WORLD BANK GROUP

THE DEVELOPMENT, CLIMATE, AND NATURE CRISIS:

SOLUTIONS TO END POVERTY ON A LIVABLE PLANET

Insights from World Bank Country Climate and Development Reports covering 42 economies

1818 H Street NW, Washington, DC 20433
Telephone: 202-473-1000; Internet: www.worldbank.org

Cover design: Brad Amburn

Contents

Acronyms

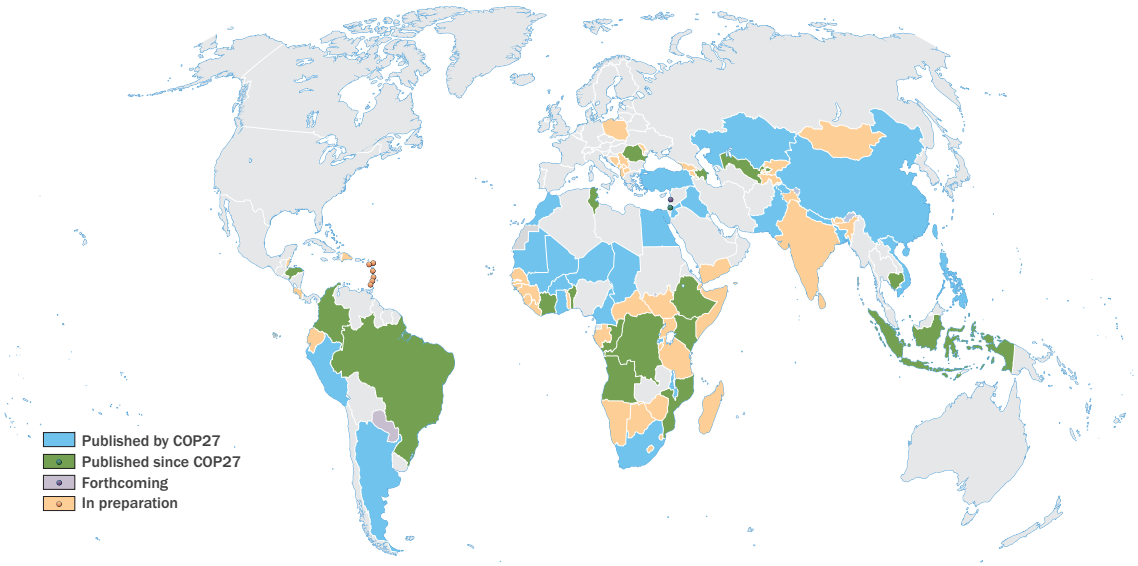
CCDR	Country Climate and Development Report
COP	Conference of the Parties to the United Nations Framework Convention on Climate Change
ERPA	emission reductions payment agreement
FDI	foreign direct investment
GCP	Global Challenge Program
GDP	gross domestic product
GHG	greenhouse gas
GtCO2e	gigatonnes of carbon dioxide equivalent
HIC	high-income country
LIC	low-income country
LMIC	lower-middle-income country
MANAGE	Mitigation, Adaptation, and New Technologies Applied General Equilibrium
MFMod	Macrofiscal Model
MIC	middle-income country
MtCO2e	million tonnes of carbon dioxide equivalent
NDC	nationally determined contribution
REDD+	reducing emissions from deforestation and forest degradation
tCO2e	tonnes of carbon dioxide equivalent
UMIC	upper-middle-income country

1. Introduction

The world faces a triple crisis of three interconnected issues—development, climate, and nature—and current levels of climate action are insufficient. Ending poverty on a livable planet requires all countries to build the resilience of their people and economies to the impacts of climate change, while also reducing greenhouse gas (GHG) emissions to mitigate damaging changes to climate and nature. But barriers to progress—including poor governance, limited access to finance, and political economy challenges—are slowing efforts down. Countries are not reducing emissions and building resilience fast enough, and natural resources are being depleted, putting hard-won development progress at risk.

Beyond the grim headlines, there are increasingly clear opportunities to achieve triple wins. To support the alignment of sustainable development priorities and actions with climate change risks and objectives, the World Bank launched the Country Climate and Development Report (CCDR) in 2022.[1] This core diagnostic tool aims to help countries prioritize the most impactful actions to boost resilience and adaptation and reduce GHG emissions, while delivering on broader development and sustainability objectives. The first set of 20 CCDRs, covering 24 countries, were published by the 27th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP27) in 2022. Another 18 reports, covering 18 countries, have followed, bringing the total of published CCDRs by COP28 to 38, covering 42 countries (figure 1). Building on the lessons learned from these reports, the World Bank aims to roll out CCDRs to all client countries over the next two to four years.

FIGURE 1: *Map of CCDRs, published and underway*



Notes: CCDRs published by COP27 cover 24 countries: Argentina, Bangladesh, Burkina Faso, Cameroon, Chad, China, the Arab Republic of Egypt, Ghana, Iraq, Jordan, Kazakhstan, Malawi, Mali, Mauritania, Morocco, Nepal, Niger, Pakistan, Peru, the Philippines, Rwanda, South Africa, Türkiye, and Vietnam. CCDRs published since COP27 cover 18 economies: Angola, Azerbaijan, Benin, Brazil, Cambodia, Colombia, Côte d'Ivoire, the Democratic Republic of Congo, Ethiopia, Honduras, Indonesia, Kenya, Mozambique, the Republic of Congo, Romania, Tunisia, Uzbekistan, and West Bank and Gaza.

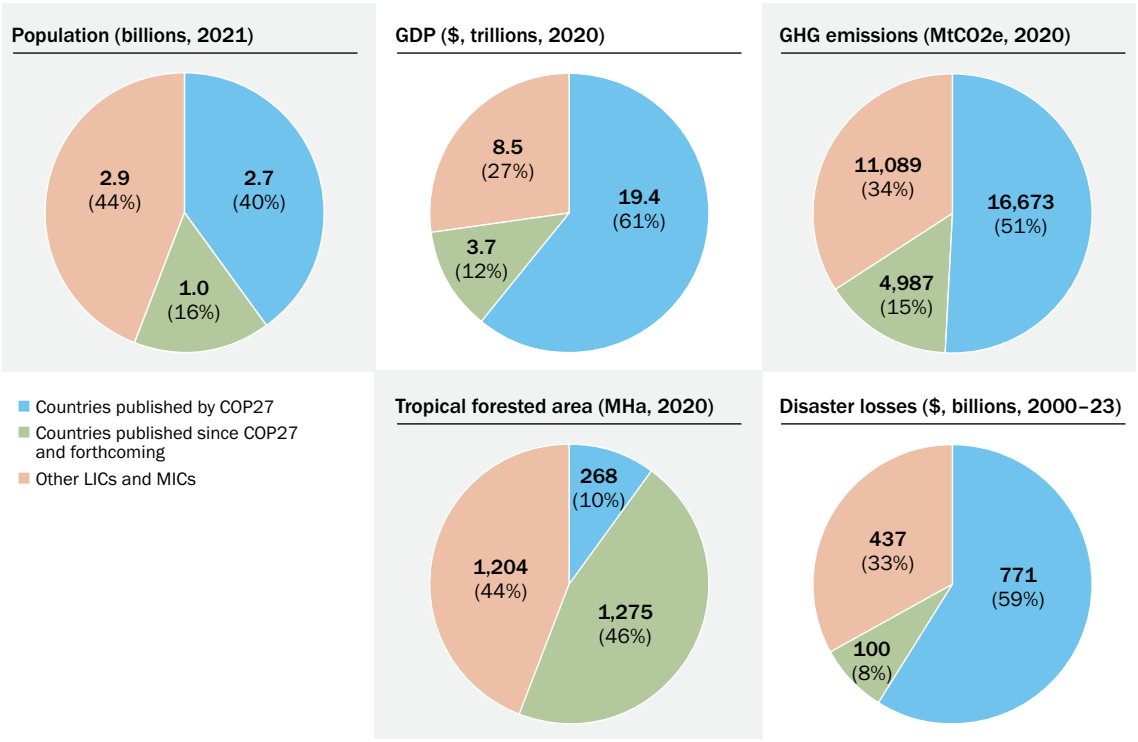
CCDRs now cover 56 percent of the population of low- and middle-income countries (LICs and MICs) and 73 percent of their gross domestic product (GDP) (figure 2). In terms of resilience and adaptation, CCDRs cover an increasing fraction of the world's climate vulnerability: two-thirds

[1] https://www.worldbank.org/en/publication/country-climate-development-reports.

of the disaster losses in LICs and MICs since 2000 occurred in CCDR countries. In terms of GHG emissions, coverage has also expanded, with 66 percent of GHG emissions in LICs and MICs emitted from CCDR countries. The second set of CCDRs also includes one high-income country (HIC), **Romania**. The addition of more countries allows this summary report to confirm the conclusions and key insights of last year's report, and to provide additional insights on how opportunities and challenges differ across countries.[2]

A main addition of the CCDRs published since COP27 relates to tropical forests, a key dimension of the global climate change challenge. The first set of CCDRs covered only 10 percent of the world's tropical forests, but the addition of key forested countries—including **Brazil**, the **Democratic Republic of Congo**, **Indonesia**, and the **Republic of Congo**—increases coverage to 56 percent. Many CCDRs (including **Romania** and **Türkiye**) also discuss the role of non-tropical forests for resilience and emission reduction.

FIGURE 2: *Share of LICs and MICs covered by CCDRs, by various metrics*



Notes: GDP = gross domestic product; GHG = greenhouse gas; MHa = million hectares; MtCO2e = million tonnes of carbon dioxide equivalent; the population, GDP, GHG emissions, and disaster losses charts cover LICs and MICs; the tropical forested area covers all countries.

This second summary report builds on the first report published ahead of COP27. Although it is important to caveat the differences in scenarios and ambition, modeling framework, and scope of analysis, this report provides aggregated results that can help governments, private sector investors, citizens, and development partners prioritize the most impactful climate actions. It confirms—with more granularity and stronger evidence, based on more countries—key findings from the first summary report; but it also discusses new issues, such as deforestation and land degradation. It aims to inform global priorities, including the World Bank's Evolution Roadmap and Global Challenge Programs (GCP), as well as other global initiatives.

[2] World Bank Group. 2022. *Climate and Development: An Agenda for Action—Emerging Insights from World Bank Group 2021–22 Country Climate and Development Reports*. Washington DC: World Bank. http://hdl.handle.net/10986/38220.

2. Resilience and development are mutually reinforcing, but countries are not seizing available opportunities to adapt to climate change

The first set of CCDRs showed the vulnerability of development progress and poverty reduction to climate change impacts, especially in lower-income countries. With a more harmonized approach, the second round confirms this finding and goes deeper in identifying opportunities to boost adaptation and resilience and quantifying the returns from these interventions. But important caveats remain. Estimates capture only a subset of (direct) impact channels and do not capture critical risks—including those related to indirect impacts, conflict and violence, unmanaged migration, ecosystem tipping points, and limits to adaptation, especially in small countries and islands—nor do they capture impacts beyond 2050.

2.1. Climate change has deep, widespread, and cascading effects

Everyone, everywhere is exposed to climate change risks; but impacts tend to be context-specific and highly localized, with countries and regions exposed to different threats. The CCDR estimates demonstrate significant climate change impacts on people, assets, and sectors. In **Ghana**, for example, hydropower generation could be reduced by 8–30 percent by 2040 compared to 2020 levels, with significant implications for energy security. In **Bangladesh**, projected sea level rise could nearly double the assets at risk from flooding by 2050. In **Romania**, annual flooding is expected to raise road transport costs by almost 6 percent and passenger railway cost by nearly 25 percent. In **Kenya**, where road transport carries 93 percent of all freight and passenger traffic, the impact of climate change on roads and bridges by 2030 could cost $100–900 million per year. In many countries, including **Honduras**, **Kenya**, and **Mozambique**, the tourism sector is a key driver of economic growth and an important job creator. But it is also highly vulnerable to multiple types of climate change impact—including natural hazards (such as hurricanes) and slow-onset changes (such as sea level rise and coral bleaching)—as well as natural habitat loss, more generally.

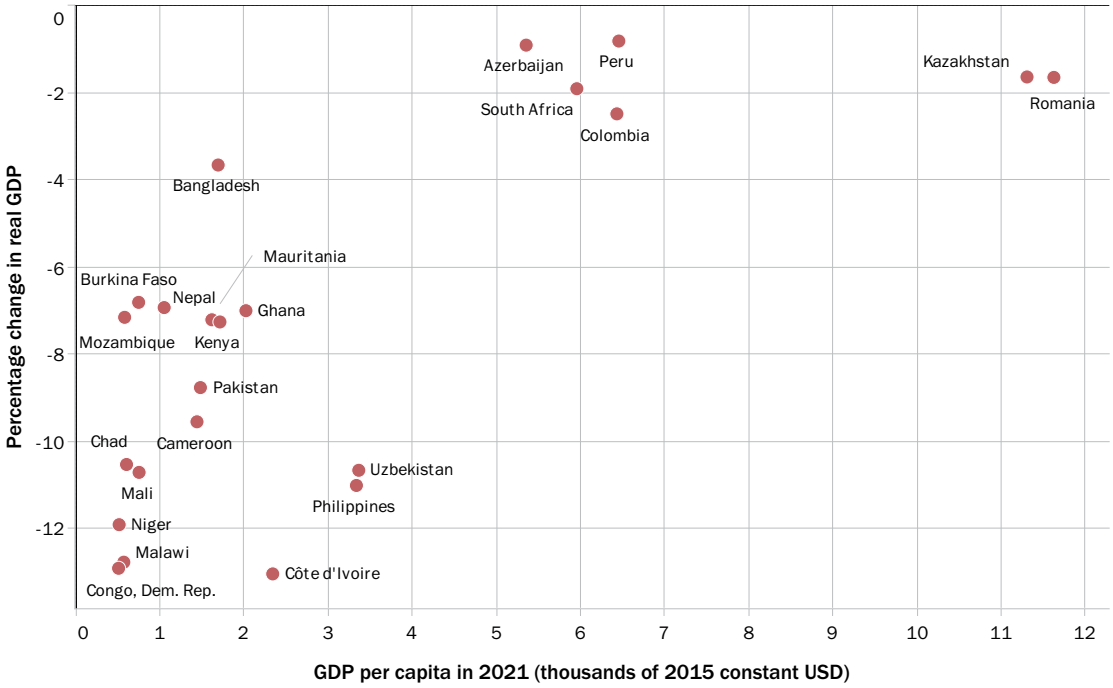
Even when estimated only for a subset of impact categories and without exploring the larger impacts expected post-2050, the macroeconomic impacts on GDP are significant, particularly for lower-income countries. Current knowledge does not allow for an exhaustive assessment of all climate change impact channels, especially some of the biggest risks linked to ecosystem or economic tipping points. But the CCDRs focus on some of the most critical impacts, including labor productivity, agricultural yields, water availability, natural disaster risks, and migration.[3] Even with such a partial analysis, figure 3 suggests that climate change impacts can have significant economywide costs, as measured against GDP. The time profile of these impacts—for example, whether they cause a progressive slowing down of economic growth or a sudden shock—is largely uncertain; but has implications for how they affect well-being. The CCDRs acknowledge that their estimates are partial and uncertain, and they complement their aggregate estimates with discussions of additional risks, including some that are hard to quantify, such as the effect of climate change on conflict (**Democratic Republic of Congo**, **Mozambique**), or ecosystem tipping

[3] On the impacts of climate change on internal migration, see also Clement, V, Rigaud, K K, de Sherbinin, A, Jones, B, Adamo, S, Schewe, J, Sadiq, N and Shabahat, E. 2021. *Groundswell Part 2: Acting on Internal Climate Migration*. Washington DC: World Bank. https://openknowledge.worldbank.org/handle/10986/36248.

points (**Brazil**, **Peru**, **Sahel**[4]). Work is ongoing to refine the methodologies for assessing climate change impacts, particularly on the effects of higher temperatures on labor productivity, the role of nature in economic production, and the macroeconomic impacts of disasters.

Impacts through shifts in ecosystems and the services they provide, or through tipping points in physical systems such as glaciers or continent icesheets, could generate large losses that are not quantified in the CCDRs. Deforestation in the Amazon Basin disrupts the continental water cycle by reducing evapotranspiration, increasing land surface temperature, increasing rainfall runoff, and decreasing overall rainfall in **Brazil**, **Colombia**, and **Peru**, with impacts that can extend far beyond the Amazon Forest. Feedbacks between continued deforestation and climate change could lead to a tipping point beyond which large areas of the Amazon Basin no longer have enough rainfall to support native ecosystems and forests. Reaching a tipping point in the Amazon biome would not only irreversibly damage the structure of the biome and its ecosystem services; it would also mean a major change in the climate and water availability across the whole continent. For **Brazil** alone, the economic impacts of reaching such a tipping point could amount to $184 billion (about 10 percent of 2022 GDP) by 2050.

FIGURE 3: *Estimated impacts on GDP in pessimistic climate scenarios, by 2050*



Notes: GDP = gross domestic product; GDP impacts are derived from the World Bank's Macro-Fiscal Model (MFMod), the Mitigation, Adaptation, and New Technologies Applied General Equilibrium (MANAGE) model, and, in the case of the Democratic Republic of Congo, the Long-Term Growth Model (LTGM). Pessimistic scenarios either represent a subset of climate runs that represent some dry/hot conditions or the average change in climate from a level of global emissions consistent with a radiative forcing of 7.0–8.5 Watts per square meter by 2100. In the latter case, the change in climate is also possible with lower emission levels and higher climate sensitivity or positive feedback from the carbon cycle.

There are strong interactions between fragility and climate change that are only partially captured. Conflicts are major magnifiers of future climate impacts and reduce people's ability to prepare and respond, while climate impacts often increase the likelihood of conflict. In **Mozambique**, the conflict in the north exacerbates the impacts of natural disasters on already depleted and inadequate infrastructure, housing, and services. Situated downstream of nine major river systems that are

[4] Sahel includes Burkina Faso, Chad, Mali, Mauritania, and Niger.

affected by climate variability, **Mozambique** is already vulnerable to change in water dynamics in neighboring countries. Projections from future climate scenarios suggest that reduced water availability, coupled with increased population growth, will lead to significant water conflicts within the country. In the **Democratic Republic of Congo**, more individuals tend to join armed groups when there is increased competition over natural resources and when livelihoods, particularly in agriculture, are impacted by climate-related shocks.

The CCDRs have yet to evaluate the vulnerability of small island nations. The CCDRs published to date do not include small islands, which may face more daunting—or even existential—challenges with very limited adaptation options, but CCDRs covering small island states are currently in progress.

2.2. Beyond aggregate monetary impacts, climate change is expected to affect people's health and well-being

Aggregate monetary impacts do not capture the full extent of welfare and equity implications, as impacts are highly heterogenous and more pronounced for poorer countries and people. Higher vulnerability of people who are in or close to poverty is sometimes linked to higher exposure to risk—for example, due to dependency on agricultural income or living on hazard-prone land. But it can also be linked to a lower ability to prepare and respond, due to a lack of savings and access to borrowing, remittances, social protection, insurance, and other support systems, as well as a lack of voice in decision-making. In **Côte d'Ivoire**, the poverty rate in 2050 could increase from 17 percent in the baseline to 23 percent under the dry and pessimistic climate scenario without adaptation measures, representing another 3.5 million people falling into poverty. Similarly, climate shocks could increase the extreme poverty rate in **Brazil** by 0.6–1.3 percentage points as early as 2030. In the **Democratic Republic of Congo**, the poverty rate could increase by nearly 8 percentage points under the most pessimistic climate scenario, pushing 16 million additional people into poverty by 2050.

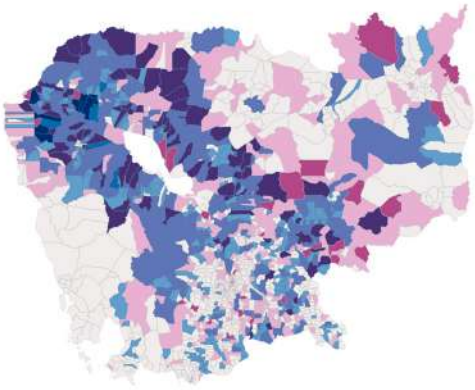
While it is difficult to estimate the future impact of climate change on the poverty headcount, many CCDRs identify priority interventions using vulnerability hotspots. These hotspots are defined as the overlay of current poverty (used as a proxy for lack of adaptive and coping capacity) with future climate-related risks. This is illustrated in figure 4, which shows that high poverty rates, especially in the northwestern parts of **Cambodia**, coincide with significant population exposure to agricultural losses from floods (panel a), droughts (panel b), and heat stress (panel c).

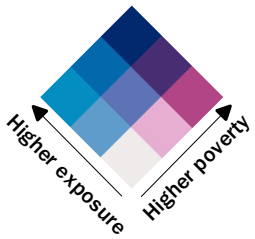
Climate change impacts on well-being go beyond monetary impacts and include various deprivations. These include gender inequality, food insecurity, and the loss of human capital (health, education), natural habitats, ecosystem services, and the intangible value of historical or cultural heritage.

Climate change impacts can magnify gender inequality. In **Benin**, women are particularly vulnerable to climate-induced shocks due to pre-existing gender inequalities. For example, only about 4 percent of women claim agricultural land ownership compared to 26 percent of men, and women have lower access to quality employment: 94 percent of women are self-employed, compared to 83 percent of men. With this bias in vulnerability, and without specific action, climate change impacts are expected to widen gender inequality.

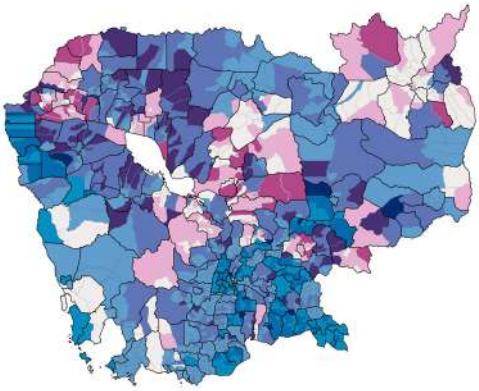
FIGURE 4: *Exposure of poor households to extreme weather events in Cambodia*

a) Exposure to agricultural losses from floods

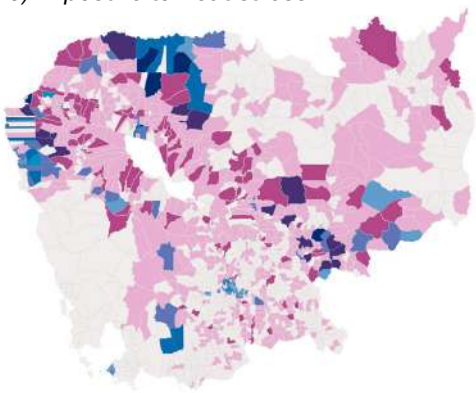




b) Exposure to agricultural losses from droughts



c) Exposure to heat stress



Climate change is expected to increase food insecurity, magnifying the challenges created by a growing population and rapidly shifting diets. In **Argentina**, annual losses in rainfed agriculture from water deficits or excesses are estimated at $2.1 billion (0.6 percent of GDP). In **Uzbekistan**, rising temperatures could result in an 8–13 percent decline in livestock production by 2040. In **Côte d'Ivoire**, the potential decrease in productivity for agriculture could reach 17 percent by 2050, while the impact on services may be close to 6 percent. The World Bank's Food and Nutrition Security GCP aims to contribute to breaking the cycle of food and nutrition insecurity, strengthening food stability, availability, use, and access, and establishing and enhancing crisis preparedness, early warning, and early action systems at country, regional, and global levels.

Impacts on mortality and morbidity can be large. The **Kenya** CCDR notes that climate change will increase exposure to health shocks (through increased incidence of vector-borne and waterborne diseases), heat stress, and air pollution. Mortality and morbidity due to malaria and dengue are expected to increase by 56 and 35 percent, respectively, by 2050. In the **Republic of Congo**, economic costs associated with climate change-induced diarrhea are projected to increase nearly sixfold between 2010 and 2050, reaching about $84 million, while total health costs could increase from $91 million to $259 million.

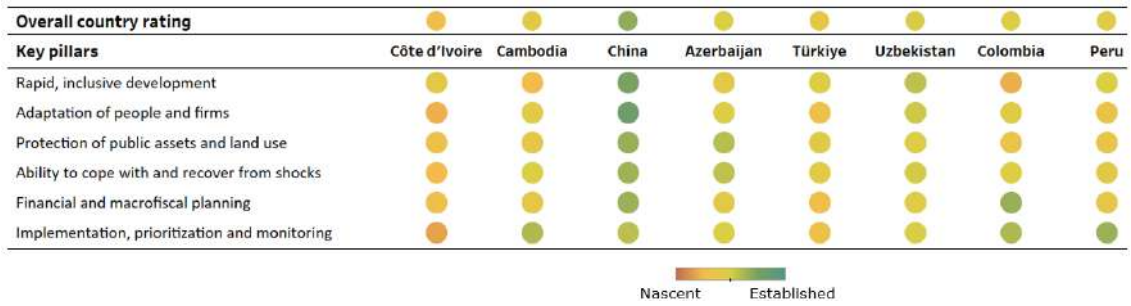
Climate change impacts could also affect people's ability to access health care, due to costs or accessibility challenges. In **Cambodia,** a 1-in-50-year flood lowers the share of people with access to a referral hospital within 60 minutes' travel time by 47 percent in Battambang, 34 percent in Prey Veng, and 25 percent in Banteay Meanchey. The World Bank's new *Enhanced*

Health Emergency Prevention, Preparedness and Response GCP aims to respond to this threat by enhancing capacity to prevent and prepare for health emergencies and future climate change impacts, strengthening health systems at country, regional, and global levels, building emergency-ready health systems, and mainstreaming "One Health" capacities to prevent and prepare for health emergencies.

2.3. A whole-of-society approach is needed to adapt to climate change

To assess the capacity and readiness for adaptation and resilience action and identify key priorities for action, a whole-of-economy assessment was carried out in a subset of CCDR countries. Using a consistent diagnostic framework and scoring system to examine readiness and enabling conditions that are crucial for effective resilience building, the assessments follow the approach outlined in the World Bank's *Adaptation Principles*.[5] This uses an indicator-based scoring tool to evaluate country adaptation and resilience readiness along six pillars: 1) building resilient foundations through rapid and inclusive development; 2) facilitating the adaptation of people and firms; 3) adapting land use and protecting critical public assets and services; 4) increasing people's and firms' capacity to cope with and recover from shocks; 5) anticipating and managing macroeconomic and fiscal risks; and 6) ensuring effective implementation with a robust governance structure and continuous monitoring. Around 150–180 quantitative and qualitative indicators were selected for each country to evaluate its progress and identify gaps and priority interventions for enhancing adaptation and resilience action and capacity. Overall performance scores along the six pillars are presented for a subset of countries in figure 5. While all the countries shown were assessed using the same framework, the performance ratings should not be interpreted as direct comparisons between countries as the indicators used in each assessment reflect that country's priorities and data availability and use different peer groups for benchmarking analysis. This section discusses the key priorities identified by CCDRs in these six pillars.

FIGURE 5: *Summary of country adaptation and resilience ratings*



Note: The dots are colored according to the country's average score, ranging from 1: nascent (dark orange), through 2: emerging (yellow), to 3: established (dark green).

Foundations: rapid, inclusive socioeconomic development to build resilience

Rapid and inclusive development, poverty reduction, and universal access to infrastructure and social services contribute to build resilience to climate change. People with access to clean energy and water, quality health care and education, good dwellings, decent jobs, financial instrument, and reliable social safety nets are more resilient to climate change impacts.[6] In many CCDRs—such as the **Sahel**, the **Republic Democratic of Congo**, or **Malawi**—structural change and economic growth are found to reduce vulnerability by making the economy less dependent

[5] Hallegatte, S, Rentschler, J and Rozenberg, J. 2020. *Adaptation Principles: A Guide for Designing Strategies for Climate Change Adaptation and Resilience*. Washington DC: World Bank. http://hdl.handle.net/10986/34780.

[6] Hallegatte, S, Bangalore, M, Bonzanigo, L, Fay, M, Kane, T, Narloch, U, Rozenberg, J, Treguer, D and Vogt-Schilb, A. 2016. *Shock Waves: Managing the Impacts of Climate Change on Poverty*. Washington DC: World Bank. http://hdl.handle.net/10986/22787.

on low-productivity agriculture and providing people with better jobs that are less exposed to climate risks. In the **Democratic Republic of Congo**, **Mozambique**, and the **Sahel**, conflicts and institutional fragility contribute to people's vulnerability to climate variability, leading to human and economic impacts that are much larger than they would be otherwise.

Progress toward achieving the Sustainable Development Goals is key to building populations' resilience to climate change. For example, low access to basic services—including health care, and education, information and communications technology, safe water, and sanitation—and a high degree of informality increase the population's vulnerability and decrease socioeconomic resilience. In **Côte d'Ivoire**, 17 percent of the population has access to safely managed sanitation services, compared to lower-middle-income country (LMIC) and upper-middle-income country (UMIC) averages of 50 and 60 percent, respectively. **Cambodia** also trails behind its regional peers in terms of health and education outcomes, including access to secondary education, access to safe water and sanitation, and the ability to mitigate welfare losses from natural disasters and climate impacts. In some countries, such as the **Democratic Republic of Congo**, **Peru**, and **Colombia**, there are large spatial disparities in access to critical public services (such as safe water and sanitation), transportation, and financial services, especially among the rural poor.

When domestic policies are inadequate and development progress is slow, climate change impacts are often amplified. In **Pakistan**, distortionary and inequitable fiscal policies, unequal land ownership, and tenure insecurity make smallholder farmers even more vulnerable to future climatic change. And in **Brazil**, rapid deforestation and unsustainable land practices contribute to the vulnerability of the Amazon ecosystems to climate change. But although good development policies and poverty reduction are crucial for climate resilience, they are not enough on their own. A whole-of-society approach to resilience and adaptation is needed to ensure all decisions and investments consider climate risks.

Create an enabling environment for people and firms to adapt and to facilitate business opportunities in adaptation

Climate risk information is needed to inform resilience decisions by private and public decision-makers. Most countries have developed good hydrometeorological capability[7] and have carried out climate risk and vulnerability assessments for key sectors. However, the coverage and availability of high-resolution data, detailed hazard maps, and local-scale climate change scenarios usually need improvements and to be made more accessible. In **Uzbekistan** and **Azerbaijan**, inefficient data collection channels for real-time monitoring, the lack of site-specific forecasts, and limited workforce undermine the effectiveness of their impact-based forecasting systems in helping firms and households adapt to climate change. In **Côte d'Ivoire** and the **Democratic Republic of Congo**, the lack of climate information and services makes it difficult for farmers and pastoralists to prepare for weather extremes and other impacts of climate change.

To increase the resilience of the agriculture sector and ensure food security, countries need to implement new technologies (such as water use efficiency), increase access to insurance and risk finance, enhance early warning systems, and advance climate risk and adaptation knowledge. In **Cambodia**, adopting climate-smart agriculture, and particularly irrigation, presents a major opportunity for changing production practices and achieving farming efficiency, higher productivity, and higher incomes among farmers. But in **Colombia** and **Côte d'Ivoire**, scaling up climate-smart agriculture practices faces numerous structural challenges and capacity limitations.

[7] *Hydrometeorological (or hydromet) capacity* refers to the ability to monitor and predict hydrological, climatic, and meteorological variables.

Private sector actions in adaptation and resilience lag, but are emerging; the lack of policy and regulatory framework and finance are key barriers for private sector investment in resilience. **China's** regulatory system provides limited information and incentives for private actors to prepare for and insure against the effects of a warming climate, while in **Uzbekistan**, the lack of regulatory frameworks and implementation capacity for integration of adaptation and resilience principles are key obstacles for private sector firms to integrate climate resilience. In **Azerbaijan**, very few firms have developed frameworks for climate change adaptation and business continuity plans in their operations, while a lack of financing mechanisms and incentives prevent firms from mainstream adaptation in their practices in **Cambodia**. In **Cameroon**, a more favorable business environment would also make it more attractive for the private sector, domestic as well as foreign, to play a bigger role in financing resilience.

Protect public assets, infrastructure, and services, and adapt land use planning

Most countries have major infrastructure resilience investment gaps and lack a countrywide strategy for resilient infrastructure. CCDRs build on global analyses showing the high return of investing in more resilient infrastructure, with on average $4 in avoided impacts per $1 invested.[8] **Colombia** has one of the most significant infrastructure gaps in Latin America and needs to develop a governmentwide strategy to increase public infrastructure resilience that includes an updated resilient infrastructure plan, a dedicated resilience agency for the transport sector, and a modern asset management system for the primary infrastructure network to track asset maintenance and repair history. Some countries have found that locally-led climate action programs can supplement infrastructure to deliver effective resilience measures at a lower cost. In **Bangladesh**, devolved climate finance and partnerships with local governments and nongovernmental or civil society organizations have successfully delivered localized investments that strengthen community and household resilience to coastal storms.

Many countries face water stress, with climate change predicted to exacerbate existing water scarcity conditions. Low water productivity is evident in most countries, highlighting the need for better water resource management and more cross-sectoral planning and integration to ensure water availability for domestic, agricultural, industrial, and environmental uses. Most countries would benefit from strengthened capacity of water institutions to collect data, monitor and implement projects to efficiently allocate water resources, and accommodate changing conditions due to climate change. In **Uzbekistan**, which has relatively low water use efficiency and high freshwater withdrawals, better institutional collaboration between different ministries would ensure coordinated actions and enhance water use efficiency. With only 97 cubic meters of water per capita per year, **Jordan's** available water is well below the absolute water scarcity threshold of 500 cubic meters per year. Climate change will magnify this crisis by further decreasing water availability while increasing water demand. The World Bank's *Fast-Track Water Security and Climate Adaptation* GCP aims to strengthen water security through systems change and by scaling up more sustainable water management and disaster risk reduction solutions, including improved access to water supply and sanitation, improved irrigation service delivery and water productivity, and flood and drought risk reduction through sustainable water management and disaster risk reduction.

Urbanization is undergoing rapid growth, but many countries lack an adequate institutional and regulatory framework, the technical capacity, and the finance needed to implement integrated urban and land use planning that incorporates climate risk management. In **Peru**, informal developments continue to grow in areas at risk due to institutional weaknesses, including a

[8] See Hallegatte, S, Rentschler, J and Rozenberg, J. 2019. *Lifelines: The Resilient Infrastructure Opportunity*. Washington DC: World Bank. http://hdl.handle.net/10986/31805.

weak regulatory environment for urban and land use planning and overlapping institutional roles. **Côte d'Ivoire** has established a framework for urban planning, but the process—which is largely centralized at ministry level—does not sufficiently address climate and disaster risks or the specific needs of cities. The country's urban areas face difficulties in providing basic services, such as transportation, clean water, and sanitation, especially in informal settlements. In **Bangladesh**, **China**, **Kenya**, **Türkiye**, and other countries, community engagement and participation in planning process is considered an important component for disaster prevention and response.

Countries need to improve health and education system resilience in the face of climate change and disasters, through quality service delivery and by closing digital gaps. Investing in human capital will limit the impact of climate change on people and help them combat climate change.[9] **Peru** has a health sector emergency response plan and a national health adaptation plan, and while it has implemented some of the actions in these plans, others are outdated and do not cover all relevant hazards. Its health system has insufficient capacity to respond to sudden surges in demand for care. In **Uzbekistan**, the lack of private sector data in the health sector prevent data-driven decision-making for enhancing health sector resilience. Box 1 outlines the role of digital technologies enabling adaptation and resilience.

Box 1: Digitalization as a key enabler of adaptation and resilience

All six pillars of the Adaptation Principles used to measure countries' readiness to adapt to climate change can benefit from digital technologies, which can help bring the right information at the right time to public and private decision-makers alike.

Digital tools and networks enable real-time environmental and hydromet monitoring and the ability to forecast and deliver timely warnings, allowing people and firms to make decisions. New technologies also allow companies and governments to maintain infrastructure services during extreme weather events, making systems more resilient and adaptable. The ability of governments to support people and firms when affected by shocks is also greatly enhanced by digital public services that make it possible to collect information and deliver support rapidly.

The World Bank's *Accelerating Digitalization* GCP will support digitalization at scale to enable innovation and adoption of technology, including by fast-tracking affordable broad band for all, scaling up inclusive and safe digital public infrastructure, and building digital skills for jobs. This will support countries in building their resilience, but also in reducing energy consumption and GHG emissions.

Increase people's and firms' capacity to cope with, and recover from, shocks

Countries need to strengthen their infrastructure and capacity to deliver critical services—including hydromet information, early warnings, and social protection—to the population before, during, and after climate shocks. Côte d'Ivoire has yet to establish early warning systems, and its national meteorological agency lacks sufficient infrastructure to collect and disseminate real-time weather data and forecasting information. **Cambodia** lacks capacity for monitoring hydromet parameters and has inadequate communication systems for transmitting data and disseminating forecast information.

[9] World Bank Group. 2023. *How to Protect, Build, and Use Human Capital to Address Climate Change*. https://thedocs.worldbank.org/en/doc/cc99b238fa9a0f266579d49dc591b2d4-0140062023/original/HCP-Climate-Policy-Brief.pdf.

Significant gaps in financial access and social protection coverage further exacerbate vulnerability in the face of climate shocks and natural disasters. Although there is progress with households having some type of protection and risk management strategies, several countries—including **Peru**, **Cambodia**, and **Uzbekistan**—lack a comprehensive national strategy for managing residual climate and natural risks. Insurance provision and uptake are low, even in HICs like **Romania**. Access to finance for the poorest is relatively low in the **Democratic Republic of Congo**, **Cambodia**, **Azerbaijan**, and **Uzbekistan**. Social protection coverage is low in **Cambodia**, especially among the poorest populations, significantly affecting their resilience to shocks. One important step highlighted in most CCDRs is ensuring access to digital technologies (including for women) and creating a unified social registry system that integrates poverty and vulnerability assessments with climate data and digital payment platforms.

Macroeconomic stability and financial and fiscal planning

Building economic and system resilience requires countries to manage macroeconomic stability, improve economic growth, and adopt economywide diversification efforts. Excessive specialization exacerbates climate change vulnerability in many countries, such as the **Sahel**, **Iraq**, and the **Democratic Republic of Congo**. The government of **Cambodia**, a predominantly agrarian economy that is vulnerable to climate change and not well-diversified compared to other countries in the region, has taken steps to adopt policies to diversify its economy, as evidenced in its industrial development policies (2015–25). In **Uzbekistan**, reforms toward a market economy provide opportunities for developing manufacturing and industry while enhancing the efficiency and competitiveness of current dominant sectors.

Most countries have not yet comprehensively assessed the physical risks to their fiscal sustainability and public finances, nor do they systematically include contingent liabilities in budget planning. Colombia and **China** have developed robust national climate and disaster risk financial strategies to manage contingent liabilities and use multiple risk finance instruments and mechanisms to reallocate emergency budget and manage post-disaster financial needs. But other countries—such as **Peru**, **Türkiye**, and **Uzbekistan**—lack a comprehensive national strategy for managing residual climate and natural risks. With an insurance market penetration rate of less than 1 percent, **Cambodia** faces a significant funding gap ($400 million for a 1-in-20-year flood) between the government's projected disaster-related contingent liabilities and available resources. The CCDR recommends a strategic approach toward disaster risk finance, developing an enabling policy, legal, and institutional environment, and implementing a combination of financial tools such as contingent financing and sovereign risk transfer instruments.

Effective governance, implementation, monitoring, and evaluation

All the CCDR countries have made progress in developing institutional and policy frameworks for climate change adaptation, but capacity, investment, and implementation gaps remain significant. Most have national adaptation strategies and action plans with regular updates and communication and many have integrated adaptation needs in their development plans. But establishing the legal basis for enacting adaptation and resilience strategies and improving public investment management is crucial to accelerate implementation and investments. In 2021, **Ecuador** established an overarching coordinating body for climate change, the Inter-ministerial Committee for Climate Change, which brings together institutions horizontally and is chaired by the Ministry of Environment and Water. More recently, it published its first national adaptation plan (2023–27), which proposes a multisectoral adaptation and resilience strategy; but challenges remain to support the plan with enough funding, technical capacity, and clear responsibilities

assigned to ministries. In **Uzbekistan**, which has a patchwork of presidential decrees, government resolutions, and sectoral strategies on climate change impacts but no overarching policy framework, the national adaptation planning process provides an important opportunity to align national adaptation strategies with climate adaptation and resilience priorities.

2.4. Boosting resilience and adaptation is a high-return investment, but cannot cancel all impacts of climate change

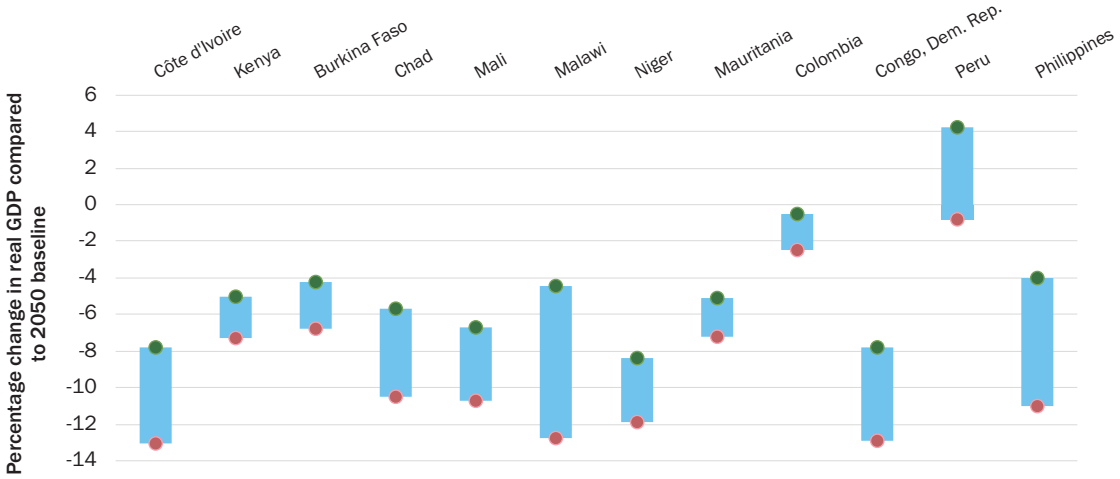
The CCDRs show that targeted adaptation actions can significantly reduce the impacts of climate change and have high economic returns. Many of the adaptation and resilience investments identified in the CCDRs are also *no-regrets* investments. This means they deliver net benefits in all possible scenarios, and in some cases, their development co-benefits make them attractive even without considering avoided climate change impacts. In **Peru**, adaptation investments would have a positive impact on growth and could increase GDP by 5 percent, mostly due to co-benefits in agriculture and water. In **Cambodia**, investing around 5 percent more annually in better access to improved water and sanitation could nearly offset negative climate change impacts on labor supply by 2050. Improved sanitation and fecal sludge management in **Pakistan** could result in a decline in stunting from 40 to 30 percent by 2030 and down to 5 percent by 2050. This, in turn, leads to a 30 percent increase in the effective labor supply of adults who would otherwise be stunted.

An analysis conducted for the Cambodia CCDR using a triple dividend framework[10] shows that climate-related spending has substantial development benefits above and beyond the benefits of avoided climate change impacts. The triple dividend approach has three dividends of resilience. The first measures avoided losses from climate change; the second includes induced economic benefits that are independent of avoided impacts; and the third has wider environmental or social benefits. In three sectors—land use, land use change, and forestry; water; and resilient roads—the benefit-to-cost ratio far exceeds 1, suggesting these are worthwhile investments. The second and third dividends, which do not depend on climate change impacts, are four to six times greater than avoided losses. For example, measures to upgrade and improve rural roads can lower disruptions from flooding, but also increase economic activity and access to jobs in rural areas in all scenarios. Likewise, improved irrigation and water management lower the potential negative impacts of climate change, but also increase crop yields and agricultural productivity in all scenarios. And improved forestry management lowers the effects of floods and droughts, benefiting rural communities through improved agricultural productivity and water resources. In **Uzbekistan**, a triple dividend analysis of water resources, agriculture, and land restoration to 2040 also reveals a high net present value of adaptation investments of more than $9 billion and a benefit–cost ratio above 2.

Adaptation and resilience interventions can reduce, but not cancel, the impacts of climate change. The CCDRs find that adaptation measures can substantially reduce the direct impacts of climate change on GDP (figure 6). In the West and Central African countries represented, implementing the suggested adaptation interventions could reduce total GDP losses in 2050 by 2–5 percentage points. In **Côte d'Ivoire**, such investments could reduce annual economic losses from climate change from 13 to 8 percent of GDP by 2050.

[10] Tanner, T, Surminski, S, Wilkinson, E, Reid, R, Rentschler, J and Rajput, S. 2015. *The Triple Dividend of Resilience: Realising Development Goals through the Multiple Benefits of Disaster Risk Management*. Overseas Development Institute and World Bank.

FIGURE 6: *GDP impacts of climate change in 2050 in pessimistic scenarios, with current policies and with additional adaptation measures for selected countries*



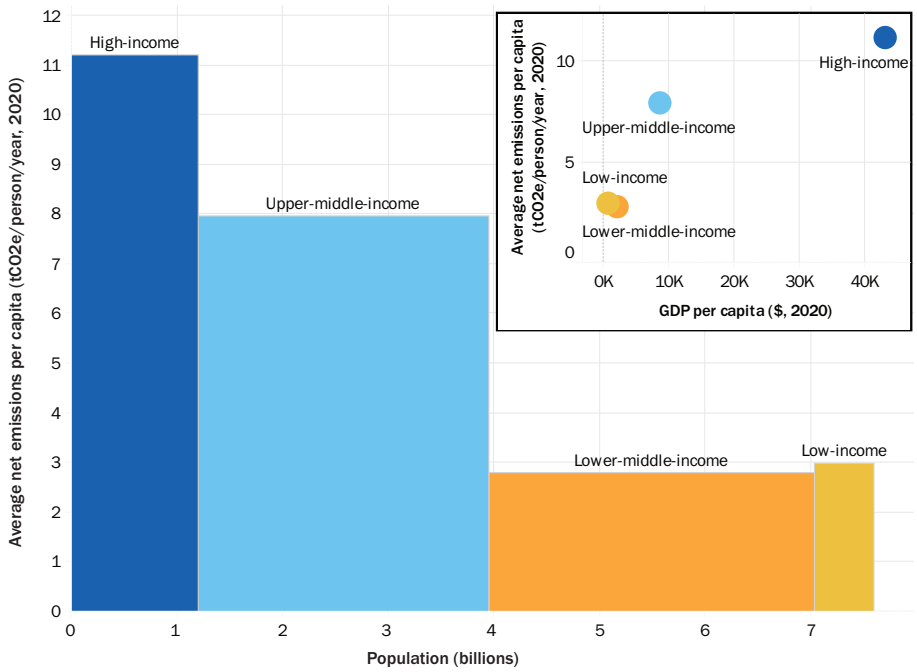
Notes: The red dots show the impact of climate change represented in CCDRs, with current policies and practices; the green dots show the impacts with recommended adaptation measures and their co-benefits.

3. GHG emissions can be reduced without compromising economic growth and poverty reduction

Rapid acceleration of global mitigation action is urgently needed to prevent the worst impacts of climate change. As illustrated by the recent synthesis report of the United Nations Framework Convention on Climate Change's global stock take technical dialogue,[11] policies are not yet consistent with global climate goals. With current policies, warming will exceed 2 °C and could be as high as 3.4 °C by 2100. It is vital that HICs—which are more responsible for historical emissions and have higher per capita emissions (figure 7), more capacity to develop new solutions and technologies, and more resources—lead the way with deeper decarbonization at a faster pace. But to achieve global mitigation objectives, all countries have a role to play.

Most CCDRs explore illustrative ambitious low-emission development strategies that lead to decreasing GHG emissions (figure 8). They do not identify an optimal decarbonization pathway, but instead explore the implications of plausible decarbonization scenarios that are consistent with countries' own climate targets. The second set of CCDRs adopt a more standardized approach to low-emission development, with UMICs and HICs systematically exploring an illustrative pathway consistent with net zero emissions to highlight costs, benefits, opportunities of, and barriers to, such pathways. Lower-income country CCDRs, including most LMICs, explore less ambitious scenarios, with scenario definitions based on local context and countries' existing commitments. Since achieving the Paris Agreement's global mitigation objectives depends on global emissions, no single country trajectory can be consistent with the Paris Agreement objectives on its own.

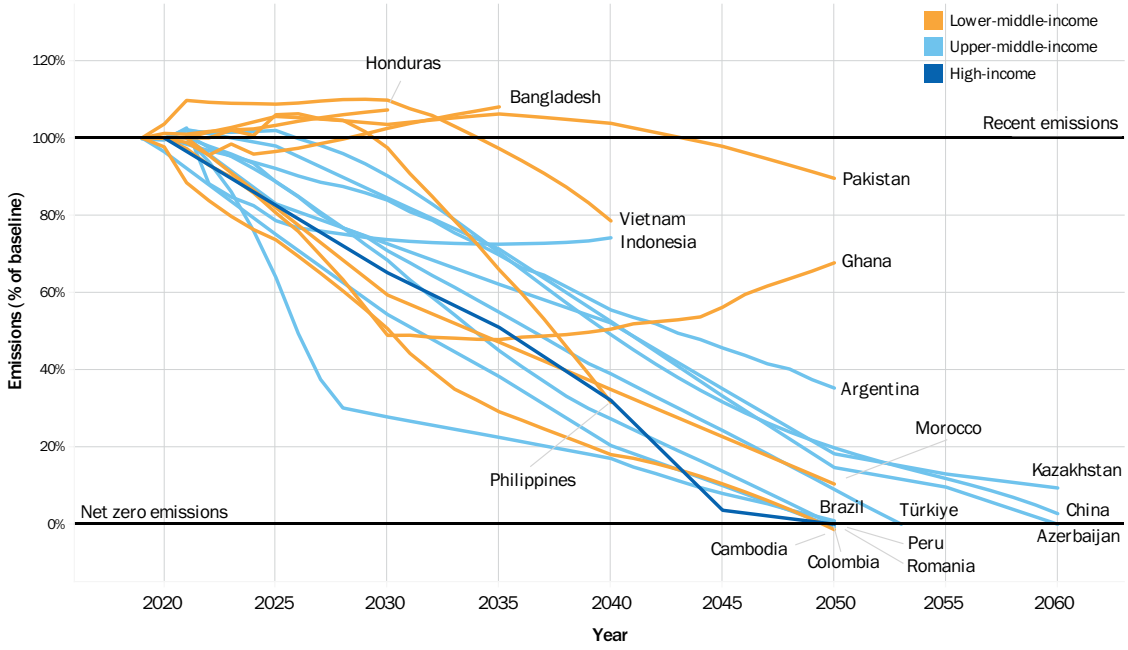
FIGURE 7: *GHG emissions per capita, per country income group*



Note: tCO2e = tonnes of carbon dioxide equivalent.

[11] UNFCCC. 2023. Technical dialogue of the first global stock take. *Synthesis report by the co-facilitators on the technical dialogue*. https://unfccc.int/documents/631600?gclid=Cj0KCQiAr8eqBhD3ARIsAIe-buMK5phu0jWUeTUx5QvpGefY1x0n7Spe1eyPnwKvPT7QuxBrAA990h8aAhOgEALw_wcB.

FIGURE 8: *Change in GHG emissions in low-emission development scenarios*



The illustrative low-emission development scenarios in the CCDRs reduce countries' GHG emissions by 73 percent by 2050, compared to current levels, and 76 percent, compared to the reference scenarios. Without **China**—which, due to its size and current emissions, has an outsize role in total numbers—2050 emissions in the CCDR low-emission scenarios would be reduced by 61 percent, compared to current levels, and 77 percent, compared to reference scenarios. The low-emission strategies in CCDRs are often more ambitious than nationally determined contributions (NDCs), emphasizing the importance of the current decade in achieving long-term climate objectives and the need to align short-term commitments with long-term pledges.

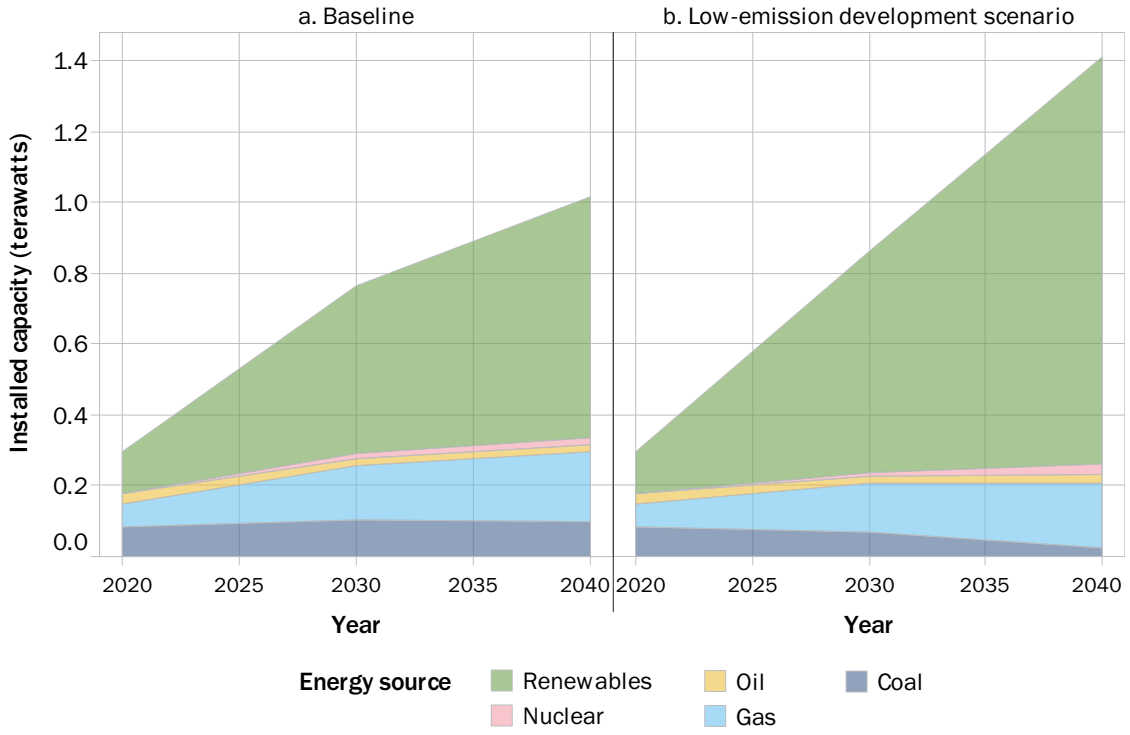
Even in the low-emission development scenarios, annual emissions in CCDR countries could still reach more than 4.9 gigatonnes of carbon dioxide equivalent (GtCO2e) by 2050. Achieving the Paris Agreement's global mitigation objectives and reducing net global emissions to zero in or around 2050 would require enhanced ambition beyond the CCDR low-emission development pathways, including larger reductions in fossil fuel use.

3.1. Growing evidence of synergies between development, mitigation, and resilience

The second set of CCDRs confirm the opportunity offered by renewable energy to meet the growing demand for electricity at the lowest possible cost, improve energy security, and reduce emissions in the energy sector. Power sector modeling in CCDRs shows that solar and wind energy play a significant role in meeting the growing demand for electricity this decade at the lowest cost to consumers, even without considering climate objectives. The shift to renewable energy is driven by economic considerations (figure 9a), and, as in previous CCDRs, grows even larger in a low-emission scenario, where they represent almost all new capacity additions (figure 9b). In **Malawi**, the government intends to replace high-cost diesel generation with solar power from independent power producers, reducing both the fiscal burden of meeting growing electricity demand and emissions. Countries with large renewable potential, like **Brazil**, can even fully decarbonize their power systems without increasing costs or affecting resilience. In

other countries, such as **Côte d'Ivoire** and **Uzbekistan**, rapid projected growth in electricity demand combined with decreasing gas supplies necessitates power system transformation; and renewable options—particularly solar photovoltaic—are the most cost-efficient solutions. Benefits can be large in countries with frequent power blackouts, such as **Uzbekistan**, where the latest enterprise survey finds that access to reliable electricity is the third most-cited constraint to business operations.

FIGURE 9: *Power generation capacity in 25 CCDRs*



Note: China is not included in this figure, due to the size of its power system, but the figure with China shows similar trends.

Domestic and international climate policies can affect the competitiveness of firms and the comparative advantage of countries, creating both risks and opportunities. **Morocco** and **Türkiye** are well placed to reap benefits from global decarbonization, as their economies are closely integrated with the European Union, which is among the regional blocs that have embraced ambitious climate action targets. Decarbonization represents an opportunity for their industries to not just maintain, but also expand, their market shares in Europe, enhance their attractiveness for foreign direct investment (FDI), and become hubs for green investment and export, with positive spillovers in terms of economic growth and jobs. In **Brazil**, which already has one of the world's least carbon-intensive economies, the potential for cheap renewable energy could make it possible to decarbonize the manufacturing sector at a low cost, through a combination of electrification and zero-carbon fuels such as green hydrogen. On the other hand, new trade regulations (such as the European Union's Carbon Border Adjustment Mechanism or Corporate Sustainability Due Diligence) or legislation to support domestic production (such as the United States' Inflation Reduction Act) may create barriers to LIC and MIC participation in green value chains—for example, by excluding small and medium-sized enterprises if they cannot meet increasingly demanding reporting requirements. Trade and market integration act as important driving forces of climate action.

Fossil fuel exporters are more likely to be exposed to transition risks than energy importers, but domestic emissions reductions—through energy efficiency or increased use of renewable energy—can also be in their economic interest. Countries that export fossil fuels, such as **Iraq**, **Kazakhstan**, or **Angola**, are highly vulnerable to global decarbonization, which, in the case of Iraq, could reduce GDP by around 21 percent by 2040. In these economies, greening the energy system could help diversify the economy into sectors that are less exposed to climate physical and transition risks, increase their resilience to fossil fuel market fluctuations, and develop new drivers of sustainable economic growth. This is because the cost of renewable energy or energy efficiency is often lower than the opportunity cost of fossil fuels, and a green transition enables larger energy exports (to meet demand from existing fossil fuel assets, at least for the next decades). In **Azerbaijan**, domestic decarbonization investments would raise economic energy system costs only modestly (by up to 13 percent by 2060 in the net-zero scenario) and allow for a significant increase (up to 5–10 percent) in additional oil and natural gas available for export per year in the medium term, between 2030 and 2050. In **Brazil**, the low cost of renewable energy means that meeting domestic energy demand with domestic renewable energy, rather than building fossil fuel generation capacity, would not affect energy costs. Instead, it would lead to economic benefits through larger energy exports of fossil fuels to the international market in the short term, and through green carriers (green hydrogen or ammonia) or green products (such as green steel) in the longer term. Revenue from energy exports can also contribute to financing the transition toward low-emission development, as illustrated in the **Colombia** CCDR.

As well as confirming synergies with providing universal access to electricity, the CCDRs point to a need for large investments in power grids and interconnections, difficult energy market and utilities reforms, and integrated supply-side and demand-side interventions, including in energy efficiency. Battery energy storage plays a key role in many low-emission scenarios, reaching a volume much larger than the current market. Countries can also reduce investment needs in the power sector with the right regulations, financing, and investments in energy efficiency in all sectors (industry, transport, and buildings in particular). This would require reforming energy and power markets and having financially viable utilities.[12] The World Bank's new *Energy Transition, Efficiency and Access* GCP will contribute to achieving these goals by increasing access to affordable, reliable, sustainable, and modern energy, scaling up clean energy, phasing down fossil fuel use, supporting the decarbonization of the transport sector, and facilitating a just transition, while leveraging domestic and foreign private sectors to scale up financing and technology transfer.

Improving transport infrastructure helps reduce GHG emissions, connect people with jobs and services—including those provided in schools and hospitals—and increase productivity and competitiveness through better logistics. There are opportunities to improve road safety and accessibility, and reduce GHG emissions in **Malawi's** transport sector, by promoting a modal shift in passenger and freight transport to rail and investing in non-motorized transport. Similarly, road maintenance and shifting to multimodal transport in **Mozambique** could also contribute to more resilient urban growth and reduce emissions. Estimates show that integrating road and rail transportation could reduce the economic risk of climate events on roads by up to 10 percent and emissions by about 200,000 tonnes per year. Traffic congestion in **Kenya's** Nairobi Metropolitan Area costs the economy about $1 billion a year, while the annual cost of road traffic accidents, in which most victims are pedestrians in urban areas, is about $3 million. An improved public transit system by 2030, with a 43 percent modal share of public transport, and greener public transit, could reduce emissions and make Nairobi a more productive and livable city.

[12] World Bank. 2023. *Scaling Up to Phase Down: Financing Energy Transitions in the Power Sector*. Washington DC: World Bank. http://hdl.handle.net/10986/39689.

3.2. There are cost-effective opportunities to reduce methane emissions

At the global level, methane emission reductions offer opportunities for no- or low-cost GHG emissions reductions in three key sectors: agriculture, oil and gas, and waste management. Agriculture emissions represent 44 percent of the total, mostly from rice production and livestock. Fugitive emissions from the energy sector represent around 37 percent, and waste management almost 20 percent.

Inefficient agricultural practices both increase emissions and lower productivity in the agriculture sector, while having negative consequences for climate adaptation. In **Cambodia**, methane emissions from rice production account for 65 percent of all GHG emissions from agriculture. The shift from continuously flooded irrigation to irrigation with one single drainage could reduce the emissions intensity of rice by 40 percent, bring about up to 30 percent in water savings, and reduce fertilizer use. The **Kenya** CCDR explores options to reduce methane emissions from cattle. By improving animal feed and breeds, it would be possible to achieve the same levels of meat and milk production with 13 million rather than 28 million head of cattle, meeting a per capita milk/beef consumption of 180 liters/30kg per person, per day, with better rangeland quality, using less water, and reducing methane emissions by 21–36 percent. Farmers in **Cambodia** are already using waste from livestock farms as input for biodigesters, providing biogas for clean cooking and organic fertilizer for better crops and healthier soil while reducing GHG emissions. This practice should be encouraged and supported to scale.

The International Energy Agency estimates that almost 45 percent of oil and gas methane emissions can be avoided with measures that would come at no or negative net cost.[13] Effective established policies include leak detection and repair requirements for fugitive sources, equipment mandates for sources known to emit significant volumes of methane, and measures designed to limit nonemergency flaring and venting, including energy efficiency measures, electrification and integration of renewable energy in operations, displacement of high-carbon fuels with low-carbon heat and power processes, improved operations and maintenance protocols, and carbon capture and storage. **Côte d'Ivoire** can reduce upstream methane emissions from the oil and gas sector. In 2022, it emitted close to 40 kilotonnes of methane—roughly equivalent to 1.2 million tonnes of carbon dioxide equivalent (MtCO2e). Of this, 63 percent was from venting, 30 percent from fugitive emissions, and 4 percent from incomplete flaring of natural gas. At 2.33 cubic meters of gas flared per barrel of oil produced, flaring intensity in **Côte d'Ivoire** in 2022 had dramatically improved over the past 10 years, and was well below world average of 4.72. In **Azerbaijan**, total fugitive emissions (mainly methane leakage in oil and gas operations and gas distribution and carbon dioxide emissions from natural gas flaring) have almost tripled since 2000 and today account for about a quarter of the country's total GHG emissions. Natural gas losses in the distribution network also remain far above international benchmarks (7.4 percent in 2021), despite improvements since 2015 and a recently announced effort to further reduce them. The **Republic of Congo** could reduce gas flaring by about 50 percent at no cost over a 10-year horizon, and optimized flaring performance could generate over $50 million per year in extra overall revenues.

With landfill representing 11 percent of all global methane emissions, improving waste management can deliver synergies between development and GHG emissions. To reduce methane emissions, **Uzbekistan** can improve waste collection systems by minimizing open dumping and

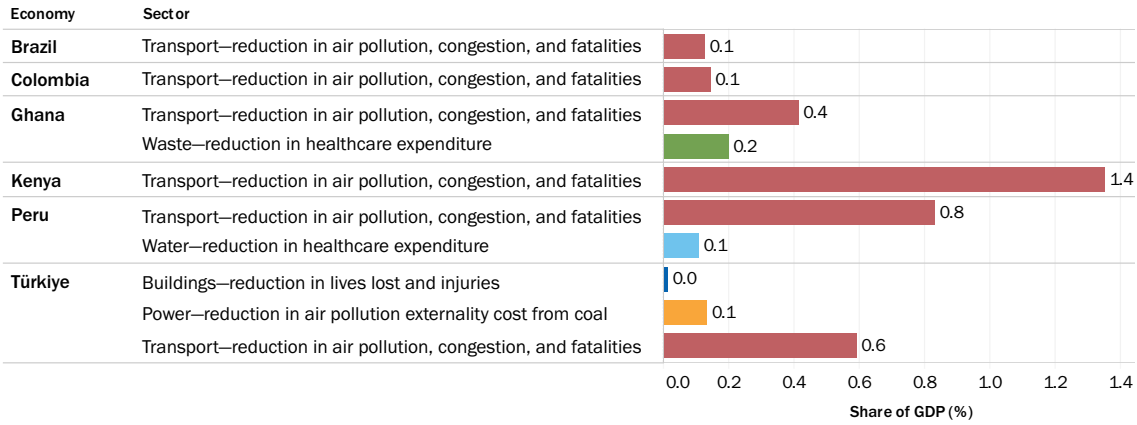
[13] IEA. 2022. *Curtailing Methane Emissions from Fossil Fuel Operations: Pathways to a 75% cut by 2030.* https://www.iea.org/reports/curtailing-methane-emissions-from-fossil-fuel-operations

uncontrolled landfilling, managing landfill gas emissions, and diverting organic waste from landfill, implementing measures to ensure integrated sector development, including minimizing waste and ensuring separate, increased, and improved treatment of waste. Establishing regulatory and institutional frameworks to facilitate compliance, accountability, and efficient enforcement would strengthen sector governance. Methane capture and destruction would allow **Brazil** to reduce total methane emissions from landfill from 92 to about 78 MtCO2e.

3.3. Climate action can generate large co-benefits through air pollution and health

Reducing GHG emissions is expected to deliver large co-benefits through improved air quality. Global estimates suggest that nearly 4 million people die annually from exposure to indoor air pollution and 4.2 million from ambient air pollution,[14] amounting to economic losses equivalent to $2.5 trillion per year.[15]

FIGURE 10: *Health, congestion, and accident-related benefits in CCDRs' low-emission development pathways (current-2030)*



Many of the CCDRs estimate these co-benefits and find that they play a key role in aligning development and climate objectives (figure 10). By reducing carbon dioxide emissions and short-lived climate pollutants, such as black carbon, and implementing measures to achieve the World Health Organization interim target of 35 micrograms of pollutant per cubic meter of air, Nepal could see a significant reduction in air pollution-related premature deaths. Implementing these measures would reduce premature deaths from air pollution in the South Asia region by approximately 750,000, with **Nepal** experiencing a reduction of about 67 percent. In **Ghana**, investing in a circular economy, particularly in the waste sector, can have a significant impact on public health and well-being and reduce health care expenditures. By eradicating open burning and implementing landfill gas capture, the country could mitigate 8 MtCO2e, as well as 4,700 tonnes of black carbon, 63,000 tonnes of fine particulate matter, and 61,000 tonnes of nonmethane volatile organic compounds. Improving waste management practices would not only have positive environmental impacts; it would also lead to an estimated saving of up to $6 billion in health expenditure between 2022 and 2050 and prevent approximately 200,000 avoidable deaths a year. Decarbonizing the transport sectors would be highly beneficial, with large potential

[14] WHO. 2022. Household Air Pollution and Health. World Health Organization Fact Sheet, July 27. https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health; WHO. 2021. Ambient (Outdoor) Air Pollution. World Health Organization Fact Sheet, September 22. https://www.who.int/en/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health.

[15] Parry, I W H, Black, S and Vernon, N. 2021. *Still Not Getting Energy Prices Right: A Global and Country Update of Fossil Fuel Subsidies*. IMF Working Paper No. 2021/236. https://ssrn.com/abstract=4026438.

for public health co-benefits from reducing air pollution, traffic congestion, and fatalities in **Brazil**, **Colombia**, **Ghana**, **Kenya**, **Peru**, and **Türkiye**.

Clean cooking and reduced food waste are other examples of synergies between development and emissions reductions. Switching to clean cooking options can have multiple positive effects on health, economic opportunities, livelihoods, the environment, and gender equality. Using firewood for cooking is a major cause of deforestation and has negative impacts on health in **Cambodia**, where it is responsible for 123 annual deaths per 100,000 people. Replacing firewood with clean cooking fuels would reduce deaths by 25 percent, saving 4,600 lives annually, as well as reducing the morbidity of household members and saving women's time in collecting and preparing firewood and cooking. In the **Democratic Republic of Congo**, clean cooking practices can lead to weekly gains of over eight hours per household by 2050, primarily by reducing fuelwood and biomass collection, with women benefiting most. This, in turn, could result in a 0.6 percent increase in overall labor supply. The health co-benefit is estimated at $2 billion a year linked to avoided deaths and avoided disability-adjusted life years, due to decreased air pollution. In **Benin**, the gender impact of time spent performing cooking-related tasks—collecting fuel, cooking, and cleaning stoves—and lost productivity is estimated at $2.6 billion. In **Bangladesh**, agriculture sector emissions could be cut by reducing food loss and waste across the food system, as an estimated 32 percent of all food production is lost or wasted each year, accounting for 13 percent of GHG emissions.

3.4. Low-emission scenarios can have similar (or higher) economic growth by 2030, if key conditions are met

To explore the economic impacts of emission reductions, the CCDRs combine granular insight from the sector-level analysis with the consistency and general equilibrium dimensions that can only be captured through macroeconomic modeling. In practice, they start from decarbonization pathways for selected sectors—for example, power, transport, industry, buildings—describing the changes in supply and demand, productive capital, and technologies, as well as required (public or private) investments and associated economic costs and benefits, such as reduced fuel consumption. These investments, costs, and benefits are then fed into macroeconomic models to explore the scenario's feasibility, implications for growth, and other macroeconomic variables. These analyses aim to ensure consistency across various sectoral scenarios, identify positive or negative spillovers across sectors, and highlight economic trade-offs from mitigation policies. Facing a diversity of data and model availabilities, different CCDRs use different macroeconomic models, including: multisector computable general equilibrium models (Envisage and CGEBox at global level, and MANAGE at country level); macrostructural models (MFMod); the Long-Term Growth Model; simpler elasticity-based models, such as the Climate Policy Assessment Tool (co-developed by the World Bank and the International Monetary Fund); and a multisector macroeconometric model, E3ME.

The impact on short-term growth of incremental investments in low-emission development scenarios depends on the economic returns of climate-related investments. GDP impacts differ depending on whether returns are lower, similar, or higher than other productive investments. When the returns on climate-related investments are high—as in the case of energy efficiency investments with payback periods of a few years—higher investments will lead to higher short-term growth, even if they crowd out other investments. On the other hand, when returns are lower, such as when investing in green steel, where reducing emissions has higher operational costs, redirecting investments toward greener technologies will reduce short-term growth.

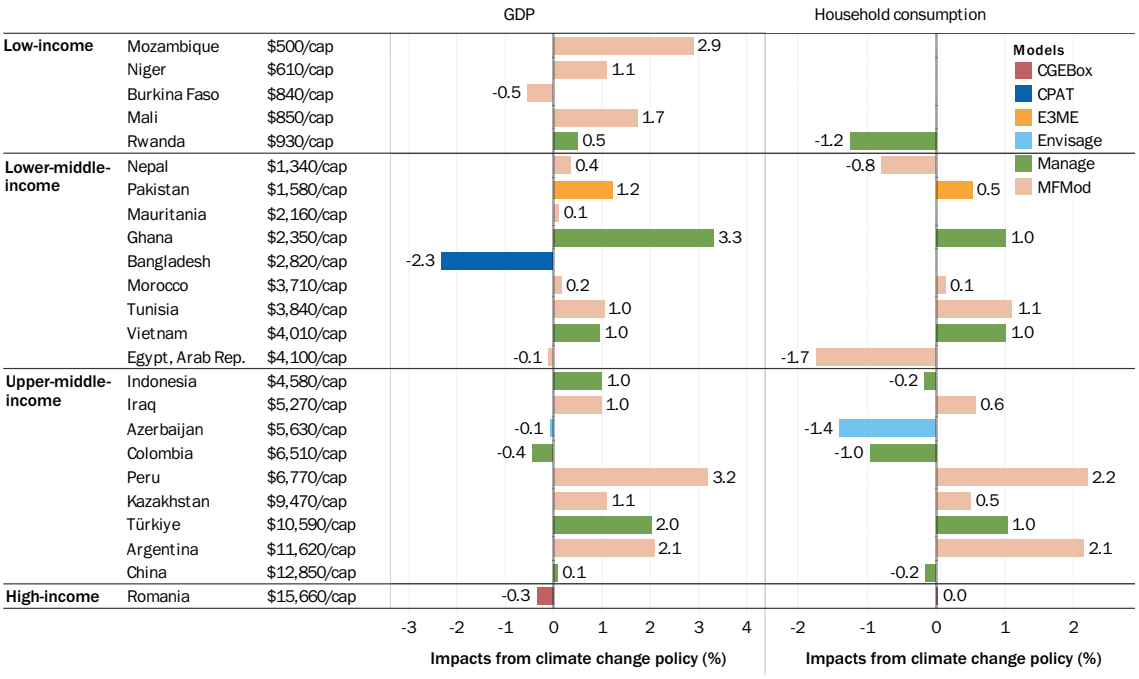
The impact on short-term growth also depends on how climate-related investments are financed, and how they impact other investments. Different assumptions on crowding out other investments lead to different results, as illustrated in the case of **Türkiye**. If climate-related investments crowd out other investments and have low returns, they will have a negative impact on growth. But climate action can also crowd in private investment—for example, when investments in a better, more affordable, or more reliable power system encourages investments in businesses and industries, as discussed in the **Sahel**, **Philippines**, and **Bangladesh** CCDRs—accelerating economic growth.

The impact on short-term growth also depends on the economic system's ability to reallocate resources—including capital and labor—across sectors and, in some cases, regions. For adaptation actions, as for low-emission development, transition costs are smaller if economic and development reforms are implemented to tackle structural challenges, such as the lack of macroeconomic stability, lack of institutional capacity, challenges with multilevel governance, and market frictions. For example, **Romania** can accelerate its potential growth from 3.7 to 5.2 percent per year over the next decade by implementing productivity-augmenting structural reforms that are a prerequisite for achieving the net zero scenario analyzed in the CCDR. Synergies between structural reforms and climate and development can also enhance outcomes. The **Brazil** CCDR emphasizes product and factor (including land) market reform and better enforcement of related policies, as well as policy reforms that enhance flexibility and facilitate the reallocation of labor and capital across firms, sectors, and regions. It also notes that a just transition in energy, manufacturing, and agriculture will require active labor market programs and professional training to close skills gaps and help workers find new jobs.

Overall, the CCDRs find economic growth to be similar or even faster in low-emission development scenarios than in the reference scenarios, when assuming well-designed policies, synergies between structural reforms and a supportive environment (figure 11). Because low-emission development scenarios systematically require higher investments and lower operational costs, the short-term impact on household consumptions is larger than on GDP. This impact on consumption highlights the importance of how countries mobilize financial resources, with different sources of finance creating different trade-offs, opportunities, and challenges. It also shows importance of appropriate compensation and social interventions to protect poor people's consumption and facilitate a just transition for the workers and communities affected by climate policies.

Longer-term impacts are more uncertain, as they depend on technological development, socioeconomic changes, and avoided climate change impacts. Slow progress on technologies may increase costs, and there are large technological uncertainties regarding key solutions, from batteries and long-term electricity storage to green steel and carbon capture and sequestration. In contrast, accelerated innovation thanks to climate policies may result in larger economic gains, as seen with solar power or some e-mobility sectors. If that happens, the long-term benefit from low-emission development scenarios will be larger than estimates from the CCDRs.

FIGURE 11: *Impacts of low-carbon development pathways on GDP and household consumption by 2030 compared with the reference scenario, by country and income class*



Note: The choice of modelling tool and underlying assumptions on market adjustments influences results as they affect the transmission of policies and investments to economic growth.

3.5. Aggregated impacts can hide concentrated income and job losses, and the need for complementary policies

Even with aggregate economic growth and total employment gains, some regions or sectors are disproportionally affected, showing the challenges to a just transition. In **China**, the low-carbon transition without complementary measures would disproportionately affect the poor; impacts are also regionally and sectorally concentrated. Recycling part of the carbon tax revenues into social support for households, workers, and communities negatively affected by the transition could help stem rising inequality. In **Brazil**, some of the workers who lose their jobs in high emitting extractive sectors may be able to shift to greener jobs, but will need support to manage skill, location, and wage mismatches. Stopping deforestation would also affect workers, and social protection intervention can be needed to support these transitions. For example, payment for environmental service programs, such as the discontinued national Bolsa Verde program or the ongoing Bolsa Floresta program in Amazonas state can play a key role in supporting the transition in forest communities.

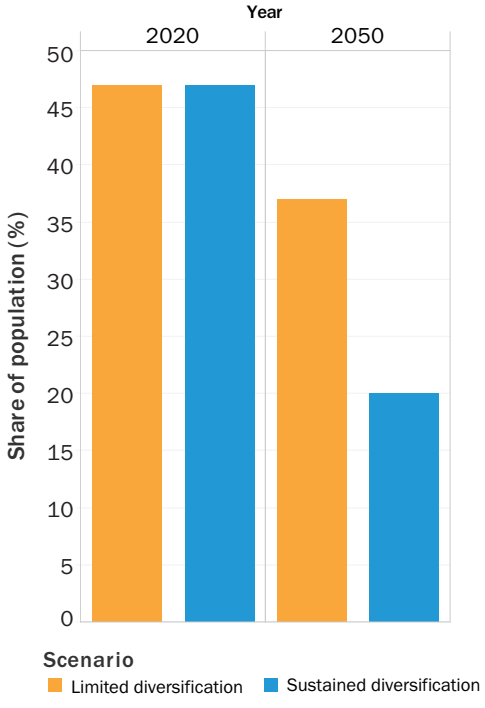
Communities and workers that depend on coal mining or coal power plants will be particularly vulnerable. Despite representing a small share of population and employment in most countries, several CCDRs show that these communities' vulnerabilities require specific approaches to ensure a just transition. Even in **Indonesia**, the world's second-largest coal exporter, the coal industry's share of the economy is less than 2 percent and it employs only 0.2 percent of the workforce. However, local impacts can be large. In **South Africa**, the province of Mpumalanga will be most affected by the low-carbon transition, as it is home to over 80 percent of the country's coal-fired power plants and coal mines, and Sasol's coal-to-liquid industrial complex. It is estimated that 150,000–200,000 jobs are at risk, including about 75,000 coal miners and 15,000 jobs

in the transport sector and representing around 18 percent of the employed provincial labor force. The CCDR recommends developing a comprehensive provincial development strategy or roadmap to not only manage the impacts of the transition, but also create new opportunities building on the province's comparative advantages. Such a roadmap could combine temporary financial assistance to affected workers, active labor programs, and targeted support to informal and small enterprises to encourage economic diversification. It should be supported by a clear communication strategy to explain the costs and opportunities of transition and build a broad consensus among social partners.

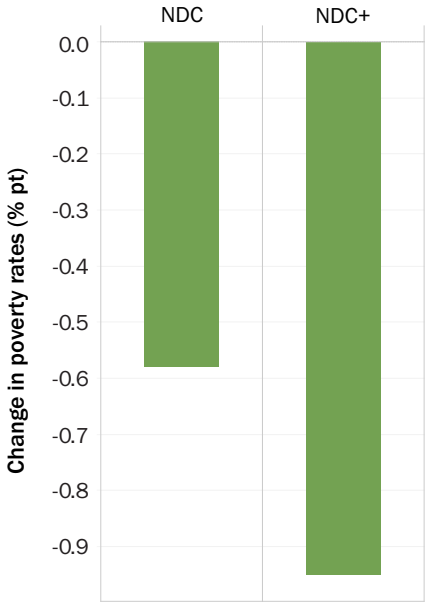
The transition to a low-emission development pathway can help reduce poverty, but only with appropriate complementary action. Among others, the **Brazil**, **Uzbekistan**, **Morocco,** and **Türkiye** CCDRs show that reallocating budget, including through subsidy reform, and carbon pricing can mobilize public resources to finance public investments and the required social transfers. The **Republic of Congo** CCDR explores the benefits of a scenario with sustained diversification, which can accelerate productivity and economic growth, and reduce poverty much faster than an alternative scenario with more limited diversification (figure 12a). The **Indonesia** CCDR explores the effect of land policies together with the introduction of a carbon tax and find that more ambitious climate policies could reduce poverty (figure 12b). This is largely driven by recycling revenues into social assistance and benefits from higher agricultural productivity and lower food prices, which are much larger components of the overall consumption basket than energy.

FIGURE 12: *Change in poverty rates in Republic of Congo and Indonesia*

a) Republic of Congo, poverty rates (2020 and 2050)



b) Indonesia, change in poverty rates relative to the reference scenario (2040)



Note: NDC is a policy scenario with a carbon tax of $40/tCO2e and a limited set of land policies implemented. NDC+ is a more ambitious policy scenario with a carbon tax of $200/tCO2e and a broader suite of land policies implemented. Panel a uses a $2.15-a-day poverty line. Panel b uses a $5.5-a-day poverty line.

4. The private sector has a key role to play in achieving resilient low-emission development

The private sector will be instrumental in meeting the investments needed to transition to resilient and low-emission development, and is also needed to deliver innovation, faster technology adoption, and new business models. The second set of CCDRs confirms early findings that the transition to resilient and low-emission development will require an increase in current investments, and the private sector has the potential to account for a large share of the financing across multiple sectors in all economies.

4.1. Resilient low-emission development requires large investments, especially in lower-income countries

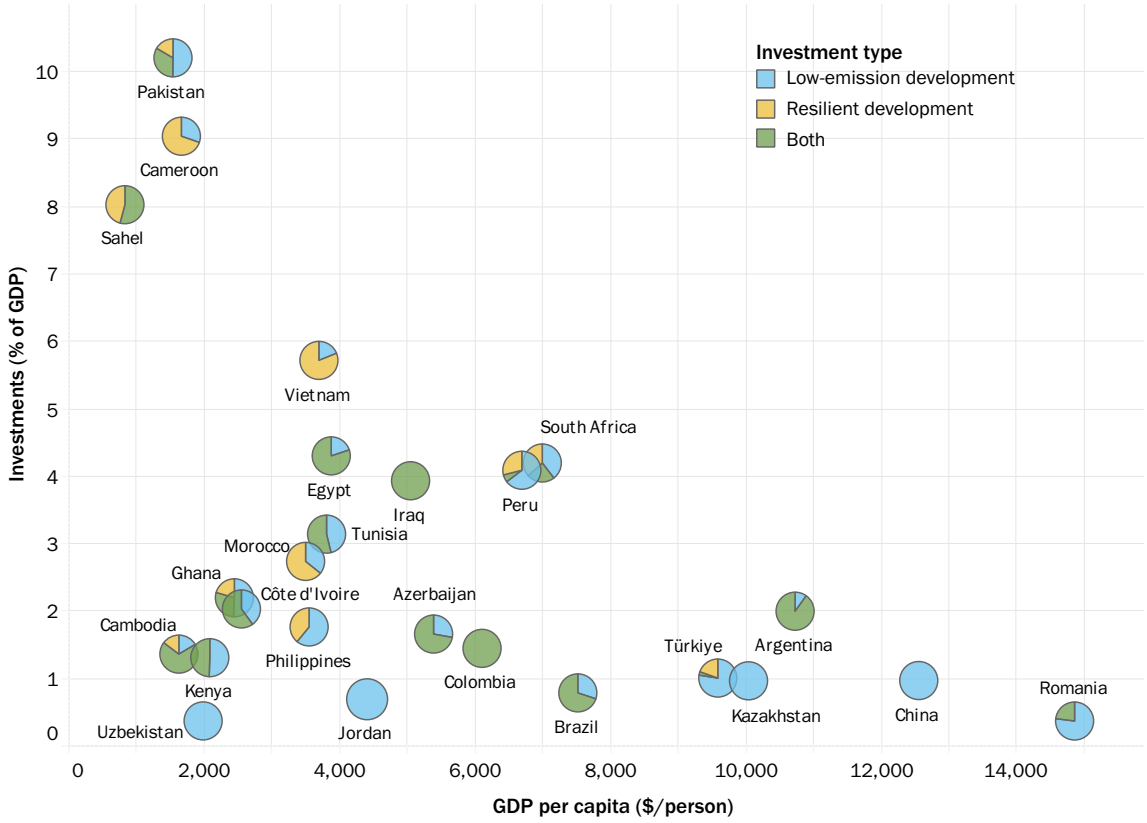
To build resilience and be on track to reduce emissions by 73 percent, compared to current levels, by 2050, countries require an additional 1.4 percent of their GDP, on average, in annual investments between now and 2030. Investment needs range from less than 1 to 10 percent of GDP, and are higher as share of GDP for low-income countries (figure 13). Extrapolating CCDR results using the average incremental investment needs by 2030 per income group suggests a total of $574 billion (2.8 percent of GDP) in annual climate-related investments are required in all LICs and MICs other than **China** between now and 2030. This is lower than estimates from the Independent High-Level Expert Group on Climate Finance[16] for 2030 ($1.2–1.7 trillion), because it captures only the incremental investment needs compared with a realistic business-as-usual baseline, not the full investment needs for sustainable development. The estimates also differ in their timing and ambition of climate action, with CCDRs considering a 73 percent reduction in GHG emissions by 2050.[17] Finally, it is important to note that many CCDR estimates are partial. They include the sectors that cover each country's most important needs, making them good—but still conservative—proxies for total needs.

By closing development and infrastructure gaps that magnify people's vulnerability, these investments would deliver development benefits above and beyond avoided climate change impacts and emission reductions. This includes providing universal access to basic infrastructure services—such as improved water and sanitation and modern energy, but also education and health—with objectives that vary across CCDRs, depending on country context and priorities. For example, of the $348 billion in investment needs identified in the **Pakistan** CCDR, $55 billion are for universal access to water and sanitation. In the **Sahel**, solar panels and mini-grids are the least-cost option for achieving energy access and contribute to the resilience of the population and its economic future. Because development and resilience are closely interlinked, increased support for climate action cannot deliver more resilience if done at the expense of support to development.

[16] Songwe, V, Stern, N and Bhattacharya, A. 2022. Finance for Climate Action: Scaling Up Investment for Climate and Development. London: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science. https://www.lse.ac.uk/granthaminstitute/publication/finance-for-climate-action-scaling-up-investment-for-climate-and-development/.

[17] World Bank. 2023. What You Need to Know About How CCDRs Estimate Climate Finance Needs. https://www.worldbank.org/en/news/feature/2023/03/13/what-you-need-to-know-about-how-ccdrs-estimate-climate-finance-needs.

FIGURE 13: *Required increase in annual investment in CCDR countries*



Note: Sahel is Burkina Faso, Chad, Mali, Mauritania, and Niger.

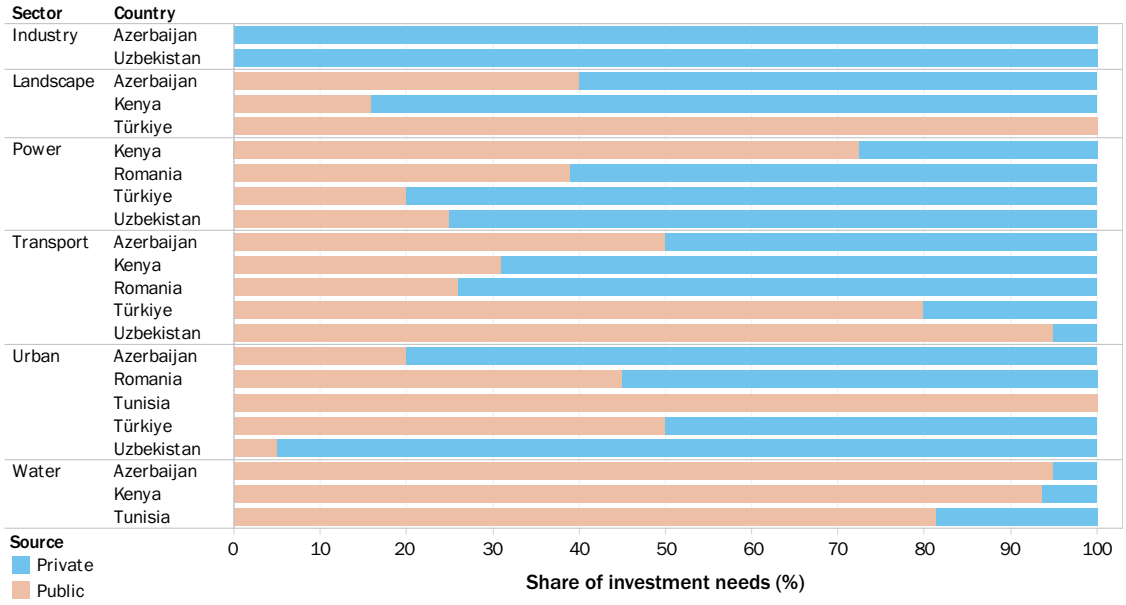
Climate-development financing needs are larger as a percentage of GDP in countries that have contributed least to global warming, and where access to capital markets and private capital is more limited. Figure 13 suggests that, due to larger investment needs for resilience and the urgency of closing existing infrastructure and development gaps that magnify climate vulnerability, LICs and LMICs require larger upfront investments (relative to their GDP) than UMICs. As LICs and LMICs are historically least responsible for climate change, hold relatively low levels of domestic resources and have limited access to capital markets and private capital, international concessional climate finance will be vital in addressing their climate and development challenges.

4.2. The private sector has a key role to play in meeting investment needs for resilient low-emission development

The private sector can undertake a major part of the investments and financing for climate adaptation and mitigation, if the policy, regulatory and, where appropriate, blended finance conditions are in place to provide attractive combinations of risk and return. Figure 14 shows that, in a subset of countries and sectors, the private sector could provide a majority of financing across multiple sectors, although the expected share of private sector participation varies widely between countries and sectors. Given the scale of resources required in **Uzbekistan**, ushering in greater private financing, both domestically and through FDI, and developing green finance will be crucial. The CCDRs also highlight that some countries have been successful in mobilizing the private sector in various sectors. For example, in **Cambodia**, private finance plays an important role in independent power transmission and production, accounting for 42 percent of the 115–230-kilovolt transmission lines and 27 percent of substations under build-own-operate-

transfer arrangements. To mobilize more private investments, countries will need to have the ability to make more long-term financial commitments, financially stronger utilities, more robust planning capacities, and more transparent and competitive procurement processes.

FIGURE 14: *Public-private split of future investment in CCDRs' low-emission development scenarios*



Note: Landscape includes forestry, agriculture, and land management.

FIGURE 15: *Climate finance instruments considered in the CCDRs*

Public	Private
» Fiscal measures (fossil fuel subsidies, carbon tax)	» Corporate bonds for transition and mitigation: green bonds, blue bonds, forestry bonds
» Grants	» Infrastructure funds
» Trust funds	» Emissions trading systems
» Concessional loans to government	» Non-concessional (green) loans to firms
» Sovereign bonds for sustainability, adaptation, mitigation	» Green equity funds
» Debt for climate swaps	» Private-public partnerships
» Guarantees from multilateral development banks for the sovereign	» Blended finance
» Government guarantees	» Private risk-sharing mechanism
» Payment for ecosystem services, voluntary carbon offset mechanisms (tourism, REDD+)	» Green Exchange-Traded Funds

Financial solutions are context specific, and CCDRs provide country-specific priorities. Common themes include the opportunity for blended finance (including to mitigate foreign exchange rate risk where relevant) to expand the range of projects that offer an attractive risk-return trade-off for private firms and investors (**Vietnam**, **Rwanda**).[18] Even so, the choice of available and suitable instruments for climate financing (figure 15) follows from a country's level of economic development, whether the mobilizing actor is public or private, and several other considerations such as macrofiscal conditions. For example, providing new solutions for hedging against currency risk can help mobilize

[18] International Energy Agency and International Finance Corporation. 2023. *Scaling Up Private Finance for Clean Energy in Emerging and Developing Economies*. https://www.ifc.org/en/insights-reports/2023/scaling-up-private-finance-for-clean-energy-in-edmes.

international private capital for climate infrastructure projects (**Indonesia**), especially in countries where foreign exchange markets are thin or absent and hedging instruments are not available today.

Blended finance can strategically deploy donor funds from governments or philanthropies to enable private investments that would otherwise not take place. At present, the cost of capital for a typical utility-scale solar project can be twice as high in key emerging economies than in advanced economies, reflecting real and perceived risks at country, sectoral and project levels. Bringing in private capital at the scale and pace needed will require developing a much larger flow of resilience or decarbonization projects that match investors' risk and return expectations. First-loss guarantees, political risk insurance, subordinated loans, and other instruments can offset investor fears about instability or uncertain project returns. Deploying these tools, however, requires the availability of appropriate amount of concessional fundings.

Evaluating a country's financial sector stability and soundness, regulatory framework, and market depth—and the capacity of its key market players—serves as the cornerstone for making well-informed, effective recommendations when proposing tailored financing solutions. In **Jordan**, the first area for action to mobilize green finance is improving government practices with regard to public investment management and leveraging private investments. **Jordan** could explore opportunities to integrate climate criteria into private sector development programs and strategies—including those related to FDI, export development (for example, its new National Export Strategy), access to finance initiatives, innovation policy and entrepreneurship (for example, its National Entrepreneurship Policy)—to drive existing and new firms and industries to adapt their business models and technologies. Fully operationalizing the climate finance governance system to strengthen coordination across government, the private sector, the financial sector, and the public is also vital.

4.3. The role of the private sector and foreign direct investment goes beyond providing capital

To align development with climate objectives, the role of the private sector must go beyond private capital to include efforts to develop new business models, improve green technologies, and build climate resilience into all investments and operations. Firm surveys show that, while foreign-owned and large firms increasingly include climate change in their planning, very few small or medium-sized enterprises are able to do so. In **Côte d'Ivoire**, a firm-level survey shows that 80 percent of companies believe that climate change has already had an impact on their revenues, but only a small percentage have adopted climate risk management measures, such as risk insurance, and few see growth opportunities in adaptation investments. The private sector often lacks financial instruments to manage shocks; access to finance is an important, but not the only, barrier. Approximately 40 percent of **Indonesian** firms surveyed for the CCDR reported having a green strategy, 58 percent having dedicated energy teams or personnel, and only 15 percent set energy and emissions targets.

Private firms are often best placed to bring innovation, create and operate projects, and develop new business models. Governments need to do their part to unlock these opportunities. For example, in **Angola** and **Bangladesh**, lower fossil fuel subsidies and stronger carbon price signals give incentives for the private sector to conserve energy and shift to greener sources. The private sector needs to be allowed to participate in energy generation, transmission, and distribution. Regulatory policies such as building codes, as highlighted in the **Nepal** CCDR, or energy performance standards, as seen in the **Philippines**, **Cambodia**, and many other countries,

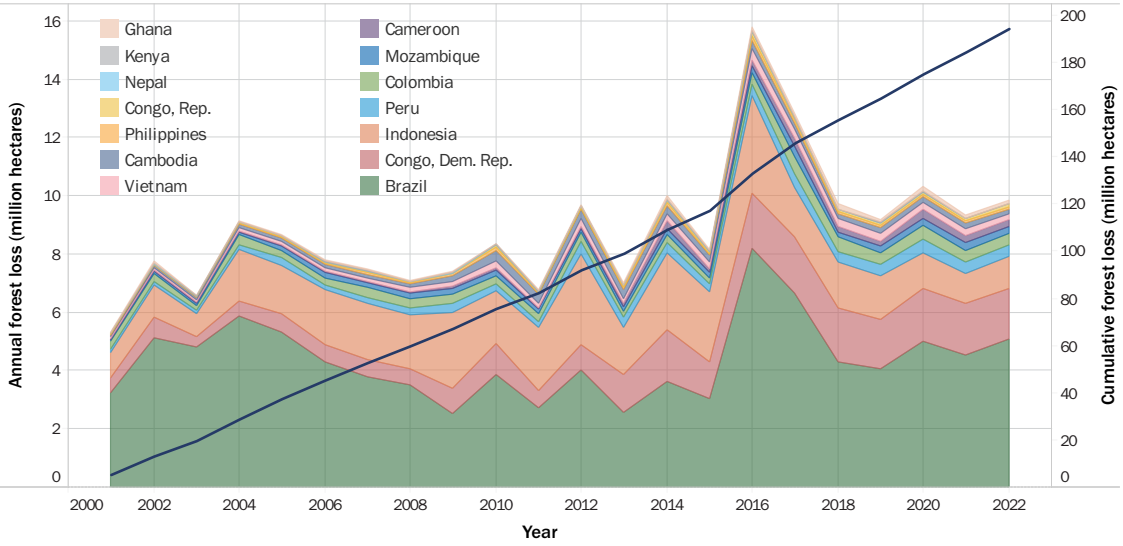
should give clarity to private firms and investors and reassure them that long-run returns will not be disrupted by excessive mid-course changes in the rules of the game.

FDI and other cross-border capital flows will also play a key role in meeting infrastructure investment needs and providing the green solutions and new business models needed to align development with climate objectives. They can be a source of financing, especially in countries where domestic credit and equity markets are shallow and unprepared to provide the required long-term investments. And they can also be a source of technical expertise. To attract long-term foreign capital, countries will need to start purposeful public-private sector dialogue and consolidate and enhance the enabling environment. For example, in the **Republic of Congo**, FDI has a significant role to play in the climate change agenda as a source of private capital to many sectors affected by or affecting climate change, including agriculture, food and forestry, energy, and infrastructure. Progress could also be accelerated by increased support from HICs for countries and firms to adopt green technologies and practices, adapt them to their needs, or develop new ones that are adapted to their context.

5. Addressing global forest loss and boosting carbon sequestration is key to achieving global climate change objectives

Recent global evidence shows that more efficient land use could sequester an additional 85.6 GtCO2e with no adverse economic impacts.[19] Tropical deforestation is largely driven by expanding agriculture activities, including commodity production, croplands, and pastures. Certain land management practices—such as shifting cultivation and tillage—also release the carbon stored in these ecosystems, reducing their ability to sequester it in the long-term. **Angola, Bangladesh, Brazil, Burkina Faso, Cambodia, Cameroon, Chad, Colombia, the Republic of Congo, the Democratic Republic of the Congo, Egypt, Ghana, Honduras, Indonesia, Kenya, Malawi, Mali, Mauritania, Morocco, Mozambique, Niger, Peru, Philippines, Rwanda,** and **South Africa** are home to 56 percent[20] of the world's tropical forest area and are responsible for 48 percent of global emissions connected to forest loss.[21]

FIGURE 16: *Annual and cumulative forest loss in 14 CCDR countries, 2001–22*



Source: Hansen, M C, Potapov, P V, Moore, R, Hancher, M, Turubanova, S A, Tyukavina, A, Thau, D, Stehman, S V, Goetz, S J, Loveland, T R, Kommareddy, A, Egorov, A, Chini, L, Justice, C O and Townshend, J R G. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." Science 342: 850–53.
Notes: Forests are defined as land with ≥ 30% tree cover density; the shaded areas show annual forest loss; the line shows cumulative loss.

5.1. Deforestation remains a key cause of GHG emissions

While some key forest countries are making important inroads to reduce forest loss, overall rates remain stubbornly high (figure 16). In **Indonesia**, about 8.5 million hectares of forest cover was lost between 2000 and 2020, but the deforestation rate has slowed considerably in recent years, from an average of 1.13 million hectares per year between 2000 and 2006 to less than 0.12 million hectares per year for 2019–21, the lowest rates since 1990. **Cambodia** lost 2.64 million hectares (26 percent) of forest cover over the same time period (one of the world's

[19] Damania, R, Polasky, S, Ruckelshaus, M, Russ, J, Amann, M, Chaplin-Kramer, R, Gerber, J, Hawthorne, P, Heger, M P, Mamun, S, Ruta, G, Schmitt, R, Smith, J, Vogl, A, Wagner, F and Zaveri, E. 2023. *Nature's Frontiers: Achieving Sustainability, Efficiency, and Prosperity with Natural Capital*. Washington DC: World Bank. https://openknowledge.worldbank.org/handle/10986/39453.

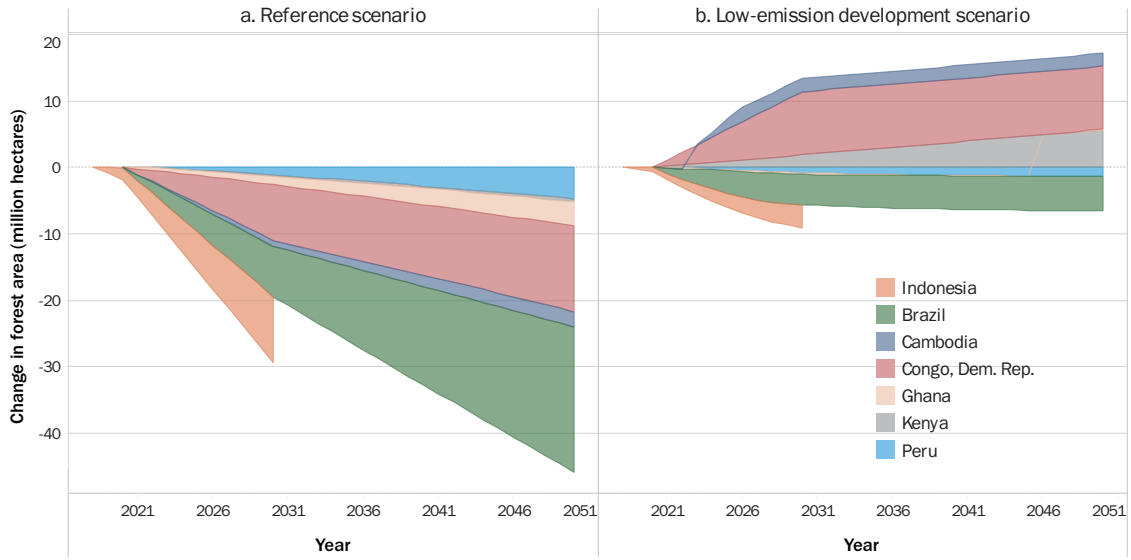
[20] Calculated using data from Global Forest Watch (>10% forest canopy density) for countries located in the tropics.

[21] Although this summary report focuses on tropical forests, some CCDRs reach similar findings in nontropical contexts. For example, the Türkiye CCDR shows that growth in forested land could contribute significantly to achieving the country's objective to be carbon neutral in 2053, while the Malawi, Romania, and Tunisia CCDRs also highlight the economic gains of stopping deforestation—such as better soil quality or water management—in a nontropical context.

most rapid rates of deforestation during that period) and remains the highest among its regional peers. **Brazil** reduced deforestation by 80 percent in the Amazon from 2004 to 2012 through a combination of favorable macroeconomic factors, command-and-control measures, and enforcing land use regulations, showing that these are effective for curbing deforestation. Across the African continent, and in the **Congo Basin** countries in particular, forests have been on an unsustainable trend. Over the past 20 years 3 million hectares of forest in the **Democratic Republic of Congo** have been converted to croplands and for shifting cultivation. If these trends continue, the country is set to lose another 7.7 million hectares by 2030 and 12.9 million by 2050. The **Republic of Congo** has successfully kept its deforestation rate low at 0.1 percent, but deforestation in the south of the country has accelerated compared to the national average. **Côte d'Ivoire** lost about 80 percent of its forest cover between 1900 and 2015—one of the world's highest deforestation rates—and could lose all its forests by 2034 if it does not take transformational action.

Improved land use can contribute significantly to emissions reductions. Without efforts to slow deforestation, another 56 million hectares of forest could be lost by 2050, based on recent trends in seven CCDR countries (figure 17a).[22] But this trend could be reversed in low-emission scenarios, where economywide policies to protect and restore forests are effectively implemented (figure 17b). The low-emission development scenarios[23] could increase forest area by about 63 million hectares by 2050, compared to the reference scenario. In five of the seven countries, the low-emission development scenarios can reduce emissions by about 2.7 GtCO2e per year by 2050, or around 5.5 percent of total GHG emissions in 2019, compared with the reference scenario, for a total of 63 GtCO2e in avoided emissions between 2023 and 2050 (figure 18).

FIGURE 17: ***Change in projected forest area in seven CCDRs: reference vs. low-emission development scenarios***

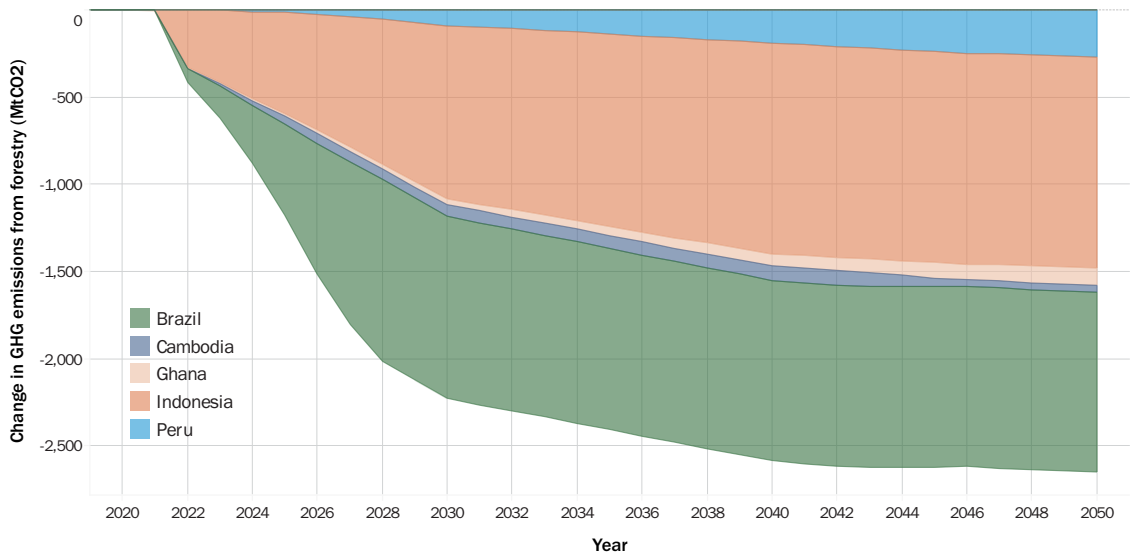


Note: Scenarios in the Indonesia CCDR end in 2030.

[22] Assuming Indonesia's loss rates remain constant for 2030–50.

[23] More ambitious scenarios than what is included in the CCDRs' low-emission development scenarios are also possible. For example, in Brazil, net gains in forested areas are possible while the low-emission development scenario assumes zero net deforestation.

FIGURE 18: *Change in GHG emissions from changes in land use and forestry induced by a low-emission scenario (compared to the reference scenario)*



Notes: GHG = greenhouse gas; MtCO2e = million tonnes of carbon dioxide equivalent.

5.2. Countries can benefit from more sustainable land management practices

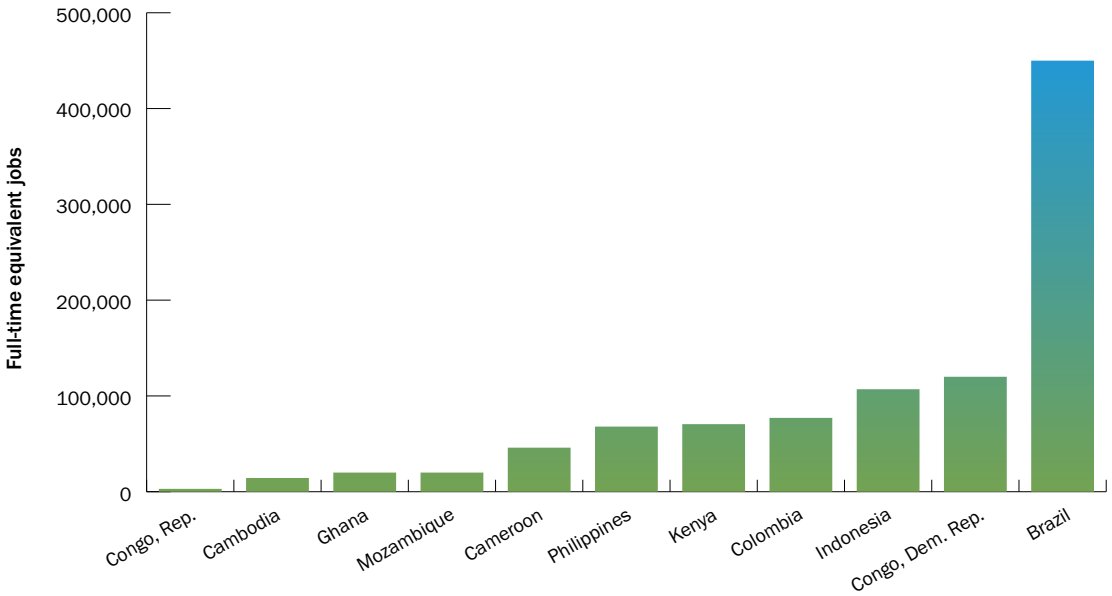
Countries that generate a high share of emissions from land use change stand to benefit economically from reducing or eliminating deforestation, mobilizing nature-based solutions, and scaling up sustainable land management practices. Forests often play a crucial role in the growth, transformation, and sustainability of national economies, particularly in the income growth of poor communities that are heavily dependent on natural capital. Efforts to halt forest loss and use land more efficiently can also have positive spillover effects beyond agriculture or forestry and create jobs (figure 19). In **Peru**, moving to a zero-carbon forest sector and investing around $6 billion by 2050 in agroforestry, sustainable timber concessions, forest restoration plantations, and other interventions could generate 85,000 new jobs every year and increase the sector's value-added sevenfold, representing an increase in real term GDP from 1.9 percent in 2023 to 5.5 percent in 2050. In **Colombia**, where each hectare of avoided deforestation would increase GDP by $90 at constant prices, achieving zero deforestation by 2035 could increase GDP by $456 million relative to 2016–18 and decrease poverty by 0.15 percentage points. In the **Republic of Congo**, forests provide substantial economic, social, and environmental benefits—with $260 million worth of annual timber exports accounting for 2.3 percent of the country's GDP and 5.5 percent of export earnings—but these are being eroded by deforestation and unsustainable practices. Recovering natural assets can also increase tourism opportunities: nature-based tourism in Kenya has an estimated value of $1 billion. Having lost 68 percent of its wildlife between 1977 and 2013, largely due to land use change, the country now plans to recover almost 11 million hectares of degraded land to boost revenue from tourism.

Reducing deforestation will avoid the loss of hydrological, carbon sequestration, biodiversity conservation, and other ecological benefits. The magnitude of these benefits depends on which forests are conserved and whether hydrological and biodiversity benefits are spatially heterogeneous (figure 20). Carefully targeting conservation actions can maximize benefits, and integrating climate and nature agendas is a priority.[24] In **Peru**, new forests can generate ecosystem services with an

[24] World Bank. 2022. *Integrating Climate and Nature Action. Nature and Development Brief*. https://thedocs.worldbank.org/en/doc/0054ddab7bfac0338f255a2ea5d9c32e-0320012022/original/2-Nature-Climate.pdf.

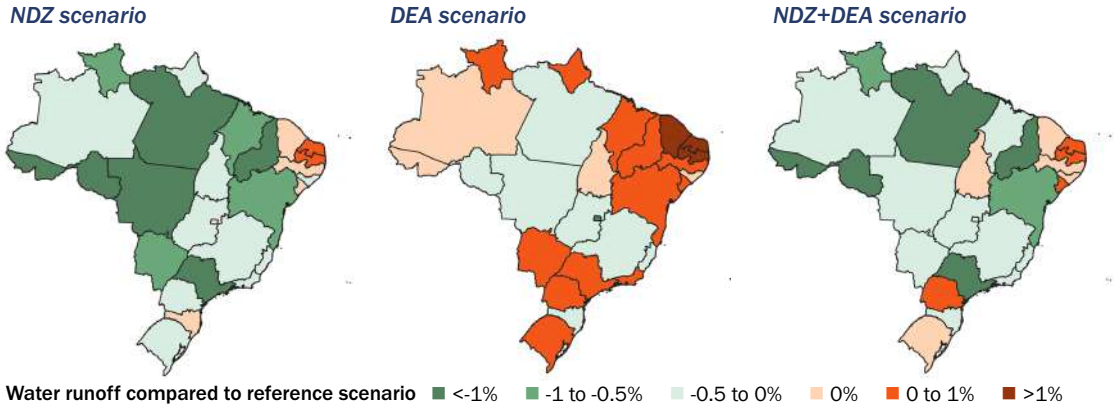
estimated value of $3.5 billion per year. In **Vietnam**, ecosystem services are worth an estimated $2,077 per hectare, $381 of which is for climate regulation services, such as flood control. **Indonesia** aims to restore or enhance protections on 600,00 hectares of mangroves by 2024—the largest such target in the world—to sequester emissions and prevent coastal erosion. The average annual economic value of the country's mangroves is estimated at $15,000 per hectare, and up to $50,000 in densely populated areas.[25] In the **Democratic Republic of Congo**, improving landscape management and conservation could increase the annual value of its ecosystem services from forests by about $1.8 billion by 2030[26]: for every $1 invested in landscape and forest restoration, the country stands to gain nearly $3 in benefits over the next 10 years.

FIGURE 19: ***Estimated annual labor demand from forest restoration activities***



Source: World Bank staff calculations, based on data from Roe, S, Streck, C, Beach, R, Busch, J, Chapman, M and Daioglou, V. 2021. Land-based measures to mitigate climate change: Potential and feasibility by country. Global Change Biology, 27(23), 6025-6058, and relevant CCDRs.
Notes: Approximations are based on policy efforts reported in CCDRs associated with replanting, reforestation, afforestation, and similar concepts. Activities were classified into low, mid, and high labor intensity, applying a per hectare per year full-time equivalent labor demand of .10, .20, and .30, respectively. Other assumptions included the number of years countries planned to achieve their targets in.

FIGURE 20: ***Implications for water runoff of curbing deforestation in Brazil, compared to the reference scenario***



Note: The NDZ scenario includes effective forest law enforcement and forest governance; the DEA scenarios includes the development of diversified land based economic activity, including forest based economic activities and increased agricultural productivity in the Amazon; the NDZ + DEA scenario combines the two policy scenarios.

[25] World Bank. 2022. *The Economics of Large-scale Mangrove Conservation and Restoration in Indonesia.* https://www.worldbank.org/en/country/indonesia/publication/the-economics-of-large-scale-mangrove-conservation-and-restoration-in-indonesia.

[26] Depending on assumed market price of carbon, this value ranges from $0.98 billion to $2.5 billion.

Better land and forest management enhances resilience to climate change. Conserving forests and integrating trees in agricultural production landscapes lowers risks for agriculture, prevents erosion, and regulates temperature and precipitation. For example, native tree cover in **Brazil's** Cerrado biome increases the extreme heat regulation value provided to the soy industry by 25–95 percent by 2050, while vegetation loss is today costing the industry $99 per hectare in lost revenue. Landscapes with higher forest cover would help increase resilience to changing precipitation both directly, by promoting infiltration and reducing peak flows with their attendant flood risks, and indirectly, by reducing siltation in water storage reservoirs. In the **Philippines**, which has one of the region's lowest per capita water storage capacities, increasing forest cover would protect both existing and future reservoirs from siltation by reducing sedimentation and sequestering carbon. In mountainous **Nepal**, forests crucially enhance resilience by creating microclimate conditions that boost crop productivity, regulate the water cycle, and reduce landslide and erosion risk. In **Kenya**, adaptation actions focused on landscape restoration are more effective at reducing the negative impacts of climate change on GDP than adaptation measures focused on reducing labor exposure to heat stress.

Beyond the benefits that can be generated locally or within a country, the ecological integrity of the world's forest basins is of planetary importance. Loss of forest in the Amazon Basin would have implication for climate conditions and rainfall at both continental and global levels. Central African forests have maintained a steady net carbon sink function for the past decades,[27] unlike the Amazon, which has become a net source of emissions due to the compounding effects of climate change, forest loss, and forest degradation. The recent mapping of 167,600 square kilometers of peat shows that the central Congo peatlands—which span the **Democratic Republic of Congo** and the **Republic of Congo**—are the world's largest tropical peatland complex, storing 28 percent of the Earth's tropical peat carbon stock. While current threats to these forests are limited, the experience of rapid drainage and conversion of peat swamp forests in Sumatra and Kalimantan (**Indonesia**) to oil palm and other land uses from the 1980s to the 2000s shows that these enormous carbon sinks can be quickly transformed from a vital planetary carbon sink to a major source of emissions.

5.3. More sustainable land use requires a whole-of-economy approach and to manage distributional impacts

Boosting agricultural productivity is crucial to improve sector performance, reduce pressure on forests, and dampen the impacts of climate change, but only as part of a broader strategy. In **Ghana**, climate-smart agriculture can help enhance the productivity of agricultural land and curb the country's reliance expanding agriculture into forests; coupled with strong forest conservation, this can reduce Ghana's total emissions by one-third (40 MtCO2e) by 2050, compared to a "do nothing" scenario. Sustainable intensification in **Peru**—for example, by integrating smallholders and communal organizations into agriculture value chains—can reduce farmer encroachments on adjacent forest areas. But, as seen in **Brazil**, increasing productivity can also indirectly worsen local deforestation by increasing economic incentives to convert forests into agricultural land. Unless less carbon-intensive agricultural practices and technologies are actively promoted and forest protection measures strengthened, increased agricultural productivity can lead to higher emissions.

[27] Structurally intact tropical forests sequestered about half of the global terrestrial carbon uptake in the 1990s and early 2000s, removing about 15% of anthropogenic carbon dioxide emissions. Hubau, W, Lewis, S L, Phillips, O L, Affun-Baffoe, K, et al. 2020. "Asynchronous carbon sink saturation in African and Amazonian tropical forests." *Nature* 579: 80–109. https://www.nature.com/articles/s41586-020-2035-0.

The necessary transformation of land use requires an economywide approach, integrated land management approaches, and careful consideration of distributional impacts and political economy implications. Deforestation often occurs because the private benefits of conserving forests to individual actors such as loggers, farmers, or community groups, are lower than those of alternative land uses. Incentivizing forest protection requires a combination of making alternative uses less attractive, increasing the direct benefits that individual actors derive from forests, and making direct payments for conservation. Conversely, some tools—such as establishing protected areas or restricting land use—impose costs, including out-of-pocket costs for complying and opportunity costs of forgone income from alternative activities, that make them politically challenging. The **Brazil** CCDR emphasizes the need to generate alternative income and jobs in activities with a small land footprint to build consensus on forest-related policies.

No single policy will stop emissions from land use; rather, countries need to use a combination of tools synergistically. The evidence shows that effectively reducing forest loss and shifting to sustainable land use requires a multiprong approach that includes policy action at both national and subnational levels, targeted fiscal spending, innovation and technology that improve management practices, market incentives, and effective stakeholder engagement. Key actions include:

- **Removing perverse incentives:** Repealing poorly targeted taxes, subsidies, laws, and regulations that drive land transformation is a crucial, but often not fully exploited, step.[28] In **Brazil**, a subsidized rural tax crediting scheme and subsidies to the beef industry ($24.6 billion between 2008 and 2017) provide strong incentives for cattle ranching in the Legal Amazon, and progressive land tax puts extensive cattle ranching in a lower tax bracket. Updating these policies would create better incentives and free up resources that could be re-purposed to other ends.

- **Establishing protected areas and promoting inclusive community-based natural resource management:** This requires resources and budget allocation to effectively manage protected areas over the long term, as illustrated in the **Brazil** CCDR. The **Republic of Congo** has made establishing protected areas an integrated part of the National Climate Change Strategy to keep deforestation rates low.

- **Enforcing logging regulations, promoting sustainable forest management, and restricting logging concessions:** Issuing fewer or no new logging concessions (a critical policy action in **Indonesia**), and practicing reduced impact logging in existing concessions are highly effective ways to reduce deforestation. Depending on market conditions, sustainable forest management certification, such as through the Forest Stewardship Council, can be promoted or incentivized through tax reductions. Measures to combat illegal logging and trade are also often needed. The costs of such measures generally lie in monitoring and enforcement, as well as reduced revenue from logging.

- **Increasing forest profitability:** For some forest activities, such as ecotourism or sustainable extraction of nontimber forest products, sustainable forest management through certification and other means can create market access for landholders. Such elements are central to **Nepal's** strategy to boost incomes from tourism, forest-based livelihoods, and sustainable timber exports. These can often be implemented over shorter timeframes and generate

[28] See also Damania, R, Polasky, S, Ruckelshaus, M, Russ, J, Amann, M, Chaplin-Kramer, R, Gerber, J, Hawthorne, P, Heger, M P, Mamun, S, Ruta, G, Schmitt, R, Smith, J, Vogl, A, Wagner, F and Zaveri, E. 2023. *Nature's Frontiers: Achieving Sustainability, Efficiency, and Prosperity with Natural Capital*. Washington DC: World Bank. https://openknowledge.worldbank.org/handle/10986/39453.

additional benefits. Subsidies might be needed to make these approaches financially viable. In **Kenya** and **Mozambique**, protected forests play an important role in attracting income- and job-creating tourism activities.

- **Paying for ecosystems services:** Extensively used in Latin America and to a growing extent in other regions, this approach is based on direct payments to landholders to conserve forests. In **Peru**, low-income families are paid to conserve and restore forests and their ecological services. Such payments must usually, though not always, be made indefinitely, requiring long-term financing, such as an earmarked funding source. In **Vietnam**, coastal water utilities pay communities in the mountains upstream for forest management activities that regulate soil erosion and stream flow, supported by a long-standing government program. Costs for implementing such programs include contracting landholders, compliance monitoring, and processing payments.

- **Improving tenure security and governance:** Insecure land tenure disincentivizes longer-term and profitable forestry activities over annual crops. The costs of improving tenure security—a central element of the **Democratic Republic of Congo's** ongoing land reform and new agricultural policy—include regularizing tenures, issuing titles, and adjudicating any disputes. In **Kenya**, accelerating the registration of community lands is a no-regrets, low-cost investment that would provide tenure security and unlock opportunities for communities to engage in alternative economic development. Preliminary estimates suggest that registering all community lands in a county would cost about $3 million, and with greater tenure security, communities could engage with potential investors in activities such as carbon offsets. In **Cameroon**, strengthening community control over forests is a high priority action to advance the sustainable management of forests. In **Colombia**, improving institutional and community governance for Indigenous peoples and local communities will be key to reducing land use emissions, rebuilding the adaptative capacity of landscapes, and curtailing deforestation. In **Brazil,** governance challenges stem from the overlapping functions of government agencies and inconsistent regulations: five federal entities handle the registration of different land tenure categories and they do not coordinate with the many state and municipal agencies that have overlapping mandates and manage separate and disconnected databases. These complexities facilitate illegal land-grabbing, a key driver of deforestation.

- **Promoting sustainable non-forest activities:** Higher-return sustainable activities on non-forest land can reduce pressure on forests, provided they are financially viable and cannot be extended into forested areas. These include climate-smart agricultural technologies and activities that boost productivity on existing crops and pastures—such as improved water management, agroforestry, conservation tillage, improved nutrient management, and biochar use—coupled with effective governance and the protection of adjacent forest areas. It is vital, however, that these new activities do not extend into forested areas, as this may increase deforestation. The **Brazil** CCDR emphasizes the need for higher productivity in the manufacturing and service sectors to generate alternative income and jobs in activities with a small land footprint; this will require a combination of market reforms and investment in infrastructure and connectivity.

- **Promoting the development of sustainable value chains for energy and clean cooking:** In countries like the **Democratic Republic of Congo**, where reliance on firewood and charcoal for cooking is prevalent, this may involve addressing both the supply and demand sides.

Approaches can include supporting the development of fuelwood plantations and helping people access efficient cooking technologies and alternative fuels, including electricity when possible, to reduce the preponderance of wood energy in the energy mix.

- **Increasing the use of nature-based solutions in infrastructure development:** Infrastructure development may cause deforestation, but if established in correct habitats, some ecosystem services—such as vetiver planting for slope stabilization—can replace the function of traditional infrastructure, promoting overall forest protection.

Public sector interventions are needed to ensure that poor rural households benefit from the transition. Poor households and Indigenous communities that depend on forests for their livelihoods are disproportionately affected by both climate impacts and climate policies. Relatively low human capital levels and limited access to finance for investing in labor-augmenting capital are among the underlying factors for unsustainable land and forest management practices. In Peru, econometric analysis showed a strong and significant link between informal, small-scale agricultural activities and deforestation. And across countries, policies related to land tenure have disadvantaged poor forest-dependent households. The tenure security needed to unlock opportunities—for example, by attracting infrastructure development—has benefitted larger agroindustry firms, but rarely low-income communities. **Brazil's** ABC program, the main subsidy credit program that supports agriculture intensification, requires formal land titles and excludes lower-income and tribal communities. Poorer households also have limited knowledge on how to navigate government policies: although the share of **Brazil's** tax break expenditures that went to agriculture grew from 9 percent in 2006 to 12 percent in 2021, most of this went to agribusiness and forest industry rather than the rural ABC program and rural insurance.

5.4. Scaling up international cooperation and financial flows will be key

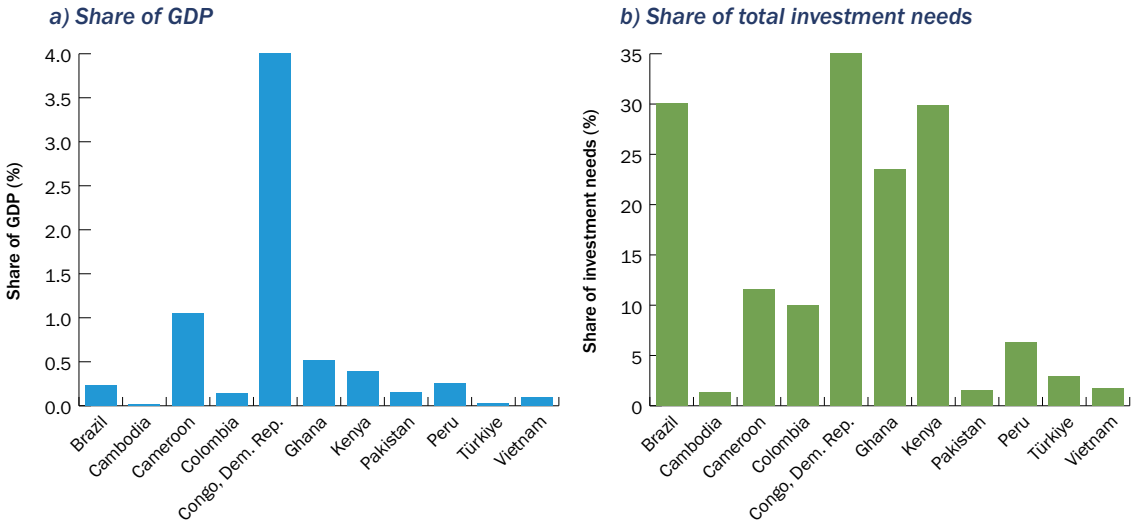
The international community has a key role to play in helping countries stop deforestation, protect biodiversity, and use their land more efficiently. Investment needs for forested landscapes can be high and can make up a large share of the investments needed for resilient and low-emission development (figure 21). These include: improved management practices, such as agroforestry (**Kenya, Democratic Republic of Congo**) or silvopastoral systems (**Peru, Colombia**); restoring degraded forests, plantations (**Brazil, Peru, Cameroon**), or mangroves and soils (**Vietnam**); or commercial forest plantations or concessions (**Ghana, Kenya, Democratic Republic of Congo, Vietnam, Peru**). Most countries also need to improve management and planning capacity, and real-time monitoring systems and enforcement capacity (**Brazil**). Investing in sustainable agrifood systems is also crucial, given their significant contribution to nearly one-third of global GHG emissions, despite receiving only about 4 percent of global climate finance.[29] Countries that heavily rely on wood fuel will also need direct investments toward renewable energy and cleaner fuels to enhance access to electricity and clean cooking.

Realigning incentives to promote sustainable forest and land use policies and investments requires increasing existing climate finance flows, including by supporting countries in securing international payments for the ecosystem services their forests provide globally. Recent policy reforms in the **Democratic Republic of Congo** and **Colombia** exemplify the strategic use of large-scale development finance to drive policy reform in forest countries, facilitating the implementation of development strategies aligned with forest sustainability.

[29] Chiriac, D, Vishnumolakala, H and Rosane, P. 2023. Landscape of Climate Finance for Agrifood Systems. Climate Policy Initiative. https://www.climatepolicyinitiative.org/wp-content/uploads/2023/07/landscape-of-climate-finance-for-agrifood-systems.pdf.

While still in their infancy and facing many obstacles, voluntary carbon markets and associated cross-border capital flows can help finance countries' development agendas and low-carbon transitions. To unlock the potential of results-based financing and markets for forest carbon, countries will need to establish robust policy and regulatory frameworks and strengthen their institutional capacity for monitoring, reporting, and verification, effective oversight, and equitable carbon revenue sharing. Given its history in carbon credit project development and carbon trading, **Brazil** is often placed among the countries with the highest selling potential in international carbon markets. It has substantial potential for generating carbon credits from nature-based solutions linked to its extensive forests, as well as other emission mitigation sources, such as bioenergy and various forms of renewable energy. If it can leverage this potential, **Brazil's** natural competitive advantages would materialize, attracting significant flows of foreign capital and boosting development.

FIGURE 21: *Investment needs in the land use and forestry sector (up to 2030)*



The Democratic Republic of Congo CCDR recommends creating a dedicated international fund, capitalized through grants or an international climate tax. This fund would aim to catalyze private investments through blended finance, facilitating a range of activities. These include de-risking large-scale energy infrastructure projects to attract private investment in urban and peri-urban areas, supporting the expansion of clean cooking solutions and mini-grids near national parks, facilitating activities to reduce emissions from deforestation and forest degradation and increasing carbon sequestration (REDD+).

Several innovative financing channels and programs have emerged to work alongside voluntary carbon markets and pilot approaches for generating more substantial levels of investment. The Forest Carbon Partnership Facility has signed emission reductions purchase agreements (ERPAs) with several forest nations—including **Côte d'Ivoire** (US$50 million), the **Democratic Republic of Congo** ($55 million), **Republic of Congo** ($42 million), **Ghana** ($50 million), **Nepal** ($45 million), and **Vietnam** ($51.5 million)—to unlock result-based payments for REDD+. **Vietnam** and **Ghana** received their first Forest Carbon Partnership Facility payments in 2023, of $41.2 million and $4.8 million, respectively. The environmental integrity of the emissions reductions resulting from these large-scale land programs is strengthened through the use of robust methodologies for carbon estimates—including baseline or reference level, additionality, permanence, leakage, and

uncertainty—as well as third-party verification. Inclusive benefit-sharing plans with local communities that protect and restore landscapes are also an essential component of these programs. Other countries, including the **Republic of Congo, Brazil, Ghana, Nepal, Kenya**, and **Vietnam**, have signed large-scale ERPAs with the Lowering Emissions by Accelerating Forest Finance Coalition, a group of buyers of high-integrity emissions reductions achieved through REDD+.

Cooperative agreements under the provisions of Article 6.2 of the Paris Agreement also allow carbon credits buyers to engage bilaterally with suppliers to transfer mitigation outcomes. Some countries have used this strategic opportunity to attract finance for low-carbon agriculture—for example, **Ghana** has agreements with Switzerland and Sweden to this effect. However, the rules regarding forests under Article 6.4 (the market-based mechanism for carbon crediting under the Paris Agreement) have not been finalized, and the issue of whether avoiding emissions (for example, by reducing the rate of deforestation) is an eligible activity remains unresolved.

A notable limitation of existing market mechanisms is their difficulty in providing incentives for conserving standing forest. Typically, carbon credits are awarded for emission reduction efforts, assessed by comparing actual and historical emissions. This approach presents challenges for countries like the **Republic of Congo** and the **Democratic Republic of Congo**, which have standing forests that are not under immediate threat or have historically low deforestation rates, as it offers limited opportunities to finance forest conservation efforts through carbon credits. For example, in the **Republic of Congo**, conserving peatlands can prevent the release of 44 GtCO2e stored in 5.47 million hectares of forest. The **Democratic Republic of Congo's** forests contain approximately 77 GtCO2e, and its total estimated carbon stock is worth $3.5–6.4 trillion. Effectively addressing forest conservation requires policies and approaches that recognize the value of standing forests as global assets and unlock financing to incentivize countries to adopt consistent public policies, ensure their effective implementation, and realize essential investments in economic sectors and human development—for example, through payment for environmental services. Emerging approaches, such as conservation crediting and market mechanisms that stack payments for carbon and biodiversity outcomes, can provide complementary funding sources, particularly for rewarding efforts to protect high-integrity forests.

6. There are opportunities to spend better, but weak governance and the political economy remain key challenges

Countries need to be able to mobilize domestic public resources, but also require increased support from the international community. Public resources are vital for countries to enhance resilience in poor communities, meet spending needs for social expenditures for a just transition, and invest in sectors where attracting private finance in more challenging (figure 14). To meet these needs, especially in lower-income countries, access to increased amounts of concessional funding will be necessary. But in all countries, better governance and higher spending efficiency offer important opportunities for synergies between development and climate objectives.

6.1. An effective governance framework is needed to respond to climate change challenges

A country's laws and regulations affect its ability to meet its climate goals. While the Paris Agreement calls on countries to develop and communicate NDCs and adaptation plans, these contain mitigation and adaptation measures that are neither legally binding nor enforceable internationally. So, to give them legal force and facilitate effective and meaningful climate action, countries often need to translate these measures into their legal frameworks through new or amended laws and regulations. For example, in **Ghana**, a legal framework could anchor NDC climate policy priorities in law, establish terms for its participation in global carbon markets, and enable it to develop a long-term strategy and integrate climate in planning and budgeting. Similarly, the **Brazil** CCDR notes that managing the power of special interest groups requires autonomous institutions, such as the General Accounting Office and Judiciary, to be able to hold public and private entities to account when they do not comply with the law.

Many CCDRs undertake climate change institutional assessments to analyze countries' institutional foundations for climate action. They identify strengths and weaknesses in climate governance, and recommend paths forward, including for countries in acute crisis situations (box 2). In many cases, weak governance structures contribute to underperformance of key sectors, including the power sector, and strengthening the governance framework offers win-win opportunities to improve sector inefficiencies while reducing emissions.

Some countries have set up specialized institutions to manage climate change, but the lack of effective coordination mechanisms and ill-defined mandates hinder whole-of-government action. Many countries have passed climate change framework legislation that sets out policy instruments and an institutional framework. But most lack effective implementation and regulatory mechanisms for their climate legal frameworks and/or have a patchwork of legislation, policy documents, and institutions, leading to ambiguous, fragmented, and overlapping responsibilities in different central and sectoral agencies. Effective coordination arrangements are particularly important, given the multisectoral nature of climate change policy. **Romania** established the Inter-ministerial Committee on Climate Change to encourage intergovernmental collaboration, and **Türkiye** established the Climate Change and Air Management Coordination Board as the entity responsible for coordinating climate change activities across government. But other CCDRs—including **Cameroon, Democratic Republic of Congo, Egypt, Mozambique**, and **Nepal**—highlight limited coordination due to the absence of support structures or the lack of high-level political commitment needed to ensure these

Box 2: Lessons from the CCDRs in countries in crises

For countries in crisis, climate change is both a recovery risk and an opportunity. Countries in crisis are more vulnerable to the effects of climate change because of the impact on recovery-drivers of the economy. In countries with weak economic growth and little social progress, whole-of-government and whole-of-society approaches are gaining traction, including in the fight against climate change.

The CCDRs find that some countries need to switch to new models and approaches. For example, after the 2011 revolution in **Tunisia**, stalled economic and social progress and a decline in public trust led to the view that the private sector needed to lead the way in generating new jobs and that the state should focus on using resources sustainably, and activities with the highest social and economic returns. These included ensuring water availability for all users, enhancing urban and coastal areas' resilience to climate stressors, and decarbonizing the energy sector, all of which require whole-of-government and whole-of-society approaches to ensure greater cooperation at both national and local levels. This transition will also require society to have increased rights and responsibilities, building a wider understanding and ownership of climate problems and transitions, including vulnerable communities that are most affected, such as youth.

Weak institutional capacity and a fragmented government response both amplify climate change vulnerabilities. In focus group discussions in **Iraq**, farmers expressed concerns over increased risks of community conflict over scarce resources, sharing how worsening water scarcity was already disrupting their livelihoods and leading some to resort to migration as an adaptation strategy. Weak institutional capacity—including with respect to government effectiveness, regulatory quality, rule of law, and control of corruption—exacerbates such risks, for example by hindering the effective use of revenues to address development needs. To that end, the CCDR for **Iraq** calls for a cross-sectoral governance and coordination framework with adequate provisions for transparency and public engagement to better plan, implement and monitor climate change actions at the national and subnational levels.

structures function effectively. In **Brazil**, where multiple federal entities handle the registration of different land tenure categories, connecting and harmonizing these different databases is a priority to reduce illegal land grabbing and deforestation.

Some CCDR countries have started to integrate climate policies in their development planning instruments, but conflicting priorities and inadequate monitoring undermine the efficacy of long-term climate plans. Most countries have developed medium- or long-term decarbonization and adaptation plans, with some incorporating climate change actions in their national development and sectoral plans. **China** has included a carbon emission intensity reduction target into its 14th Five-Year Development Plan. Some CCDRs identify inconsistencies and conflicting priorities between countries' climate strategies and development plans. For example, **Argentina's** development plans focus on developing infrastructure to increase fossil fuel production and expand agriculture land, which will increase deforestation and carbon emission. Most CCDRs note that systems for monitoring, reporting, and verification are at an early stage of development.

A few countries have begun to address climate change in their budgets and public investment management practices. The **Philippines** has tracked budget allocations for climate actions since 2013, focusing attention on the financing for adaptation and climate and disaster risk management. **Peru** has issued guidelines to include the social price of carbon in investment projects. But most countries have significant financing gaps between the cost of the actions proposed in their NDCs

and the public resources available to implement them. The **Cameroon** and **Malawi** CCDRs note that climate considerations are not mainstreamed in the budget process and financing is largely reliant on donor support.

Subnational governments can play an important role in climate action, but moral hazards, inadequate resources, and limited capacity are common constraints. In **Argentina, Cameroon, Pakistan,** and **Türkiye**, subnational governments are required to prepare climate change plans. In recent years, three of **Pakistan's** four provinces have developed specific policies, strategies, or action plans to address climate change, and there are encouraging examples of provincial action under green growth programs and the national afforestation program. However, all countries face significant obstacles for local climate action, including: a lack of adequate information on localized climate impacts, limited capacity on climate issues, and a reliance on national governments, especially in small and medium local governments.

Countries have yet to implement robust arrangements for civil society participation in, and oversight of, climate policy. A few, including **Argentina** and **Cameroon**, engage civil society actors in—or keep them informed of—climate policy design, but civil society rarely has significant influence on decision-making. Supreme audit institutions have yet to address the effectiveness of climate policy in the CCDR countries. In some, the judiciary is beginning to take interest in climate change. In **Brazil**, the judiciary has created working groups on climate change as part of its environmental protection mandate and civil society has used litigation to pursue climate policy goals.

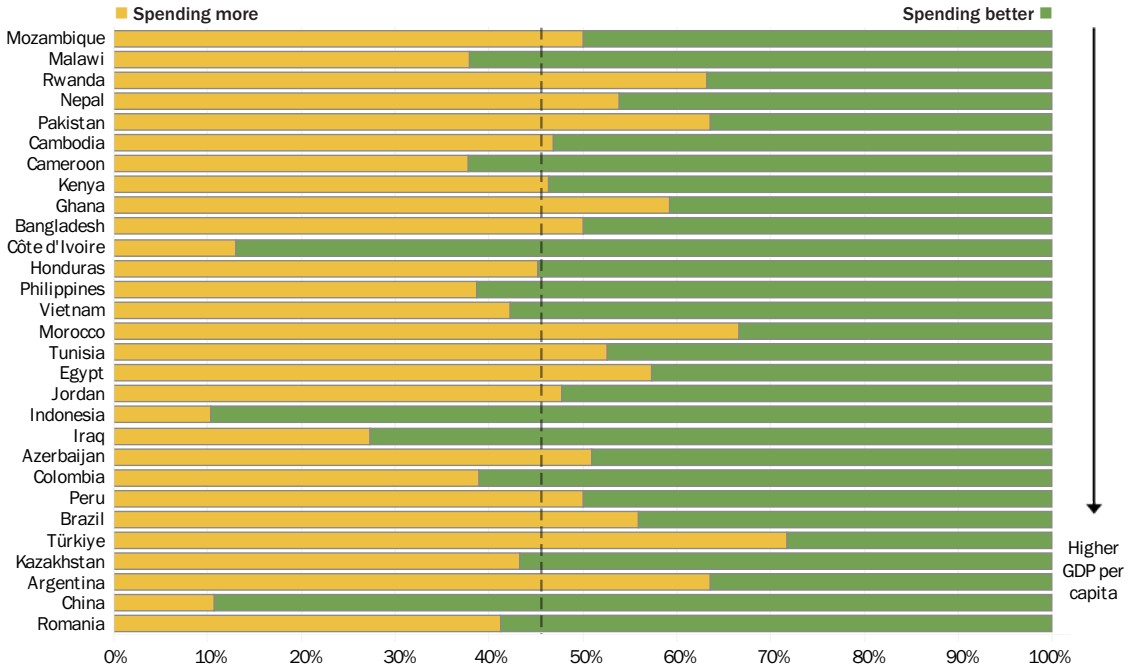
All countries need to make further efforts to mainstream climate change into their planning, public finance, intergovernmental, and accountability systems. Framework legislation can clarify institutional mandates for climate change, enhance accountability, and promote vertical and horizontal coordination. Integrating decarbonization and adaptation into development plans across all levels of government can help reconcile climate action with developmental priorities, while integrating climate change considerations into budgets, public investment management systems, and public procurement, translates climate policies into climate action. Robust monitoring, reporting, and verification systems inform climate policy and commitments and help track progress in implementation. Capacity building and conditional grants can empower and incentivize subnational governments to act on climate change, while the legislative, supreme audit institutions, the judiciary, independent advisory body, civil society, and other institutions all play a vital role in holding governments to account for their climate actions.

6.2. Countries can capture many opportunities to spend existing resources better, but face complex political economy challenges

By recent estimates, countries spend more than $1.2 trillion on energy, water, and agriculture subsidies. These are inefficient at best, and often significantly counterproductive. They were typically introduced to support worthwhile policy goals: to make energy affordable for the poorest, support industrial competitiveness, help farmers make a decent living, or provide affordable food to all. But they often fail to achieve their well-intentioned goals and come at a high cost in terms of efficiency, equity, and the environment. And as many countries are experiencing elevated levels of debt distress, improving the efficiency and allocation of public resources is not optional; it is necessary. In this context, the CCDRs include recommendations for increasing institutional capacity and on repurposing or redirecting spending with the aim of advancing both development and climate objectives (figure 22).[30]

[30] Since recommendations are very different in ambitious and scope, "counting" recommendations is an imperfect proxy. As such, the analysis of the number of recommendations per sector or category is illustrative only.

FIGURE 22: *Share of CCDR recommendations focused on spending more (increased investment) vs. spending better (more efficient use of existing resources)*



Aligning prices, ensuring consistency across policies, and reforming or repurposing subsidies are all key. Countries can reform or repurpose subsidies to make sure they efficiently achieve their socioeconomic objective while also supporting resilience or mitigation objectives.[31] **Colombia**, **Morocco**, and **Indonesia's** CCDRs recommend the following subsidy reforms:

- **Fossil fuel subsidies: Colombia** has had a carbon tax since 2016, while also spending about 2.6 percent of GDP on fuel subsidies, and as result, its net effective carbon rate is low compared to its peers. In 2007, the government established a formula and financing mechanism to smooth domestic fuel prices without incurring fiscal costs over price cycles. But the system effectively established fuel subsidies equivalent to about 50 percent of the international price, with high fiscal costs. The government has established a path for decreasing fuel subsidies to almost zero, but a permanent solution to eliminate these subsidies over the long run is still outstanding.

- **Water tariffs:** Water tariffs in **Morocco** do not cover the operation and maintenance costs of its water systems. The CCDR suggests that adjusting water tariffs to reflect the true value of water resources could incentivize more rational and efficient water use and help improve the sector's financial sustainability, citing positive examples of such reform in **Brazil, Cambodia,** and **South Africa**, where well-sequenced communication and awareness-raising campaigns have led to behavior change and successful water reforms. As water tariff reforms can have disproportionate impacts on the poor and vulnerable, the CCDR recommends carefully crafting compensatory measures to ensure an equitable transition—for example, with a well-targeted cash transfer program to offset the negative impacts on disadvantaged households.

[31] Damania, R., Balseca, E., De Fontaubert, C., Gill, J., Rentschler, J., Russ, J., and Zaveri, E. 2023. *Detox Development: Repurposing Environmentally Harmful Subsidies.* Washington DC: World Bank. http://hdl.handle.net/10986/39423.

- **Agricultural subsidies:** Globally, agricultural subsidies account for $635 billion per year, and for each dollar spent, only 35 cents reach the farmers. Repurposing these funds toward greener production practices holds massive potential for reducing emissions and enhancing productivity. Notably, a significant opportunity for reducing GHG emissions lies in curbing the excessive use of nitrogen-based fertilizers and improving application methods. In 2020, **Indonesia** spent approximately 20 times more on fertilizer subsidies than on its agricultural knowledge and innovation systems ($16 billion, versus $82 million). Gradually redirecting resources from input subsidies to more targeted forms of climate-sensitive support, including extension services for new technologies and expanding agriculture credit, could help.

Spending better also means ensuring that there is clear planning, good prioritization of projects and programs, and that funds are spent efficiently and with integrity. It is important to assess institutional ability and country capacity to undertake these types of investment, especially for adaptation and resilience.

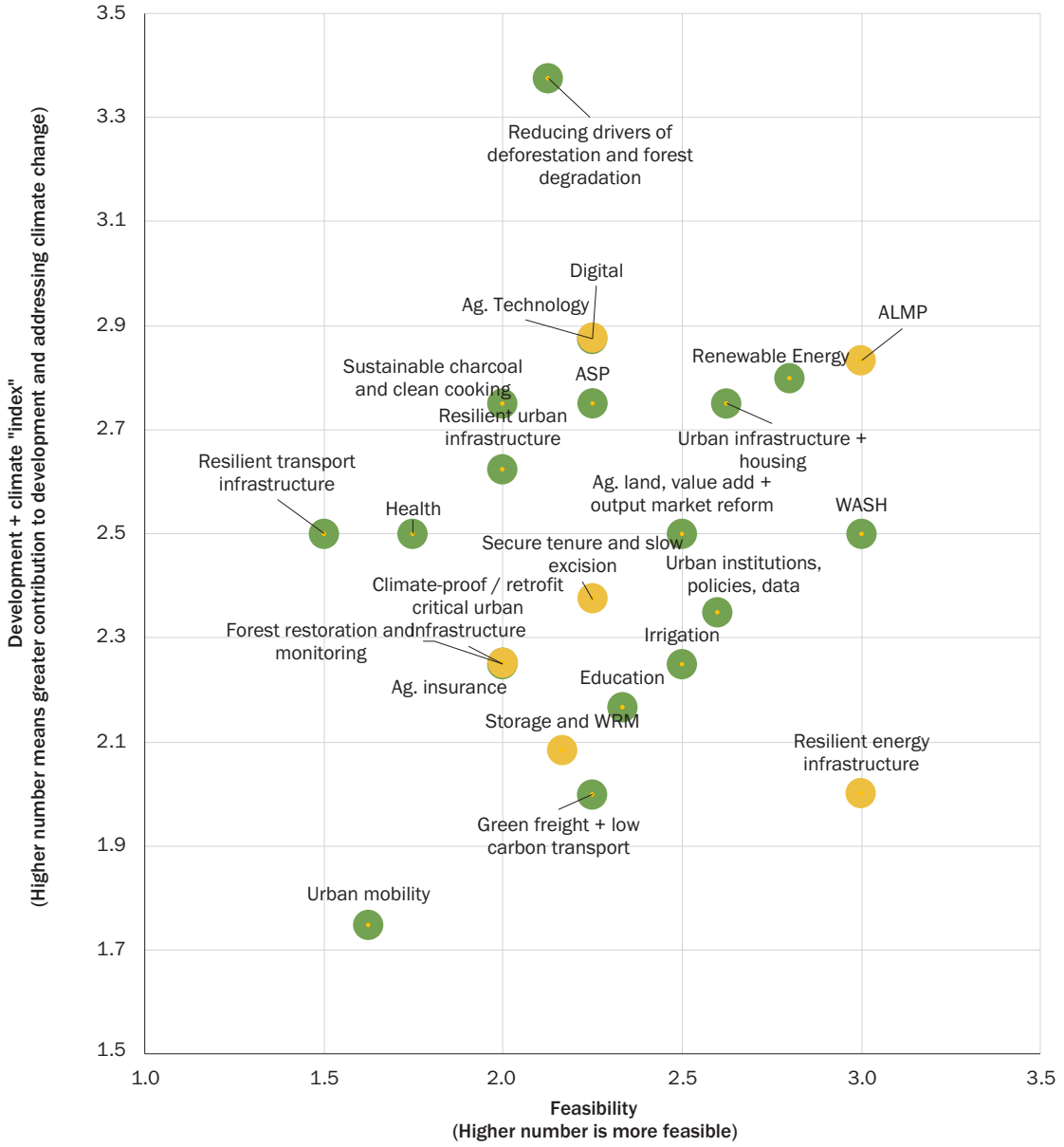
There are important opportunities to also align trade policies with climate and development objectives. For example, **Cambodia's** tariffs on final environmental goods, parts, and components are higher than both the world average and its regional peers', undermining its competitiveness and participation in value chains for low-carbon goods. It has a 10 percent tariff on renewable energy products, which is five times higher than the global average, its tariff on solar panels is 7 percent, while its tariffs on critical intermediate inputs for solar photovoltaic installations—such as batteries, cables, fuses, breakers, and surge protection devices—are as high as 35 percent. This raises costs for manufacturers, hindering their competitiveness and raising the cost of decarbonization.

These reforms are politically challenging, and CCDRs take institutional readiness or political feasibility into account. For example, the **Kenya** CCDR proposes an expert-based ranking of possible measures to prioritize multisectoral interventions. This ranking is based on how much interventions contribute to both climate resilience (assessed against contribution to adaptation and mitigation) and development (assessed against improved productivity and reduced inequality). There are also different degrees of urgency—that is, which interventions are costlier if delayed—and feasibility, which is assessed against institutional readiness and public financing required. Figure 23 reveals that actions related to agricultural productivity, expanding irrigation, climate-proofing critical infrastructure links, health, waste management, and forest resource management and restoration all warrant prioritization, are relatively feasible, and will generate relatively more climate and development benefits. If financial resources are constrained, other important measures (shown in yellow) could be delayed, but not indefinitely.

Some CCDRs explore the political economy barriers that make it hard to capture some of the most attractive synergies between development and climate objectives. For example, in **Brazil**, pressure from vested interests in 2011–12 led to declining budget allocations for and weakened regulations around enforcing land regulation, leading to an increase in deforestation over the following years. In **Uzbekistan**, rolling back the pervasive role of the state by privatizing state-owned enterprises and ensuring robust, conducive competition and investment regulatory environments are key to increasing much-needed FDI for the green transition. A recent World Bank global report further explores the social and political challenges posed by climate change mitigation policies and proposes methodologies and analyses for future CCDRs to build on.[32]

[32] Hallegatte, S, Godinho, C, Rentschler, J, Avner, P, Dorband, I, Knudsen, C, Lemke, J and Mealy, P. 2023. *Within Reach: Navigating the Political Economy of Decarbonization. Climate Change and Development Series*. Washington DC: World Bank. http://hdl.handle.net/10986/40601.

FIGURE 23: *Kenya CCDR recommendations in terms of development benefits and practical feasibility*



Note: Green symbols correspond to the most urgent actions; yellow symbols correspond to "less urgent actions" which can be delayed without a large increase in costs.

7. Conclusion

The CCDRs are diagnostics that aim to help countries achieve their development and climate goals together. Built on each country's development priorities, key climate risks, and main opportunities for action, they can inform initiatives and priorities at country level, including the World Bank's operational portfolio through their impact on Country Partnership Frameworks. Beyond the World Bank portfolio, the CCDR preparation and publication process offers opportunity for governments, private sector investors, citizens, international financing institutions, and World Bank partners to engage on development and climate action, with better country-level coordination. Building on reports covering more than 40 economies, this summary report highlights key findings from the full set of CCDRs published by COP28.

CCDRs offer a rich layer of climate-informed analysis and make concrete recommendations to overcome the key barriers for better development. They are part of a new playbook to drive impactful development and lead to a better quality of life—through access to clean air, clean water, education, and decent health care—with more resilience and lower GHG emissions. Most importantly, they will contribute foundational knowledge to global and country debates on how to align climate and development, providing substantive guidance on how to create a world free of poverty on a livable planet.