which aims to offset desertification by growing a 15-kilometer-wide forest across the continent from Dakar to Djibouti. It will include economically valuable plant species adapted to drought conditions, and agricultural production systems and other income-generating activities linked to the land, as well as basic social infrastructure²⁰. The African Risk Capacity, a Specialized Agency of the African Union, is making important progress enabling countries to manage climate risks and access rapid financing to respond to climate disasters²¹.



Pictures: Great Green Wall

REGIONAL OVERVIEW: SUB-SAHARAN AFRICA



Satellite-linked rain gauge and weather station

Picture: Robert_Ford/iStock

Regional coordination on coastal erosion

Regional partnerships, such as the West Africa Coastal Areas Management Program (WACA), with Côte d'Ivoire, Ghana, Guinea, Mauritania, Nigeria, São Tomé and Príncipe, Senegal, and Togo, have also been successful^{22 23}. Coastal erosion and flooding in West Africa severely threaten people's communities, livelihoods, safety and investments. About 56 percent of West Africa's GDP is generated in coastal provinces, where one-third of the population resides. Rapid and often unplanned urbanization has devastated the natural landscape that once served as a buffer against erosion and flooding. In Benin, Côte d'Ivoire, and Senegal alone, the cost of erosion, flooding and pollution has been estimated at US\$ 3.8 billion. These developments disproportionately affect the poorest and most marginalized, and will intensify due to climate change. Collaboration at the policy and technical levels helps countries to manage erosion hotspots. WACA helps provide expertise and finance for sustainable management of coastal areas and the livelihoods that a healthy coastal ecosystem provides to people and economies, while promoting political and financial commitments to a coordinated, regional approach for coastal resilience.

TOWARD AN ENABLING ENVIRONMENT FOR CLIMATE SERVICES IN ETHIOPIA

Droughts in Ethiopia between 1999 and 2003 led the country's National Meteorological Agency (NMA) to focus on early-warning systems. It took some time to become a policy priority in the country, which was focusing on economic development and reducing poverty. Moves to bring climate-change adaptation into the mainstream then began around 2010.

In 2015, the Strengthening Climate Information and Early Warning Systems for Climate Resilient Development and Adaptation to Climate Change in Ethiopia (SCI-EWS) project was launched. Funded by the African Development Bank, it improved the NMA's observation network and forecasting skill by installing or improving weather and hydrological stations, upper-air stations and satellite monitoring equipment. However, improved data has limited value if the people who need it can't act on it, so Ethiopia created a National Framework on Climate Services in 2018 to coordinate the delivery of science-based climate data in relation to agriculture, water and energy, health, disaster risk reduction, and environment.



Optimization of the urban stormwater drainage system in the city of Beira

Picture: Inros Lackner

A PROGRAMMATIC AND COLLABORATIVE APPROACH TO URBAN RESILIENCE IN MOZAMBIQUE

The municipal government of Beira, a city in central Mozambique, and the Netherlands have worked together since 2012 in a long-term partnership to support urban resilience. Rather than setting specific objectives upfront, the partnership is designed to enable adaptability as circumstances change. For example, the partners developed a flood-resilience strategy masterplan stretching out to 2035, which helped build knowledge and stakeholder relationships early on. Five years later, when Cyclone Idai struck in March 2019, planners were well placed to make rapid use of US\$ 200 million in international relief to expand Mozambique's improved drainage system. The partners are now working on creating a market for affordable, flood-resilient housing.

Digital collaboration

Africa's digital economy represents a significant opportunity for accelerating adaptation. For example, the Strengthening Climate Information and Early Warning Systems for Climate Resilient Development and Adaptation to Climate Change in Ethiopia (SCI-EWS) program (see case study, opposite) has improved the weather observation network, increasing forecast accuracy and allowing farmers to harness climate data better to cope with weather volatility and crop variability.

Countries including Senegal and Rwanda are frontrunners in readiness for digital agricultural advisory services, while Kenya is a world leader in mobile currency²⁴. Digital financial services play an important role in supporting livelihoods and adaptation strategies by facilitating access to resources and alleviating risk. An example of this is index-based insurance, which pays out when a predetermined event such as flooding destroys assets^{25 26}. Both public and private sectors have worked together to build digital businesses. The University of Cape Town is a pioneer in satellite imagery, using Amazon Web Services, and has a leading climate modeling team.

REGIONAL OVERVIEW: SUB-SAHARAN AFRICA



Challenges and Opportunities

Adaptation can be transformative if it is integrated into planning across every sector and coordinated across different sub-sectors. Most African countries have a National Adaptation Programme of Action (NAPA), National Adaptation Plan (NAP) or a Nationally Determined Contribution (NDC) as a first step in articulating the priorities for adaptation. Ethiopia, for example, has taken steps to articulate ambitious NAPs and mainstream adaptation across its policy spectrum, involving multiple government

departments and agencies²⁷. Using nationally integrated plans to access available global funding, such as the Climate Investment Fund's Pilot Program for Climate Resilience (PPCR), could be a highly effective approach to build an integrated and scalable plan for adaptation. The PPCR currently supports 28 countries, of which 10 are in Africa^{28 29}.



Katse Dam, Lesotho, South Africa

Picture: YolandaVanNiekerk/iStock

New financial instruments

While there are opportunities for national-level finance mobilization in most countries through climate trust funds, for example, the continent is relatively under-represented in global climate finance flows³⁰. Innovative financial instruments, such as resilience bonds, can help countries access public and private finance for adaptation³¹. Partnerships could strengthen the capacity for cross-sectoral adaptation agendas and mobilization of finance to develop and implement adaptation solutions³².

New financial instruments offer an opportunity to enhance Africa's infrastructure resilience and connectivity, linking rural and urban areas, and supporting regional and national exchange³³. This depends on being able to find financial instruments that institutional investors are willing to hold. One option would be for them to invest directly in infrastructure or become partners in infrastructure adaptation funds. Countries could also leverage pension funds on the continent, which have about US\$ 380 billion in assets under management. Pension funds are already investing in infrastructure projects and service delivery to the poor in countries such as Cape Verde, Kenya, South Africa, Swaziland, Tanzania, and Uganda.

African cities—Abidjan, Accra, Addis Ababa, Cape Town, Dakar, Dar es Salaam, Durban, Johannesburg, Lagos, Nairobi, and Tshwane—can also use their global networks, such as the C40 Cities Climate Leadership Group, for information and expertise to drive action on the ground³⁵.

Harnessing the energy of youth

Finally, Africa has the youngest population in the world, which represents an enormous opportunity³⁶. The share of those under 24 years of age is expected to increase by 42 percent by 2030 and double from current levels by 2055. Young people's social-media savvy, ability to connect across generations and countries, entrepreneurial spirit, and strong willingness to take action on climate change are valuable assets. Recent youth climate activism demonstrates that young people are not only pushing the climate-change agenda, but also ensuring fair structures and processes within their own movements.

Improved education and access to job opportunities could help translate activism into action³⁷. Also, providing youngsters with opportunities and resources, for example through building their entrepreneurship in agriculture using digital climate advisory services, could result in a double pay-off: generating employment and making younger people central to the adaptation agenda³⁸.

REGIONAL OVERVIEW: SUB-SAHARAN AFRICA

FOOD INSECURITY IS AT THE HEART OF AFRICA'S CLIMATE ADAPTATION CHALLENGES

Climate impacts are expected to decrease agricultural outputs in Africa by up to 30 percent by 2050, while global food demand will likely increase by 50 percent in the same timescale. The Covid-19 pandemic, meanwhile, dramatically increased poverty and food insecurity in this already fragile scenario. Providing transformational adaptation impact in Africa and enhancing resilience to climate change requires simultaneous delivery on productivity growth, new tools and instruments, and market connections. An encouraging set of sustainable adaptation initiatives are already in place across the continent, demonstrating good strategies for driving the resilience of Africa's farmers and consumers to climate change. Several parallel actions are needed to build on these, all of which must be linked, scaled up, and replicated. These include:

Crop insurance protects farmers from financial ruin when crops fail. Well-designed insurance products can act as a safety net for rural families during hard times³⁹. A prime example is ACRE and its predecessor Kilimo Salama. It provides smallholder farmers with a range of insurance products to protect them from financial losses due to drought, excess rain, and storms, and also serves as an intermediary between insurance companies, reinsurers, and distribution channels⁴⁰.

A bigger role for the private sector is urgently needed to scale up investment in agricultural adaptation to provide more durable, scalable, and sustainable support to farmers, reducing their reliance on public and/or donor funding or internal cross-subsidization. Private-sector involvement in African agricultural development has been growing since the early 2000s, speeding up after the 2007-08 global food-price crisis⁴¹. In Rwanda, Africa Improved Foods (AIF)⁴² is a public-private



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Millions of lives depend on Africa's agricultural sector. Adapting and improving its resilience to climate change is therefore a must. By investing in African local food systems we catalyze sustainable value chains and support the vulnerable but small-scale, often female, producers

Feike Sijbesma
Honorary Chairman, Royal DSM and
Co-Chair of the Global Center on Adaptation

consortium that has been making high-quality, nutritious foods since 2015. Its members include Dutch nutrition and science multinational Royal DSM, the Rwandan government and the World Bank's International Finance Corporation. Increasing private-sector involvement requires: (a) blended finance; (b) public-private partnerships for adaptation; and (c) matching grants for investments.

Digitalizing agriculture for climate adaptation, including more climate-smart practices. An estimated 614 million Africans will own mobile phones by 2025⁴³, and digital services such as climate advisories are already helping farmers to make better choices, boosting productivity and profitability as well as enhancing resilience to climate change. Kenya has the highest number of active services worldwide⁴⁴, but elsewhere in Africa, digital services need more funding to reach a much wider audience.



Picture: Victor Karanja/iStock

Two hundred million smallholders and pastoralists could be using digital agricultural services by 2030, compared with 33 million in 2019. The gamut of services is also growing. In 2012, there were 41; by 2019, there were 390, ranging from help to link farmers with markets and sources of finance, to supply-chain management, and general advice and information. Digital transformation will also create new jobs, particularly important for rural youth.

Empowering women and marginalized groups.

Improving gender equality and increasing the productivity of women farmers and other marginalized groups is critical to improving food security. In Tanzania and Malawi, the Global Framework for Climate Services' Adaptation Programme for Africa has used different distribution channels to reach both genders to ensure equity of information access⁴⁵.

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To create lasting food security, we need more collaboration between governments, the private sector, academic institutions and inter-governmental bodies. Working together we can help those not just left hungry today and tomorrow by Covid-19, but those who are vulnerable to hunger every day of their lives through no fault of their own

Dag-Inge Ulstein

Minister of International Development, Norway

Reshaping supply chains. Africa's dependence on food imports is another source of insecurity. By 2025, the continent could be spending US\$ 110 billion on imported food⁴⁶. Often, the imports are of crops such as rice and cereals, which are grown locally. Part of the solution lies in promoting small and medium-sized enterprises that process food. These create jobs and more security for small-scale producers. Further food-security gains can be made by better and climate-resilient food storage.

Sound policy environment. Adaptation initiatives that deliver greater food security can be enabled and enhanced with the right government policies. These include: (a) policies that facilitate access to credit and financial services and subsidize adaptation solutions; (b) public-sector de-risking mechanisms to promote private-sector investment⁴⁷; (c) policies that bring more fertile land under production in ways that benefit local populations; (d) policies that encourage the development of secondary and tertiary industries and skills training in rural areas; and (e) policies targeted at relieving poverty and food insecurity for under- or unemployed African youth⁴⁸

REGIONAL OVERVIEW: SUB-SAHARAN AFRICA

Recommendations

Make climate resilience a key element of economic recovery plans. The pandemic response and financial stimulus for Africa should be optimized by integrating measures to address both climate threats and the Covid-19 health crisis. Adaptation measures can benefit economic and social recovery, debt sustainability, and job creation through investments in sectors such as agricultural digital advisory services and social protection programs that include a cash-for-work component. In addition, recovery and growth plans should prioritize support for the national adaptation planning process and improving integration of these plans into long-term strategic development processes and frameworks.

Getting finance right. African nations should improve their ability to incorporate climate risks into planning and financing major infrastructure and other resilience-related investments. This is an important initial step in understanding how much finance is needed. Support is necessary for the growth of a consolidated risk-capacity insurance pool, and policy reforms and innovation to develop funding mechanisms for climate adaptation. Existing collaboration among multilateral development banks (MDBs) should be scaled up to more effectively mobilize multiple sources of climate adaptation finance—from government budgets, Official Development Assistance, and the private sector—including through blending these financing sources across institutions and investors.

Invest in increasing access to basic resilient infrastructure. Africa's economic recovery will be enhanced with resilient infrastructure such as low-emission energy generation, nature-based solutions (NBS), and communication networks, especially in urban centers.





Picture: himarkley/iStock

Strengthen water security. A new generation of standards and approaches in areas such as irrigation, hydropower, land zoning, flood mapping, road construction, and coastal infrastructure will be needed, using a cross-sectoral approach to create safe and improved water systems and disaster-resilient water infrastructure amid growing climate uncertainty.

For adaptation to be transformative, it needs to be scaled. Implementing NBS programs at large scale could reduce costs by 90 percent for the same level of benefits, or expand benefits ten-fold for the same costs. NBS schemes could also support the UN Convention on Biodiversity's target to protect 30 percent of the planet by 2030. Existing procurement and applied design services would need to be adapted to accommodate NBS, while knowledge and data derived from NBS programs implemented locally should be developed for a larger-scale roll-out.

Support local action through community, academia, and youth engagement. Design of adaptation actions must include and be led by local communities, who are best placed to understand needs. An inclusive resilience plan, which, for example, recognizes young people as key stakeholders, will ensure greater sustainability. Solutions need to be context relevant and accompanied by 'soft' support designed to enhance uptake, such as formal education, agricultural extension, or behavioral change campaigns.

Drive technology deployment and digital innovation. Many countries in Africa have embraced digital innovation. This should continue to be scaled up in all countries to improve the design and development of resilient infrastructure and services, social safety nets, health and old-age insurance, agricultural extension and marketing information. The active participation of the private sector is critical for innovation to flourish.



Europe & Central Asia

Water scarcity and heatwaves will become severe across much of the region, with implications for health, agriculture, and ecosystems. Extreme rainfall and sea-level rise will sharply increase flooding risk. Economic losses from weather and climate-related events could increase by more than a factor of 15, and reach 1.4 percent of GDP by the end of the century

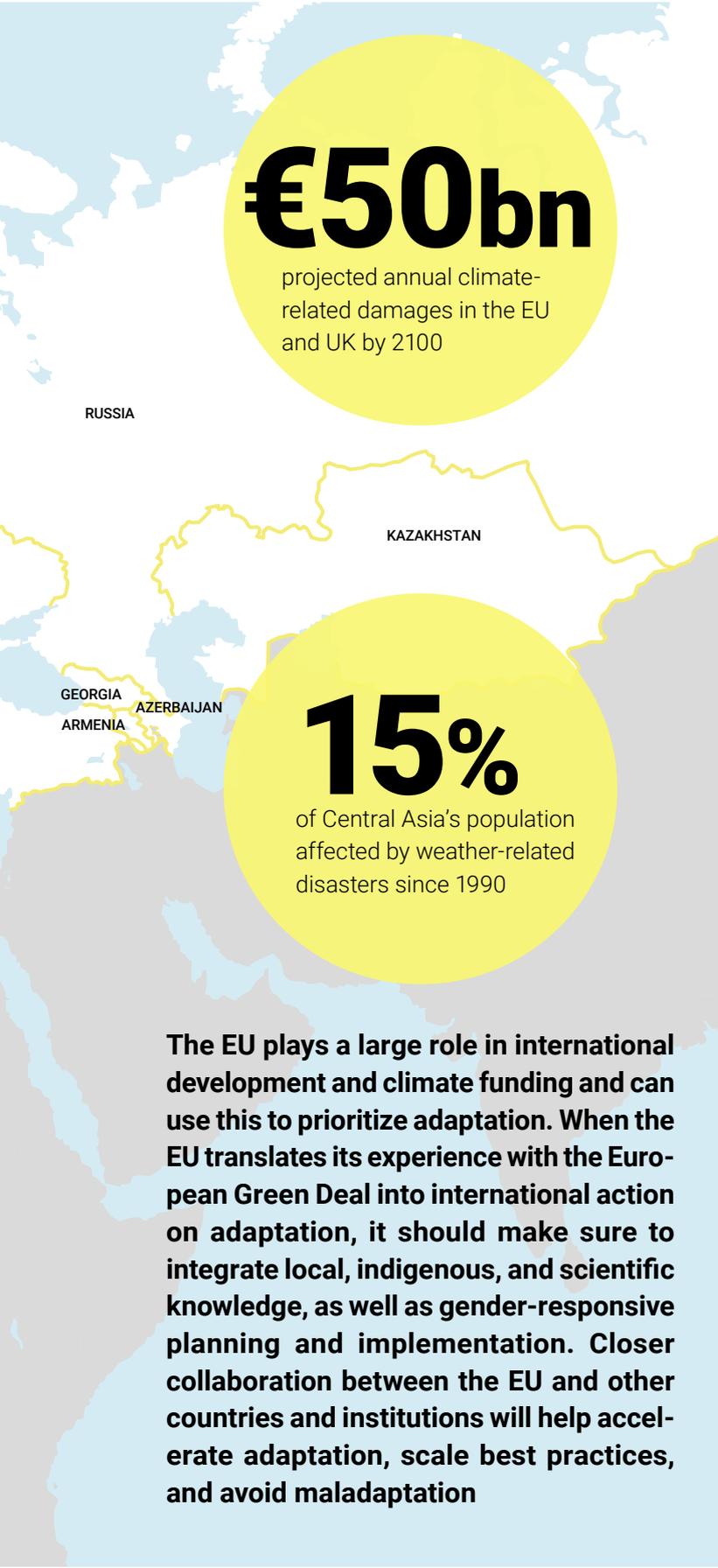
Regional, national, sub-national, and city-level adaptation planning is improving, but increased funding is needed along with the encouragement of private investment to help accelerate the shift from planning to implementation. Greater awareness of the economic benefits of adaptation would drive further investment. In Europe, increasing funding for adaptation under the EU's European Green Deal and 2021-27 budget should reflect the fact that the costs of inaction are much greater



100 million

Europeans will experience intense heatwaves by 2100

Innovation that strengthens resilience and reduces economic uncertainty is urgently required. More bilateral or multi-lateral collaboration should be fostered across the region, especially among the early movers of adaptation (often in western Europe) and others



€50bn

projected annual climate-related damages in the EU and UK by 2100

15%

of Central Asia's population affected by weather-related disasters since 1990

The EU plays a large role in international development and climate funding and can use this to prioritize adaptation. When the EU translates its experience with the European Green Deal into international action on adaptation, it should make sure to integrate local, indigenous, and scientific knowledge, as well as gender-responsive planning and implementation. Closer collaboration between the EU and other countries and institutions will help accelerate adaptation, scale best practices, and avoid maladaptation

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Only by furthering greater international collaboration can we create a greener, more resilient and inclusive future for all

Vijay Rangarajan

Director General, Americas and Overseas Territories at the Foreign, Commonwealth & Development Office, United Kingdom

Context and Key Climate Impacts

Desertification, heatwaves, wildfires, flooding, and acute water shortages—while always present in some corners across Europe and Central Asia—are now widespread and happening with worrying frequency.

The 2020 State of the European Environment report¹ describes these changes in detail. Rising heat and lower precipitation are causing drought and increasing desertification, particularly in southern European countries such as Spain and Italy. The year 2020 saw either the driest or second-driest April in Belarus, Germany, the Czech Republic, and Romania, alongside a record 43-day dry spell in Geneva, Switzerland. At the same time, more intense rainfall events have hit Europe in recent decades and are projected to increase the most for north-eastern Europe. Riverine flooding has become more severe and is expected to become more frequent, particularly across north-western and central-western Europe.

REGIONAL OVERVIEW: EUROPE & CENTRAL ASIA

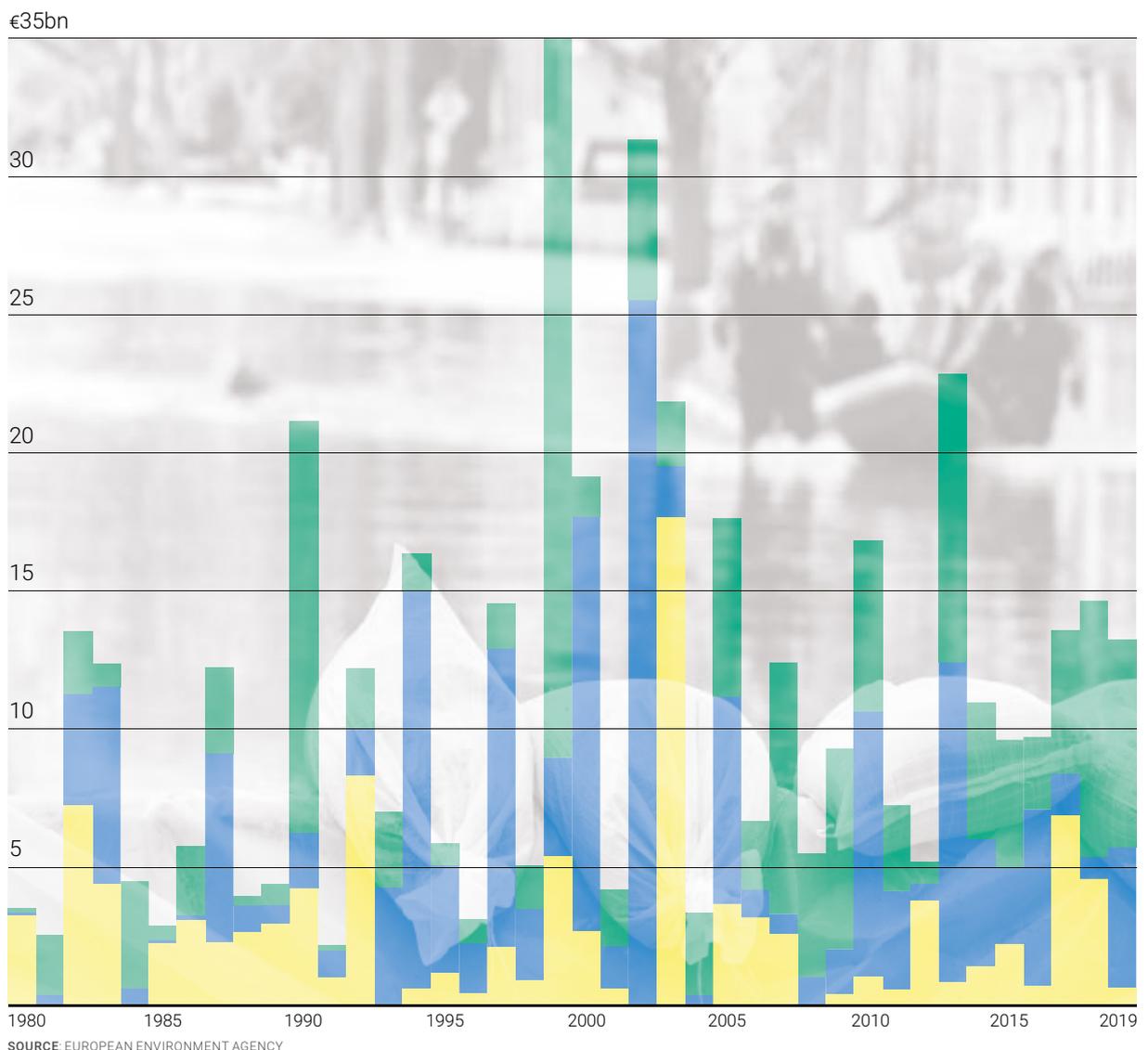
In the European Union, economic losses from weather and climate-related events have reached €12 billion per year² on average. If 3°C global warming occurred in today’s economy, annual welfare loss in the EU and U.K. could represent around €170 billion, equivalent to 1.4 percent of GDP – and this considers only a limited set of climate impacts (river flooding, coastal flooding, agriculture, droughts, energy supply, mortality from

temperature extremes, and windstorms). With 4°C global warming, annual welfare loss would be 1.9 percent of GDP³. On average, only 35 percent of climate-related economic loss is currently insured, with coverage around 5 percent or less in southern and eastern Europe. In Central Asia, climate impacts are projected to cost 1 percent of GDP a year by 2050, and could be as high as 10 percent by 2100⁴.

ECONOMIC DAMAGE CAUSED BY WEATHER AND CLIMATE-RELATED EXTREME EVENTS IN EUROPE

Euro billions (2019 values)

- Meteorological
 - Hydrological
 - Climatological
- Weather and climate-related extreme events are defined as meteorological events (storms), hydrological events (floods, mass movements), and climatological events (heatwaves, cold waves, droughts, forest fires).



In Russia, ground that used to be frozen all year is melting, with unprecedented forest fires above the Arctic Circle. Turkey is coping with the retreat of melting glaciers in eastern Anatolia and unseasonal rains and hailstorms⁵, while Kazakhstan, the world's largest landlocked country, has experienced intense droughts, but also heavy rain and more mudflows from glacial melt⁶. In the past three decades, almost 15 percent of Central Asia's population has been affected by weather-related disasters such as avalanches or floods⁷. This is a particular problem in the region's north, where 60 percent of the population lives in rural areas totally dependent upon agriculture for food security and livelihoods⁸.

Killer heat

Temperatures across Europe have repeatedly broken long-term records in recent years. The year 2019 was the warmest on record, with the largest temperature anomalies in central and eastern Europe; July of that year was the hottest month ever⁹.

Extreme heat kills—some 70,000 people died in Europe in 2003¹⁰, when a heatwave struck with a severity made twice as likely by human-induced global warming¹¹. Successful adaptation literally saves lives—this is exemplified by France implementing measures that limited mortality from the 2019 heatwave to one-tenth of that suffered in the one of 2003¹². The risk without adaptation is very large. Even if

global warming is limited to 1.5°C above pre-industrial levels, 100 million Europeans each year will experience intense heatwaves by 2100, compared with 10 million today¹³—a ten-fold increase. Without effective adaptation and mitigation measures, mortality from extreme heat could be 30 times higher by 2100¹⁴, affecting more than half of the European population, with estimated costs of heat-related deaths exceeding 1 percent of GDP by the end of the century¹⁵. The impacts will be uneven, with Mediterranean countries the worst affected and Scandinavia the least. If global warming rises 3°C above pre-industrial levels, drought frequency is projected to double across nearly one-quarter of the Mediterranean¹⁶. Across the EU, annual economic losses from drought could be five times higher compared to the current level¹⁷.

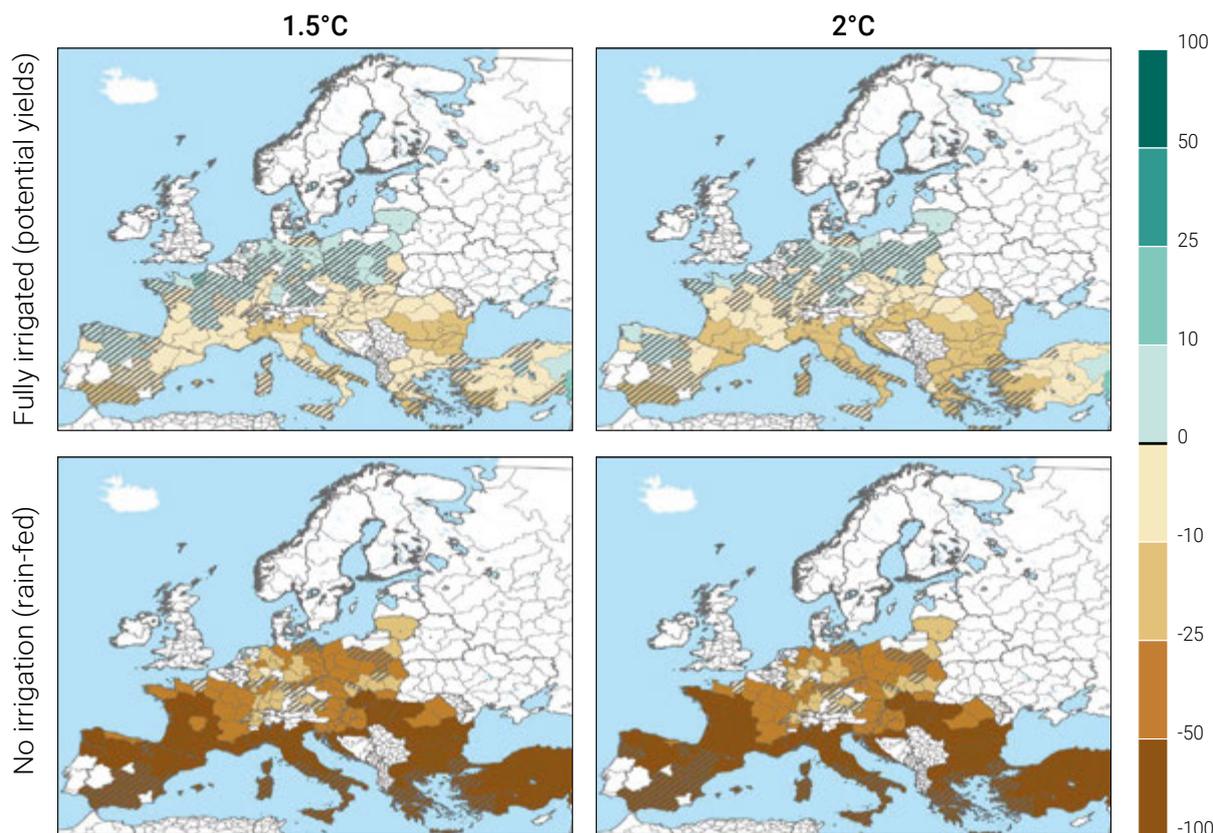
Disease and pest outbreaks are also more likely at higher temperatures. In the summer of 2020, for example, eggs of the tiger mosquito were found as far north as Namur, Belgium¹⁸. The insect, which can carry Zika, dengue, and West Nile virus, caused several outbreaks (in 2007, 2010, 2014, 2015, and 2017) of previously unknown chikungunya disease in Europe¹⁹. With rapid expansion of chikungunya worldwide broad but patchy, invasion across southern parts of Europe is projected (see below)^{20 21}. Summer outbreaks of West Nile virus carried by other mosquitoes have been on the rise over the past 10 years²².



A wildfire takes hold in the Spanish countryside

Picture: Lucas Ranzuglia/iStock

REGIONAL OVERVIEW: EUROPE & CENTRAL ASIA



SOURCE: [HTTPS://EC.EUROPA.EU/JRC/SITES/JRCSH/FILES/PEJETAIV_SUMMARY_FINAL_REPORT.PDF](https://ec.europa.eu/jrc/sites/jrcsh/files/pejetaiv_summary_final_report.pdf)
(FEYEN, L., CISCAR, J. C., GOSLING, S., IBARRETA, D., & SORIA, A. JRC SCIENCE FOR POLICY REPORT)

Results of the biophysical assessment, showing ensemble mean changes of grain maize yield relative to baseline (%) for 1.5°C (left panels) and 2°C (right panels) warming scenarios, assuming fully irrigated conditions ('potential yields'; top panels) or no irrigation in the future ('rain-fed yields'; bottom panels). Hatching denotes areas with low agreement in model responses to global warming.

The urgent need for better water management

Some 52 million people across Europe—11 percent of the EU's population—already live in water-scarce regions, mostly in southern Europe²³. Water availability could fall by half in summer months in countries already facing the highest water stress²⁴. Longer and hotter summers will also result in less water for irrigation. Yields of grain maize could fall by more than 10 percent on average across southern areas for 2°C global warming. In Portugal, Bulgaria, Greece, and Spain, reduction in crop yields could reach 80 percent²⁵. In turn, as the south's existing climate effectively moves north, some regions stand to benefit. More rain in northern areas could see wheat production increase by 5 percent there²⁶.

However, precipitation intensity can be a problem too. More than 170,000 people are at risk of river flooding caused by rainfall or snowmelt every year, with damages of €7.8 billion across the EU

and United Kingdom. Without any mitigation and adaptation measures (3°C scenario) damages are expected to increase to nearly €50 billion per year by 2100 (at least six times more than the present situation)²⁷. Coastal flooding related to sea-level rise and storm surges could affect 2.2 million people by 2100, and are associated with annual damages multiplying sharply from €1.4 billion currently to almost €240 billion by 2100—of which 95 percent could be avoided through successful mitigation and adaptation²⁸. A recent pan-European study found that on the sectoral level, most affected are the manufacturing sector—with long value chains vulnerable to disruption—and the commercial sector, with a high value-added services component²⁹. The EU is prioritizing nature-based solutions (NBS) such as flood-plain restoration to protect urbanized populations and economically important areas that occupy one-fifth of the European coastline³⁰.

Protecting ecosystems

Restoring natural wetlands and flood plains is urgent. Around 80 percent of protected habitats across the EU, ranging from coastal regions to mountains, have been declared to be in poor or bad condition³¹. Nursing them back to health will help prevent flooding and promote biodiversity, and this is one of the objectives of the European Green Deal and the EU's new Biodiversity Strategy.

The Alpine tundra, for example, is an important freshwater resource and habitat for rare species such as the gyrfalcon, a bird of prey. If the world warms by 3°C, the tundra could shrink by 84 percent and the gyrfalcon's habitat would all but disappear. Loss of snow would also mean less water downstream in the summer months³². Near-surface permafrost in the entire Northern Hemisphere may shrink by 15-30 percent by 2050³³. With 60 percent of Russia's territory located in permafrost regions, this radically changes vegetation and hydrology, and human systems

Wildfires caused by drought and heat are endangering forests. Portugal, Spain, Italy, Greece, and France account for around 85 percent of the total burned area in the EU in recent years³⁴. Sweden experienced unprecedented forest fires during extreme heatwaves combined with droughts in 2014 and 2018. The number of European citizens exposed to at least 10 days of high to extreme fire danger per year is projected to increase from 63 million now to 78 million in a 3°C global-warming scenario³⁵. In the 2000-17 period, forest fires resulted in economic losses of about €3 billion per year. In a fast-warming world, damages for Greece, Spain, France, Italy, and Portugal would exceed €5 billion per year by 2070-2100³⁶. In Russia, which has the some of the largest, oldest and most biodiverse forests in the world, the area of burned forests has grown increasingly over the years³⁷. However, wildfires are not the only factor damaging forests, as across the whole of Europe and further eastwards they are being severely damaged by insect outbreaks, amplified by climate change—and showing the clearest worsening climate-related trend compared to wildfires and storms³⁸.



Pictures: slowmotingli/ MariusLtu/iStock

NORWAY: WELL PLACED TO ADAPT

Norway's northerly location—including island territory in the Arctic Circle—means temperatures are increasing faster than elsewhere.

The key impacts of rising temperatures are related to water: glaciers are melting at an accelerating rate; and precipitation has increased by about 20 percent over the past century. There is increased water runoff, less snow, and more severe floods³⁹. In summer, river flow is reducing and in 2018, the country experienced a highly unusual summer drought.

Norway's mountainous terrain and fjords mean increased precipitation is leading to more frequent landslides. The long coastline will be significantly affected by higher ocean temperatures, increased acidification, sea-level rise, and storm surges. The Norwegian Directorate for Civil Protection has planned for crises including landslides and storms in densely populated areas.

The natural environment, infrastructure and buildings, in particular water and sewage facilities, are especially vulnerable to climate change. Road and rail links, power-supply infrastructure, and oil and gas production all face increased climate risks. The country's Arctic territories are even more vulnerable as temperatures are rising faster than elsewhere.

The graph below highlights that most losses are related to storms and floods.

Prioritizing nature-based solutions

Norway's 356 municipalities and 11 counties are key to implementing adaptation measures as many impacts are felt at the local level. Functions include storm-water management and development planning using so-called blue-green infrastructure, or more generally nature-based solutions, to help cope with the changing climate⁴⁰.

Norway's government emphasizes nature-based solutions and if municipalities do not choose them, they must explain why. These include measures such as restoration of wetlands, green roofs, and expanding existing streams and rivers to cope with rainfall, rather than just building bigger pipes to remove it. Such solutions improve local environments and help to protect biodiversity, as well as their adaptation benefits.

Norway co-operates with its neighbors on adaptation through the Nordic Council of Ministers. The Nordic Climate Facility finances early-stage innovation green business and climate-change projects in developing countries such as Bangladesh⁴¹.

Open economy brings risks

Climate adaptation is a priority for Norway—not just within its own borders, but also internationally, because its open economy exposes it to climate risks in its trading partners.

NATURAL HAZARDS COMPENSATION

In Norwegian Krone, billion



SOURCE: FINANCE NORWAY



Picture: A&J Fotos/iStock

Domestically, the biggest impacts will be from increased rainfall and flooding affecting infrastructure such as roads, rail and power supply, as well as domestic and commercial property. Terrestrial and marine ecosystems will also be affected.

With 98 percent of electricity in Norway generated by hydro-electric facilities, in the short term, higher rainfall and water run-off could increase power generation. However, longer term, hydro-power dams may face water shortages that could affect power generation.

As a leading seafood exporter, the country's fisheries will be affected by increasing sea temperatures and ocean acidification, but the full impacts are not yet clear.

While the country is already affected by climate change, it has the funding capacity to implement strong adaptation measures. But Norway's open economy makes it reliant on goods produced elsewhere that could in turn be affected by climate change. Most food is imported, for example, and textiles and clothing are largely imported from South Asian countries such as India and Bangladesh, which are particularly vulnerable to flooding, rising sea levels and extreme weather⁴².

Data use in disaster loss reduction

Using data to help map climate-adaptation needs in advance of critical situations emerging will be important in the adaptation effort. Finance Norway, an association of banks and insurers, in 2013 launched a two-year project involving 10 municipalities to assess the usefulness of sharing insurance loss data for use in preventive measures and city planning. Finance Norway provided data related to urban flooding and natural hazards from all insurance companies for the previous 10 years, which the municipalities transferred to their databases. The results were gathered into a 'kunskapsbanken' (knowledge bank) and provided fresh insights into previously unknown risks and an improved knowledge base for risk and vulnerability analyses, as well as helping prioritize management, maintenance, rehabilitation, and reinvestment. The project highlighted areas most affected by urban storm water, landslides, storms, floods, and storm surges, and allowed municipalities to identify the most vulnerable areas that needed work to make them more resilient⁴³.

Increasing resilience and knowledge

Norway should build on its good work on adaptation, both domestically and internationally, including through its membership of the World Meteorological Organization's Global Framework for Climate Services and as a member of the Adaptation Committee of the UN Framework Convention on Climate Change and the Global Center on Adaptation.

Domestically, Norway should ensure that its infrastructure is resilient in the face of increased precipitation and implement more nature-based solutions, such as permeable paving and green corridors. It should secure transport and power infrastructure and increase monitoring capabilities to warn of disruption.

Knowledge is key to effective adaptation. There are several areas of uncertainty over climate-change impacts, such as the impact of climate change on terrestrial or marine ecosystems, as well as health in the long term. These should be identified and more research carried out to provide a clearer picture of future impacts.

REGIONAL OVERVIEW: EUROPE & CENTRAL ASIA

Key Actors and Best Practices

Institutions

Climate-change adaptation is increasingly being mainstreamed across policies, programs, strategies, and projects in the EU. The European Commission (EC), the executive body of the 27-member EU, launched the EU Strategy on Adaptation in 2013. Since then, all EU member states (up from 15 in 2013) have adopted national strategies or plans of their own. Key elements of the 2013 strategy include promoting adaptation at all levels of government, improving the knowledge base, and exploiting synergies with the EU's Common Agricultural Policy, the Cohesion Policy, and the Common Fisheries Policy. Adaptation has also been mainstreamed in the Energy Union Governance Regulation (adopted in December 2018), and ensuing national energy and climate plans by member states⁴⁴.

Many countries, including Germany, Austria, Finland, Portugal, the Netherlands, and France, are also making progress in implementation⁴⁵. In Germany, there is close co-operation between the federal government and states as they implement the country's second National Adaptation Plan, in place since 2015. France's National Climate Change Adaptation Plan, meanwhile, was passed into law in 2018, and the country is developing a framework to guide implementation, which was expected to begin in 2021⁴⁶. The national plan includes a community-oriented approach to adapting sectors such as water and energy⁴⁷. Since 2010, the Netherlands has had what's called the Delta Programme to build more resilience against water in the low-lying country, which includes a Delta Fund to finance adaptation measures⁴⁸. Its recent Delta Programme 2021 and Delta Decision on Spatial Adaptation provides a clear strategy to make the country water-resilient and climate-proof by 2050. This requires government to analyze vulnerabilities at least every six years; to lay down an adaptation strategy based on a risk dialogue with partners; to embed the strategy in implementation frameworks, legislation, and regulations; and to embed climate-proof and water-resilient planning and implementation in the environmental plans of sub-national authorities⁴⁹.





Picture: CHUYN/iStock

As part of the European Green Deal, the European Commission organized a public consultation in 2020⁵⁰ to inform a new, more ambitious EU strategy on adaptation to climate change. Expected to be adopted early in 2021, its aim is to strengthen efforts on climate-proofing, resilience building, prevention and preparedness, and ensure that businesses, cities and citizens are able to integrate climate change into their risk management practices. Initial ideas focus on improving knowledge of climate impacts through data; reinforcing planning and climate risk management; and accelerating action with a focus on innovation prevention⁵¹. The next long-term EU budget (2021-27) will invest substantially in climate and environment-related objectives. As much as 30 percent of this will contribute to climate spending across several

programs, including the European Agricultural Fund for Rural Development⁵², European Agricultural Guarantee Fund⁵³, European Regional Development Fund⁵⁴, Cohesion Fund⁵⁵, Horizon Europe⁵⁶, and Life funds⁵⁷⁻⁵⁸. The EU and its member states are committed to further scaling up their financial assistance, reinforcing their role as the largest contributor of international public climate finance for adaptation purposes to developing countries, in particular Least Developed Countries (LDCs) and Small Island Developing States (SIDS). The core of EU international action on adaptation will be the translation into its development policy of the economic and societal development model that the European Green Deal sets for the EU, with an explicit aim of integrating local, indigenous and scientific knowledge, as well as gender-responsive planning and implementation⁵⁹.

“

Europeans are already seeing and feeling the impacts of climate change. We must invest now in reinforcing the capacity of the Union's social and economic fabric to better withstand the next flood, the next heatwave, the next disease outbreak. And we must start from those among us who are the most vulnerable

Frans Timmermans
Executive Vice President for
the European Green Deal

REGIONAL OVERVIEW: EUROPE & CENTRAL ASIA

The European Investment Bank, the lending arm of the EU and one of the largest providers of climate finance, aims to support at least €1 trillion in climate-action investment in the decade to 2030. This will be mobilized under the European Green Deal Investment Plan, fulfilling three main objectives: supporting sustainable investments over the next decades (in particular InvestEU); creating and enabling frameworks for private investors and the public sector; and providing support to public institutions in identifying, structuring, and executing sustainable projects. InvestEU will leverage around €279 billion of private and public climate and environment-related investments over the period 2021-30⁶⁰. In 2021, it will issue an adaptation plan to support the forthcoming EU strategy.

NATIONAL ADAPTATION STRATEGIES AND PLANS IN EUROPE

- NAS and NAP adopted
- Only NAP
- Only NAS
- Neither NAS nor NAP



SOURCE: [HTTPS://CLIMATE-ADAPT.EEA.EUROPA.EU/COUNTRIES-REGIONS/COUNTRIES](https://climate-adapt.eea.europa.eu/countries-regions/countries)

Research and data analytics

European bodies conducting climate research and EU-financed research projects gather top researchers from around the world, benefiting adaptation policies across the region and beyond.

- The Joint Research Centre (JRC) of the European Commission aims to better understand the effects of climate change on Europe and the effectiveness of mitigation and adaptation policies⁶¹.
- The European Environment Agency provides independent data and information for those involved in climate policy and the general public⁶². It also assesses the implications of EU policies and those of member states, publishing a report on the monitoring, reporting, and evaluation of national adaptation policies⁶³.
- Climate-ADAPT was launched in 2002 and is a platform providing resources to support adaptation policy-making in Europe⁶⁴.
- Specialized research is conducted by several EU-funded research collaborations, such as COACCH, CO-designing the Assessment of Climate Change costs, which gathers climate-change

experts from 14 European research institutions⁶⁵. It researches complex climate-change impact chains, the economic valuation of climate action including adaptation, and climate tipping points of irreversible change⁶⁶.

- Further adaptation research will come from Horizon Europe, the EU's research and innovation program⁶⁷. One of its research areas will be the importance of climate adaptation and how to demonstrate its relevance for citizens⁶⁸.
- EU member states have also set up knowledge-development and exchange institutions. For example, Germany has launched a climate-preparedness portal (Deutsches Klimavorsorge Portal, KLiVO), where businesses municipalities and other societal organizations can find information and tools to help them prepare for climate-change impacts⁶⁹.
- The Central Asia Centre for Emergency Situations and Disaster Risk Reduction was inaugurated in Almaty in 2016⁷⁰. It works to strengthen regional co-operation and act as an early-warning information exchange hub.

Adaptation action shows the benefit of multi-level, multi-stakeholder participation and knowledge exchange

A wide range of adaptation initiatives is underway across Europe and neighboring regions at the national, municipal, and local levels. While these are as diverse as the climate risks threatening the region, a common thread of success and innovation is the active participation of many different actors and the knowledge exchange between them (see case study, overleaf).

- In **Germany**, the city of Munich implemented a flooding risk management plan on the River Isar, called the Isar-Plan⁷¹, responding to increased rainfall, flooding, and economic and infrastructural losses. The measures protected Munich from a 2005 flood, which damaged other cities in southern Germany, and improved water quality, and water and land habitats. An interdisciplinary project group consisted of the State Office of Water Management, the City of Munich and NGOs, while public participation was driven by internet engagement, dissemination of pamphlets, workshops, press engagement, round tables, and telephone/information services.
- The federal office for the environment in **Switzerland** has one of the strongest mandates of any country to coordinate adaptation efforts, enshrined in federal law^{72 73}. One of 31 projects in the 2013-17 phase of an adaptation program focused on innovation was the Grimsel project, addressing risks to roads, settlements, and infrastructure from increased slope instability due to increased rainfall, thawing, and glacier retreat. Data exchange between the public and governments on natural hazards has been improved, with monitoring systems procured and databases built. The project's success was enabled by the integration of cross-sectoral stakeholders at different levels of management, a participatory approach, and the inclusion of private and public actors.
- **Sweden** is one of Europe's most densely forested countries, with forestry playing an important role economically (forest products account for 3 percent of GDP and 10 percent of export value)⁷⁴. The importance of forestry is underpinned in Sweden's National Adaptation Strategy and the Swedish government has set up a national network for adaptation, promoting vertical and horizontal co-operation between the counties and government agencies⁷⁵.
- With an estimated 73 percent of the Russian population living in cities, these play an important role in **Russia's** adaptation. Currently, only two Russian cities—Moscow and Rostov-on-Don—have committed to climate adaptation and mitigation action in the Global Covenant of Mayors⁷⁶. There is a growing trend toward greener building in Moscow, while geological risk assessments of landslides and floods inform urban development, particularly in the location of new high-rise buildings⁷⁷.
- On the **Turkish-Bulgarian** border, an EU-funded flood control project for cross-border rivers helped to create a flood-forecasting and early-warning system⁷⁸. This reduced economic losses from floods in 2016⁷⁹.
- Across borders, urban leaders worldwide are working together under an EU-supported initiative to engage cities: the Global Covenant of Mayors for Climate and Energy. Adaptation is a fundamental part of this international alliance of more than 10,000 cities and local governments. Involvement of cities in these initiatives can lead to longer-term commitment and action, and provide a platform for knowledge exchange through sharing of good practices and lessons learnt⁸⁰. In Europe, Covenant adaptation resources include business models for nature-based solutions, an urban adaptation map viewer, and the Urban Adaptation Support Tool⁸¹.

REGIONAL OVERVIEW: EUROPE & CENTRAL ASIA

Landscaping project in Nijmegen to make the river 350 meters wider to prevent flooding in the future



SPATIAL PLANNING AND NATURE-BASED SOLUTIONS FOR RISKS OF FLOODS IN RIVERINE AREAS OF THE NETHERLANDS

The impact of disastrous coastal floods in 1953 led to one of the biggest water management projects in the world: Delta Works in the Netherlands (1958-1997). Since then, Dutch water management gradually saw a shift from top-down interventions to more inclusive, participatory approaches involving citizens, NGOs, the private sector and government agencies. In 1986, innovations in flood-prevention planning came with a dual focus on spatial quality and safety, based on incorporating flood-protection measures, ecological robustness and cultural meaning into planning. By then, flood management had become central to the adaptation agenda in the Netherlands, which is heavily impacted by both coastal and riverine flooding

risks exacerbated by global warming. Extreme hydro-meteorological events during 1993 and 1995 increased the urgency for new plans to ensure flood protection of rivers. This spurred the development of the Spatial Planning Key Decision that set the stage for the Room for the River initiative. This involved 34 sites/projects along the Rhine and Meuse rivers to increase their discharge capacity through various measures including dike relocation, deepening summer beds, de-poldering, bypasses, and lowering groins and flood plains.

The Room for the River initiative showcases innovative approaches to flood-protection management based on a collaborative and



Picture: Peter Hermus/iStock

participatory planning approach. Multi-institutional and multi-stakeholder co-operation was facilitated by the Room for the River Programme Office linking national, regional and local governments, and integrating local stakeholders in early stages of the project design. The adaptive management approach taken by the program office also created a learning process during implementation to identify opportunities and address challenges for continued improvement across implementation sites. The implemented measures also generated social and environmental co-benefits, such as new natural areas for recreation, educational opportunities, and local business opportunities. Looking forward, the development of institutional capacities ensures long-term benefits, and the sharing of lessons learnt translates into broader actions through the Delta Program for future river management and flood protection.

Challenges and Opportunities Mainstreaming adaptation

The European Commission aims to embed adaptation into all its budget deliberations and decision-making bodies, and to help member states do the same in their own countries. Even though the EU adaptation strategy has made progress, it has been less effective in establishing a comprehensive framework to implement, monitor, and evaluate the actions and plans of EU member states. Despite concerted efforts on climate-proofing agriculture in Europe, gaps remain, such as inadequate funding for adaptation (in comparison with mitigation) and slower uptake of measures due to lack of a common understanding of its co-benefits⁸².

Such mainstreaming of adaptation has the potential to improve access to funding. Despite the benefits arising from the EU Flood Directive, the implementation of flood-prevention measures suffers from weaknesses in allocating funding that can be improved with better integration of climate change into flood risk management processes⁸³.

Transboundary co-operation to promote adaptation is included in the plans of almost all EU member states. However, currently, the focus of this co-operation is on the water sector. More structured co-operation is needed to cope with climate-change impacts, especially in the vulnerable trans-national regions like the Northern Periphery and Arctic, South West Europe, the Mediterranean region, and the Alpine stretch⁸⁴.

Opportunity for government-to-government collaboration is another way in which early adopters of adaptation within the EU can support mainstreaming in other parts of the continent. A good example of this is the Dutch-Romanian collaboration that enabled Romania to draft the adaptation component of its National Climate Change Strategy 2011-20⁸⁵. This bilateral co-operation also resulted in knowledge exchange and implementation of projects, including the Room for the River project in Cat's Bend, Romania⁸⁶.

REGIONAL OVERVIEW: EUROPE & CENTRAL ASIA

Outside the EU, Russia is preparing to introduce institutional, organizational, and methodological measures to facilitate adaptation⁸⁷. But challenges lie ahead in engaging industries such as mineral extraction and transport.

Deepening scientific knowledge

EU bodies produce high-quality research, but more could be done to make the information easily accessible to all stakeholders, such as cities and citizens⁸⁸. One way to address this could be to combine diverse sources of EU information, such as data from the European Forest Fires Information System and the European Drought Observatory⁸⁹, for maximum impact.

Gaps also exist in terms of the geographical distribution of knowledge and research. Adaptation expertise and scholarship is found to be more heavily concentrated in a limited number of western-European countries, namely the Netherlands, the U.K., and Germany. This bias can have far-reaching implications, as a stronger focus on few countries means that the understanding of adaptation is biased toward certain socio-political and institutional settings, leading to preferred types of adaptation responses. Bias also exists in terms of sectoral insight, with most of the adaptation research in Europe focusing on river flooding and sea-level rise, necessitating the inclusion of other less studied sectors such as health and rural development⁹⁰.

Climate finance

On 17 December, 2020, the European Council adopted the EU budgetary plans for 2021-27, following the European Parliament's consent on 16 December. As much as 30 percent of the budget should directly contribute to climate

adaptation and mitigation, amounting to about €320 billion, up from €206 billion in the period 2014-20⁹¹. Around 80 percent of the budget is managed by member states, which report on climate spending under five European structural and investment funds⁹². The new budget aims to integrate climate expenditures across all EU policy areas, including agricultural support funds and research.

The private sector also has an important part to play in climate adaptation in the region. Research published in the EC's blueprint for a more ambitious adaptation strategy includes a rough estimate that a 1 percent increase in insurance coverage might reduce the global cost of climate-related disasters to taxpayers and/or governments by 22 percent⁹³.

Germany's InsuResilience Solutions Fund aims to make climate risk insurance against extreme weather events more affordable for vulnerable households in developing and emerging countries⁹⁴. It was launched in 2017 by KfW, Germany's development lender, after the G7 Summit in 2015 identified climate insurance as a key priority.

The EC has been working to deepen its sustainable finance strategy, which aims to mobilize private investment and integrate climate risks into the financial system, such as defining which investments conform to adaptation principles⁹⁵.

The EU and member states are also assisting developing nations in the field of adaptation. France, for example, has recently pledged to keep up its US\$ 1.5 billion annual finance for adaptation through the global Green Climate Fund to assist developing countries in countering climate change^{96 97}.



Picture: deimagine/iStock

Recommendations

Increased funding and reinforced planning for adaptation is needed—particularly in comparison with mitigation—along with the encouragement of private investment. This would help accelerate the shift from planning to implementation. Plans and their implementation under the European Green Deal and EU 2021-27 budget should reflect the fact that the costs of inaction are much greater. Greater awareness of the economic benefits of adaptation would drive further investment, while private investment in adaptation can be encouraged through a taxonomy of sustainable investments.

Closing the knowledge gap on adaptation and better geographical and sectoral representation of knowledge actors would make it easier to prioritize initiatives that build resilience to climate change. Improved messaging and knowledge exchange in technology, governance, and locally-led action would allow countries to deploy each more effectively.

Ramp up innovation. This is vital for vulnerable regions such as the Mediterranean. Innovation that strengthens resilience and reduces economic uncertainty is urgently required. More bilateral or multilateral collaboration should be fostered across the region, especially among the early movers of adaptation (often in western Europe) and others.

Increase support for international adaptation efforts. The EU plays a large role in development and climate funding, and can use this to prioritize adaptation. Closer collaboration with other countries and institutions will help accelerate and scale best practices and avoid maladaptation. When the EU translates its experience with the European Green Deal into international action, alliances or partnerships on adaptation, it should make sure to integrate local, indigenous, and scientific knowledge, as well as gender-responsive planning and implementation.

REGIONAL OVERVIEW: EUROPE & CENTRAL ASIA

Winter floods in
Yorkshire, England, 2019



A SIGNIFICANT YEAR FOR THE U.K. AS IT HOSTS COP26 AND HOLDS THE G7 PRESIDENCY

The U.K. is already taking steps to adapt to climate change, especially in infrastructure areas such as energy, rail, water supply and demand, and strategic roads, and is investing in flood and coastal erosion risk management

Planning for the future includes strategies on food security and farmland management

As holder of the G7 presidency and host of COP26, the U.K. is providing global leadership on adaptation and green finance

An island getting warmer and wetter

Uniquely positioned between the Atlantic Ocean and continental Europe, the U.K. enjoys a cool, mild temperate maritime climate, but this is set to get wetter and warmer. It faces significant challenges as a result of increased global temperatures, changes in rainfall patterns and sea-level rise, including heatwaves,

drought, coastal, river and flash flooding. Latest government projections lay out an 'increased likelihood of warmer, wetter winters and hotter, drier summers'⁹⁸, while extremes are likely to be more intense and more frequent.

Winters in the decade to 2019 were on average 4 percent wetter than 1981-2010 and 12 percent wetter than 1961-1990, according to the Met Office. Summers are seeing more rainfall, up 11 percent and 13 percent in the same time frames⁹⁹.

Floods are a priority risk

Severe flooding episodes between 2012 and 2017 caused deaths, disrupted thousands of lives, and damaged infrastructure from ports to piers. At least one-in-six properties in the country is at risk of flooding, according to an Environment Agency report¹⁰⁰.

London is at increasing risk from tidal floods in the River Thames, with government offices in Whitehall and the Houses of Parliament all



Picture: Jonathan Christian Photography/iStock

within the natural Thames flood plain. The government has established the Thames Estuary 2100 plan (see case study, page 82) to protect 1.3 million people, as well as £275 billion-worth of property and infrastructure¹⁰¹.

Hotter summers bring health risks

The top 10 hottest years in the U.K. have all been recorded since 2002. Heatwaves as in the summer of 2018, when temperatures exceeded 35°C in parts of the country, are now 30 times more likely¹⁰² and by the 2050s could happen as often as every other year¹⁰³. Hotter summers bring greater health risks¹⁰⁴, excess deaths¹⁰⁵, building overheating¹⁰⁶, and significant reductions in employee productivity¹⁰⁷ across all sectors.

Global leadership

The U.K., in collaboration with Egypt, launched the Call for Action on Resilience and Adaptation at the United Nations Climate Action Summit in 2019, which has been signed by 120 coun-

tries and the European Union. In 2021, the U.K. will lead international discussions on climate change at the United Nations Climate Change Conference (COP26) and will make it a key focus of its presidency of the G7. 2021 will be a critical year for climate ambition, both domestically and internationally. The government has said its international climate leadership must be underpinned by robust domestic policy and continued progress at home.

The U.K. is focused on putting adaptation and resilience at the heart of its COP26 presidency, alongside finance and nature-based solutions, which have strong interdependencies. The U.K. has also been leading global calls for a 'green, resilient recovery' from the Covid-19 pandemic and a shift to 'building back better' in economic stimulus plans. Programmes supported through UK International Climate Finance have to date helped over 66 million people in developing countries to cope with the effects of climate change.

REGIONAL OVERVIEW: EUROPE & CENTRAL ASIA

A blueprint for progress

The U.K.'s landmark Climate Change Act (2008) was one of the first to put climate-change adaptation into domestic legislation, requiring a five-yearly cycle of systematic reporting on climate risks and a national adaptation program of policy measures. The Department for Environment, Food and Rural Affairs (Defra) is responsible for coordinating domestic adaptation policy, while individual parts of U.K. government are responsible for its integration in key policy areas.

The U.K. submitted its Adaptation Communication to the UNFCCC in December 2020. This laid out the priority national risks and vulnerabilities to be addressed within adaptation planning, based on the latest Climate Change Risk Assessment. These are flooding, especially in coastal communities, the wellbeing impact of higher temperatures, water supply shortages, changes to terrestrial and marine ecosystems, impact on domestic and international food production and trade, and new and emerging pests and diseases.

The government has called for progress reports on climate-change preparedness from infrastructure providers and utilities under its Adaptation Reporting Power (ARP), which was introduced in the 2008 Act. As well as providing government and the public with information on the resilience of core sectors, the ARP process offers a means of raising awareness and of publicizing examples of good practice.

The 2008 Act also set up the independent Committee on Climate Change (CCC)¹⁰⁸, which advises the government on emissions targets and makes regular reports to parliament on progress made in reducing greenhouse gas emissions and adapting to the impacts of climate change.

Reducing flood damage

Since 2015, over 700 new flood and coastal defense projects have been completed across the country. Progress in building more flood-resilience infrastructure and reducing damage meant that during the winter of 2019/20, around 4,600 properties were flooded, compared with about 55,000 in the floods of summer 2007¹⁰⁹.

The government is investing £5.2 billion in flood and coastal defense programs over the next six years, on top of the £2.6 billion invested from 2016-21—designed





Picture: William Barton/iStock

to protect 300,000 homes—with the aim of protecting an additional 336,000 properties and reducing national flood risk by up to 11 percent by 2027¹¹⁰. This will create around 2,000 new flood and coastal defenses¹¹¹.

Infrastructure resilience

The Prime Minister's 10-point plan for a Green Industrial Revolution, announced in November 2020, highlights investments in infrastructure that will contribute both to the country's target of net zero emissions by 2050 and to adaptation measures.

For example, the plan calls for investment of £1.3 billion to accelerate the roll-out of charge points for electric vehicles across the country's road network. It targets an ambitious expansion of offshore wind generation, aiming to produce enough to power every home by 2030¹¹².

Transforming finance for climate-related risks

The U.K. will issue its first sovereign green bonds in 2021 as part of efforts to stimulate the economy after the damage of the Covid-19 pandemic.

The government's Green Finance Strategy aims to align private-sector financial flows with clean, environmentally sustainable and resilient growth. It includes steps to improve adoption of the Taskforce on Climate-related Financial Disclosures framework, which includes disclosure of physical climate risks. By 2025, climate disclosures will be mandatory across the economy.

Partnerships for nature-based solutions

The Environment Agency, in partnership with Natural England, local authorities, the Royal Society for the Protection of Birds, wildlife trusts, water companies, and local groups, has created 531 hectares of blanket bog and restored a further 2,148 hectares across England in 2019/20. Restoring peatland has many benefits, including reducing downstream flood risk.

A £640 million Nature for Climate Fund has been designed to protect, restore, and expand habitats such as woodlands and peat bogs, expanding natural carbon capture and helping to alleviate flooding. Funding will also help triple U.K. tree-planting rates to 30,000 hectares every year, equating to 40 million more trees.

REGIONAL OVERVIEW: EUROPE & CENTRAL ASIA



Picture: anthurren/iStock

Thames Estuary 2100: reducing London's tidal threat

Tidal surges and flooding in the Thames estuary have long threatened London. The massive Thames Barrier, which spans the river east of the capital, became operational in 1982 and the Thames Estuary 2100 plan sets out to enhance this and other existing defences.

The estuary's biggest risk of flooding is from a tidal surge. The flood plain includes London, the Houses of Parliament, heritage sites and critical energy, transport and water infrastructure. From 2050 to 2100, the focus will be on the future of the Thames Barrier, which has been used over 190 times.

When the plan was developed it was expected to cost £3.3 billion until 2050¹¹³.

Mobilizing investment

Monitoring progress in adaptation remains a challenge in the absence of robust metrics and indicators. Without these, private finance flows will remain small. Mobilizing investment in nature-based solutions is similarly challenging without standardized metrics.

Shift to adaptation

Much of the government's strategy so far, including the latest 10-point plan from the Prime Minister, Boris Johnson, focuses on mitigation, with adaptation featuring in infrastructure measures, such as those referenced above.

The second National Adaptation Programme was published in 2018 and runs until 2023, and the U.K. acknowledges in its Adaptation Communication that there is a need to go further to implement adaptation measures. The U.K.'s Devolved Administrations also have their own respective adaptation programs for Scotland, Wales and Northern Ireland.

While the government wants adaptation to form part of policy across all sectors, embedding it within established policy frameworks such as for transport, housing, and land use will require mastering the challenge of reconciling adaptation and net zero measures.

For example, the government points out in its response to the CCC's 2020 Progress Report to Parliament¹¹⁴ that electricity demand could double by 2050 as it is used to decarbonize heat and transport. The response adds that the country will need 'a substantial increase in low carbon generation and a mix of technologies to deliver a low carbon, low cost and reliable electricity system that can adapt to our needs.'

Food and farming sustainability

There are urgent questions about how to make food production genuinely sustainable. The U.K. currently produces only around 55 percent of the food it consumes¹¹⁵. Global pressures—rising populations, climate-change impact on crops, Brexit—will put supply chains to the test.

The government is developing a National Food Strategy that aims to provide healthy, affordable food while restoring and enhancing the natural environment¹¹⁶. At the same time, the Environmental Land Management Scheme, which aims to support farmers and the rural economy in pursuit of net zero emissions by 2050, should roll out in 2024.

International strategy

The U.K. will spend £11.6 billion from 2021-25 on international climate finance, broadly balanced between mitigation and adaptation. Given the impact of dealing with the Covid-19 pandemic on the economies of developing countries, the challenge going forward will be to find ways of expanding the money governments and multilateral development banks have available for climate-adaptation initiatives. The U.K. government has earmarked this issue for discussions at COP26.

Recommendations

Continue efforts to support flood defenses, ensuring communities are better prepared.

The government will invest £5.2 billion through to 2027 to create flood and coastal defenses that should protect hundreds of thousands of properties in England. It also plans better management of water flows to both reduce flood risk and manage drought. There will be schemes such as rewetting of peatlands to harness the power of nature to reduce flooding. There should be local plans in every area of the U.K. to deal with flooding. Insurance should cover amounts to build flood-resilience measures into repairs.

Enhancing food security in production and consumption.

The government should ensure that its food and agriculture policies strive for increases in food production at the same time as protecting the environment. The National Food Strategy and the Environmental Land Management Scheme should work in tandem to achieve this. At the same time, efforts should continue to improve diets and promote healthy eating.

Ensuring adaptation is 'baked in' to all government policies.

The government needs to ensure that climate resilience is embedded in policy decisions. The Green Book Supplementary Guidance on Accounting for the Effects of Climate Change will be an important tool in supporting government departments in this. Efforts will need to be coordinated across departments to ensure that climate adaptation initiatives are well aligned and mutually supportive.



East Asia & Pacific

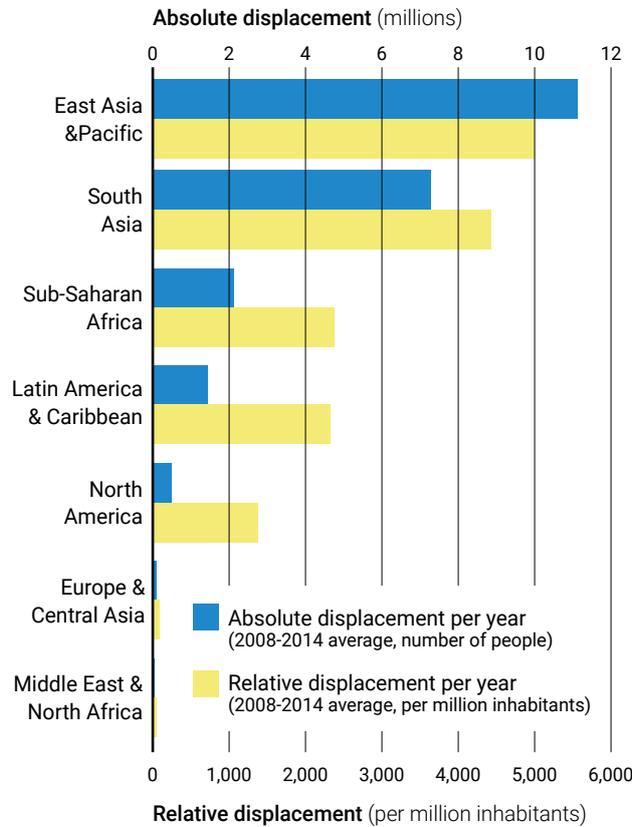
East Asia is home to countries with very densely populated areas, with many people living in low-lying coastal cities or on Pacific islands that are vulnerable to rising sea levels

The region has the highest proportion of weather-related disaster displacement in the world, with millions forced to leave their homes each year

Nature-based solutions ranging from mangroves to 'sponge cities,' along with technological innovation, will be crucial to the region's efforts to adapt



WEATHER-RELATED DISASTER DISPLACEMENT BY REGION – 2008-2014 AVERAGE



SOURCE: IDMC ESTIMATES AS OF 1 JUNE 2015
[HTTPS://PUBLIC.WMO.INT/EN/RESOURCES/BULLETIN/DISASTER-RELATED-DISPLACEMENT-CHANGING-CLIMATE](https://public.wmo.int/en/resources/bulletin/disaster-related-displacement-changing-climate)



Climate change is a global challenge which requires global co-operation. It is important for us to enhance capacity in both mitigation and adaptation

Premier Li Keqiang
 People's Republic of China

Context and Key Climate Impacts Vulnerable on multiple fronts

The East Asia and Pacific region is home to about one-quarter of the global population, and experiences more than 70 percent of the world's storms and more than half of its floods¹. Rapid economic development over the past 50 years and a large coastal population in low-lying areas mean that the region, which includes multiple small island developing states (SIDS), is extremely vulnerable to various climate hazards, including flooding, cyclones, and rising seas. Three out of the 10 global cities with populations most exposed to natural disasters—Guangzhou, Shanghai, both in China, and Osaka/Kobe in Japan²—are found in this region, with millions of people forced to leave their homes because of extreme weather events each year^{3 4}.

Moreover, soil productivity, water availability including groundwater, ecosystems, coastal and marine resources, and health in highly populated coastal areas are already impacted by climate change. Some areas face increasing water shortages, causing poor sanitation and reducing crop yields. Annual mean temperatures have risen across the region since 1970,

The region experiences

70%

of the world's storms and
50%+ of the world's floods

REGIONAL OVERVIEW: EAST ASIA & PACIFIC

but there are no clear trends in mean annual rainfall or the number of wet days per year.

The East Asia and Pacific region's vulnerability to climate change poses threats to agriculture and food security through drier conditions, higher temperatures, flooding, and sea-level rise. This is also influenced by the importance of agriculture and fishing in providing livelihoods for the rural poor. The region also faces a dual challenge of adaptation and mitigation. Rich biodiversity—in marine ecosystems and the rainforests of the Mala archipelago, for example—are found in this region and are extremely vulnerable to the changing climate.

Rapid urbanization exposes shortcomings

East Asia and Pacific is the world's fastest urbanizing region, with 60 percent of its population living in towns and cities. While city-led growth has helped lift 655 million people out of poverty in the past two decades, 250 million live in slums, many in flood-prone areas⁵. Consequently, weather-related disaster displacement, which climate change will continue to increase, is the highest in the world⁶.

Cities are also growing faster than the rate at which services can keep pace. In Indonesia, 28 percent of the urban population lacks adequate sanitation, while 30 percent of roads and 50 percent of drainage networks in the region's slums are poor quality, leading to higher risks of flooding⁷. Bringing adaptation efforts into the mainstream helps tackle the multiple climate risks that urban areas face, and which in 2016 were predicted by the Asian Development Bank to cause an 11 percent fall in GDP across South-east Asia alone by 2100⁸.

Additional challenges facing small island developing states

The economic impacts of climate change will be especially severe for the Pacific region, which is home to several SIDS, such as Samoa, Fiji, and Tonga. Under a business-as-usual scenario, climate change could cause a 2.2–3.5 percent loss in the Pacific region's annual GDP by 2050, and as much as 12.7 percent by 2100. Even with rapid global moves toward renewable energy use, the region may still face losses of 4.6–8.2 percent in annual GDP by the end of the 21st century⁹.

SMALL ISLAND DEVELOPING STATES

Although small islands account for only a fraction of the total global damage from climate change, the projected damage is enormous in relation to the size of their economies. Several small island nations are included in the group of 10 countries with the highest relative impact projected for 2100¹⁰ and the Fifth Assessment Report of the IPCC notes, for example, the prevalence of the small islands in the Asia Pacific region in terms of relative exposure and loss as a percentage of GDP.

The unit cost of shoreline protection per capita in small islands is substantially higher than for a similar structure in a larger territory with a larger population. This scale-reality applies throughout much of a small island economy, including the indivisibility of public utilities, services, and all forms of development. Moreover, the relative impact of an extreme event such as a tropical cyclone that can affect most of a small island's territory has a disproportionate impact on that state's gross domestic product, compared to a larger country where an individual event generally affects a small proportion of its total territory and its GDP. The result is relatively higher adaptation and disaster risk reduction costs per capita in countries with small populations and areas—especially those that are also geographically isolated, have a poor resource base and high transport costs.

However, while the economics of these adaptation efforts apply similarly to all small islands, appropriate adaptation measures and tools vary widely, and must be appropriately designed for different circumstances. For example, while insurance is being promoted as an element of the overall climate-change response strategy in some island regions, such as the Caribbean, concerns have been expressed about possible

linkages to maladaptation. These include the imposition of high premiums that are beyond the capacity of resource-scarce governments as the perception of climate-change risks increase, discriminatory coverage of sectors that may not align with local priorities, and tacit encouragement for the state, individuals, and the private sector to engage in behavior that is not risk-averse, for example, development in hazard-prone areas¹¹.

Community-based and locally led adaptation actions, such as traditional construction

methods, have been identified across the Pacific as a means of reducing vulnerability to tropical cyclones and floods in rural areas. While there is clear evidence that traditional knowledge networks, technologies and skills can be used effectively to support adaptation in certain contexts, the limits to these tools are not well understood. To supplement the existing research in the Pacific and Caribbean small islands, additional studies in the central and western Indian Ocean, the Mediterranean, and the central and eastern Atlantic would improve understanding on this topic.

TOP TEN COUNTRIES IN THE ASIA-PACIFIC REGION BASED ON ABSOLUTE AND RELATIVE PHYSICAL EXPOSURE TO STORMS AND IMPACT ON GDP (BETWEEN 1998 AND 2009; AFTER TABLES 1.10 AND 1.11 OF ESCAP AND UNISDR, 2010)

Rank	Absolute exposure (millions affected)	Relative exposure (% of population affected)	Absolute GDP loss (US\$ billions)	Loss (% of GDP)
1	Japan (30.9)	Northern Mariana Islands (58.2)	Japan (1,226.7)	Northern Mariana Islands (59.4)
2	Philippines (12.1)	Niue (25.4)	Republic of Korea (35.6)	Vanuatu (27.1)
3	China (11.1)	Japan (24.2)	China (28.5)	Niue (24.9)
4	India (10.7)	Philippines (23.6)	Philippines (24.3)	Fiji (24.1)
5	Bangladesh (7.5)	Fiji (23.1)	Hong Kong (13.3)	Japan (23.9)
6	Republic of Korea (2.4)	Samoa (21.4)	India (8.0)	Philippines (23.9)
7	Myanmar (1.2)	New Caledonia (20.7)	Bangladesh (3.9)	New Caledonia (22.4)
8	Vietnam (0.8)	Vanuatu (18.3)	Northern Mariana Islands (1.5)	Samoa (19.2)
9	Hong Kong (0.4)	Tonga (18.1)	Australia (0.8)	Tonga (17.4)
10	Pakistan (0.3)	Cook Islands (10.5)	New Caledonia (0.7)	Bangladesh (5.9)

Note: Small Islands are highlighted in yellow

SOURCE: IPCC, 2014: CLIMATE CHANGE 2014: IMPACTS, ADAPTATION, AND VULNERABILITY. PART B: REGIONAL ASPECTS. CONTRIBUTION OF WORKING GROUP II TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE [BARROS, V.R., C.B. FIELD, D.J. DOKKEN, M.D. MASTRANDREA, K.J. MACH, T.E. BILIR, M. CHATTERJEE, K.L. EBI, Y.O. ESTRADA, R.C. GENOVA, B. GIRMA, E.S. KISSEL, A.N. LEVY, S. MACCRACKEN, P.R. MASTRANDREA, AND L.L. WHITE (EDS.)]. CAMBRIDGE UNIVERSITY PRESS, CAMBRIDGE, UNITED KINGDOM AND NEW YORK, NY, USA, PP. 688.

REGIONAL OVERVIEW: EAST ASIA & PACIFIC



Adapting solutions to needs

Adaptation needs are highly diverse, due to significant differences in climate impacts and development patterns within a region that includes some of the world's richest and biggest countries, as well as some of the poorest and smallest. Some countries, for example Australia, are world leaders in sectors such as adapting to water stress, using techniques including reusing wastewater, making appliances more water-efficient, and water trading¹². China has been pushing forward its adaptation work on the ground, especially in the areas of agriculture, water resources, forests and other ecosystems, as well as coastline and coastal ecosystems, health,

disaster prevention and reduction, climate risk control and early warning, and international co-operation on adaptation.

The Climate-Adaptive City Action Plan and Pilot Work of China started in 2017 with an initial 28 cities. Five task areas were decided to guide the pilot cities' work: strengthen the concept of urban adaptation; improve monitoring and early-warning capability; carry out prioritized adaptation actions; establish experimental policy areas; and build international co-operation platforms. This involved improving the construction of meteorological disaster monitoring and early-warning platforms, as well as information



Picture: FabVietnam_Photography/iStock

systems, and Big Data application; revising and improving urban infrastructure design and construction; addressing the negative impacts of the heat island effect and urban flooding; further enhancing work on sponge city projects; strengthening the management of climate disaster and increasing the ability of urban climate emergency support services. It also involved expanding the adaptation system through increased participation by public and private sectors, communities, and residents.

Other countries, like Japan and South Korea, have good adaptation governance frameworks and implementation structures, which have allowed

them to build additional programs where there are additional opportunities, such as through Covid stimulus packages¹³. The adaptation actions of other countries, such as SIDS in the Pacific, however, could benefit from strengthening with additional capacity and resources. Water and disaster risk reduction are acute needs for all countries. Urban areas at all levels of development require sustainable infrastructure that increases economic activity and wellbeing, and reduces vulnerability to future climate change by working more in harmony with nature. Adapting food systems to safeguard and strengthen food security, especially in poorer areas, is also vital.

CHINA'S NATIONAL CLIMATE CHANGE ADAPTATION

China attaches great importance to adaptation and emphasizes the balance of focus between mitigation and adaptation. It has also showcased its ambition and commitment to addressing the negative impacts of climate change with flagship initiatives such as the Sponge City Pilot Project, Climate-Adaptive City Action Plan and Pilot Work, and the Mangrove Conservation and Restoration Action Plan. In 2007, China first raised the balance between mitigation and adaptation in its National Climate Change Program and made it a national principle of addressing climate change. The Plan also outlined concrete targets and tasks for enhancing the country's climate-adaptive capacity by sector. In November 2013, the first National Climate Change Adaptation Strategy was released, providing strategic guidance to coordinate nationwide adaptation policies and actions. The National Climate Change Plan (2014-20), released in 2014, further identified the main goals for a significant improvement of the country's climate-adaptive capacity. The government then identified 'cities' as the entry point for its national adaptation action by releasing the City Climate Change Adaptation Action Program in 2015. This was implemented by disseminating the Climate-Adaptive City Pilot Work Program and Climate-Adaptive City Construction Pilot Work Notice in all provinces in 2016 and 2017.

Meanwhile, relevant national government offices and some provincial and city governments also actively joined this effort by developing laws and regulations, organizing capacity-building activities, and embedding adaptation into their work plans. In 2018, China joined the Global Commission on Adaptation



as one of its initial convening countries, followed by joining the board of the Global Center on Adaptation (GCA) and launching GCA China, showing its leadership and active contribution to global adaptation action. Currently, China is developing a new National Adaptation Strategy based on the most up-to-date national needs. The more comprehensive strategy, planned to be released in 2021, will guide the country's adaptation actions in all sectors until 2035.



Key Actors and Best Practices

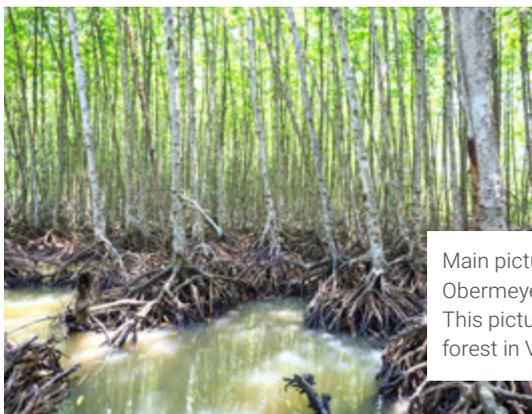
Nature-based solutions

There have been significant efforts to better understand the impacts of climate change across the region, and to identify adaptation measures, especially nature-based solutions and green-gray infrastructure.

China, for example, established the concept of the ‘sponge city’ in 2013 (see case study, overleaf) to tackle flooding and manage water scarcity. More than 120 pilot projects have been approved in 30 cities that prioritize natural drainage and the creation of permeable surfaces to absorb rain, as well as increasing wetlands and water storage¹⁴.

VIETNAM: using mangroves to protect communities from extreme weather

Vietnam is one of the countries most affected by extreme weather events, both in terms of fatalities and economic losses¹⁵. Underway in the country since 1994, the Mangrove Plantation and Disaster Risk Reduction project in the disaster-prone northern and central coastal provinces is an excellent example of a nature-based solution increasing resilience in communities, as well as reducing flooding risk. Mangrove forests not only provide essential resources and services to the local coastal communities, but also have great climate-change mitigation potential by reducing flooding risk. Over 17 years, the project’s afforestation efforts, which have involved the Vietnam Red Cross, Danish Red Cross, Japanese Red Cross, and the International Federation of Red Cross and Red Crescent Societies (IFRC), had created almost 9,500 hectares of forest in 166 communes by 2011. This benefited approximately 350,000 people, while indirectly protecting another two million from flooding, as well as improving water quality¹⁶.



Main picture: Xinyuxie Park, Obermeyer urban planning.
This picture: mangrove forest in Vietnam

Picture: quangpraha/iStock

REGIONAL OVERVIEW: EAST ASIA & PACIFIC



Picture: onlyyouqj/iStock

CHINA: building a modern sponge city to adapt to climate change

Extreme flooding is a pressing issue for China, because rapid urbanization has limited clean water availability in cities. In 2013, President Xi Jinping introduced the concept of ‘sponge cities’ to improve the capacity to store and purify water, and reduce waterlogging. In 2015, 16 pilot cities were selected, including Wuhan, Tianjin, and Shenzhen¹⁷. Sponge cities use combined green and gray solutions to create a ‘sponge infrastructure’ that captures runoff, controls flooding, recharges groundwater and reuses storm water to help soak up rainfall and reduce extreme waterlogging. During Typhoon Lekima in 2019, the city of Jinan, which has 8.7 million residents, avoided significant economic losses, prevented deaths, and saved over 1,000 properties.



Picture: rudi_suardi/iStock

INDONESIA: public and private sectors working in partnership

In Indonesia, farmers receive satellite data providing weather information via SMS to help them respond to changes in weather patterns and water availability. The SMARTseeds project, launched in 2016, is a highly effective public-private partnership that provides a crop calendar, agricultural practice advice, and market information. By April 2019, it had reached 25,000 farmers, delivering cost savings of up to 34 percent and a yield increase of up to 12 percent¹⁸.



Picture: Newscom/Alamy

JAPAN: working together for success

Japan, a country known for putting resilient recovery at the heart of its planning for disaster resilience¹⁹, announced in 2020 a new inter-ministerial approach to prevent disasters and support adaptive recovery from more frequent severe floods and rains due to climate change²⁰. It launched a Platform for Redesign 2020 scheme to showcase policies and actions taken by national governments toward a sustainable and resilient recovery from Covid-19, including policies to enable Japanese companies to help developing countries adapt, and the use of Big Data to tackle natural disasters²¹.



Picture: Kaszoad/iStock

STRENGTHENING A COORDINATED APPROACH TO CLIMATE ADAPTATION IN THE PACIFIC

Adaptation is nothing less than an existential challenge for the 14 countries of the Pacific Islands region. In 2009, they created the Pacific Adaptation to Climate Change (PACC) Program to enhance community-based adaptive capacity and build climate risks into national development planning and activities²².

In 2010, Tonga became the first Pacific nation to adopt a Joint National Action Plan for Climate Change and Disaster Risk Management (JNAP), which launched initiatives such as the Tonga Climate Change Trust Fund and the development of disaster response funds. Another 12 nations followed, using the plan to integrate disaster risk management and climate-change adaptation. Since the launch of Tonga's JNAP, the region has developed further strategies to strengthen resilience. Led by the Solomon Islands, the region is working on a joint regional framework on climate change and disaster risks, integrating disaster risk management and climate change into development. Pilot projects in the Solomon Islands and Kiribati have established national coordination mechanisms that facilitate the management and monitoring of multi-sector interventions, providing the basis of the Institutional Strengthening for Pacific Island Countries to Adapt to Climate Change (ISACC) project.

ISACC aims to strengthen the Pacific islands' institutional capacity to plan, coordinate, and respond to climate-change disaster risks, using three strategies:

1 Integration of national frameworks for multi-sectoral approaches to climate change and disaster risks. This has involved a regional institutional mapping exercise to identify capacity and policy gaps, which enables the design of projects and training tailored to national needs.

2 Enabling access to climate-change finance by improving institutional capacities, systems, and finance tracking tools. The Regional Climate Change and Disaster Risk Financing Forum shares knowledge and raises awareness of climate-change finance, while the web-based Pacific Climate Change Finance Tracking Tool provides analytics on climate finance in the region.

3 Strengthening regional coordination across member countries by sharing learning support. The ISACC project also supported Fiji's Integrated Vulnerability Assessment database to inform stakeholders about climate-change adaptation actions.

REGIONAL OVERVIEW: EAST ASIA & PACIFIC

Challenges and Opportunities

Competing priorities hamper action

China, Japan, and South Korea recently announced ambitious carbon neutrality pledges, which will bring mitigation to the fore in climate policies in East Asia. However, today's carbon emissions will have consequences for centuries to come, so there must be a balance between mitigation and adaptation.

While some practical experiences of adaptation are emerging in the region, implementation is limited due to competing national priorities, lack of public awareness—as well as of capacity—and scarce availability of adaptation finance. In addition, the question of how to combine nature-based solutions with biodiversity conservation still needs to be tackled at national, regional, and local level.



Majuro Atoll in the Marshall Islands

Picture: kurakurakin/iStock

THE URGENCY OF ACTION FOR ATOLL NATIONS

Low-lying atoll nations are especially threatened by climate change, with many islands mere meters above sea level and subject to more frequent and intense extreme events. Mitigation is critical for the survivability of atoll nations. At the same time, ambitious adaptation actions are needed to prevent them from becoming uninhabitable. Several atoll nations, like the Republic of the Marshall Islands, Kiribati, and the Maldives, are protecting their coastal areas by planting mangroves, restoring wetlands, and improving water systems.²³ However, higher temperature scenarios will limit the viability of these actions. Some may follow the lead of Kiribati, which purchased land in Fiji as a way to proactively plan for managed retreat.²⁴ Others, like the Marshall Islands, may commit to remain and look for ways to build higher islands.²⁵

Despite high demand for new infrastructure, regulations in most countries lack adequate guidelines for including long-term climate-change impacts in infrastructure planning. While progress is being made, especially among higher income countries, the level of climate risk awareness and the integration of climate impacts into urban development remains low. Additionally, most existing adaptation policies and measures in the region are relatively new, so limited lessons can be drawn.

Many countries also lack the appropriate financial products and models for resilience and adaptation. While some have developed initial risk insurance products—such as China’s agricultural insurance system—they are nascent. This is mainly due to a lack of systematic risk-assessment guidelines to quantify climate risks and methodologies for adaptation reporting and tracking. In addition, adaptation activity data gaps and inaccurate data are common, especially in developing countries where monitoring systems are incomplete.

The importance of good governance

Australia provides an interesting example of how to face multiple climate-related threats. Its climate ranges from tropical to desert and alpine areas, exposing it to extreme events, including cyclones, floods, droughts, fires, and heat.

The summer of 2019-20, in which 6 million hectares burned, causing A\$100 billion in damage, and as many as three billion animals to perish or be injured, shows the threat caused by fire is catastrophically real²⁶. Yet improvements to fire-fighting services and long-term fire management have been limited. This is due partly to the distraction of Covid-19, but competing governance structures are also an issue.

These have also come to the fore in the management of the Murray-Darling river basin, which drains much of the densely populated

south-eastern crescent of Australia. Five major cities draw on it and the rivers flow through some of the driest farming lands in the world. Heavy demand for drinking water as well as agriculture in the 20th century led to serious water shortages and significant damage to river ecosystems.

This was exacerbated by the Millennium Drought (2001-09), which triggered an A\$10 billion decade-long effort to reach a national agreement on water use in the Murray-Darling Basin, redress the over-allocation of water licenses and return water to the environment from irrigated agriculture. However, the agreement left states to work out the details, and the water-flow models ignored climate change, leading many to view the plan as doomed to fail. These doubts fed demands by townships and irrigators for access in times of drought, which are the norm in much of the basin, and the Murray-Darling Basin planning process has slipped from being a model of good practice to possible collapse.

The lesson from the fires and the Murray-Darling Basin is that even the best technology—remote sensing of fires and models of their spread, and modeling and remote monitoring of water flows respectively—and planning processes will not help achieve effective adaptation if governance structures are not effective, especially if climate change is ignored.

Disruption of supply chains

Disruption in supply chains caused by extreme weather events can propagate through global trade flows. Since Asia’s industries are particularly highly interlinked, extreme events here can have strong repercussions within the region and also impact the rest of the world^{27 28}. In addition, as supply-chain disruptions can spread across national borders, information sharing between countries, which remains a challenge, should be enhanced. Tailored adaptation plans need to be crafted by private and public sectors to enhance the resilience to shock cascades.

REGIONAL OVERVIEW: EAST ASIA & PACIFIC

Recommendations

Incorporate climate risks into the early stages of planning and designing infrastructure. Resilience should be encouraged by working across sectors and with multiple stakeholders. For many countries in the Pacific region, existing infrastructure faces enormous risks from extreme climate events, especially transport and water infrastructure. Half of the 20 top port cities suffering losses caused by floods are in the Pacific region²⁹. Impacts on ecosystems must be thoroughly considered when making existing infrastructure more resilient and building new infrastructure, supported by robust guidelines and stringent regulations. Nature-based solutions should be used where possible.

Introduce climate resilience indicators to incentivize adaptation action. Industrialized countries and fast-growing nations often link progress on addressing climate change to energy-efficiency indicators. Existing research in agriculture and water needs to be built on, customized to regional needs, and indicators incorporated into economic, social and environmental systems to highlight the impacts of climate change.

Develop mature financial products and models for resilience and adaptation. Governments must integrate disaster-linked social protection into national financing and insurance strategies. As an example, the Philippines, in South-east Asia, has developed an innovative climate adaptation and disaster resilience fund that combines private investment with disaster-risk financing and insurance³⁰. Many countries have introduced catastrophe insurance and sectoral insurance products. However, many such products do not link directly or indirectly to climate change.

Build international support, including technology transfer, capacity building, and finance. The region's highly industrialized countries are providing increasing support to other countries, but more should be done.





Volunteers in Phuket, Thailand planting young mangrove trees

Picture: normalfx/iStock

At the 2019 G20 Ministerial Meeting on Energy Transitions and Global Environment for Sustainable Growth, Japan launched the AP-PLAT (Asia-Pacific Adaptation Information Platform) to enable Japanese companies to make their adaptation expertise more widely available overseas³¹. With some of the best available technologies, these countries can strengthen international co-operation at sub-national and regional levels to improve technology transfer, support the sustainable management of natural resources, and promote public and private investment.

Strengthen regional and sub-regional co-operation to foster knowledge-sharing and mobilize financial flows. Due to the region's high vulnerability to the changing climate, many countries have developed effective, efficient local adaptation solutions to different climate risks. Regional alliances complement national responses to emergencies related to extreme climate events through initiatives such as the ASEAN Agreement on Disaster Management and Emergency Response, in South-east Asia. Stronger co-operation and coordination are also needed in building resilience. East Asia is home to several major developing economies and south-south co-operation can be further fostered to highlight success stories and mobilize funding from all available sources. In 2018, a group of Chinese philanthropists, foundations, university research institutions, and social commonwealth organizations jointly launched seven initiatives. One of these initiatives accelerates adaptation actions by protecting forests, oceans, and coastal ecological environments from climate-change hazards and impacts, supporting other developing countries to conserve and restore their coastal ecosystem, including mangrove forests³².

REGIONAL OVERVIEW: SOUTH ASIA



South Asia

South Asia was the region of the globe most affected by disastrous weather over the past two decades and millions of people face displacement and poverty

Water scarcity is a particularly serious threat to coastal and delta regions, where high population densities combine with intense economic activity

Countries need to expand adaptation good practices and pilot projects, boost green infrastructure, and strengthen the business case for private-sector investment

TURKMENISTAN

UZBEKISTAN

KYRGYZSTAN

TAJIKISTAN

AFGHANISTAN

PAKISTAN

NEPAL

INDIA

SRI LANKA



“

The time to act on climate change is now. If anyone still doubts climate change, even slightly, I invite you to visit Bangladesh. I am ready to walk with you to show how climate change silently impacts the lives of millions

Sheikh Hasina
Prime Minister of Bangladesh

Context and Key Climate Impacts **The most climate-hit region in the world**

South Asia faces an urgent need to adapt; it was the region most affected by disastrous weather between 1999 and 2018, according to the Global Climate Risk Index¹. According to the World Bank, changes in average weather patterns are predicted to reduce living standards in Bangladesh, India, Pakistan, and Sri Lanka². South Asia is exposed to changing monsoon and weather patterns, rapid increases in heatwaves, sea-level rise, and more³. Even with a temperature rise of 1.5°C above pre-industrial levels, the consequences for the region's inhabitants and economy will be severe⁴.

REGIONAL OVERVIEW: SOUTH ASIA



Of the world's total population exposed to floods each year, 64 percent live in South Asia. Afghanistan, Pakistan, India, Nepal, and Bangladesh lie in very high-risk zones, where the overlap of seismic and hydro-meteorological hazards is a particular threat. Urbanization, environmental degradation, and lack of strong governance are exacerbating nations' vulnerabilities⁵.

According to an estimate by the World Bank, South Asian summer temperatures were projected to increase by between 3°C and nearly 6°C by 2100, with the warming most pronounced in Pakistan⁶. Annual precipitation was projected to increase by up to 30 percent.

Climate-change effects in the Himalayas are also striking. Glaciers have been retreating, yet hundreds of millions of people depend on the glacier-fed Indus and Brahmaputra river basins for fresh-water resources. Reduction in water availability could significantly reduce the amount of food that can be produced in these river basins, according to the World Bank⁷.

The economic and social impacts of climate disasters in the region are significant. Between 1990 and 2019, more than 1,000 climate-induced disasters in South Asia affected 1.7 billion people and caused more than US\$ 127 billion in damages⁸. Climate change could drive 62 million people in South Asia into extreme poverty by 2030; floods alone could cost an estimated US\$ 215 billion annually by 2030, also according to the World Bank⁹.

Too much—and too little—water

South Asia faces urgent and daunting water challenges due to climate change's serious effects on the region's water systems. Changes in seasonal precipitation patterns and more extreme weather events will lead to increased frequency of both water scarcity and flooding, and will reduce water quality and increase water pollution¹⁰. In coastal and deltaic regions, these problems will be exacerbated by sea-level rise and storm surges. The coastal zones and deltas of South Asia are also the geographies that combine high population density with intense economic activity. This will trigger significant migration, risking social instability.



Picture: Sudipta Das/iStock



Picture: Bartosz Hadyaniak/iStock

Inability to manage water poses severe risks to a country's growth and its ability to ensure the welfare of its citizens, because water is a critical determinant of the quality and quantity of ecosystem services¹¹. Without large-scale, comprehensive adaptation measures, GDP per capita losses in the South Asian deltas are predicted to reach between 9 percent and 19.5 percent, with larger economic losses in areas with greater economic activity, such as Bangladesh.

Extreme weather causes storm surges and rising seas that lead to flooding. But it also causes water scarcity, when large volumes of flood water carry chemical fertilizer with them to contaminate rivers, canals, and reservoirs, reducing the amount of safe fresh water. Rising sea levels can cause salt-water contamination, preventing fields from being cultivated.

Highly populated coastal and delta regions are particularly at risk. Indeed, Bangladesh, which is flat and low-lying, and has a highly dense population significantly dependent on agriculture, is likely to be the worst affected by climate change¹². Its sea level, temperature, and water evaporation are increasing, and the changes in precipitation and cross-boundary river flows are already causing drainage congestion. There is less fresh water, and the country is experiencing increasing flooding.

A sea-level rise of 45 centimeters by 2100 would flood almost 11 percent of Bangladesh's territory. One-in-seven Bangladeshis could be displaced by 2050, with up to 18 million people having to move due to rising sea levels alone¹³. The encroachment of salt water could extend up to 100 kilometers inland and affect fresh-water resources, which are vital to the livelihoods of many more millions in rural areas¹⁴.

REGIONAL OVERVIEW: SOUTH ASIA

Drought is a key issue in other areas where people are unable to grow enough crops due to lack of good-quality water. Afghanistan, where the worst drought in a decade has displaced an estimated 260,000 people, has been struggling with the acute consequences of climate change and 40 years of war that have taken a toll on the country's water infrastructure. In a land where agriculture contributes between 20 and 40 percent of GDP, and employs about 60 percent of the workforce, lack of investment has been disastrous.

For India, the largest economy in South Asia, water security is also a major challenge. India has 18 percent of the world's population, but only 4 percent

of global renewable water resources. Parts of the country are already considered water scarce as a result of groundwater pollution from mining, industry and agriculture, erratic monsoons, and three major droughts in the past decade, while other parts of the country have floods and saline water due to sea-level rise. Increased claims from a growing population on this fragile and finite resource, coupled with the effects of climate change, pose risks to health, livelihoods, and food security¹⁵.

The table below shows the different risks that some South Asian countries experience in relation to water resilience, access and safety¹⁶.

RANKING OF CLIMATE-RELATED RISKS

Risk level	Countries						
	Afghanistan	Bangladesh	Bhutan	India	Nepal	Pakistan	Sri Lanka
High risk level	Flash flood Landslide Riverine flood	Riverine flood Storm/cyclone Coastal flood Siltation	Landslide Flash flood Glacial lake outburst flood (GLOF)	Drought Riverine flood Flash flood Groundwater depletion	GLOF Flash flood Landslide	Drought Groundwater depletion Landslide	Storm/cyclone Riverine flood Coastal flood
Medium risk level	Drought Erosion/siltation Groundwater depletion	Erosion Drought Groundwater depletion Coastal aquifer salinization	Erosion/siltation Riverine flood Drought	Landslide Storm/cyclone Coastal aquifer salinization	Drought Erosion/siltation Groundwater depletion	Riverine flood GLOF Flash flood Erosion/siltation Groundwater salinization	Flash flood Landslide Erosion/siltation Drought Coastal aquifer salinization
Low risk level	GLOF Storm/cyclone	Flash flood Landslide	Storm/cyclone Groundwater depletion	GLOF Erosion/siltation	Riverine flood Storm/cyclone	Coastal flood Storm/cyclone	Groundwater depletion

SOURCE: [HTTPS://RELIEFWEB.INT/SITES/RELIEFWEB.INT/FILES/RESOURCES/124894-WP-P153431-PUBLIC-CLIMATE-CHANGE-AND-WRM-SUMMARY-REPORT-FINAL-WEB-VERSION.PDF](https://reliefweb.int/sites/reliefweb.int/files/resources/124894-WP-P153431-PUBLIC-CLIMATE-CHANGE-AND-WRM-SUMMARY-REPORT-FINAL-WEB-VERSION.PDF)



Picture: f9photos/iStock

An increasingly complex issue in these countries is urban water security, which is compounded by challenges arising from water pollution and solid waste management¹⁷. South Asia is home to some of the world’s largest megacities, such as Delhi in India and Dhaka in Bangladesh, as well as fast-growing secondary cities, such as Kandy in Sri Lanka and Khulna, also in Bangladesh. These often have unreliable and unsafe water supplies and are exposed to flooding because of inadequate infrastructure and poor building construction¹⁸.

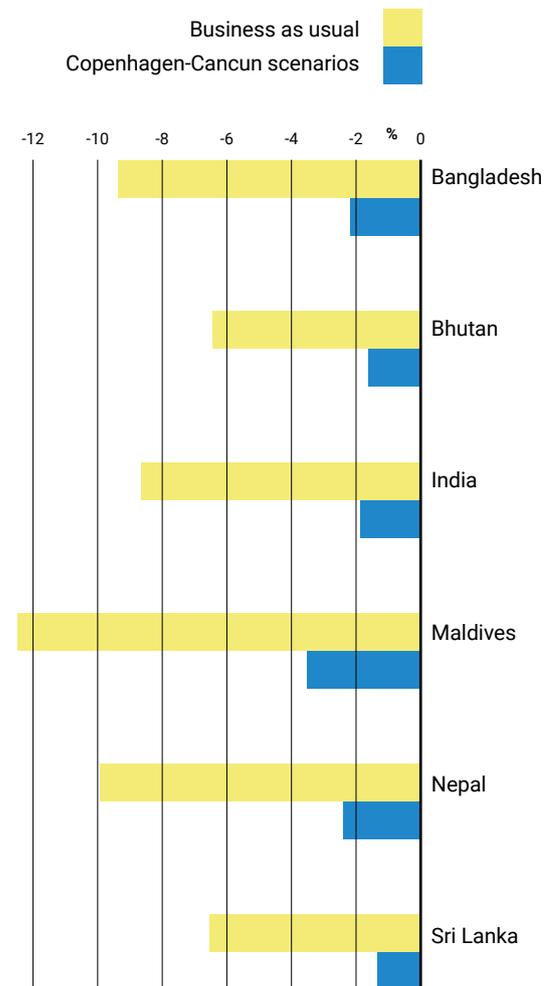
Economic costs

Under a business-as-usual scenario, South Asia could lose nearly 2 percent of GDP by 2050, rising to a loss of nearly 9 percent by 2100. The impact on members of the South Asian Association for Regional Cooperation (SAARC) are particularly notable. The Maldives looks set to be hardest hit, while Bangladesh, Bhutan, India, Nepal, and Sri Lanka are projected to face respectively a 2 percent, 1.4 percent, 1.8 percent, 2.2 percent, and 1.2 percent loss of annual GDP by 2050.

The impact of climate change will be compounded by Covid-19, which has sent South Asia into slower growth or recession. The region needs to provide average adaptation expenditure of 0.48 percent of GDP per annum or US\$ 40 billion by 2050, and 0.86 percent of GDP per annum or US\$ 73 billion by 2100¹⁹. However, an annual average of only US\$ 2 billion in adaptation investment was made in the region across 2015-16, as tracked by the Climate Policy Initiative for the GCA²⁰.

MEAN ECONOMIC COST OF CLIMATE CHANGE

Percentage of projected GDP in South Asia, 2100



SOURCE: ASSESSING THE COSTS OF CLIMATE CHANGE AND ADAPTATION IN SOUTH ASIA, ASIAN DEVELOPMENT BANK, 2014. WWW.ADB.ORG/SITES/DEFAULT/FILES/PUBLICATION/42811/ASSESSING-COSTS-CLIMATE-CHANGE-AND-ADAPTATION-SOUTH-ASIA.PDF

REGIONAL OVERVIEW: SOUTH ASIA

Key Actors and Best Practices

Making use of nature

One way to help make areas more resilient to climate change, and at the same time boost economic growth, is to draw on solutions from nature. Protecting and restoring green ecosystems, such as forests and wetlands, can harness the power of

nature to complement gray infrastructure, such as dams and seawalls. Furthermore, green measures often have lower costs than human-made solutions.

One example in Bangladesh involves reforesting coastal greenbelts while developing floating vegetable farms and fish cultivation (see case study, below)²¹.

Planting mangroves under the ICBA-AR Project in Bangladesh



Picture: UNDP Bangladesh

MANGROVE RESTORATION LEADS TO GREATER RESILIENCE

The Integrating Community-Based Adaptation into Afforestation and Reforestation (ICBA-AR) project in the Bay of Bengal, Bangladesh, was initiated by the United Nations Development Programme in 2015. It aims to reduce the climate vulnerability of communities and increase species diversification. Coastal greenbelts are restored with mangrove forests, and floating vegetable gardens and fisheries are being developed.

The project has three aims. To:

Increase the resilience of local communities through diversification of livelihoods and species within coastal greenbelts

Strengthen community involvement in, and ownership of, forestry-based adaptation and climate-risk reduction activities

Protect communal livelihood assets from extreme weather events

The initiative was introduced a year after Cyclone Sidr in 2007, prompting Bangladesh to shift its focus from disaster-risk reduction to climate adaptation. In 2010, the Bangladesh Climate Change Trust Fund and Bangladesh Climate Change Resilience Fund were established to provide finance to community-based afforestation and environmental infrastructure projects, among others. The Bangladesh Forest Department gives technical and implementation support to such community-based initiatives.

Colombo, in Sri Lanka, has suffered severe flooding as the city's growth has led to the loss of natural wetlands that used to retain storm water. Thanks to the Metro Colombo Urban Development Project, approved by the World Bank in 2012, the use of green wetland protection and more traditional riverbank walls has helped reduce flood risks, improve drainage, and create parks. The project benefits 2.5 million people and enhances ecosystems²².

There is a huge potential economic dividend to such activities. Every \$1 invested in nature-based solutions can yield \$10 of benefits²³, while the total lifecycle cost of infrastructure is significantly reduced. However, too many of these types of solutions are still at the pilot stage. They need to be expanded and routinely incorporated into the planning, design, and implementation of projects.

Local action for local needs

Local action on adaptation is well advanced when it comes to South Asia's adaptation practices, compared with other parts of the world. For instance, Nepal is a global pioneer with its Local Adaptation Plan of Action (LAPA) framework. This includes systems to monitor whether a dam built in one area will impact fields in another²⁴. Meanwhile, Pakistan's community-led, early-warning systems alert people to prepare for river floods.

South Asia also has many civil-society organizations that not only play a critical role in adaptation domestically, but have spread across the world. One example is Slum/Shack Dwellers International, a network of community-based organizations of the urban poor. It began in the slums of Mumbai, India, and has since spread to 32 countries²⁵. SDI combines action on housing, the upgrading of slums, sanitation, and tenure security in exchange for results on climate adaptation.

Harnessing youth and protecting women

The energy and innovation of South Asia's

youth are key resources to drive the region's adaptation efforts. With almost half of its population of 1.8 billion below the age of 24, mostly in India, Pakistan and Bangladesh, South Asia will have the largest youth labor force in the world until 2040²⁶. This offers tremendous opportunities for the next generation to reshape societies and make them more resilient.

Their adaptation efforts need to focus on the disproportional impacts that climate change has—not only on the poor, but also on women. Local initiatives can have a crucial impact. For example, the Jal Bhagirathi Foundation in Rajasthan, India, has introduced rainwater harvesting techniques that help ease the burden on women, who otherwise must walk up to four miles a day in intense heat to find safe drinking water²⁷.

However, although civil society is relatively well advanced in South Asia, groups often lack access to the finance and knowledge needed to drive real progress. Development partners could help access funds and improve governance to enable local adaptation action²⁸.

Challenges and Opportunities

Communities in South Asian countries vulnerable to climate effects are doubly trapped, first by socio-economic circumstances which mean they are unable to move elsewhere, and second by the fact that they are buffeted by successive natural disasters that often strike before they have had a chance to recover from the effects of the previous one.

To end this cycle, South Asian communities need to build greater resilience, adapt quickly, and adopt adaptation ambitious policies and strengthen planning.

With more extreme weather events likely, coastal and mountain soil erosion in South Asia will worsen over the next decades. The region's long and heavily settled coastlines are seriously threatened by sea-level rise.

REGIONAL OVERVIEW: SOUTH ASIA

As the region is home to some of the highest-populated deltas in the world, building resilience in these areas is particularly critical. This means focusing on their cities and surrounding watersheds, river basins, and coastal zones. Governance of water resources for different uses—agricultural, urban, industrial, and institutional—within countries and between countries could improve some of the extreme water security issues in the region.

Climate finance

It is estimated that US\$ 40 billion is needed annually in South Asia up until 2050 to adapt to climate change. Looking at the needs of individual countries, the total is likely to be higher. As of the latest estimate by the Asian Development Bank, US\$ 2 billion per year of adaptation finance flows to the region, making financial resources a key limiting factor in driving resilience²⁹. The table below from the ADB shows adaptation costs for different emission scenarios, indicating high investment needs in any pathway³⁰. To drive adaptation at the scale and pace needed, it is critical to make it attractive to the private sector.



ANNUAL AVERAGE ADAPTATION COST DURING 2010-50 FOR SOUTH ASIA

Policy scenario	Adaptation target	US\$ billion		GDP %	
		Annual average cost	Range	Annual average cost	Range
BAU ₁	2100 worst case (6.9°C, 1.1 m SLR)	110.9	51.2–198.0	1.32	0.64–2.29
BAU ₂	2100 (4.5°C, 0.70 m SLR)	72.6	33.1–127.8	0.86	0.42–1.46
BAU ₃	2050 (2.5°C, 0.30 m SLR)	40.2	18.3–71.5	0.48	0.23–0.81
C–C ₁	2100 (2.5°C, 0.55 m SLR)	40.6	18.8–71.4	0.48	0.24–0.82
C–C ₂	2050 (1.9°C, 0.30 m SLR)	31.0	14.2–54.5	0.36	0.18–0.62

BAU = business as usual, C–C = Copenhagen–Cancun, GDP = gross domestic product, m = meter, SLR = sea-level rise

SOURCE: ASSESSING THE COSTS OF CLIMATE CHANGE AND ADAPTATION IN SOUTH ASIA, ASIAN DEVELOPMENT BANK, 2014. WWW.ADB.ORG/SITES/DEFAULT/FILES/PUBLICATION/42811/ASSESSING-COSTS-CLIMATE-CHANGE-AND-ADAPTATION-SOUTH-ASIA.PDF



Flood risk reduction in Nepal

Picture: UNDP Bangladesh

Key Recommendations

Expand climate-change adaptation-related good practice across the region and globally. Countries in South Asia have some of the largest at-scale interventions in all aspects of adaptation, including disaster-risk reduction, nature-based solutions, and community and locally-led action. Knowledge-sharing, including of these solutions with other countries in the region and beyond, would be an important step in strengthening adaptation responses. A particularly strong topic for knowledge-sharing is on the region's globally recognized civil-society actions for locally led adaptation actions such as in Bangladesh.

Drive large-scale and integrated water management. Climate change is threatening water security issues in the region in multiple dimensions, through disasters, floods and cyclones, droughts, and contamination of water sources. Addressing water security requires excellent co-operation among countries, organizations, and development partners to ensure that the political, technical, civil, and financial resources are aligned.

Combine nature-based solutions with infrastructure investments at scale to drive adaptation that enhances development and supports nature. South Asia requires significant infrastructure to meet the needs of its population and the business needs of its private sector. To sustain growth and deal with climate change, South Asia was in 2018 estimated by the Asian Development Bank to need to invest almost 9 percent of its GDP on infrastructure development over the period 2016-30, higher than most other sub-regions of Asia³¹.

Strengthen the business case for private-sector investment in adaptation. In South Asia, adaptation finance accounted on average for about 13 percent of total adaptation climate finance received in 2017 and 2018³². However, the private-sector portion of this and engagement by the sector are still relatively modest. Strengthening the business case for adaptation investment will enable increased private flows into climate adaptation investments.



Latin America & Caribbean



Climate events are the greatest threat to development gains in the region and could displace up to 17 million people by 2050

The most economically unequal region in the world, Latin America and the Caribbean (LAC) must manage climate-change effects that disproportionately affect the poorest people

Investment in adaptation is happening, but very little is coming from the private sector, which will have to do more if the region is to meet its goals

Measures including internalizing climate risk, increasing market transparency and adopting disclosure frameworks will spur financial markets toward greater action on adaptation

US\$13bn

Annual investment in resilient infrastructure needed by 2030



would deliver a net benefit of:

US\$700bn



Context and Key Climate Impacts

Climate events are the greatest threat to development gains in Latin America and the Caribbean (LAC), a region already struggling with inequality, displaced people and, in some countries, social unrest. Without action, GDP will fall and poverty increase.

The impacts of climate change in the region are already acute. In 2020, severe drought affected northern Argentina, Paraguay, and Brazil, causing an estimated US\$ 3 billion in agricultural losses. An extended and exceptionally active North Atlantic hurricane season, meanwhile, saw Hurricane Laura cause US\$ 14 billion in damages across the U.S., Haiti and the Dominican Republic, and Hurricane Eta wash away 53,000 hectares of cropland in Honduras and affect millions of people. Wildfires also affected much of South America and devastated the Pantanal—the world's largest wetlands¹.

The effects of events like these will continue to be significant. By 2050, 17 million



Each generation has its own challenges, but no generation has had such an urgent and formidable challenge as climate change and global warming

Sebastián Piñera

President of the Republic of Chile

people—2.6 percent of the population—could be displaced². The region could also lose 1.6 percent of GDP to climate events in the same timeframe, according to the OECD, without intervention. The table below summarizes the main impacts under different warming scenarios.

SUMMARY OF CLIMATE EFFECTS IN LAC SUB-REGIONS UNDER 1.5°C, 2°C, AND 3°C WARMING³

Effect	1.5°C	2°C	3°C
HIGHEST ANNUAL MAXIMUM TEMPERATURE			
Amazonia	+1.2	2	
Southern South America	1	1.6	+2.4
Central America	1	1.5	
WARM SPELL DURATION (DAYS)			
Amazonia	28	71	
Central America	22	45	
DROUGHT (MONTHS)			
Central America	+5	+8	+19
South America	+1	+3	+8
POPULATION EXPOSED TO WATER SCARCITY (MILLION)			
Amazon	+6	+6	
Central America	+6	+10	
Annual cases of dengue fever in LAC by 2050 (million)	+6	+6.7	+7.5

SOURCE: [HT T P S : / / I N T E R A C T I V E . C A R B O N B R I E F . O R G / I M P A C T S - C L I M A T E - C H A N G E - O N E - P O I N T - F I V E - D E G R E E S - T W O - D E G R E E S / ? U T M _ S O U R C E = W E B & U T M _ C A M P A I G N = R E D I R E C T](https://interactive.carbonbrief.org/impacts-climate-change-one-point-five-degrees-two-degrees/?utm_source=web&utm_campaign=redirect)

REGIONAL OVERVIEW: LATIN AMERICA & CARIBBEAN

This adds to the 1.7 percent of GDP already lost to climate-related disasters over the past two decades. Direct damage to energy and transport infrastructure has averaged US\$ 2 billion a year over the past decade⁴, and the annual loss to households and businesses could be as high as US\$ 95 billion.

The Caribbean has suffered particularly badly, with annual average losses of up to 3 percent of GDP. Grenada, the Bahamas, and the Dominican Republic have all endured hurricanes that caused insurance-declared losses greater than their annual GDP⁵.

Social challenges

Many estimates of climate damage underestimate the costs of water scarcity. Andean glaciers, which are significant water sources, are expected to disappear by the end of the century⁶. In the Amazon, runoff will be reduced in the southern basin and increased in the western basin in the wet season^{7,8}, threatening biodiversity, increasing forest fires, and causing forest degradation.

Droughts are estimated to contribute to a regional economic loss equivalent to 1 percent of GDP, mostly in agriculture and manufacturing⁹. This is a concern in a region that is a net export food producer and depends on agriculture for 10 percent of GDP and up to 40 percent of jobs¹⁰.

LAC is the most unequal region in the world¹¹, home to 14 of the 30 countries with the worst Gini coefficients for income equality¹². Climate change disproportionately affects lower-income communities and threatens the substantial progress in poverty reduction and increases in per capita income made in LAC over the past decade^{13,14}.

When Hurricane Mitch hit Honduras in 1998, it destroyed 18 percent of assets in the poorest 20 percent of the population, but only 3 percent for the richest¹⁵. Indigenous people, who



represent about 6.5 percent of the region's population, are most at risk from climate effects because of their higher levels of poverty and marginalization¹⁶.

Inequality makes the Covid-19 response more difficult. LAC countries make up six of the top 20 in Covid-19 cases per capita, and nine of the top 20 in deaths per capita. Economies in LAC could have contracted by up to 14 percent in 2020¹⁷, with the pandemic effect pushing a further 4.8 million people



Destruction from Hurricane Mitch in 1998, Savanna Bight village, Guanaja Bay Islands, Honduras

Picture: Robert_Ford/iStock

into poverty. Nine of the top 20 countries to suffer climate-related losses as a percentage of GDP are in LAC.

Amid these growing threats, several LAC countries have experienced social unrest. Chile, Colombia, and Ecuador have recently seen violent protests, despite decades of growth and poverty reduction. The combined impacts of the pandemic and climate change may increase social unrest in future years, further threatening economic and social wellbeing.



Picture: Villamilk/iStock

Key Actors and Best Practices

Given these impacts, it is not surprising that every country in the region has prioritized adaptation. In Costa Rica, for example, a landslide early-warning system was implemented after at least seven people were killed and hundreds evacuated in devastating landslides in 2002. Nine months later, when similar landslides occurred, aid agencies reported faster and more effective reaction from the community and emergency services¹⁸.

Increased resilience can have immediate and significant development benefits. In Santiago, Chile, for example, the local water provider invested US\$ 150 million in storage and source diversification to reduce the risk of service interruption from unseasonal rain in the Andes. In Ecuador, farmers are growing maize at higher altitudes in response to drier conditions, improving yields and boosting food security¹⁹. Finally, the Mexican government's CADENA program provides weather-indexed insurance to compensate for drought losses and boost the productivity of small-scale farmers²⁰.

REGIONAL OVERVIEW: LATIN AMERICA & CARIBBEAN

Reduced social inequality is another benefit for LAC. In Peru, where 41 percent of the Amazon region population is poor, a climate mitigation and adaptation strategy seeks to clearly assign land-use rights for primary forest land, improving participation of native communities in conservation and sustainable forest management.

Community-based approaches to integrated landscape management and reduced water availability risks are being promoted in Mexico through multi-agency actions addressing forestry, water, and environmental issues (see case study, below).

Challenges and Opportunities

Investment in resilient energy, water, and transportation infrastructure is a huge opportunity for LAC. The World Bank estimates that this would cost up to US\$ 13 billion per year until 2030, with 3 percent incremental costs compared to non-resilient infrastructure, but would deliver a net benefit of US\$ 700 billion—a four-to-one benefit-to-cost ratio. Delaying these investments would cost US\$ 16 billion a year in infrastructure damage and loss of economic activity²¹.



Picture: Joseph Sorrentino/iStock

ENABLING GOVERNMENT AT ALL LEVELS TO ENGAGE ON ADAPTATION IN MEXICO

The P'urhépecha people of western Mexico are a marginalized population living in poverty and vulnerable to climate change. The Inter-communal Integral Intervention in the P'urhépecha Valley project will integrate water, environment, and forest management agencies to develop an inter-institutional strategy for the valley. The project is part of Mexico's 2013 National Climate Change Strategy, which gives government at all levels a leading role in formulating, regulating, and implementing mitigation and adaptation actions.

The aim is for stakeholders and institutions to collaborate and create greater resilience in areas including water availability, forest restoration, and the establishment of a forest fire brigade. Financial mechanisms tailored to local needs will fund environmental services and compensate for environmental damage. New strategies will help create livelihoods for locals, such as in community forest management for indigenous people. The project contributes to NDC goals on watershed reforestation, with special attention to riparian zones, and to multiple SDGs, including water and sanitation, life on land, and climate action.



Picture: Nicolas Heredia, Greenpeace

BOATS, DRONES, AND WEATHER STATIONS FOR WETLAND CONSERVATION IN ARGENTINA

Argentina's Paraná Delta is a mosaic of heterogeneous wetland systems covering more than 20,000 square kilometers that has long been neglected despite being close to major cities. In recent years, rapid land-use changes and more erratic rainfall patterns have caused more frequent and severe droughts, which in turn have led to an increase in both the number and severity of wildfires.

A 'conservation lighthouse' project uses local inhabitants as 'Delta guardians' to improve their socio-economic situation while tackling wetland conservation. They have access to technical personnel, as well as to boats, drones, weather stations, and environmental monitoring equipment to help manage the delta. The program links communities, civil-society organizations and different jurisdictions to overcome longstanding obstacles to co-operation and help Argentina meet its NDC commitments.

Finance is a challenge in most of the region. Climate-mitigation activities, including forest protection and reforestation, have received US\$ 3.2 billion from multilateral climate funds—six times as much as adaptation (US\$ 500 million), with the largest contribution coming from the Green Climate Fund²². MDBs have provided substantial amounts of climate finance for LAC. In 2019, US\$ 3.65 billion was provided by the World Bank for adaptation²³, and US\$ 4.85 billion for mitigation.

However, this funding came with virtually no private co-financing. Public investment can cover only around one-quarter of the US\$ 77 billion LAC countries must spend by 2030 to meet their climate change goals²⁴. The rest will have to come from private-sector investors.

There has been modest progress in climate risk financing. A recent survey among 78 LAC financial institutions, which together hold 54 percent of the total assets managed by the region's banking sector, revealed that 38 percent incorporate climate-change guidelines

REGIONAL OVERVIEW: LATIN AMERICA & CARIBBEAN

in their strategy, and 24 percent have a policy on climate risk evaluation and disclosure²⁵.

Green bonds are becoming an important source of sustainable finance for several LAC countries. During 2019, the region issued close to US\$ 5 billion in green bonds, bringing the overall historic total to US\$ 13.6 billion. Even so, these bonds account for just 2 percent of the global green bond market.

With the exception of some countries, such as Mexico and Chile, most Covid-19 recovery packages prepared by LAC governments are broadly not addressing structural climate risks. Chile announced a US\$ 4.5 billion infrastructure recovery package, with 30 percent dedicated to adaptation and mitigation projects prioritized according to their recent net zero emission NDC²⁶. These include investment in water infrastructure, irrigation, rural water sanitation, desalination plants, and renewable energy²⁷.

This will be a decisive decade, which will determine whether we can manage climate change and make LAC communities safer. The region has a historic opportunity to recover from this economic crisis by addressing social inequities through the policy framework of a green and resilient economic recovery.

Recommendations

Reduce inequality as part of a resilient recovery.

Covid-19 and climate change will increase poverty, and people in poverty will suffer more from climate-change effects. Recovery and climate adaptation efforts in LAC need to address this. In the short term, emergency employment programs should be inclusive and focus on lower-income workers, women, and indigenous and migrant communities. Cash transfer programs should be designed for climate emergencies and target the most marginalized.

Include in stimulus package actions to close infrastructure gaps and meet the SDGs with projects that create jobs.

LAC has the resourcefulness to create a resilient recovery that will reduce inequality and create jobs. Employment programs can help restore damaged or destroyed ecosystems, including through reforestation, landscape protection, and soil and water conservation.





Devastated rainforest near Jurua river, state of Amazonas, Brazil

Picture: Joerg Boethling/Alamy

Invest in resilient infrastructure and reap the benefits of protecting the paybacks they produce. As part of their recovery packages, many LAC countries are planning infrastructure spending, but these must contribute to addressing adaptation challenges, unlocking the triple-dividend benefits of avoided losses, positive economic gains, and social and environmental benefits.

Leverage the financial system to mobilize private capital toward resilience. Increasing the proportion of global finance spent on adaptation is a more acute challenge for LAC countries, whose governments face a structural fiscal imbalance which is being worsened by Covid-19. Governments need to strengthen national development finance institutions to increase their capacity and effectiveness. LAC needs to help mobilize financial markets toward adaptation by internalizing risk, increasing transparency, and adopting disclosure frameworks. Governments should prepare a pipeline of adaptation projects to be prioritized for investment and provide information to investors about projects matching their ESG priorities. Governments should also explore new instruments for climate action financing such as ‘debt-for-climate’ swaps or greater use of climate bonds.

Accelerate the development of nature-based solutions and of green resilient infrastructure. Nature-based solutions should be central to a resilient recovery. The UN Convention on Biological Diversity’s 2030 target to conserve 30 percent of the earth will contribute to a healthier, wealthier, more resilient planet. LAC countries stand out for their rich biodiversity and they can be global leaders in nature-based projects with a portfolio of large bankable projects.

Improve governance and public policies aligned with strengthening resilience and addressing structural challenges. Countries need stronger economic institutions to better assess the challenges created by the pandemic and implement structural reforms for tackling inequality, taking action on climate and leveraging digitalization.



Middle East & North Africa

GETTING HOTTER

The region is projected to experience an average temperature increase of 4.8°C by the end of the century

MOROCCO

TUNISIA

ALGERIA

LIBYA

MAURITANIA

60%

of the MENA population lives in areas of high water stress

66%

of the MENA's freshwater resources cross one or more international boundaries

Climate adaptation is a priority for all countries in the region and is paving the way for regional co-operation on data sharing and best practices

A future of acute water stress requires an integrated approach to address the needs of growing urban populations and more sustainable agricultural practices. In particular, governments need to accelerate implementation of transformative adaptation strategies and investment plans to raise agricultural productivity and increase water efficiency

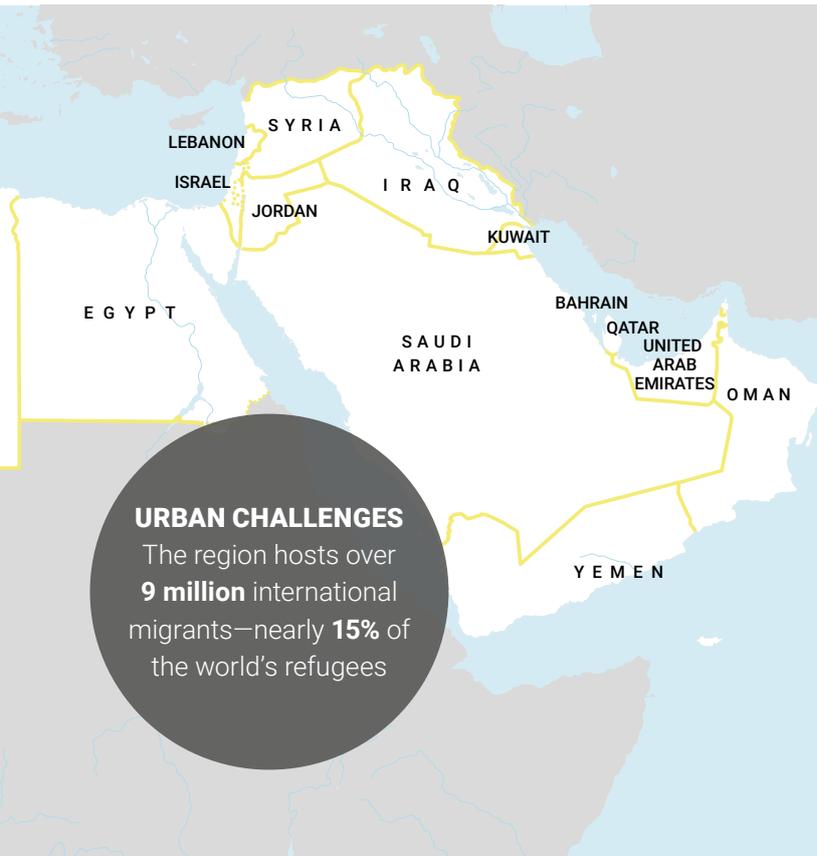
Climate finance and securing resources for climate-resilient recovery are lacking in quantity and quality, and are easy victims at a time of fiscal pressures. Countries need to get better at costing their adaptation needs and identifying bankable projects to leverage private-sector participation in adaptation



*The Arab region is taking action to reduce emissions. However... adaptation is our priority and more support is needed**

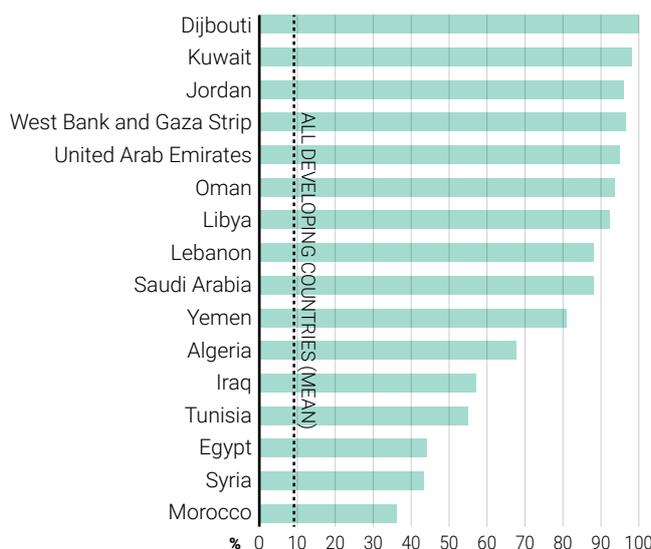
Rola Dashti

Executive Secretary, United Nations Economic and Social Commission for Western Asia



FOOD INSECURITY

The MENA is the highest food-importing region in the world. **Cereal Imports Dependency %**



SOURCE: FAO STAT SEP. 2016

*Dr. Rola Dashti, Under Secretary-General and Executive Secretary, Economic and Social Commission for Western Asia, opening remarks to the 2019 Forum of the Standing Committee on Finance on Climate Finance and Sustainable Cities (Beirut, 12 September 2019)

Context and Key Climate Impacts

Climate adaptation in the Middle East and North Africa is all about water: managing it, conserving it, improving access to it, co-operating over it, and planning for a future of even greater water scarcity and stress.

The 21 countries of the MENA region include 12 of the driest and most water-stressed countries in the world. About 60 percent of the region's population lives in areas of high water stress, compared to the global average of 35 percent.

The MENA is a hotspot for future temperature changes due to its arid environmental conditions. Regional climate projections show that average temperature is expected to rise by 3.2°C to 4.8°C under the business-as-usual scenario by the end of the 21st century¹. This is expected to be further amplified by reductions in rainfall in large parts of the region and the associated depletion of soil moisture. Extended periods of heat combined with increased sandstorms and longer drought periods could make parts of the region uninhabitable² in the

REGIONAL OVERVIEW: MENA

absence of adequate adaptation, while placing significant strains on already scarce water resources and agricultural productivity. In tandem, more extreme and intensive rainfall events are straining both the built and natural environment, and increasing loss and damage caused by flash floods³.

Water scarcity, climate change and their inter-connection with conflicts in the region have been referred to as a 'confluence of crises'⁴. At times, reduced access to water is both a cause and effect of conflict and displacement^{5 6}.

A vital resource for prosperity and regional peace

Population growth and rapid urbanization are tipping countries further into extreme stress. Aquifers are over-pumped, water quality is deteriorating, and water supply is often rationed—with consequences for human health, agricultural productivity, urban businesses, and the environment.

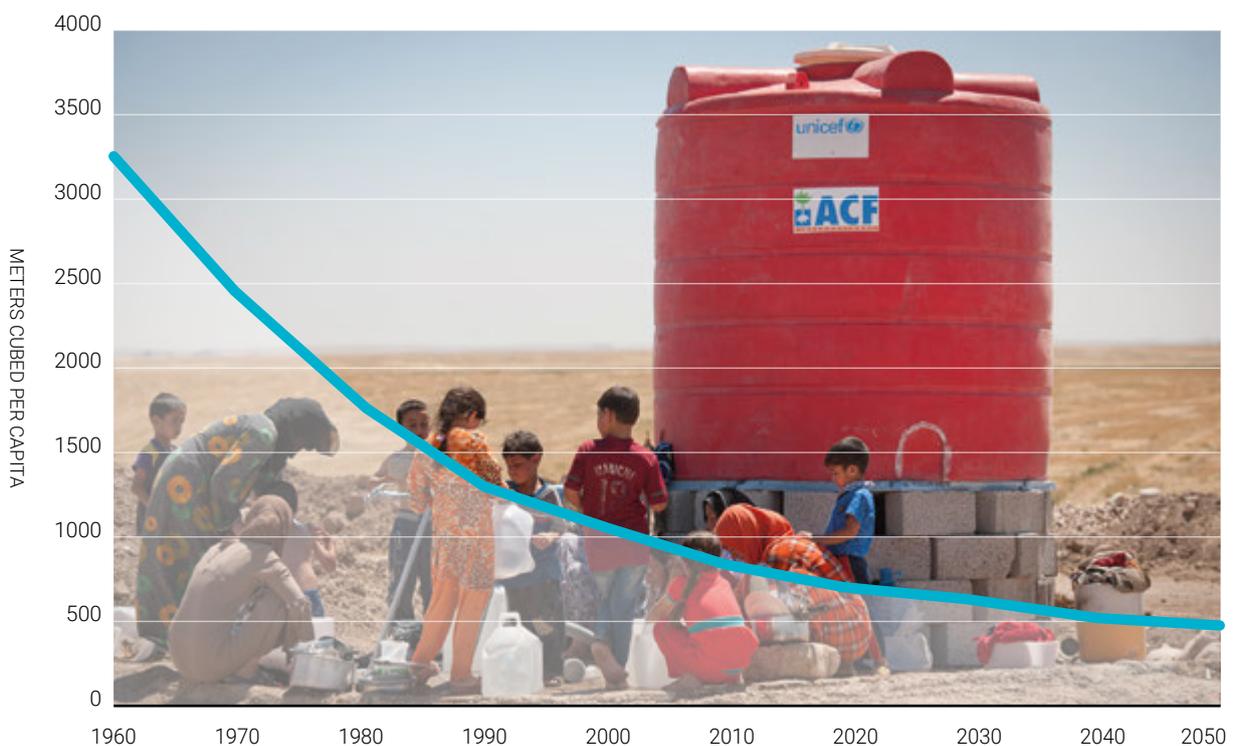
Improving the management of and access to water resources in the region has been linked to

greater social equality and prosperity. Insufficient availability and access to water has often led to conflict, migration, unemployment, and violations of the human rights to water and sanitation. Insufficient investment has also increased water use inefficiencies.

Climate change is complicating matters further: the World Bank estimates that the region's GDP could fall by 6-14 percent by 2050 as a result of economic losses stemming from climate-related water scarcity⁷. At present, 70 percent of the MENA's GDP is generated in water-stressed areas, compared to a global average of 22 percent.

Additionally, two-thirds of the MENA's freshwater resources cross one or more international boundaries, making regional co-operation on water management a top priority for peace and security. Strengthening transboundary water co-operation, particularly with a view to developing shared data systems among upstream and downstream users, can be a vital bulwark against the threat of conflict being sparked by rising water stress.

TREND IN FRESHWATER RESOURCES PER CAPITA IN ARAB COUNTRIES



Source: Abdul-Karim Sadik, Mahmoud El-Solh, and Najib Saab, eds., Arab Environment 7: Food Security Challenges and Prospects (Beirut: Arab Forum for Environment and Development, 2014).

Picture: Claudiad/iStock

The most water-stressed region in the world

Maps show mean change in annual temperature (°C) / CDD (days/yr) / (mm/month) for mid- and end-century for ensemble of three RCP 4.5 and RCP 8.5 projections compared to the reference period.

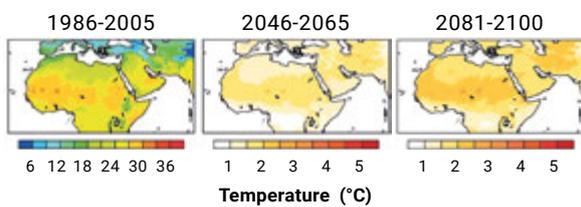
RCP 4.5 generally describes a moderate-case scenario.

RCP 8.5 corresponds to a high-emissions or “business-as-usual” scenario.

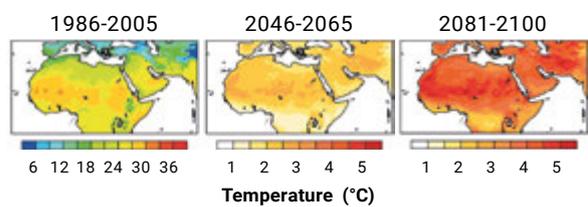
The temperature in the MENA region is increasing and is expected to continue to increase until the end of the century.

TEMPERATURE

RCP 4.5

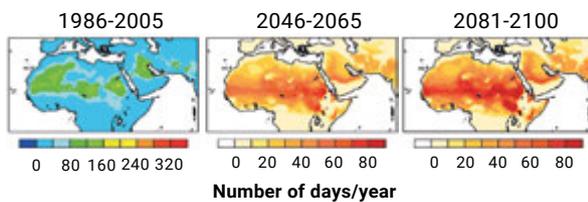


RCP 8.5

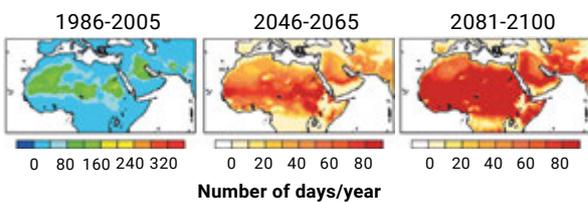


VERY HOT DAYS (SU40)

RCP 4.5



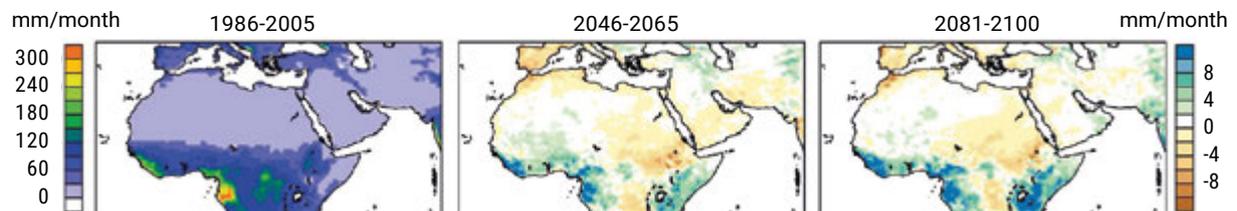
RCP 8.5



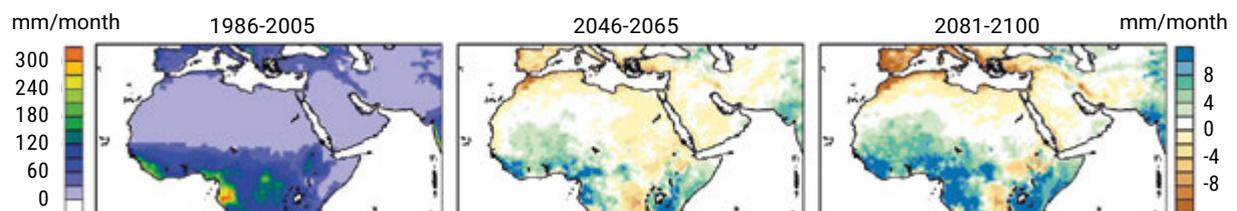
Precipitation trends are largely decreasing across the MENA region until the end of the century, although limited areas are expected to exhibit an increase in the intensity and volume of precipitation.

PRECIPITATION

RCP 4.5



RCP 8.5



Source: RICCAR Arab Climate Change Assessment Report

REGIONAL OVERVIEW: MENA

Food security

In addition to being the most water-stressed region in the world, MENA countries are the most dependent on food imports, with countries such as Djibouti, Kuwait, and Jordan importing close to 100 percent of their cereal needs, compared with less than 10 percent for developing countries as a whole. Nearly 50 million people in the Arab region report experiencing severe food insecurity, with both the prevalence of undernourishment and food insecurity higher than the global averages⁸. Most countries in the region have not pursued transformative adaptation as a goal of structural development policies. Instead, sector-specific interventions have been pursued, such as those focused on providing support for cereal production and staple food subsidy policies. While these policies have contributed to improving food security, they have showed agricultural transformative adaptation is possible through appropriate technology transfer, stronger value chains, climate-smart agriculture, and capacity building.

Outmoded food production systems exacerbate the region's food insecurity. Agriculture is highly water intensive and reliant on rain-fed systems, accounting for 85 percent of water consumption in the MENA⁹. Prioritizing climate adaptation and efficient water use in the agricultural sector is therefore the key to improving food security in the region.

Despite the enormous challenges, there is huge potential for improving the region's water and food security by improving water management and reducing wasteful consumption. This would entail reducing consumption pressures on the available supply by introducing effective demand management techniques and reducing water losses in all sectors substantially. For example, the average irrigation efficiency in the MENA is only about 51 percent. It is estimated that raising this rate to 70 percent would save 50 billion cubic meters of the region's water annually and allow it to produce an additional 30 million tons of cereals—45 percent of its cereal imports in 2011¹⁰. Ramping up food production in response to trade restrictions during the Covid-19 pandemic, particularly on cereal exports, is also placing further pressures on water resources¹¹.



Pictures: miralex/iStock



Pictures: NicVW/iStock



Atmeh refugee camp, Syria

Picture: News Cameraman Video Journalist/iStock



Picture: Joel Carillet/iStock

Livable cities and more equal societies

Sixty-eight percent of the populations of Arab countries will live in cities by 2050¹². The rapid growth of urban centers, particularly on the coast, is intensifying water and food insecurity in the region, in addition to rising levels of poverty, inequality, unemployment, and informal settlements.

Furthermore, the region hosts nearly 15 percent of the world's refugees—over 9 million¹³—and international migrants, the majority of whom have settled in cities or urban peripheries, placing further burdens on urban systems.

The outbreak of Covid-19 has added an additional layer of complexity: it is difficult to promote frequent handwashing, the simplest

protection against the coronavirus, in areas where water is rationed or otherwise scarce.

The pandemic also laid bare inherent structural inequalities in the Arab region, disproportionately affecting vulnerable communities such as daily wage earners, refugees, the elderly, women, and people who live under occupation and in war zones. Poverty levels have soared and now affect 115 million people, or one-quarter of the total Arab population¹⁴. Adding to that, the International Labour Organization (ILO) estimated that 17 million full-time jobs will have been lost to the end of 2020 in the MENA. Covid-19 has increased the number of people who are vulnerable to climate impacts, and this will need to be addressed when planning for climate adaptation if no one is to be left behind.

REGIONAL OVERVIEW: MENA

Key Actors and Best Practices

Climate adaptation identified as a priority

Regional understanding of climate-change impacts and adaptation techniques is improving. Eighteen out of the 22 Arab countries¹⁵ identify climate adaptation as a priority, according to the United Nations Framework Convention on Climate Change (UNFCCC)'s regional assessment for the MENA region. Adaptation investment needs for water and food security and the protection of coastal zones are estimated at US\$ 7.7 billion, US\$ 6.9 billion and US\$ 2.2 billion respectively, based on the estimations of seven Arab states. Wastewater reuse, desalination, and water harvesting were flagged as critical adaptation interventions in the water sector. For food security, the priorities were crop diversification, early-warning systems, and efficient irrigation¹⁶.

With water at the heart of development and security challenges, investment in the sector should be significant. But development funding for water in the MENA has been declining. Since 2006, it has been the only region to witness significant declines in water expenditure, receiving less than half of the funds destined for Sub-Saharan Africa and Far East Asia in 2013¹⁷. Furthermore, the approach to water management in the region has been largely supply-led and implemented through a siloed approach, with a main focus on access and infrastructure. Resilience interventions, such as water harvesting and drip irrigation, need further expansion.

Taking all aspects of adaptation into account, and with only 1.5 percent of the world's renewable freshwater supply, the MENA received only 6 percent of global funding for adaptation in 2017-18, or about US\$ 1.7 billion a year, according to a joint study by the GCA and the Climate Policy Initiative¹⁸.

Adaptation trends in the region remain diverse. Examples include building the resilience of agro-pastoralists to drought and

shifting growing seasons through new crop varieties and seasonal forecasts; pursuing investments in non-conventional water resources to offset water scarcity, such as through treated wastewater reuse and the use of renewable energy for desalination; and disaster risk-reduction initiatives, such as reducing vulnerabilities of coastal communities from storm surges and sea-level rise. It also includes greenification and land-use reclamation projects that are trying to combat sand and dust storms.

Regional strategies driving climate adaptation action include the Arab Water Security Strategy and the Arab Strategy for Disaster Risk Reduction. Key actors include the Arab Ministerial Water Council, the Council of Arab Ministers Responsible for the Environment, and the Gulf Cooperation Council.

Progress in water resilience

In spite of the shortcomings described above, positive adaptation innovations are already taking place in the MENA.

In Morocco, nationwide efforts to improve groundwater management have included the introduction of wastewater use, seawater desalination, and the replenishment of aquifers. These have restored groundwater imbalances or, at least, mitigated the growing deficits. Such plans may save water for future generations and sustain crop production¹⁹.

Jordan is getting the private sector involved in funding projects for recycling wastewater and enhancing supply through desalination.

Saudi Arabia is pursuing reforms to reduce untargeted subsidies and enhancing the role of private operation in support of public interest outcomes.

Egypt is strengthening local accountability for water supply and sanitation services—particularly in under-served rural areas.



Picture: redtea/iStock

BUILDING RESILIENCE AND SKILLS IN THE NILE DELTA

A project, implemented by the United Nations Development Programme (UNDP), addressed the vulnerability of the Nile Delta's coastal areas to increasing sea-level rise and damage due to coastal flooding. The project included a series of institutional and regulatory interventions, the implementation of low-cost adaptation solutions, and the development of knowledge management systems. For example, it introduced the concept of integrated coastal zone management to local authorities and stakeholders.

The process was highly inclusive and locally led, engaging local communities, farmers, and fishermen in the design and monitoring of solutions. Shoreline protection was established through the construction of different types of low-cost dike systems, of which one type was inspired by indigenous knowledge of native plants, used as fences that accumulate sand to form artificial dunes for protection²¹. The project also established a National Observation System to monitor marine parameters such as sea-level and wave data.

The interventions were tested in 2017 as winter storms hit the delta's coastal areas, after which the Egyptian government expressed great interest in replicating this project in other parts of the country. New technologies using remote sensing and earth observations are building on this project to update and climate-proof disaster risk-reduction efforts.

REGIONAL OVERVIEW: MENA



Picture: gorsh13/iStock

REGIONAL PLATFORM LEADS TO ENHANCED CLIMATE ACTION

The Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region (RICCAR), launched in 2009, provides a common platform for addressing the implications of climate-change impacts for water and water-dependent sectors.

Based on a regional consultative process involving governments, experts and RICCAR's 11 partner organizations, the initiative conducted assessments that informed planning and projects in relation to five priority sectors for co-operation in climate action, namely:

- 1** Water availability
- 2** Biodiversity and ecosystems, including forests and wetlands
- 3** Agriculture, including water available for crops, and water available for livestock
- 4** Infrastructure and human settlements, focused on inland flooding
- 5** People, including water available for drinking, health conditions due to heat stress, and agricultural employment²⁰

Challenges and Opportunities

Institutions

Despite RICCAR and other incipient co-operation projects, institutions in the MENA need to enhance their capabilities to address and respond to climate impacts and implement adaptation solutions. The design of adaptation projects in the region must therefore consider ways to overcome institutional, financial, technological, and informational barriers impeding transformative adaptation efforts. A multi-sectoral approach will facilitate the integration of adaptation into development plans, annual budgets, and policies.

Capacity building

Despite progress to improve understanding of climate-change impacts, awareness of climate risks and ways of building resilience remain poor in the region. Climate adaptation has largely remained in the realm of the environmental sector, with slow but increasing engagement by the water and agricultural sectors. More effort is needed to mainstream national and sectoral climate-change development planning through costing, mapping, and climate-proofing

exercises to mobilize policy-makers and partners to pursue climate adaptation as a core component of green recovery and development efforts.

Climate finance

Adaptation finance globally reached \$30 billion in 2017-18. As indicated earlier, the MENA region received just 6 percent of global climate finance flows despite suffering significant water scarcity. There is no indication that climate finance flows to the region have improved since the 2015 Paris Agreement. Moreover, climate funding is not only skewed toward mitigation, which receives four times more than adaptation, but it also benefits only a handful of Arab states. According to the OECD and ESCWA, over 92 percent of the flows between 2013 and 2018 have gone to Egypt, Iraq, Jordan, Lebanon, Morocco, and Tunisia, with roughly 60 percent to Egypt and Morocco alone. Meanwhile, the least-developed Arab countries, including Djibouti, Mauritania, Somalia, Sudan and Yemen, received only 4.3 percent of the climate finance support provided to the region^{22 23}.

RICCAR has been successful in building a regional platform on climate assessment and adaptation through:

Regional climate modeling, hydrological modeling, and vulnerability assessment. RICCAR provides a comprehensive set of regional projections based on a validated MENA Domain and an integrated assessment of vulnerability hotspots that is being used to provide a scientific basis for priority-setting, policy-making, and project preparation on regional and transboundary issues.

Agricultural modeling for adaptation. RICCAR projections are informing agricultural productivity analysis that forecasts the impact of climate change on

agricultural output of strategic crops, such as wheat and sorghum. Supplemental irrigation schedules and sowing seasons are among the adaptation measures being pursued in response to changes in seasons and crop growing cycles resulting from climate change.

Open-access datasets. The RICCAR Regional Knowledge Hub and Data Portal provides a shared understanding of climate impacts and vulnerabilities in the MENA region, as well as access to modeling inputs and outputs that are informing further analysis at different scales of analysis.

This common understanding of regional climate-change challenges has informed regional strategies and actions and led Arab states to mandate the establishment of the Arab Center for Climate Change Policies at the UN's Economic and Social Commission for Western Asia in 2018. The center provides technical, advisory and capacity-building support to member states on climate-change assessment, adaptation, mitigation, negotiations, integrated development planning, and finance. This example of regional co-operation informing the science-policy interface could be easily replicated in other parts of the world.

Roughly three-quarters of Arab states have been able to secure Green Climate Fund (GCF) readiness support, but there have only been 13 approved GCF projects to Arab states since the first one in 2015 through to 2019. A mere five of those focus solely on adaptation, while five others are cross-cutting projects pursuing both mitigation and adaptation objectives.

Regional crises and conflicts have also affected the ability of countries to access climate finance for adaptation, with international public climate finance flows to some countries stymied by civil unrest or sanctions. More grant support is also needed to ensure that the quantity and quality of climate finance improves²⁴.

Greater efforts are needed to mobilize and integrate external climate funds into national budgets, as well as ways to manage the variability in flows in planning cycles²⁵. Funding needs to be directed toward climate-resilient and sustainable projects, with multilateral development banks increasingly aiming to formulate policies to allow this. Examples include the Islamic Development Bank's new Climate Change Policy and the World Bank's Climate Action Plan. New financial instruments are also taking hold in the region, such as the use of green bonds and debt swap-for-climate mechanisms.

Recommendations

Water must be at the heart of an integrated approach to building climate resilience.

This includes prioritizing adaptation action in trans-boundary water basins, where climate impacts have important implications for climate security, water, energy and food security, rural livelihoods, and economic development. Adaptation needs to be mainstreamed in national and sectoral planning to maximize synergies across sectors and build coherence at all levels. This requires policy integration and harmonization, horizontally and vertically, at the national level between sectors, at the regional level between regional and national strategies, and at global level between water-related agendas and national goals and targets²⁶.





Modern desalination plant on the shores of the Arabian Gulf

Picture: Stanislav Sablin/iStock

Adaptation must encompass natural and man-made ecosystems, the water-energy-food nexus, and urban and rural development. This includes adapting the agricultural sector to evolving climate impacts on water, soil moisture, and the ability to grow strategic crops needed to sustain national food security and rural livelihoods. Urban centers in turn need to be supported to adapt to extreme climate events, such as heatwaves and flash floods, that affect human health, as well as urban infrastructure.

Open and participatory approaches are needed. Adaptation needs to consider regional, national, and local needs and priorities, and make communities and private sectors joint actors with public institutions in climate adaptation. This requires capacity building, institutional and regulatory frameworks to ensure openness and transparency, as well as adaptation metrics for informing on process and its movement forward.

Open access to more and better climate data will accelerate adaptation in the region. A multitude of new information from satellite imagery, remote sensing, sensors and telemetry, together with artificial intelligence is creating a new knowledge base that can help improve water and food security at the local, national, and regional level. Regional and localized knowledge platforms are key to disseminating and scaling up climate adaptation efforts.

Climate needs-based finance. Local and international actors in the MENA region are already promoting a needs-based climate finance approach. Despite the recognition of adaptation as a priority area for MENA and Arab states, efforts should be scaled to include a national assessment of adaptation requirements, including recognition of sub-sectoral and cross-sectoral needs, as well as project identification and costing estimations. Moreover, creating an enabling environment for investments in adaptation is crucial, along with the design of bankable projects that unlock the currently weak private-sector participation in the region.



North America

North America may be home to one of the most economically advanced regions of the world, but it is also one of the most climate-vulnerable, featuring large coastal cities, Arctic areas, and swathes of agricultural and forest lands

In the U.S., climate-related disaster damage has risen from US\$ 178 billion between 1980 and 1989 to US\$ 810 billion between 2010 and 2019 – a 450 percent increase

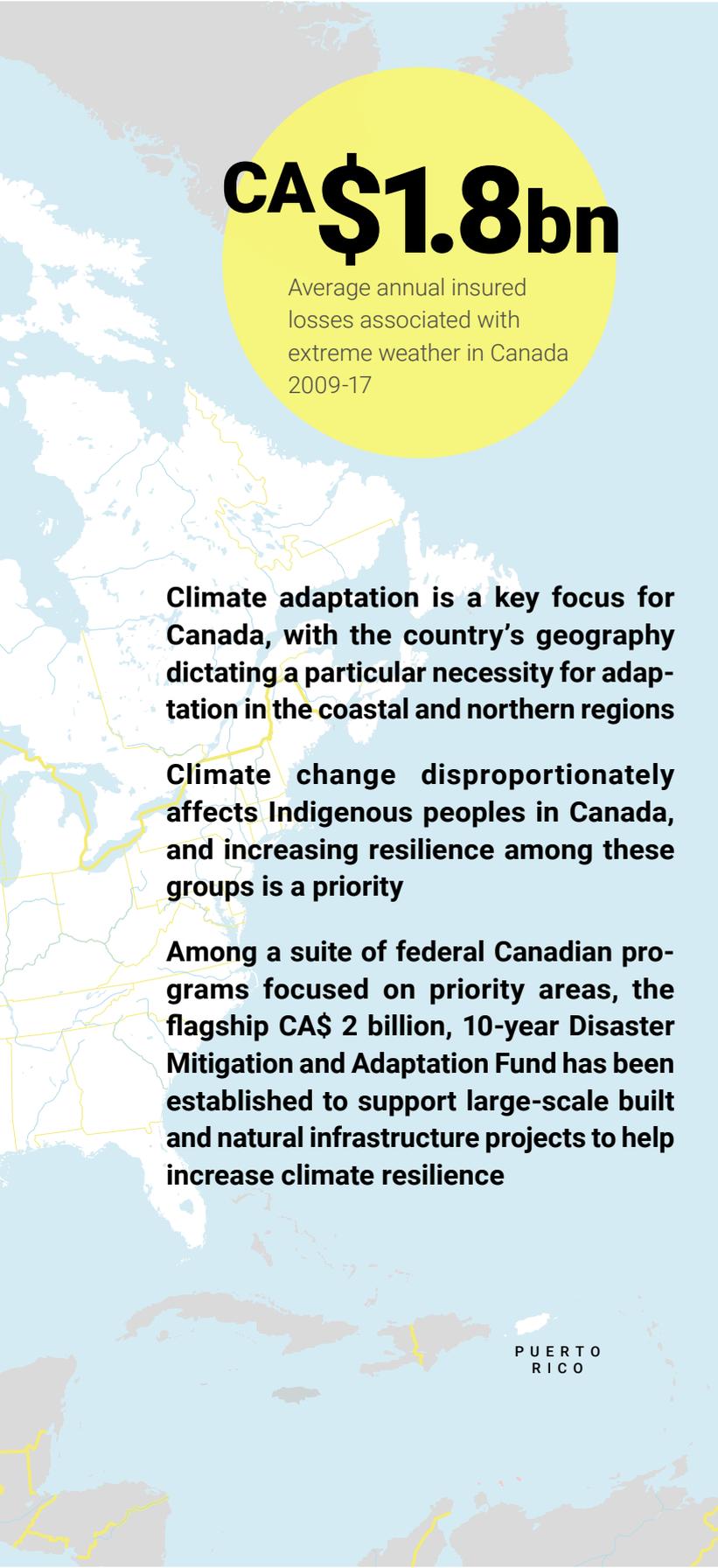
The unincorporated U.S. territory of Puerto Rico alone has endured an average of 5 percent GDP loss per year for the past two decades

The U.S. has multiple examples of adaptation, but must do more through economic recovery to build back better and emerge more resilient from Covid-19

The U.S. has recently joined the Network of Greening the Financial Sector. Incorporating climate risk in the financial sector can leverage trillions of dollars for climate adaptation

Climate-related disaster damage in the U.S. 2010-19

US\$810bn



CA\$1.8bn

Average annual insured losses associated with extreme weather in Canada 2009-17

Climate adaptation is a key focus for Canada, with the country's geography dictating a particular necessity for adaptation in the coastal and northern regions

Climate change disproportionately affects Indigenous peoples in Canada, and increasing resilience among these groups is a priority

Among a suite of federal Canadian programs focused on priority areas, the flagship CA\$ 2 billion, 10-year Disaster Mitigation and Adaptation Fund has been established to support large-scale built and natural infrastructure projects to help increase climate resilience

PUERTO RICO

“

Our current efforts to protect coastal cities will fall short of what will be required in decades to come. In spite of global efforts to rein in carbon dioxide emissions that cause global warming, they continue to rise and expose coastal cities like Miami to more extreme weather events and rising seas

Francis Suarez
Mayor of Miami

PART 1: UNITED STATES

Context and Key Climate Impacts

Rising climate-related disaster impacts

The United States is home to some of the world's best research universities and institutions, all of which have been at the cutting edge of projecting climate impacts, developing early-warning systems, or improving weather forecasts. All of this has been of vital importance due to the extreme weather the country faces even without climate change. In 1990, the Global Change Research Act established that a report on global change must be published every four years, which has resulted in the National Climate Assessment¹. This report, which undergoes extensive review by an advisory committee comprised of academia and federal

REGIONAL OVERVIEW: NORTH AMERICA

agencies, provides comprehensive analysis of the latest research on climate, drawing from NASA, the National Oceanic and Atmospheric Administration (NOAA), the National Center for Climate Research (NCAR), and research universities. The latest report highlights current climate impacts by region.

For example, the rising frequency and intensity of wildfires in the North-west, extreme precipitation, flooding and heat in the Northern Great Plains and the Midwest, extreme droughts in the South-west, and increased hurricane intensity and damage in the South, South-east, and the Caribbean (Figure 1).

FIGURE 1 Climate-related impacts that occurred in each region since 2014 and response actions that help address the risks and costs. From NCA (2018).

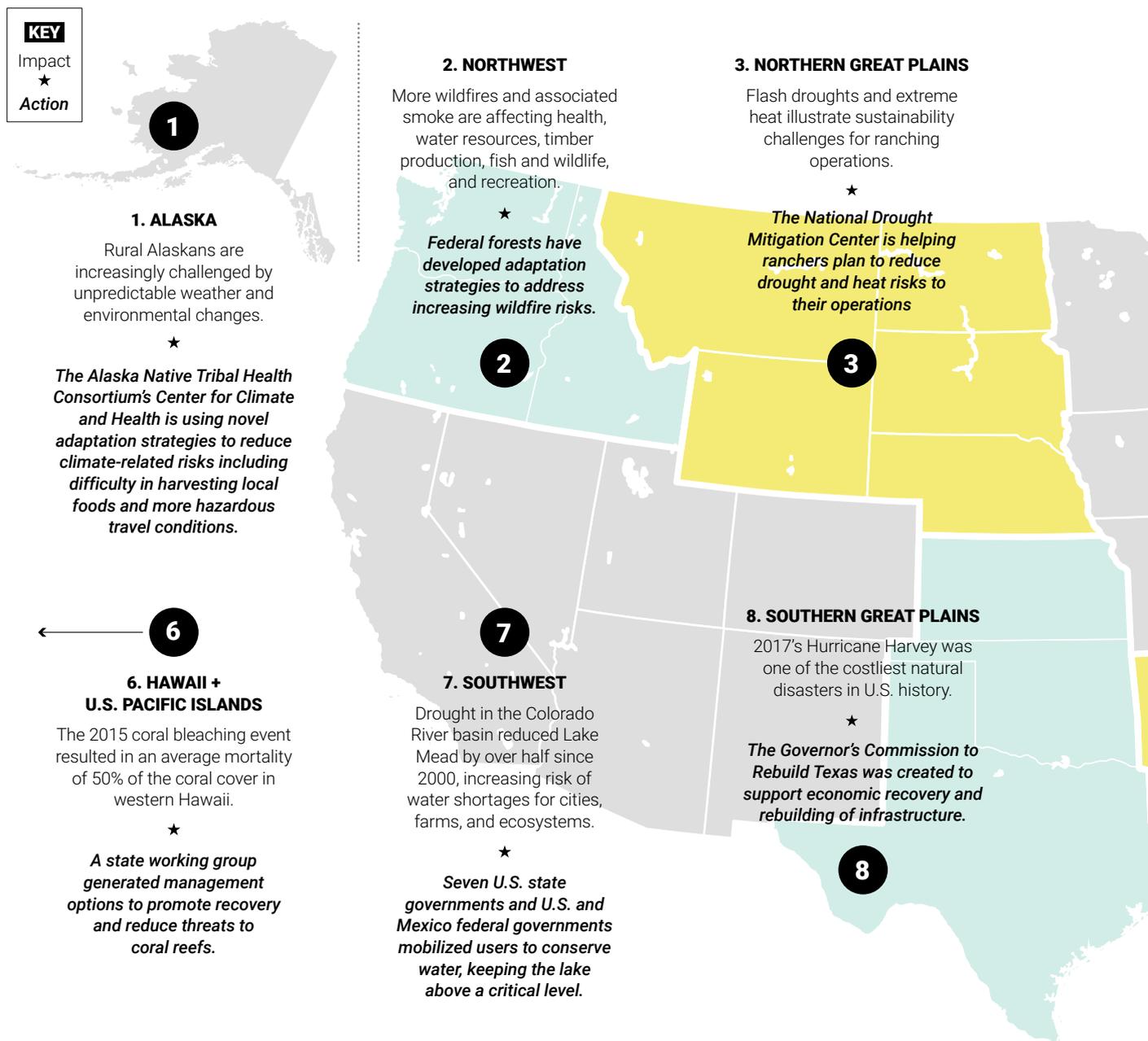
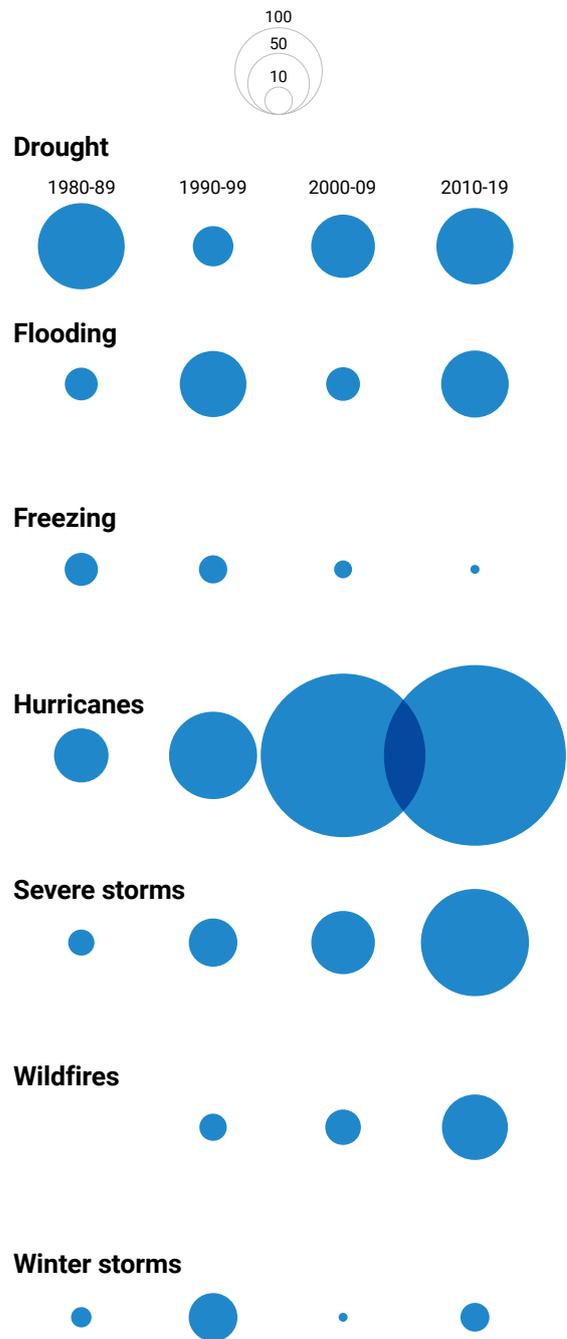
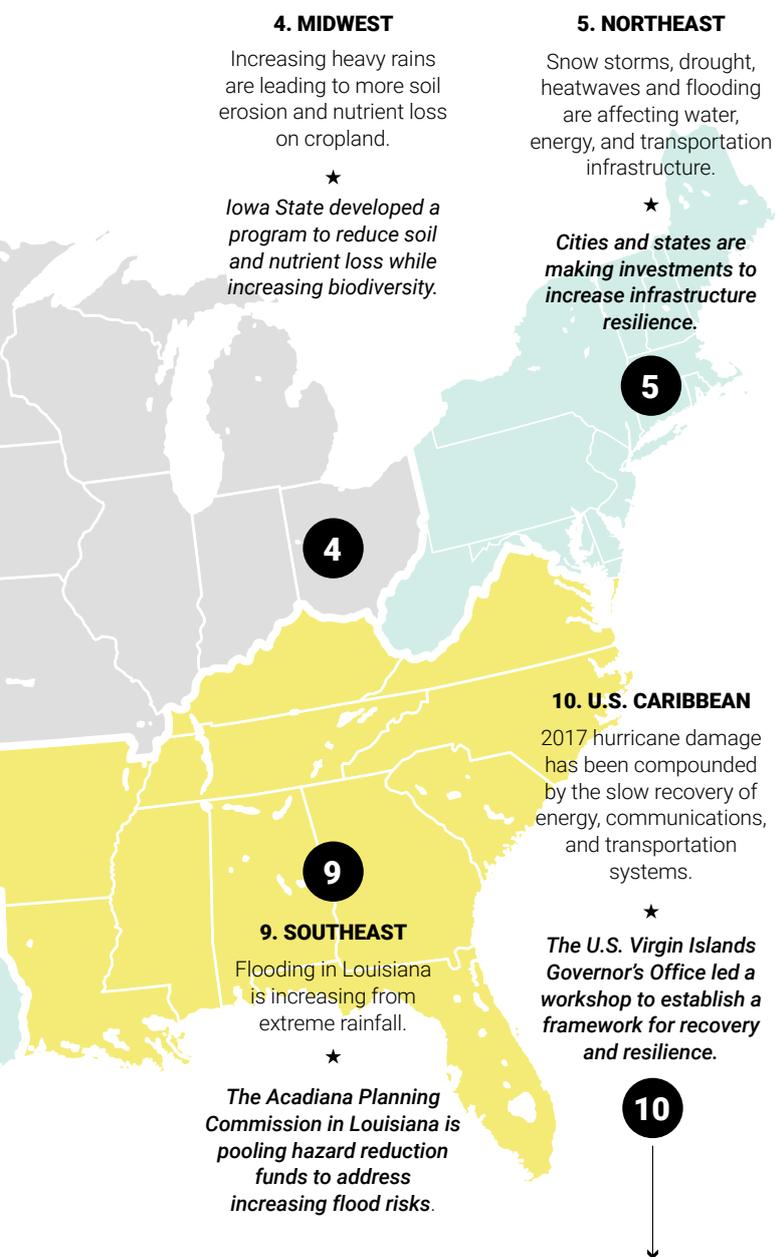


Figure 2 shows how, decade after decade, climate-related disaster damage has risen, increasing 450 percent from US\$ 178 billion between 1980 and 1989 to US\$ 810 billion between 2010 and 2019. Hurricane and severe storm damage have seen the biggest rise, from US\$ 47 billion in the 1980s to almost US\$ 600 billion this last decade. The

impacts from freezing have dropped from US\$ 14 billion to less than US\$ 1 billion in the last decade. Forty-five percent of all climate-related damage in the past 40 years has occurred in the last decade. In 2017, the hurricane season caused more damage (US\$ 278 billion) than all of the impact from natural disasters during the 1990s.

FIGURE 2 U.S. Climate-related disaster damage costs in US\$ billion: 1980-2019 (NOAA, 2020)



SOURCE: NOAA (2020). BILLION-DOLLAR WEATHER AND CLIMATE DISASTER: TIME SERIES. [HTTPS://WWW.NCDC.NOAA.GOV/BILLIONS/TIME-SERIES](https://www.ncdc.noaa.gov/billions/time-series)

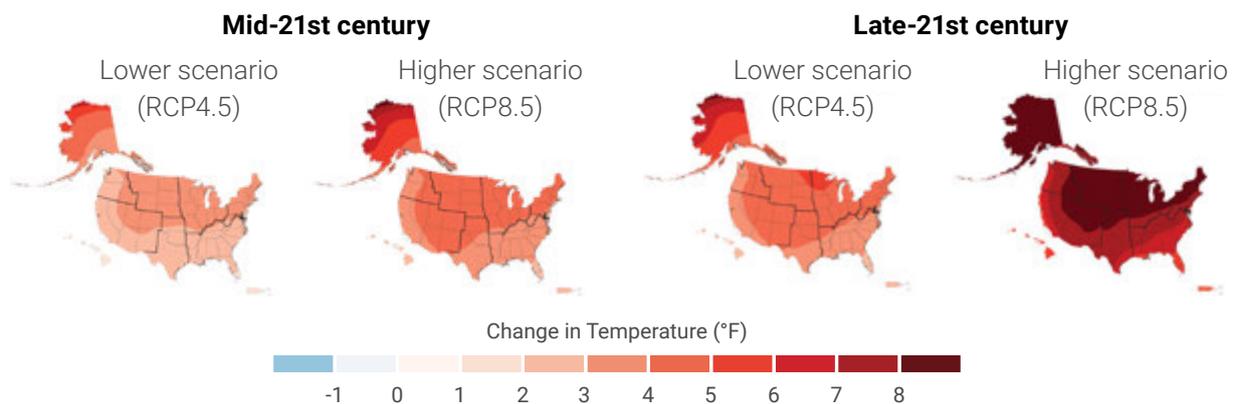
REGIONAL OVERVIEW: NORTH AMERICA

Projected impacts

Models show that warming will continue in the U.S., reaching 3°C to 6.1°C in high-emissions scenarios for the 48 states, and even more in Alaska (Figure 3). Precipitation will rise in the Great Plains and the North-eastern United States, with heavy precipitation events rising by over 40 percent², while drought-ridden areas in the West and South-west will see decreased precipitation in the growing season (Figure 4). Sea levels will continue to rise between 1 and 3 meters by the end of the century in the contiguous United States, with significant alterations in the Gulf of Mexico (Figure 5). Coastal cities such as New Orleans, Miami, Houston, Atlantic City, New York City, Charleston, and Boston will be significantly impacted³, with large areas permanently

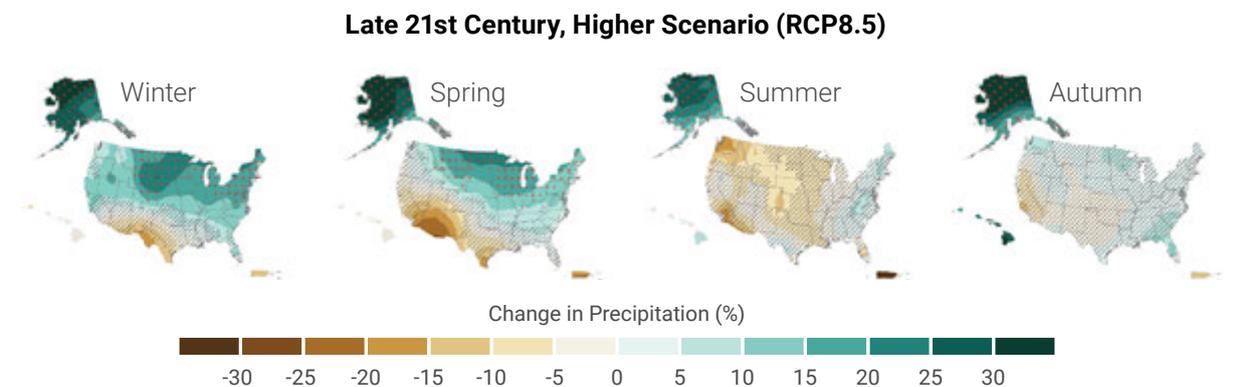
under water⁴, and the cities as a whole under greater threat from storm surges and increased hurricane intensity⁵. Figure 6 shows that combined projections of increased temperature, extreme precipitation, and drought have important impacts in agricultural productivity for corn, wheat, soybeans, and cotton, with agricultural yields dropping by 20-30 percent in the Midwest, a global powerhouse of grain production. These impacts also extend to livestock production, which can have impacts on global food prices⁶, which are in turn associated with increased civil unrest⁷. Forest fires in the West Coast have risen sharply in recent years⁸, which combined with urban expansion in riskier areas due to rising housing costs in cities⁹, have increased their lethality.

FIGURE 3 Projected temperature increase in high emissions scenarios (RCP8.5) versus medium-range emissions (RCP4.5), comparing near present measurements (1986-2015) with mid-century (2036-2065, middle) and end-of-century (2070-2099). Modeled outputs.



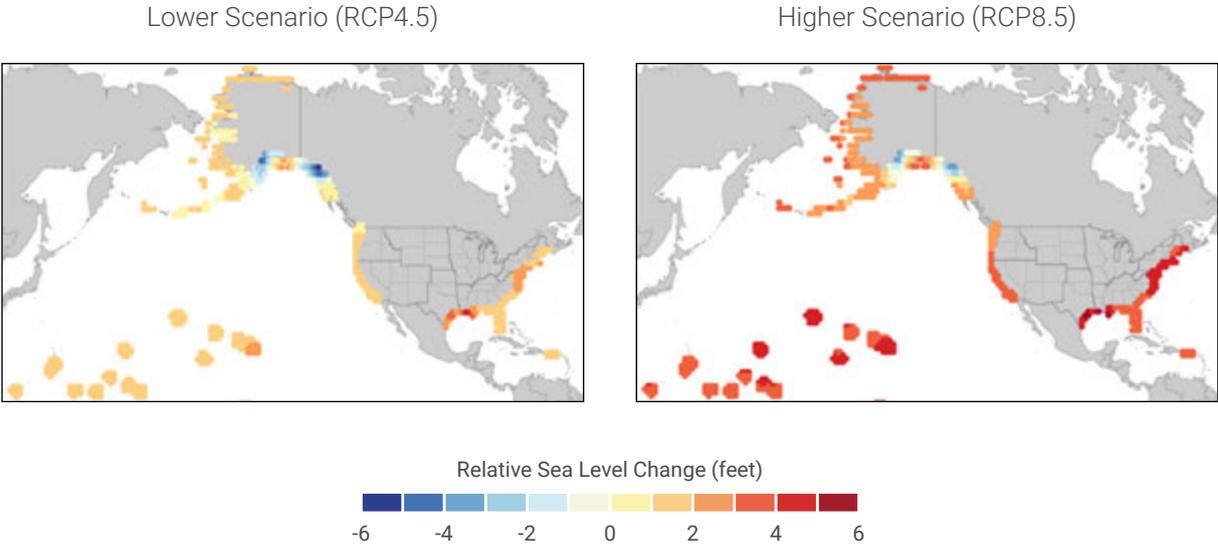
SOURCE: ADAPTED FROM VOSE ET AL. 2017.85, AS SHOWN IN NCA 2018

FIGURE 4 Observed and projected precipitation changes comparing 1986-2015 with 2070-99 under high emissions scenarios (RCP8.5) for all seasons:



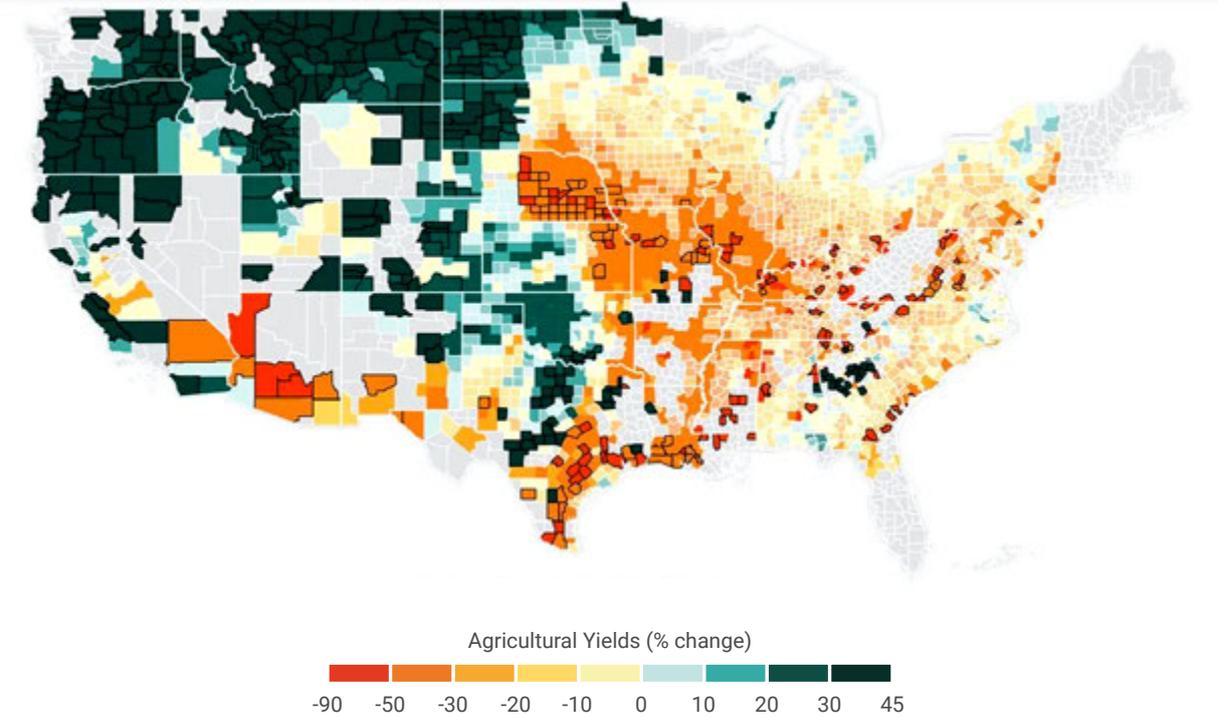
SOURCE: ADAPTED FROM EASTERLING ET AL. 2017.94 AS SHOWN IN NCA (2018)

FIGURE 5 Projected sea-level rise in the United States by the end of the century under mid-emissions and high-emissions scenarios.



SOURCE: CLIMATE CHANGE SCIENCE REPORT (2017), CHAPTER 12²⁶

FIGURE 6 Changes in projected agricultural yield of corn, wheat, soybeans, and cotton during the period 2080-99. Units represent average percentage change in yields under the higher scenario (RCP8.5) as compared to a scenario of no additional climate change. Warmer colors (negative percentage change) indicate large projected declines in yields; cooler colors (green) indicate moderate projected increases in yields.



SOURCE: NCA4 (2018) ADAPTED FROM HSIANG ET AL. 2017

REGIONAL OVERVIEW: NORTH AMERICA

Unmitigated climate change will only expand the impacts the country faces today. Many estimations have been carried out on the cumulative economic effect of climate change. Table 1 shows that lower emissions pathways can limit impacts to less than 2 percent of GDP, while unabated emissions can reduce growth by up to 15.7 percent toward the end of the century. As population will continue to grow, this will mean up to 28 percent per capita reduction in GDP. Kompas (2018)¹⁰ estimates that this could mean between US\$ 168 billion and US\$ 698 billion a year by 2100 if warming reaches 2°C vs 4°C, respectively.

TABLE 1 Summary economic consequences of climate change for the United States (as a function of reduced GDP vs current conditions)

Type of impact	RCP2.6 (lower emissions)		RCP 8.5 (higher emissions)		Source
	2050	2100	2050	2100	
% GDP		0-1.77		6.4-15.7	Hsiang et al (2017) ¹³
% GDP	0.6	1.88	3.77	10.52	NBER (2010) ¹⁴
% per capita GDP				28	Burke et al (2015) ¹⁵

Key Actors and Best Practices

The U.S. has cutting-edge agencies that carry out climate-related policies and measurements. Implementation of adaptation has been heterogeneous in terms of how granular actions are taken. The federal government is the most active in promoting adaptation awareness, but has only been moderately active in promoting planning for adaptation, with the result that regional approaches to adaptation are scarcer than would be ideal. Regional approaches have been successful in addressing issues such as air-quality management, but have been less effective or frequent in adaptation. Systemic regional climate-related risks are not being addressed in a coordinated manner. State-level agencies have been moderately active, but local¹¹ governments, counties, or municipalities do not necessarily have adaptation planning and implementation among their priorities¹². Federal agencies provide funding for technical support and guidance, along with climate science and models. State agencies support local governments, and administer state programs that can incorporate adaptation, while land-use planning at a state level can be used to lower the risk of new and existing sectoral activities. However, local governments, being the ultimate guardians of land-use planning and public investment decisions, as well as the first responders for climate-related events, need to raise their involvement in implementing adaptation practices. Other barriers to increased

adaptation have been identified as lack of funding, policy, institutional constraints, and lack of information¹⁶. However, at a national level, adaptation policies can reduce exposure to climate-related damage with costs at a fraction of the avoided impacts¹⁷. Coastal adaptation, for example, which considers NBS including conservation of healthy ecosystems, can prevent flooding costs of US\$ 50 billion by 2030, with a 7:2 benefit-to-cost ratio¹⁸.

Selected success stories

Adaptation implementation existed before it was formally considered as part of the climate action nomenclature. Disaster risk management and future-proofing investments have been used historically, and sometimes even recently, due to the politically charged nature of climate action in some states¹⁹. However emblematic projects in adaptation are highlighted, linked to the increased climate risk previously presented, including sea-level rise, energy resilience, and flooding.

Net-zero resilience in Puerto Rico

In 2017, Puerto Rico was devastated by Hurricane Maria, leaving 95 percent of the island without power, and more than half of the population without drinking water. The storm showed the vulnerability of its obsolete energy grid, which after 11 months was still not back up. As a consequence, islands that usually

rely on centralized energy systems were compelled to think further about resilience in light of increased frequency and intensity of precipitation, extreme weather, and hurricanes. Local communities and homes resorted to decentralized solar energy to cope with the loss of electrical power.

The governor committed to 100 percent renewable energy by 2050, with existing coal generation phased out by 2018²⁰. The Energy Bureau in the island mandated the Puerto Rico Energy Power Authority (PREPA) new investments for 3,500MW

of solar and 1,300MW of storage by 2025. This will allow decentralized power generation on the island, with microgrids that lower vulnerability to extreme weather, and the resilience to get power up online faster than with dirtier, larger generation²¹. Drops in battery storage costs will allow that pathway to be cost competitive with dirtier fuels, and set Puerto Rico toward a net zero, resilient pathway. The picture below shows Sonnedix Oriana solar power plant in Puerto Rico, which was the largest solar facility in the Caribbean in 2016 and a pioneer of battery storage.



Sonnedix Oriana solar power plant, located in Isabela (Puerto Rico), which provides 57MW of solar energy and 5MW/h of battery storage

REGIONAL OVERVIEW: NORTH AMERICA

The Miami Forever Bond

It is widely acknowledged that large areas of Miami will be under water if no climate-change action is taken. Following the devastation of Hurricane Irma, the city has undergone a gradual 'climate gentrification' project in which lower-income communities living in safer locations are starting to be displaced by higher-income populations who owned beachside properties that were exposed to storm surges and tropical storms²². In 2017, the city, led by Mayor Francis Suarez, authorized issuing a US\$ 400 million Miami Forever Bond to borrow money for investments to address the housing crisis and sea-level rise. The bond will fund a US\$ 192 million sea wall with pumps to tackle sea-level rise, US\$ 100 million in affordable housing, and US\$ 23 million in road improvements, raising them above rising tides.



Workman lowering drilling equipment into a storm-water culvert



Picture: Roger Bamber/Alamy

Challenges and Opportunities

The announcement of the Trump administration's withdrawal from the Paris Agreement and significant rollbacks of environmental regulations has impacted the climate agenda over the past four years. This had impacts on international climate finance, as the Green Climate Fund and the Climate Investment Funds were not optimally replenished in recent fundraising efforts, expanding the adaptation gap in developing countries. Funding cuts and cynicism about research on climate change limited the capacity of the country to address rising risks due to climate change, and to better adapt²³. Disbanding advisory committees devoted to better climate-change adaptation created knowledge gaps that need to be addressed by the incoming administration²⁴. The Biden administration's Build Back Better plan will be a unique opportunity to bring back American leadership in the climate agenda, and invest to address the infrastructure gap on energy, transportation, water, and agriculture. This requires addressing governance challenges such as creating national and international climate czars mandated from the White House to coordinate federal and state agencies working on climate adaptation—dedicated personnel to cut through red tape and force co-operation between the intricate government bureaucracy of climate, hydrometeorological services, and implementing agencies on infrastructure and planning.

An important development regarding climate finance and adaptation occurred in late 2020, when the board of the Federal Reserve decided to join the Network for Greening the Financial System (NGFS). This network intends to convene central banks and prudential supervisory authorities to share and exchange best practices in climate risk management in the financial sector to mobilize capital for low-emission and resilient investments. Now comprised of 82 institutions, including the U.S., China, Germany, France, Japan, Brazil, and the U.K., it has been highly influential in implementing the disclosure of climate risk for companies, banks, and institutional investors. In the U.S., these regulations have only been explored at a state level. This membership could be a game-changer for climate regulation in the financial sector, as 70 percent of global GDP and emissions are under the oversight of member institutions. This may be a first step to ultimately mandate climate-related disclosures in the context of the Securities Exchange Commission, as is proposed by senators in the Climate Risk Disclosure Act²⁵.

REGIONAL OVERVIEW: NORTH AMERICA

Recommendations

Build forward better. The United States has a huge infrastructure gap. The financial crisis response under the Obama administration contributed to substantial funding for a low-emission transition that resulted in more efficient homes, cars, and a cleaner energy system. Research has shown that green recovery will create an additional one million jobs and help recover lost time in mitigation. However, more must be done to increase adaptation, particularly in the private sector, as most adaptation investments are carried out by the public sector. Spending an additional 3 percent upfront can bring about much-needed infrastructure resilience and secure the benefits it provides for transportation, energy, and sanitation. Investments must be resilient in themselves, as well as also contributing and addressing systemic resilience. State-level adaptation plans must be developed to prevent the piecemeal funding of initiatives that fail to address the systemic challenges of climate adaptation and thus miss the opportunity to emerge from the Covid-19 crisis better prepared to tackle the climate crisis. The Biden administration's Build Back Better program is a step in the right direction, with comprehensive infrastructure plans being prepared for shovel-ready projects, with investing in disaster reduction for resilience at the center.

Incorporate TCFD recommendations in the U.S. financial system. The Task Force on Climate-related Disclosures has been effective in increasing climate finance, and divesting from obsolete and risky investments. The Federal Reserve has joined the NGFS, but regulations need to be implemented for these disclosures to become mandatory. This would allow climate risks to be incorporated in corporate decision-making and bring long-term vision to projects. This, in turn, would enable the financial sector to make climate risk visible and reward resilient designs, as well as deter riskier investment with unfavorable financial conditions.

Expand research on regional climate models to provide information for adaptation. Local-level and sector-level actions on adaptation require high-resolution information. Global models and their parametrization do not allow an effective evaluation of climate risks. These models need to be downscaled to a resolution that allows decisions to be taken, and tangible projects to be designed. This requires an iterative process between modelers and sector practitioners. The world also relies on the development of these tools from cutting-edge research institutions and agencies in the United States, and developing them will not only make the U.S. safer, but also other countries that look toward it for examples on climate action.

Commit to net-zero emissions by 2050. The world can't just adapt its way out of the climate crisis, particularly with the unprecedented rate of change we are seeing right now. Mitigation will always remain the most effective way to solve our climate crisis. For the United States, a net-zero pathway will bring back much-needed leadership on clean technology, as well as increase manufacturing jobs in energy and electromobility. Committing to net zero and pushing for net zero in the international context from countries that have not committed to this will allow increased demand for emerging clean technologies made in the United States. Lower global emissions will keep warming under dangerous anthropogenic levels and reduce climate-related impacts from the projected 15 percent lower GDP to under 1 percent. The United States, which contributes to approximately 15 percent of global greenhouse gas emissions, is uniquely poised to use adaptation as a means of economic development.



Stretch of road at Queensland Beach, Nova Scotia, being gradually reclaimed by the Atlantic

Picture: OliverChilds/iStock

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We still have a long way to go to better understand how climate risks will impact our way of life, what actions can be taken, and how we can make plans for addressing those risks

Jonathan Wilkinson
Minister of Environment and
Climate Change, Canada

PART 2: CANADA
Context and Key Climate Impacts
Canada’s unique geography creates specific challenges

Canada is the second-biggest country in the world and encompasses an extraordinary range of environments, many of which are being seriously affected by climate change. Wildfires, extreme heat, and the spread of infectious disease are some of the most serious climate-change issues facing Canada today, and with the world’s longest coastline—bordering three oceans—it is especially exposed to sea-level rise.

Flooding has historically been responsible for some of Canada’s most destructive and expensive natural disasters, with floods in Calgary and Southern Alberta in 2013 estimated to have cost governments, businesses, homeowners, and insurers as much as CA\$ 6 billion²⁷. This was Canada’s second-costliest disaster, after the Fort McMurray wildfires in 2016, which were estimated to have direct and indirect costs of almost CA\$ 9 billion.

REGIONAL OVERVIEW: NORTH AMERICA

Permafrost thaw is having a significant impact on northern communities, with this issue likely to become even more critical in the next few years. In Canada's Arctic regions, average temperatures are increasing at a rate of nearly three times the global average²⁸.

In 2019, a report by the Council of Canadian Academies' Expert Panel on Climate Change Risks and Adaptation Potential²⁹, an independent scientific body, identified 12 national major areas of risk from climate change over the next 20 years, with the most acute risks to physical infrastructure, human health and wellbeing, northern and coastal communities, ecosystems, and fisheries. The report highlighted the fact that insured losses associated with extreme weather events in Canada rose from an average of CA\$ 405 million per year between 1983 and 2008 to CA\$ 1.8 billion per year between 2009 and 2017, with the majority of losses associated with flood events..

In response to the growing impacts of climate change, Canada has committed to a range of efforts to move toward adaptation, including a suite of programs to support Canadians to increase climate-adaptation knowledge and capacity, improve human health outcomes, and reduce risks across Canada through climate-resilient infrastructure and other innovative measures such as nature-based solutions (NBS)³⁰.

Key Actors and Best Practices

A varied provincial approach and national adaptation funding

Canada's federal structure means that key decisions on climate-change issues are also taken at a sub-national level, resulting in different strategic approaches across the 10 provinces and three territories. The first joint federal, provincial and territorial approach, the 2016 Pan-Canadian Framework on Clean Growth and Climate Change (PCF), developed with the provinces and territories, and being implemented with Indigenous peoples, has guided Canada's recent actions on climate-change adaptation. The Government of Canada committed to develop a National Adaptation Strategy to build on the successes of the PCF and create a more ambitious, strategic,

and collaborative approach to adaptation, under its recently released strengthened climate plan.³¹ A number of programs are supporting action across Canada, including the Disaster Mitigation and Adaptation Fund (DMAF), the largest adaptation funding program in Canadian history, which is investing CAD \$2 billion to support large-scale built and natural infrastructure projects targeted at helping communities better manage the risks of disasters triggered by natural hazards.

In Surrey, British Columbia, for example, an investment of over CA\$ 76 million through DMAF³² will allow the local governments, in partnership with the Semiahmoo First Nation, to develop a flood-adaptation strategy that will increase resilience for more than 125,000 residents who are at high risk of coastal flooding. Key features include replacing the aging Nicomekl and Serpentine sea dams, upgrading 7.5 kilometers of the Colebrook dike, and establishing a riverfront park on the Nicomekl River to help control and disperse flood water. Two new 'living dikes' will be built and 1.5 new kilometers of storm sewers installed.

The best practices particularly emphasized in Canada's approach to adaptation include nature-based solutions. In Canada's southernmost city, Windsor, Ontario, extreme heat is becoming a challenge to residents³³. Already one of the hottest cities in the country, it could see nearly three times as many very hot days, where the temperature is over 30°C, by 2100. By planting trees to shade play equipment, erecting shade structures and adding splash pads, misting stations and drinking fountains, the city has made its parks far more comfortable and user-friendly for its residents. In Percé, Quebec³⁴, the beach was facing erosion that was threatening the city. The town opted for beach replenishment, adding large quantities of pebbles to combat erosion and increase beach width. This reduced wave energy on the eroding shoreline and created space for recreation, boosting tourism in the area.

Internationally, Canada is known for its leadership on adaptation. For example, Canada's climate finance commitments are supporting developing countries, particularly the poorest and most vulnerable, in



Vuntut Gwitchin First Nation children eat caribou meat at a remote Arctic winter camp near Old Crow, Yukon Territory, Canada

Picture: DEDDEDA/Alamy

building capacity to address climate-related impacts. Canada is also playing a leadership role through its work on the Global Commission on Adaptation. Domestically, a major focus is on sharing climate-change data and information, through flagship initiatives such as the Canadian Centre for Climate Services, which is vital for making climate-smart decisions and planning future adaptation strategies.

Building resilience with Indigenous peoples

A range of factors, including geographic location, reliance on traditional food sources, and historic marginalization, mean that climate change disproportionately affects Indigenous peoples, including the First Nations, Inuit and Métis. Indigenous peoples living in remote regions may be more severely impacted by extreme weather events, such as forest fires, flooding, and storm surges. Becoming active leaders

in the fight against climate change is proving crucial, and full and effective participation of Indigenous peoples is a vital element in achieving adaptation goals. In Yukon, for example, the Vuntut Gwitchin³⁵ First Nation, which is reachable only by air, has been transferring to solar energy to reduce reliance on diesel, which has to be flown in at significant financial and environmental cost. Funding has also been put in place³⁶ to support and enable Indigenous communities in responding to climate-change impacts through risk assessment and hazard mapping (e.g. for flooding), the development and assessment of adaptation options, and implementation of adaptation measures. Through programs such as the Canada Nature Fund, the federal government is providing funding to establish new Indigenous Protected and Conserved Areas to achieve environmental and cultural objectives and support Indigenous leadership.

REGIONAL OVERVIEW: NORTH AMERICA

Playing a leadership role internationally

Canada is positioning itself as a world leader in climate-change adaptation, and is the co-lead of the Global Commission on Adaptation's Nature-Based Solutions action track with Mexico. Canada has also made CA\$ 2.65 billion available in climate finance³⁷ to developing countries, which are some of the most vulnerable to climate change. Part of that funding is aimed at building adaptive capacity, including providing CA\$ 10 million over five years to the Climate Risk and Early Warning System³⁸, which has been developed to reduce loss of life and economic hardship caused by tropical cyclones, floods, severe storms, forest fires, and heatwaves.

Challenges and Opportunities Permafrost thaw and other climate impacts are a major challenge for northern communities

Much of the infrastructure in northern Canada rests on ground that remains frozen throughout the year. However, as temperatures rise, the ground begins to thaw and collapses due to pockets of melting ice. House foundations, sewers and runways are also damaged. In addition to the costs of the damage to infrastructure, thawing permafrost can cut off communities from the rest of the country and disrupt critical food and medical supplies. Between 2014 and 2017, Iqaluit International Airport underwent

CA\$ 300 million-worth of improvements³⁹, and a significant proportion of the funds had to be spent on repairing runways and taxiways that had cracked and warped. One of the taxiways was so deformed that it could no longer be used by jets. The Arctic Development and Adaptation to Permafrost in Transition (ADAPT)⁴⁰ project is working on improving understanding⁴¹ of the effects of permafrost thaw on infrastructure such as roads and runways, while the government's Northern Transportation Adaptation Initiative is supporting the development of new knowledge, tools and practices to help manage northern transportation systems affected by climate change⁴².

Extreme weather and heat events are increasing issues across Canada

As Canada comes to terms with permafrost thaw, it is also having to manage problems at the other end of the spectrum, with extreme heat becoming an increasingly serious issue. In Quebec, for example, 86 deaths were attributed to an extreme heat event in 2018⁴³, while in Toronto the city has instituted a protocol for hot weather response⁴⁴ that aims to reduce the incidence of heat-related illness and death. The strategy focuses on people in high-rise apartments, especially older or more vulnerable people, who may not have access to cool spaces such as parks, as well as the homeless.





Picture: shaunl/iStock

ADAPTATION THROUGH COLLABORATION

The Canadian Centre for Climate Services (CCCS) works with partners and stakeholders to support the implementation of the Pan-Canadian Framework on Clean Growth and Climate Change. Its goal is to increase resilience to climate change by helping to improve understanding of how the climate is

changing and providing data, guidance, tools and resources to help Canadians use this knowledge for making climate-smart decisions when planning for the future. It works in partnership with federal government departments, different levels of government, and regional climate organizations.



Waving asphalt on the Kolyma highway north of Magadan. This is due to melting permafrost during the summer season

Picture: Corentin LE GALL/Alamy

REGIONAL OVERVIEW: NORTH AMERICA

Furthermore, due to the rise in extreme weather conditions, building codes are being updated to ensure buildings and other infrastructure can withstand the impacts of climate change, including heavier snow loads on roofs and new rules for rainwater collection. The National Research Council is establishing new national building codes, as well as updating existing ones⁴⁵, to reduce risks from wildfires and flooding, which include introducing new standards for windows, exterior insulation, fire tests, air barriers, and asphalt shingles. The research council is also developing guides that integrate climate resiliency into designing and refurbishing public infrastructure, such as bridges, roads, drinking water, and wastewater systems.

A nature-based response

Traditionally built infrastructure, including roads, dikes, and sea walls, can address specific vulnerabilities by reducing the impacts of permafrost thaw or by creating protection from flooding and sea-level rise. However, Canada has also pinpointed natural infrastructure as providing a range of opportunities to adapt to climate change. By restoring, enhancing and protecting wetlands and forests, the country is showing that it is possible to build the resilience of communities and ecosystems while simultaneously delivering additional benefits such as carbon storage, biodiversity, and positive health outcomes.

Canada is committed to leveraging the power of nature to build resilience and reduce the impacts of climate change, and the implementation of on-the-ground projects is already underway. In York Region, Ontario, for example, the federal government is investing over CA\$ 10 million to plant more than 400,000 trees⁴⁶, which will help protect at least 1.2 million residents from extreme heat, flooding and erosion while also sequestering carbon, providing better air quality and enhancing the wellbeing of residents. In addition, the Government of Canada has recently committed CA\$ 3.16 billion to plant two billion trees over the next 10 years, in both rural and urban areas, to significantly advance the use of nature-based climate solutions.





Professional tree-planter
in British Columbia,
Canada

Picture: LE PICTORIUM/Alamy

Recommendations

Develop a whole-society approach. A more coordinated approach across Canada, with common aims and strategy, and scaled-up actions at all levels of government, is needed to help achieve adaptation goals. At present, large-scale adaptation projects are being supported through landmark programs such as DMAF. A further CA\$ 9.2 billion is budgeted for bilateral agreements with provinces and territories⁴⁷, including those that include adaptation and climate resilience, along with more targeted federal programs to address specific climate risks. However, serious issues still face ecosystems, businesses, and Canadian citizens, and meeting the needs of Indigenous peoples must remain a priority. As part of Canada's new strengthened climate plan, the federal government has committed to developing a National Adaptation Strategy to enhance collective action and build societal resilience⁴⁸.

Improve climate finance and climate risk disclosure.

Canadian businesses are beginning to focus on adaptation, and this should be strongly encouraged. Climate risk disclosure, through frameworks such as the Task Force on Climate-related Financial Disclosure (TCFD), should be supported in Canada⁴⁹ because it is a crucial element in the transition to a lower-carbon and resilient economy. In 2018, Canada's Minister of Environment and Climate Change and the Minister of Finance jointly appointed the Expert Panel on Sustainable Finance to explore opportunities and challenges facing Canada in this area. The final report made a series of recommendations designed to bring sustainable finance into the mainstream, which would involve climate-change opportunity and risk management becoming business-as-usual in financial services, and being embedded in everyday business decisions, products, and services. Following these recommendations will enhance Canada's adaptation policy.

Nature-based solutions. There is still potential to scale up the implementation of NBS to achieve positive climate-change outcomes. Canada has committed to protect a quarter of its land and oceans by 2025, allowing many opportunities for a creative approach to adaptation, including carbon capture through reforestation and forest-fire management.

Adaptation is everybody's business

Climate-change impacts continue to grow in magnitude and frequency. Yet recent progress on adaptation has slowed as a result of the Covid-19 pandemic. The following policy recommendations are designed not only to accelerate adaptation and resilience action, but to help the world win back the momentum lost due to Covid.

The recommendations are aimed at strengthening:

1. Understanding

To ensure that the risks are fully understood and reflected in the decisions that public and private actors make.

2. Planning

To improve policy and investment decisions and how we implement solutions.

3. Finance

To mobilize the funds and resources necessary to accelerate adaptation.



Picture: piyaset/iStock

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We urgently need more resources, more collaboration and more political will to make adaptation a global priority

Ban Ki-moon

8th Secretary-General of the United Nations
and Co-Chair, Global Center on Adaptation

1. Understanding

Scientific advancements and several flagship policy reports have advanced our understanding of climate impacts and ways to adapt to them. Deeper understanding is indispensable, with four areas where accelerated progress is needed. The GCA will be working across these, helping to broker solutions in each.

The 'how': We need to learn fast from successful adaptation practices carried out at the local, regional, and national level. We then need to share these rapidly, and adapt them to diverse local circumstances. In order to accelerate adaptation, it is important to understand what works and what doesn't; to understand what drives change in adaptation and resilience behavior in households and private businesses; and to understand how to work across sectors for greater impact. Faster translation of scientific findings into operational action will also help. The GCA, as a solutions broker, will scale up support in this area through its Adaptation Knowledge Exchange.

SYNTHESIS

Better adaptation and resilience measurement:

We need to move faster on measuring progress on adaptation to enable better design of projects and policies, to be better able to evaluate options for enhancing resilience, and to help prioritize action.

Tracking action by diverse actors:

Adaptation is not only governments' responsibility. In addition to better tracking and disclosure of financial flows and actions by national governments and international financial organizations, we need better reporting and tracking by other stakeholders that are also responsible. These include private financial institutions and investors, civil society organizations, sub-national governments, private businesses and state-owned enterprises, and local communities. This will help measure progress, share lessons, and build networks and connections for action on adaptation.

Scale: Building adaptation and resilience at a local level requires a deeper understanding of climate risks and vulnerabilities at that scale. Developing better methods of incorporating deep uncertainty about climate impacts at the local level over the next decade will also be needed.



Installing weather information sensors, Uganda



Picture: UNDP Uganda

2. Planning

While 125 of the 154 developing countries have taken steps to formulate National Adaptation Plans (NAPs), there is room for improvement in every country. These plans must be translated into action programs at the sectoral and sub-national level. Active communication and engagement with all stakeholders is not yet happening in numerous countries.

Planning and implementation of post-Covid economic recovery programs are underway in many countries. This provides a unique opportunity to catch up on the ground that has been lost on adaptation due to the necessary focus on twin health and economic crises. Unfortunately, most recovery programs announced to date do not include adaptation and resilience components. Those that do generally fall short of the scale of the climate crisis we face. Very few leverage large-scale private financing or action. Nevertheless, there is time to modify these plans to make them truly transformative, using the following initiatives:

Adaptation interventions in various areas to meet the dual objectives of economic stimulus and enhanced resilience, from infrastructure to climate-smart agriculture. Prioritizing them in recovery programs can deliver a ‘triple dividend’: reducing vulnerability to future climate shocks; fostering productivity and innovation in the private sector; and also providing social and environmental benefits.

Jobs creation will be faster with well-designed adaptation and resilience programs to support economic recovery. Nature-based solutions, water infrastructure projects, and resilient low-emissions mobility programs can generate jobs that economies urgently need.

Policies and untargeted subsidies need to be reformulated in response to the tough fiscal situation faced by most countries. This should include land-use planning, climate-responsive safety nets, agricultural subsidies to promote climate-smart agriculture, and incentives for private-sector engagement in adaptation investments.

Improve the planning capacity of city and sub-national policy-makers to open the door to innovative public-private-community partnerships for better and faster adaptation actions.

SYNTHESIS



Picture: Fabeha Monir/iStock

3. Finance

Data from 2017-18 showed that global investment in adaptation averaged US\$ 30 billion a year. This is insufficient to tackle the climate crisis.

Due to the pandemic, developing countries face a major funding gap for climate adaptation. The sharp decline in tax revenues and global trade for most countries has made things worse. Climate risks have not disappeared and numerous disasters in 2020 showed that the fiscal burden of these is only going to increase. In short, adaptation finance was no match for the severity of the climate crisis in 2020.

A step change in the amount and type of financing is required to accelerate adaptation and resilience action. Specifically:

New instruments are needed to increase the availability of adaptation and resilience finance. These include: Covid-19 response facilities and liquidity support that mainstream climate resilience actions; climate resilience bonds, debt-for-resilience swaps, and debt relief initiatives to free up fiscal space for adaptation; and new public-private partnerships to address climate risks.

Greater mobilization of private financing for adaptation can be achieved with better integration of physical climate risks into fiscal and financial decisions. This will be helped by standardized taxonomies for sustainable and resilient investments;

greater disclosure of climate risks of investments; increased awareness of the economic benefits of adaptation; and better systems to identify and appraise viable resilient investments and resilient asset classes.

Increase financial flows to the most vulnerable.

Less than 10 percent of adaptation funds reach the most vulnerable communities in climate-stressed countries. More detailed tracking of adaptation funding for the vulnerable, greater capacity of local communities to access these funds, and new tools such as adaptation micro-finance and micro-insurance are needed to change these trends.

A more equitable geographical distribution of adaptation funding

is required to ensure the most climate-vulnerable countries and regions get the resources they need. Building the institutional capacity of these vulnerable countries to frame NAPs and adaptation projects could help redress this funding imbalance.

Increase public financing for international adaptation efforts.

Donor countries can play a large role in adaptation and resilience through development assistance. These funds can be used to spur mobilization of domestic resources, as well as leverage private-sector funding. Without the involvement of all stakeholders—international and domestic—resource mobilization at the required levels will be impossible.

Regional adaptation action policies

Regions and countries need to accelerate the implementation of adaptation and resilience measures. Here are some of the most critical actions that are applicable to most regions:

Political leadership

Strong political leadership coordinated at the global, regional, national, and sub-national level is critical for successful adaptation. The leadership of private businesses and investors is equally important. The GCA will continue to play a strong role in facilitating the continued mobilization of political actors and private-sector leaders to accelerate adaptation and resilience action.

Priority sectors

Countries falling behind on the SDGs may consider incorporating adaptation into the planning and provision of basic infrastructure services, such as water and sanitation, electricity, housing, transportation, and flood protection, among others.

Nature-based solutions (NBS) must be an integral part of adaptation and resilience action. Implementing NBS programs at scale could reduce the cost of such initiatives by 90 percent for the same level of benefits in some cases. At the same time, NBS schemes could support the UN Convention on Biodiversity's target to protect 30 percent of the planet by 2030.

Systemic, cross-sectoral adaptation platforms are needed for transformative action. To be effective, adaptation must encompass natural and human-made ecosystems, the water-energy-food nexus, and urban and rural development.

Technology

Digital innovation should be brought to bear on adaptation and resilience, and applications already in use should be scaled up. These include digital climate services for agriculture; early-warning systems; innovative agricultural technologies for enhanced adaptation; and use of earth observation systems for local decision-making.

Open access to more and better climate data is needed. The capacity to access, process, and understand all Big Data sources of climate risk information is essential to better frame action on adaptation and resilience at scale. A combination of satellite imagery, remote sensing, sensors and telemetry, the Internet of Things, and artificial intelligence is opening up new possibilities for all stakeholders.

Stakeholders and governance

Local action through youth engagement.

Youth and their local communities are well-positioned to identify, design and implement adaptation solutions. Young people should be key stakeholders for the sustainability of inclusive resilience plans.

Private business and entrepreneurs. New business models for adaptation and resilience investments are needed, not least because of the parallel requirement for jobs-creation and the fostering of growth conditions for small and medium-sized enterprises as the world moves out of the pandemic. The creativity and innovation of the private sector should be unleashed by using tax incentives, regulations, and support for research and development, among other things.

Stronger governance and institutions for adaptation and resilience.

Countries need stronger economic and technical institutions so they can better assess climate challenges and design policies and programs to strengthen adaptation and resilience. Enhanced capacities, mandates, and cross-institutional collaboration platforms are required.

Open and participatory approaches. Adaptation solutions cannot be designed and implemented by central governments alone. Adaptation is everybody's business. Adaptation and resilience plans need transparent data and information disclosure, effective participation and engagement processes, and effective monitoring and transparency during implementation.

SYNTHESIS

The diversity of climate risks and different stages of development in countries and sub-regions require different approaches to adaptation. Here are specific areas of focus for each region:

Africa

The world needs to mobilize more resources for Sub-Saharan Africa's adaptation and resilience.

Stronger coordination among international financiers is needed to mobilize multiple sources of climate adaptation finance more effectively from government budgets, official development assistance, multilateral development banks, climate funds, and the private sector, including through the blending of these across institutions and private investors.



Worker at a breakwater construction site in the Mekong Delta, Vietnam

Picture: xuanhuongho/iStock



Rice in Zambia

Picture: Georgina Smith, UNCG

East Asia

Strengthen regional and sub-regional co-operation to foster knowledge-sharing and mobilize financial flows. Many countries in the region have effective local adaptation solutions to deal with the multiple climate risks they face. This provides an opportunity to accelerate adaptation through regional alliances that complement national responses to emergencies. Regional co-operation can help translate proven solutions and mobilize the necessary funding.

Europe

Ramp up innovation and cross-regional collaboration. Innovation that strengthens resilience and reduces economic uncertainty is urgently required. Greater awareness of the economic benefits of adaptation would drive further investment, while private investment in adaptation can be encouraged through a taxonomy of sustainable investments. More bilateral or multilateral collaboration should be fostered across the region, especially among the early movers of adaptation, often in western Europe.

Latin America and the Caribbean

Reduce inequality as part of a resilient recovery.

The projected poverty and inequality effects of Covid-19 and climate change are alarming. Countries in Latin America and the Caribbean can use the recovery programs to strengthen resilience and reduce inequalities. In the short term, emergency employment programs focused on adaptation and resilience should be inclusive and focus on lower-income workers, women, and indigenous and migrant communities. The experience around the region with cash transfer programs can be upgraded to include climate emergencies and expand coverage to the most marginalized.

Reducing coastal vulnerability with mangrove, Cuba



Picture: Manglar Vivo Project, UNDP Cuba

Middle East and North Africa

Water must be at the heart of an integrated approach to building climate resilience.

The region receives only 6 percent of global climate-adaptation financing. Larger resource mobilization and prioritized adaptation action in transboundary water basins are critical. Adaptation in water needs to be embedded into national and sectoral planning to maximize synergies across sectors and build coherence from the national to the local. This requires policy integration and coherence.

North America

Incorporate the recommendations of the Financial Stability Board Task Force on Climate-related Financial Disclosures (TCFD) in the U.S. financial system.

Government regulations need to be implemented to make climate risk disclosures mandatory. Incorporating climate risks into corporate decision-making will strengthen companies by directing investments to low-emissions business opportunities, including opportunities in climate adaptation.



Climate-resilient agriculture, Sri Lanka

Picture: Manglar UNDP Sri Lanka

South Asia

Large-scale and integrated water management is needed to deal with water adaptation challenges in urban and rural areas.

Climate change is threatening the integrity of water security in the region through disasters, floods and cyclones, and droughts. Water security is a highly political challenge that requires the proactive engagement of all key stakeholders through government-led platforms and science-based dialogues.

SYNTHESIS

Crops saved by dam water, Somalia



Food insecurity in Sub-Saharan Africa is the most urgent climate adaptation and development challenge the world faces in 2021. Covid-19, climate disasters, and desert locust crop damage have magnified the threat of mass starvation in Africa, the continent with the highest prevalence of undernutrition in the world. As many as 674 million people, or more than half of Africa's population, suffered last year from food insecurity—defined as not having the resources to reliably access nutritious food. A solution to this crisis requires a holistic approach that links coordinated interventions to catalyze poverty eradication, economic development, resilience, and food security for millions on the continent. Some of the key policy recommendations include:

Allowing small-scale producers to thrive while adapting to climate change. Government actions should include strengthening extension services with deep knowledge on adaptation and resilience, agricultural inputs,

irrigation systems, climate advisory services, financial services such as credits and insurances, and working markets.

Working with nature. Strengthening agricultural production systems by sustaining and working with ecosystems, such as agro-ecological practices for managing soil or harvesting water, as part of a comprehensive adaptation and resilience strategy.

Data and technology. Farmers need access to climate and weather information to improve their adaptation practices. Government should encourage private-sector providers to offer digital agriculture services such as climate advisories, on top of providing the supporting infrastructure.

Finance. Farmers need a variety of instruments that include insurance for climate risks, assistance with the upgrading of productive systems in a way that incorporates adaptation



Picture: UNDP Somalia

practices, and better connections to supply chains, in addition to expanded access to credit and financial services.

Private-sector participation could provide more durable, scalable, and sustainable support to farmers. Private-sector agribusinesses have a unique advantage in developing and strengthening climate-resilient supply chains and promoting agroindustry.

Governments can provide support for adaptation and resilience efforts through blended finance and public-private partnerships.

Inclusive job creation. Policies that empower women and marginalized groups can improve climate-adaptive farming and food security. A strong food production and processing system can provide much-needed job opportunities for unemployed and under-employed African youth.

Future State and Trends reports

This first State and Trends in Adaptation report provides the basis for upcoming editions in an annual series. The series will report—on a continuous basis—on adaptation needs, solutions and progress, systematically building on an expanding body of data, from all sectors, and geographic regions. The reports will provide updates and guidance to the global adaptation community, policy-makers, and experts on innovations, priorities and funding for resilience and adaptation actions.

The second edition of the report series is scheduled to appear on the occasion of the UNFCCC 26th Conference of the Parties, in November 2021. Africa will receive special attention among regions, given the critical adaptation needs of the continent. Future reports will have special themes exploring lessons learnt from practice, and new developments in adaptation and resilience. The report series is closely linked with the associated online platform, the State and Trends in Adaptation Knowledge Exchange (adaptationexchange.org).

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THE ADVISORY COMMITTEE TO THE GLOBAL CENTER ON ADAPTATION

The Advisory Committee to the Global Center on Adaptation provides guidance on issues, including the content of this State and Trends in Adaptation 2020 report, and identifies and engages with partners. Advisors offer support in their individual capacity. The contents and recommendations of the report do not necessarily reflect their views or those of the organizations they represent.

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Executive Summary endnotes

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