

Issue

Brief

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Takeaways for India from IPCC's Assessment of Global Mitigation Efforts

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Abstract

The findings of Working Group-III (WG-III) of the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) clearly highlight the global failure to scale-up mitigation actions to achieve the Paris Climate targets. Immediate and unprecedented action will now be needed to avoid catastrophic global warming in this century. The WG-III report details some of the policy actions needed at the global level to enable a sustainable transition. However, each country will have to adopt a plan to ensure an inclusive transition that is compatible with their development pathways. This brief highlights some policy takeaways for India from the broad areas identified by the WG-III. It notes the actions needed to enable a greater flow of cross-border finance, foster innovation to ensure a synergy between development goals and mitigation actions, and the early planning necessary to overcome the challenges associated with achieving a just transition.

The Intergovernmental Panel on Climate Change (IPCC) was set up in 1988 to provide governments with scientific information that can be used to develop climate policies. Since its inception, the IPCC has published reports every six years or so that provide comprehensive assessments of the most current research on global warming. In 2021 and 2022, it released the Sixth Assessment Report with contributions from its three working groups (WGs)—WG-I in August 2021,¹ WG-II in February 2022,² and WG-III in April 2022.³ A synthesis report is scheduled to be released in September 2022. These reports serve as a key input for international negotiations to tackle climate change, including the Conference of Parties (COP), which is convened annually. While the reports aim to inform global climate negotiations, they steer clear of being policy prescriptive. Essentially, the IPCC reports provide a global assessment without specific recommendations for any country or region. For these assessments to inform actual national-level policymaking, the recommendations must be framed for each country.

While the first two working groups focused on the physical science basis and vulnerabilities of climate change, the WG-III report provides an assessment of the progress towards climate change mitigation. It takes stock of the most recent trends in global greenhouse gas (GHG) emissions, and assesses future emissions associated with alternate mitigation pathways based on 2,500 modelled tracks submitted to the IPCC database. It also provides a sector-specific assessment of the current status of green technologies. Crucially, it also identifies key action areas that will be essential to ensure transformative climate action.

This brief aims to contextualise the findings of the WG-III report for India by assessing the specified action areas from an Indian perspective and identifying how these can inform national-level policymaking.

Are the Paris Climate Goals Still Achievable?

According to the WG-III report, the current nationally determined contributions (NDCs) under the Paris Agreement are insufficient to limit global warming to 1.5 degrees Celsius.⁴ It also finds that an implementation gap exists between present policies and the NDC commitments. Continuing on the current policy pathway could see median global warming rise by as much as 3.5 degrees Celsius by 2100, leading to a catastrophic future.

Given the current trends, limiting warming to 1.5 degrees Celsius will require immediate action to ensure global emissions peak before 2025, fall 43 percent by 2030, and reach net-zero by 2050. This scenario seems unlikely given that emissions continue to rise, particularly in developing countries. China and India, the two geographies with the fastest growth in emissions, have already stated that the earliest they could reach net zero is 2060 and 2070, respectively. Even if the NDCs for every country are achieved by 2030, none of WG-III's illustrative mitigation pathways could identify a scenario that limits warming to 1.5 degrees Celsius in the 21st century.

The possibility of limiting warming to 1.5 degrees Celsius looks bleak, but what will it take to achieve the 2 degrees Celsius target—the absolute limit identified by the Paris Agreement for “preventing dangerous anthropogenic interference with the climate system”?⁵ Even if the NDC goals were realised by 2030, achieving the 2 degrees Celsius target will require an unprecedented scaling-up of actions to limit emissions beyond 2030.

Between 2030 and 2050, GHG emission reductions will have to increase to an average of 1.3-2.1 gigatonnes of CO₂ equivalent (GtCO₂-eq) emissions per year, similar to emission reductions achieved at the peak of pandemic lockdowns in 2020. In emission pathways that involve immediate action that exceed the NDCs, the 2-degrees-Celsius target will entail a 27-percent reduction in emissions by 2030 and 63 percent by 2050. But given that even the NDCs currently face an implementation gap in many countries, achieving these targets will require unprecedented coordinated global efforts to immediately scale-up mitigation measures.

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However, it is not all doom and gloom. The WG-III report assures that abundant and affordable technological solutions are already available to allow decoupling from the present pathway. It notes that the acceptance and adoption of clean technologies has increased much faster than expected since 2010, with solar uptake increasing tenfold and electric vehicles more than hundredfold, albeit from a very low base. Most encouragingly, the cost of these technologies has declined rapidly, with an 85-percent decrease in the cost of solar, wind, and battery technologies since 2010. The report outlines many viable clean technology solutions for different sectors, notably solar and wind energy, the electrification of urban systems, urban green infrastructure, and energy efficiency.

The green technologies needed for a transformative transition already exist and are increasingly becoming cost-effective. The key question is whether investment flows can shift from fossil fuels to green technologies at a rapid enough pace to keep temperatures below the Paris Agreement targets. According to estimates, US\$900 billion (or one-third of the value of oil and gas companies) could be left stranded if governments choose to implement aggressive policies to restrict warming to 1.5 degrees Celsius for the rest of the century.⁶ Already, the risk of stranded fossil fuel assets and increasing economic returns from green technologies have led to commitments from investment institutions to divest from fossil fuels. As per 2021 estimates, around 1,500 investment institutions overseeing a combined US\$39.2 trillion in assets are now committed to divesting from fossil fuels.⁷

While the pledges appear promising, the current reality is that large sums of money continue to be invested in fossil fuels. According to the Fossil Fuel Finance Report 2022, the 60 largest banks in the world continued to invest heavily in fossil fuels, around US\$742 billion in 2021 alone, substantially more than the US\$632 billion that was invested in climate finance in 2020.⁸ WG-III estimates that existing and planned fossil fuel infrastructure could cumulatively account for 850 GtCO₂. Given that the total carbon budget to restrict warming to 2 degrees Celsius is 890 GtCO₂, the scale of the problem is starkly evident.

The 2-degrees-Celsius target will effectively require an immediate cessation of further investment in fossil fuels in favour of green technologies. While there may be positive signs, any phase-out (or, more likely, scale down) strategy will entail multiple economic and societal trade-offs and a significant change in the deeply entrenched political economy considerations associated with the

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fossil fuel industry. At a bare minimum, countries must take immediate and unprecedented action to chart out an ambitious energy transition plan backed by strong legal, fiscal, and regulatory measures.

Furthermore, all assessed pathways to achieve 2-degrees-Celsius require a substantial scaling-up of technologies that can capture CO₂ from the atmosphere, including coal use with carbon capture and storage, afforestation, bioenergy with carbon capture, and direct air capture. However, these technologies are currently nascent and their future feasibility has long been a source of debate.⁹ For instance, in 2021, only around 20 commercial carbon capture and storage projects were operational, with the cost a big impediment. Currently, the average costs vary from around US\$15 per ton of CO₂ for industrial processes with highly concentrated CO₂ streams, to up to US\$120 per ton of CO₂ for processes with dilute gas streams such as cement production and power generation.¹⁰ The costs of transport and storage add a further US\$20 per ton of CO₂ to the total cost. Cost reductions in these technologies will make them cheaper than other potential solutions, especially for hard-to-abate sectors such as steel and cement, but such cuts are based on assumed technological learnings, which are far from guaranteed. Even the WG-III report acknowledges that historical cost reduction in these technologies has been lower than expected. The risk is that dependence on these technologies can become a red herring in the future, diverting investments from more feasible mitigation technologies while allowing increased investment in fossil fuel-based processes with the hope that future emissions can be captured.

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In addition to taking stock of the present state of global climate action and low carbon technologies, the WG-III report highlights some action areas that are crucial for transformative and inclusive transition. The levers identified in the report are an acknowledgement that technological progress alone is not enough if inherent geopolitical, institutional, and social bottlenecks are not addressed.

However, while the WG-III provides a global assessment, these issues need to be contextualised in terms of the unique circumstances facing different countries to inform policymaking. Emerging countries, in particular, face the challenge of balancing climate action with their developmental goals, necessitating a very different approach from the developed world. In the Indian context, three of the most vital recommendations are related to solving inequities in climate finance, fostering innovation to ensure synergy between development goals and mitigation actions, and early planning to ensure a socially equitable transition.

Prioritising Innovation for Green Development

The WG-III report estimates that global economic benefits from pathways that limit warming to 2 degrees Celsius will outweigh the cost of climate action. While this is certainly encouraging, it does not mean that all countries will benefit from the transition equally. The transition to green technologies will spur economic development only if it improves domestic job creation, macroeconomic stability, and economic growth. This will require countries to be self-reliant in manufacturing green technologies and accessing newer raw materials.

Improving domestic manufacturing is seen as an important enabler of economic development in India. The 2011 National Manufacturing Policy aims to increase the share of manufacturing in GDP to 25 percent, almost double the present level.¹¹ The central government has already implemented production-linked incentive (PLI) schemes across 14 sectors. Recently, these schemes have also been extended to green technologies with dedicated plans for solar modules (INR 195 billion),¹² batteries (INR 180 billion),¹³ and electric vehicles and components (INR 260 billion).¹⁴ To ensure that the supply chain for these technologies is also localised, the PLI schemes have strong mandates on local content for manufacturers to avail of these incentives. The public procurement process is also skewed in favour of domestic production under

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the broader umbrella of the 'Make in India' programme. The selection process for government tenders is such that firms with local content above 50 percent are given preference even if the quoted costs are higher than other firms with lower local content.¹⁵

While these schemes might encourage domestic investment in production capacity, the lack of technological knowledge and access to raw materials needed to manufacture green technologies remains a challenge. The WG-III report also stresses the need for innovation and effective technology transfer to developing economies, with a whole section dedicated to this issue. Control over the intellectual property rights and patents for most green technologies is currently concentrated in the hands of a small set of countries. For instance, the US, China, and Japan accounted for 62 percent of all renewable energy technology patents awarded between 2000-2016.¹⁶ China, in particular, has taken great strides in developing both knowledge and production capabilities for green technologies, and is currently the largest producer of solar and wind modules and electric vehicles. These countries also have exclusive control over trade secrets, which refer to the tacit knowledge and know-how that are critical to adapting green technologies to local conditions. This concentration of expertise is a crucial challenge for developing economies aiming to boost domestic capabilities for such technologies.

Industrial policy in a latecomer economy such as India will need to have a clear focus on innovation and rapid technology transfer. Early mover countries have dedicated substantial resources to public investment in research and development (R&D). China, for example, implemented a dedicated national high-tech programme, known as the '863 Program', starting as early as 1986.¹⁷ Their approach consisted of targeting specific sectors and then dedicating resources to achieve the technological knowledge needed for large-scale manufacturing in these sectors.

This strategy can be implemented in India to some extent. Traditionally, India's spending on R&D has been only around 0.6 percent of GDP, much lower than China, Japan, and the US, where spending is around 3 percent of GDP.¹⁸ This has improved in the last decade. A 2021 study estimated that in terms of public investment in non-fossil RD&D, India has surpassed Japan to become the third-largest investor.¹⁹ Public spending will have to be scaled up further, but regulations and fiscal structures will also have to be rethought to encourage

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increased spending by the private sector. For example, in 2020, the Indian government reduced the tax exemption on R&D expenses for manufacturing companies from 150 percent to 100 percent (notably, the exemption was even higher at 200 percent before FY 2017). Such a move sends the wrong signal to industries at a time when encouraging innovation should be a priority.

Promoting entrepreneurial activities will also be critical to enabling private sector innovation. Already India has seen many new startups entering the green technology space, particularly for providing solar solutions and electric vehicles. However, India's regulatory ecosystem is far from conducive for new and small businesses. For instance, a typical micro, small, and medium enterprise (MSME) in India faces 500-900 compliances that can cost between INR 1.2 million and INR 1.8 million a year.²⁰ Furthermore, the eligibility criteria in the PLI schemes related to investments and revenue make it difficult for MSMEs to access incentives.²¹ Policymakers will have to take decisive steps to lighten the regulatory burden for startups while expanding existing PLI schemes or creating dedicated incentive schemes for MSMEs.

Beyond this, the Indian industry will also have to become more effective at acquiring and adapting knowledge from the developed world. Given the size of the Indian market, foreign firms are always looking for opportunities to invest in India. Most sectors of the Indian economy also allow 100 percent foreign direct investment (FDI), making it easy to invest. FDI not only leads to increased investment but also creates opportunities for domestic players to access technology that may otherwise be protected by strong laws. How can India's policy towards foreign investment encourage increasing technology transfer?

China has in the past had a very aggressive approach to foreign investment, mandating foreign investors to form joint ventures (JVs) with local partners in certain industries and include specific clauses for the transfer of original designs and technical know-how. Since many of the Chinese partners are state-owned enterprises, the technical know-how acquired from the JVs was shared with government research institutes, which then learned and adapted these technologies to local conditions, creating new patents.

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India does not yet have an innovation ecosystem that can quickly utilise the knowledge gained from foreign investment. Evidence from other geographies suggests that FDI inflows can not only lead to internal learning within a firm but can also increase productivity across the whole system through external technology spillovers.²² However, maximising these spillovers will require the private sector to increasingly invest in R&D and design capabilities to take advantage of these, which has been lacking in many sectors. In many cases, Indian companies simply act as assemblers of green technologies without much capacity to develop original designs. India's electric vehicle manufacturing sector is an example, with most manufacturers simply importing critical components and assembling the final vehicles using designs licensed from foreign counterparts.²³

Most importantly, the overall ecosystem for innovation in the country will need to be strengthened. In particular, there is a need to enhance collaboration between industry and research institutions with a clear focus on green technologies, including future technologies such as green hydrogen, second-generation biofuels, and non-lithium battery chemistries. India ranks a lowly 45 for university/research collaboration on the Global Innovation Index.²⁴ Strengthening such ties by developing effective collaboration platforms will be essential to take maximum advantage of technology spillovers. A few institutes have already made some progress; for instance, IIT-Delhi has implemented a Delhi Science and Technology Cluster with support from the Principal Scientific Adviser to the Government of India.²⁵ However, these efforts remain ad hoc and there is no clear national-level plan. Going ahead, innovation policies (such as the Science, Technology, and Innovation Policy²⁶) will have to be strengthened with a straightforward roadmap for enabling such collaborations. These policies should also have a clear focus on green technologies, given their importance to future industrial growth.

Essentially, without a strong focus on innovation and technology development, India could find itself as just an assembler of green technologies, dependent on other countries for designs, critical components, and raw materials.

Resolving Inequities in Accessing Climate Finance

Given that around 70 percent of historical emissions are attributable to developed nations²⁷, the United Nations Framework Convention on Climate Change (UNFCCC) asserts that developed countries are obligated to provide developing countries with a substantial share of the financial resources needed to achieve their climate targets.²⁸ The WG-III findings highlight the failure of developed nations to adhere to this crucial tenet of global climate action.

At the Copenhagen climate summit (COP15) in 2009, rich nations pledged to provide US\$100 billion per year to developing nations by 2020.²⁹ However, a clear definition of the nature of this finance was not agreed upon. The OECD estimated that financial flows to developing countries in 2019 totaled only US\$80 billion,³⁰ but this is an optimistic assessment that other agencies have disputed. Notably, Oxfam argued that if only concessional loans provided below the market rate were considered, public financial transfers were only around US\$20 billion in 2017-18.³¹ The lack of a clear delineation of these funds makes it difficult to gauge the exact deficit, but it is clear that the shortage is substantial.

The broader climate finance landscape also paints a similar picture. An assessment by the Climate Policy Initiative found that total climate finance in FY20 totalled around US\$632 billion.³² In comparison, achieving global climate objectives will require around US\$4.35 trillion annually by 2030, a 590-percent increase from present levels. Significantly, existing financial flows also suffer from a substantial home bias, with 75 percent of tracked investment restricted to its originating country. Around 25 percent of this finance was concentrated in the developed countries of Western Europe and North America. Around 50 percent was in the Asia-Pacific region, but 81 percent of these investments were in China alone. This means that only a small fraction of total finance reached the neediest developing countries in Asia, Africa, and Latin America.

This situation is inequitable and not in keeping with the spirit of the UNFCCC. The WG-III report provides a reference point for India to exert greater diplomatic pressure to remedy this situation. As agreed at the COP26 in Glasgow in 2021, the US\$100 billion goals are set to be revised from 2025, with some countries suggesting that developed countries should provide more than US\$1 trillion annually from 2025.³³ India is well placed to lead the effort to ensure that the new targets reflect not only its own needs but the needs of all developing countries. More importantly, accountability will need

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to be strengthened by assigning specific targets to countries based on their historical emissions, which would be far more useful than a cumulative target. Furthermore, the kinds of instruments that are counted towards this goal should be clearly defined, and should ideally be restricted to equity, grants, and only loans that are given at concessional rates.

Beyond the UNFCCC commitments, efforts also must be made to access additional pools of finance. In particular, private finance needs to be increasingly directed towards climate action in developing nations. Despite greater economic returns, private investors continue to remain reluctant to fund green projects in developing countries, largely due to perceived high project implementation, liquidity, and currency risks. Multilateral development banks (MDBs) can play a crucial role in remedying this situation by crowding in private capital through risk-sharing mechanisms and blended finance arrangements. India's upcoming G20 presidency in 2023 provides a major opportunity to bring this issue to the fore of the G20 agenda. The G20 is uniquely placed to influence the actions of MDBs, such as the IMF and World Bank. Prioritising this issue within the grouping's finance track could go a long way to align the priorities of MDBs with the needs of financing global climate action. In particular, climate finance must be clearly distinguished from broader development finance, which has been the historical mandate of MDBs. If India's G20 presidency can be utilised to identify a clear roadmap for increasing the flow of private capital, it could unlock large pools of financing for developing nations that have hitherto been unutilised.

India's domestic economic and financial systems also need to be altered to direct investment toward green sectors. The WG-III report highlights some actions that are particularly relevant for India, such as the need to correct market biases that continue to favor fossil fuel investments. A study found that, between 2017 and 2020, subsidies for renewable energy in India had fallen 45 percent even as fossil fuel subsidies increased, and fossil fuel subsidies were 7.3 times higher than subsidies for renewables in 2020.³⁴ The long-term solution to this problem is to have a representative carbon tax across all sectors. However, the present taxation system and the potential political implications make such a tax challenging to implement. Such a tax could also disadvantage Indian industries if the domestic electricity grid continues to be dependent on coal. A more feasible solution will be to set up a committee to develop a roadmap for rationalising subsidies across sectors, developing an effective carbon trading system and laying the groundwork for a carbon taxation system unique to

India. At the same time, implementing a comprehensive green taxonomy will also help direct finances to the right sectors.³⁵ There is also a need to derisk investment in green technologies by deepening the green bonds market. India has already taken some positive steps with its first foray into issuing sovereign green bonds worth INR 24,000 crore.³⁶ These efforts will need to be scaled with state governments and municipalities expanding efforts to issue green bonds.

Essentially, increased pressure at a diplomatic level needs to be combined with domestic reforms to enable a rapid scaling-up of green financial flows.

Early Planning for a Just Transition

The WG-III report strongly stresses the need to manage the social aspects of mitigation actions better. In short, emission reductions must be rooted in and enabled by considerations of equity and the principle of leaving no person behind. This issue becomes especially relevant in economies where the fossil fuel economy is deeply entrenched, such as India. Scaling down fossil fuels, particularly coal, will be essential to control future emissions but also has consequences in terms of lost livelihoods.

In India, around 1.3 million people are directly employed in coal mining, transport, and associated industries; if indirect employment is considered, this number is closer to 2 million. Around 70 percent of the workers in this sector are off-contract and often not even counted in official estimates.³⁷ The informal nature of employment makes it harder to implement targeted policies to transition these workers and also limits the possibility to channel transition programmes through unions. Furthermore, the socioeconomic profile of these workers also presents a challenge. Most workers have low education and skill levels, making it harder to implement the reskilling and training programmes needed to achieve technical proficiency necessary for renewable energy jobs. These factors, which are endemic to the Indian coal sector, will necessitate a completely different approach to just transition than more developed economies. While most of the attention has been given to coal, India's fossil fuel-dependent automobile sector could be another area where substantial job losses may occur with the transition to electric vehicles.

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So far, India has been very conservative in committing to any near-term cessation of coal usage. Currently, per capita power consumption in the country is around 1,200 KWh, less than half the global average.³⁸ Going forward, economic growth, industrialisation, and improved energy access needed to achieve developmental goals will necessitate an exponential increase in electricity consumption. Considering that around 75 percent of the power generation today is from coal,³⁹ it will be tough to meet the increased demand exclusively from clean sources without hampering development. As a result, India has not committed to decreasing coal usage. In contrast, the Economic Survey (2021-22) projected that coal demand will increase 65 percent by 2030. Already, a further 60 GW of coal-powered power plants are in the construction or pre-construction phase, and more can be expected in the future.^{40,41}

While India's current stand is justifiable, this has also translated into a reluctance to consider a possible roadmap for just transitions. In a reply to a question in the Rajya Sabha (upper house of parliament) about whether India should start planning for a just transition, the coal minister stated that the transition was not likely to affect any stakeholders in coal mining and there is no need for any plan as yet.⁴² This may be counterproductive in the long run since early planning for a just transition will be essential to overcome the challenges unique to the Indian coal industry. Seen differently, such a roadmap could be a tool to highlight the challenges associated with a transition in India and the financial resources that will be required from the developed world. As many of the developed countries have tried to portray India as a spoiler in the shift away from coal, such a roadmap could go a long way to improve the country's position at the climate high table.

A just transition roadmap will have to account for several things. In particular, it will have to identify the magnitude of the problem and create a comprehensive timeline for mine closures and plan for creating economic opportunities keeping in mind the socioeconomic reality of coal workers. It will also require a comprehensive roadmap for estimating the cost of this transition and a clear mechanism to finance it, with a particular emphasis on mobilising international financial flows. A national-level roadmap can provide a clear direction for the coal transition. However, it will be impactful if it can lay out a template for state- and district-level just transition plans. The coal industry is largely concentrated in the central and eastern states and as such, around half of the districts in West Bengal and Jharkhand and 30 percent of the districts in Odisha and


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Chhattisgarh are likely to be affected by the transition.⁴³ Each of these districts has local conditions and constraints that will need to be considered to enable an economic transformation away from coal.

It is also important to remember that while coal usage may not come down at the national level, many districts could be affected earlier than others. In some of the major coal-producing districts, coal reserves are already close to being exhausted; in others, there has already been a spate of mine closures in the last decade. Chhattisgarh's Korba, India's largest coal producing district, could see 95 percent of its coal-producing mines shut down by 2040.⁴⁴ A study also found mine closures in Madhya Pradesh's Betul district had led to a substantial economic downfall, with many coal-based townships getting deserted, leading to widespread suffering among coal workers.⁴⁵ Furthermore, many of the coal mines are also running in major losses and could be at risk of shutting down. For example, Coal India is estimated to have up to 200 loss-making mines that are incurring losses amounting to INR 16,000 crore.⁴⁶ These mines account for a small share of Coal India's total production but account for a large part of the workforce. Increased pressure to streamline government finances could force the organisation to shut some of these mines.⁴⁷ There is a need to identify some of the districts that could face mine closures in the future and implement just transition plans in these regions. The Ministry of Coal has already expressed a desire to seek a billion-dollar loan from the World Bank to develop a programme for mine closures, and this effort should begin in the high-risk districts.⁴⁸ The learning from these districts could then inform a broader just transition plan and serve as a template for further district-level action.

“For India, the strongest recommendations from WG-III are related to resolving inequities in climate finance, fostering innovation to ensure synergy between development goals and mitigation actions, and early planning to ensure a socially equitable transition.”

The WG-III findings are not new. The evidence has been building for some time, but it drives home a very stark and worrying message—mitigation actions must be increased immediately to avoid a catastrophic future.

By going beyond just the quantitative aspects of mitigation, the report highlights some key action areas needed to enable a sustainable transition. These learnings must inform global action going forward. Developed countries must step up their efforts and scale-up assistance to developing states. For emerging nations, policy actions must focus on maximising the synergies between development goals and climate actions. This will require rapid action to correct market distortions that hinder the flow of finance, develop green industrial policies with a clear focus on innovation, and plan early to overcome the challenges associated with achieving a just transition. 

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