

# Resilience to climate change?

A new index shows why developing countries will be most affected by 2050

A report by The Economist Intelligence Unit



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## Executive summary

**T**he world will be poorer in 2050 due to the impacts of climate change. How much poorer, and the distribution of this loss, is the goal of our new study into the economic impact of climate change. By 2050, we expect the global economy to be 3% smaller than our baseline projections. At the country level, climate research to date has shown that it is most likely that those countries that are poorer and with higher average temperatures that will be the most affected. However, as the case studies we have researched show, this does not have to be a prescription of the impacts will unfold in a given country; governance, institutional quality and policy effectiveness all have the potential to curtail economic losses. Via a new index—the Climate Change Resilience Index—The Economist Intelligence Unit has scored the world's 82 largest economies on their ability and willingness to confront climate change. The index, which is integrated into our proprietary long-term economic growth framework, makes it possible to assess country-specific economic impacts.

### **Being rich is an advantage, but institutional quality matters, too**

Being rich matters when it comes to minimising the economic impact of climate change. Economists believe that institutional quality is a major determinant of long-run economic growth, but our results also point to the importance of institutional quality in minimising the impact of climate change. Poor institutions, therefore, can simultaneously harm economic growth and exacerbate the negative impacts of climate change.

Institutional quality matters for a country's resilience to climate change via two policy areas: adaptation and mitigation policies. Adaptation policies are defined as a country's initiatives and costs undertaken to adapt to climate change, as opposed to mitigation policies that aim to reduce emissions. Such policies are wide-ranging and country-specific, but may include: building flood defences, improvements in water storage, protection of energy and public infrastructure, improvement in agricultural infrastructure, marine forecasting and early warning systems for aquaculture industries.

Regionally, Africa will be hit the hardest by climate change. Africa has a number of challenges when it comes to coping with climate change, such as higher average temperatures and a lower level of economic development. Adding to these difficulties is the challenge faced by African policymakers to meet their climate policy objectives. According to our index, Africa averages a score of 2.5 (out of a possible 5 that represents the highest resilience to climate change) for the coming three decades. Latin America, the Middle East and Eastern Europe will also be significantly affected: these regions score relatively poorly in the index with an average score of 2.8, 2.9 and 3.3, respectively, for 2021-50. The next most impacted region is the Asia-Pacific, which is especially vulnerable to the loss of physical capital from the increasing number and intensity of natural disasters. The least affected regions are North America and Western Europe: both regions are richer and more prepared to tackle climate change from an institutional standpoint.

This paper will present three case studies that highlight the importance of both economic development and policy effectiveness to tackle climate change. These case studies will present

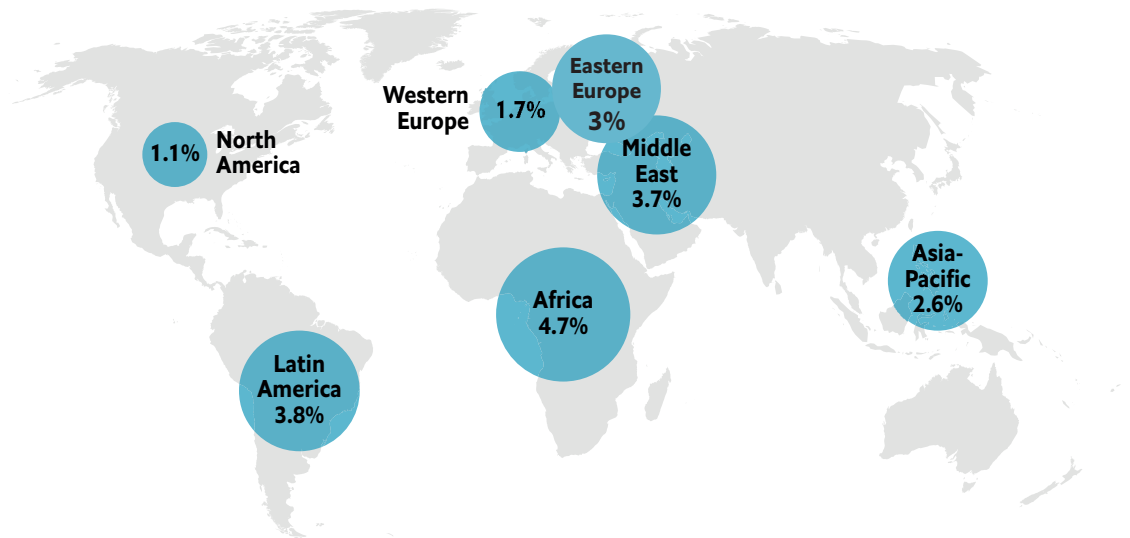
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the results of our research on the US (a wealthy and well-prepared country); Angola (where weak institutions and low levels of economic development mean that the impact of climate change will be high); and Russia and Argentina (two countries of similar levels of economic development but vastly different levels of preparedness to tackle climate change, owing to vastly differing institutional strategies).

### Average GDP loss - by region

(Real GDP loss by 2050)



Source: The Economist Intelligence Unit.

### The Climate Change Resilience Index

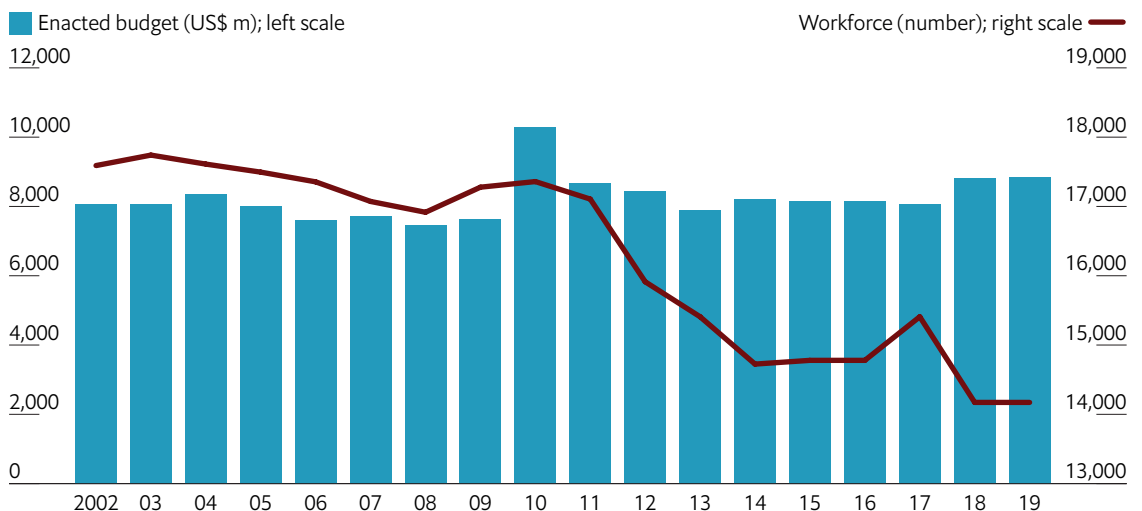
The Economist Intelligence Unit's climate change modelling framework combines elements of the Dynamic Integrated Climate-Economy (DICE) model, developed by American economist and 2018 Nobel laureate, William Nordhaus, and our new Climate Change Resilience Index. A truncated version of the DICE model is used to capture the global impacts of climate change and the central assumptions that are made at the global level. The truncated DICE framework is then linked with a country-level Resilience Index for the 82 countries that The Economist Intelligence Unit forecasts out to 2050, thus enabling the economic impact of climate change to be estimated at the country level. The eight indicators that make up the index are seen below.

| Indicator |  |
|-----------|--|
| 1         | Loss of land/ physical capital due to extreme climate/weather events |
| 2         | Impact on public services, basic needs and government expenditure    |
| 3         | Impact on agricultural sector (Loss of Crop yields)                  |
| 4         | Loss of Labour productivity  |
| 5         | Tourism Loss   |
| 6         | Trade Loss   |
| 7         | Adaptation Costs   |
| 8         | Mitigation costs   |

## United States: a temporary setback?

**W**ith the largest economy in the world (at market rates), a well-funded research and development (R&D) sector and strong national institutions, the US is comparatively well prepared to confront economic and social challenges related to climate change. The US is also less exposed to the geographic risks related to climate change than many countries in the developing world. These are all factors shared by other highly developed economies, who are less geographically vulnerable and have better-funded research and innovation sectors than countries in the developing world. The Economist Intelligence Unit climate change model calculates that by 2050, the US economy will be 1.1% smaller than it would have been in the absence of climate change.

### Environmental Protection Agency (EPA) resources (nominal budget, not inflation adjusted)



Note: The increase in budgetary resources in 2018 reflects US\$2.5bn in borrowing authority for the WIFIA program. However, only US\$1bn had been obligated by end-FY 2018, and total outlays by the EPA declined year on year.

Source: EPA.

The US provides a unique case into the role of institutions and policymaking in determining the impact of climate change. Recent events in the US have demonstrated the serious vulnerabilities that exist even in major developed economies. Wildfires currently tearing through California offer a telling example; wildfires are frequent in California, where the long, dry summer facilitates the spread of fires as annual winds pick up in the fall. These events are increasing in frequency and intensity as average temperatures rise; 15 of the 20 largest fires in California history have occurred since 2000, and the surface area burned has increased five-fold since 1970. The state utility, Pacific Gas & Electric Corporation (PG&E), filed bankruptcy in 2019, as it struggled to face the cost of mounting damage claims, as some of these fires were caused by outdated electricity infrastructure. This financial strain further reduces the pool of funds available to invest in infrastructure upgrades, creating a spiralling

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problem in one of the main US states, both in terms of economic size and its population. Trends such as these are responsible for much of the cost that the US economy is likely to bear.

A case study of the US also shows that while strong institutions are critical to a country's ability to mitigate or adapt to the effects of climate change, these can fall flat when policy is out of step. The current president, Donald Trump, has signalled his intent to withdraw from the Paris Climate Change Accord, and will do so in November 2020 if this position remains unchanged. Moreover, the Trump administration has stripped away the environmental regulations imposed by the administration of former president Barack Obama, citing the export- and job-creation potential offered by fossil fuel companies, particularly in the coal industry. In addition to stripping away federal regulation, the administration has also challenged individual states' ability to set more stringent energy efficiency standards and handicapped the Environmental Protection Agency (EPA) by slashing both staff and funding.

The long-term impact of this on our US model is fairly minimal, given that we expect successive administrations to take a more proactive stance political and popular support for more climate-friendly policies builds. Nonetheless, the Trump administration has dealt a temporary setback to the US's climate change mitigation and adaptation efforts. The same could be true of other developed nations, particularly if popular frustration grows with the fact that developed economies will have to deal with much of the financial burden (albeit not the economic and demographic impact) of climate change. The rise of more right-wing, populist parties in Western Europe over the last decade shows the potential for this kind of policy shift, even in countries that currently have some of the most climate-friendly governments in the world.

Strong institutions are no guarantor of climate-friendly policy. However, they do guarantee that policy can be quickly formed and implemented when political will allows, and in this area, the US excels. Other strengths include the domestic renewable energy sector, which has expanded quickly in recent years: renewable energy sources accounted for 11% of total US energy consumption and 17% of total electricity generation in 2018. New industries surrounding climate change will continue to develop in the US, given the country's existing research and innovation hubs, particularly as funding for such projects increases over time.

## Russia and Argentina: two countries with differing approaches

**T**he Economist Intelligence Unit's climate change model shows that the Russian economy will be about 3.3% smaller in 2050 than it would have been without this hit to growth; in Argentina, a country that has similar levels of economic development, the hit to GDP will be around 2%. There are of course wide geographical differences between Russia—a vast country that relies on energy extraction—and Argentina—an agricultural land with abundant natural energy resources. In addition to these differences, however, an important factor that explains the differential negative impact of climate change on growth outcomes in Russia and Argentina lies in another area: institutional preparedness and effectiveness.

Climate change issues have played only a peripheral role in Russia's policy debate, and Russia has not been a prominent player in international negotiations on the subject. This is in part due to the radical deindustrialisation that took place during Russia's transition after the collapse of the former Soviet Union in 1991; as a result, Russia has so far been able to meet its climate change targets against a 1990 baseline within a business-as-usual framework. It also reflects widespread climate change scepticism among much of the Russian business community and policymakers, and a lack of broader public engagement. This scepticism is bolstered by the conviction that Russia may, in fact, benefit from climate change in some regions: for instance, the Arctic Ocean is expected to be largely ice-free and navigable in the summer months by 2025-30, which could allow for the Northern Sea Route to emerge as a major transit corridor between China and Europe. In addition, Northern parts of the country will become more temperate, allowing for an increase in arable land. Despite these potentially positive side-effects of climate change, Russia will suffer more than most other countries in the world from the negative effects of climate change: according to a report released in March 2018 by Antistikhya, a research centre affiliated to the Russian Ministry of Emergency Situations, average winter temperatures across Russia may rise by up to five degrees by the middle of the century, which would have a significant impact on Russia's northern territories. This will also lead to the melting of permafrost in some northern areas, causing infrastructure—including roads, buildings and pipelines—to sink into marshes. Finally, the agricultural sector will record a decline in the productivity of regions south and west of the country, which will lead to increased incidents of droughts and wildfires. The Russian leadership has so far been slow to engage with the challenges presented by climate change and to put forward a strategy to meet the 2030 target. A 2018 decree sets out the key development goals against which the government and regional leaders will be judged. It makes no reference to climate change or mitigation strategies. This suggests that ensuring that the ambitious government economic growth targets are achieved in a sustainable manner will not be a policy priority.

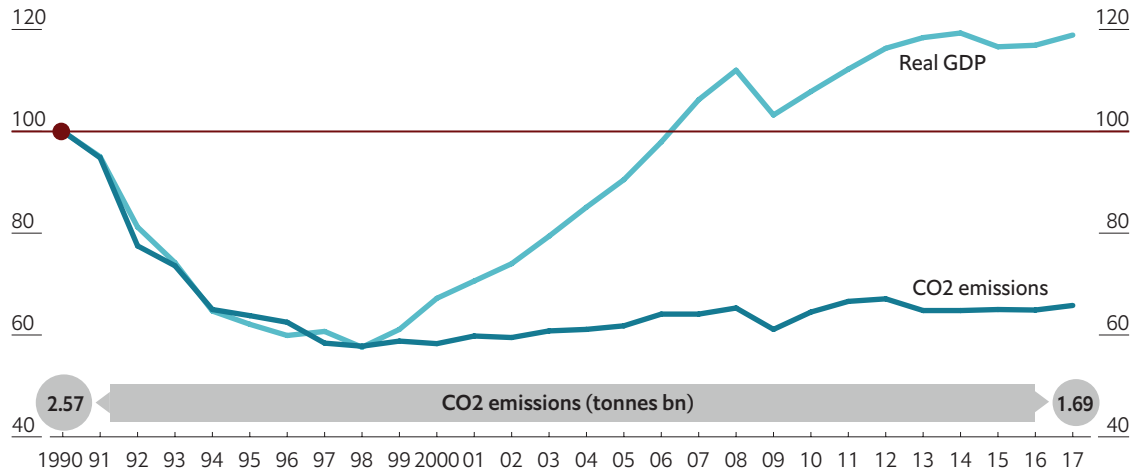


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### Russia real GDP growth and CO2 emissions, a summary

(1990=100)



Source: The Economist Intelligence Unit, Global Carbon Project.

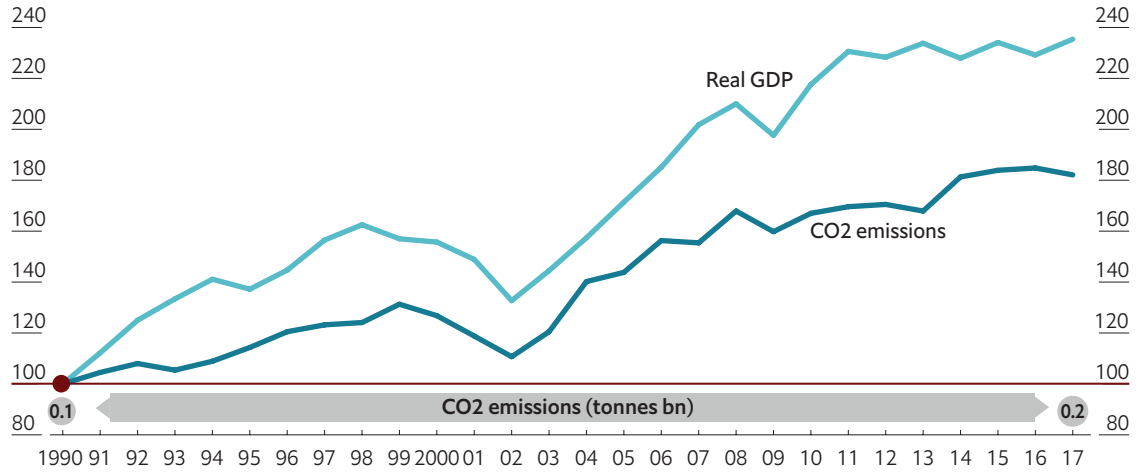
At the other end of the climate change-preparedness spectrum, Argentina's approach to climate change appears as bold and ambitious. In fact, Argentina is aiming to surpass its nationally determined contribution under the Paris Agreement; this is reflected in the high score in our model for Argentina's capacity to mitigate and adapt to climate change (at four out of five in 2041-50). This is because the Argentinean leadership recognises that climate change represents a risk to Argentina's long-term growth rate, most obviously through its impact on the important agriculture sector. Argentina has suffered four major droughts in the period since 2009 alone, and these had a severe knock-on impact on real GDP each time. Since late 2015 the government has worked to develop a comprehensive climate change plan; one element of this is the increased use of renewable energy, including hydroelectric, wind and solar power. Under the "RenovAr" programme, Argentina is now targeting a total of 20% of electricity from renewable sources by 2025 (against less than 5% currently). The government also plans to develop sectoral mitigation and adaptation plans for agriculture, transport, infrastructure, forests, industry and energy. The protection of coastal areas also forms part of public priorities. Finally, in the Uruguay River area on the border between Argentina and Uruguay, a joint initiative between the two countries is in progress to try to increase the resilience of vulnerable coastal populations in this area. It is so far unclear whether the newly elected Argentinean administration will continue the ambitious environmental efforts of the previous one. At any rate, however, high levels of institutional awareness of the climate change challenge will represent an advantage as Argentina tries to tackle global warming and environmental issues.

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**Argentina real GDP growth and CO2 emissions, a summary**

(1990=100)



Source: The Economist Intelligence Unit, Global Carbon Project.

# Angola: one of many developing economies set to be hit hardest

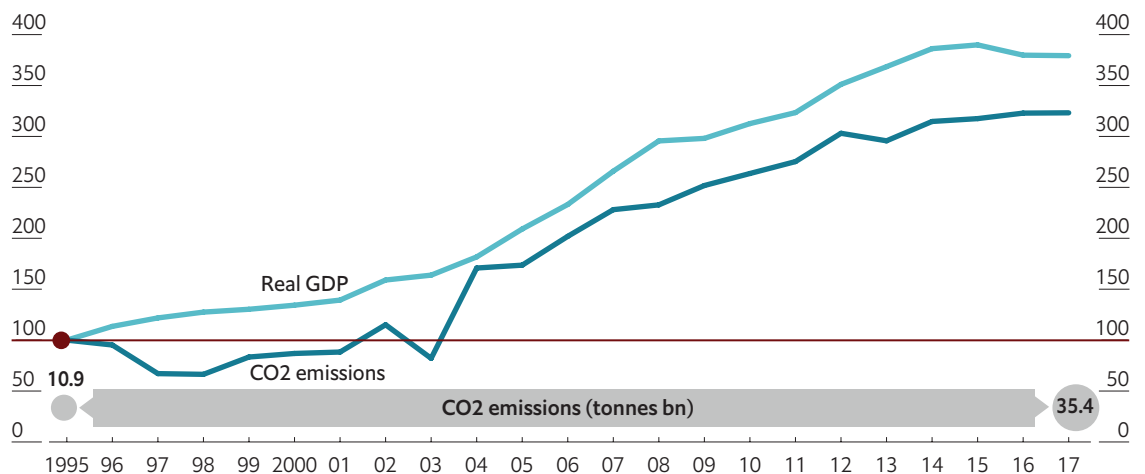
## Climate change will impact developing countries the most

One of the key findings of the Economist Intelligence Unit’s climate change model is that the impact of global warming will not be felt equally in the world; developing economies will be affected much more than developed ones. While geographic exposure to global warming tends to be higher in these countries—nearly all low-income countries are tropical—the state of their infrastructure, their economic structure and governance factors also play an important role in their vulnerability to global warming. Poor quality of infrastructure and housing make these countries less resilient to extreme weather. Developing countries also tend to have a large share of their GDP in the agricultural sector—which is primarily subsistence and rain-fed cultivation making them particularly vulnerable to climate change—or have industries featuring more outdoor work, which will translate into large loss of labour productivity as temperatures rise. Increased competition over dwindling fertile land and deteriorating food security means that many governments will face rising social unrest, unless efforts are made to limit the impact of climate change. However, with a lack of financial and institutional capacity to adapt, as well as low political wherewithal to mitigate the effects of global warming, these countries will be the most affected by climate change.

According to our model, Angola will be amongst the countries with the highest climate change impact to GDP; we forecast that real GDP will be 6% smaller by 2050 than it would have been without this hit to growth. In the last two decades, Angola has already been significantly affected by the impact of climate change, in the form of severe droughts, soil erosion (and associated problems of lower crop production), lower fishing resources, forest fires and flash flooding, particularly in the south of the country. In the coming decades the country will suffer from greater incidence of desertification, soil erosion, land inundation from rising sea levels and the drying-up of surface freshwater levels. Agriculture is only the second largest contributor to Angola’s GDP but employs most of the labour force, and the degradation of land will diminish its productivity over time. The knock-on effects on economic growth and personal consumption will be significant.

### Angola real GDP growth and CO2 emissions, a summary

(1990=100)



Source: The Economist Intelligence Unit, Global Carbon Project.

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With research indicating that Angola will be highly exposed to a worsening of all of these climate change threats over the medium to long term, in recent years there has been a growing focus on how policy can address these issues. Angola ratified the UN Framework Convention on Climate Change (UNFCCC) in 2000 and subsequently developed its climate policy around this convention, approving a National Implementation Strategy in 2008 and further developing policy in an Intended Nationally Determined Contribution (INDC) document submitted to the UN in November 2015. Other government programmes, including the Strategy to Fight Poverty (SFP), the National Adaptation Programme of Action (NAPA) and the Long-Term Strategy for Development of Angola (projecting out until 2025), also contain aspects related to climate policy. However, despite the laudable aims of Angola's climate policy, implementation has been weak, reflecting limited public-sector capacity, as well as questionable commitment from all sectors of government. In our climate change index, Angola scores very low on the two indicators that relate to policy: adaptation and mitigation. On average, Angola scores 1.2 for these indicators over the coming three decades, compared to an overall score of 2.7 for Africa, the lowest of all the regions. Poor institutional preparedness and effectiveness to tackle climate change means that inequalities between rich and poorer countries in the coming decades will widen.

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