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REPORT

Executive Summary

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Executive Summary

Overview

Nepal must adapt its development pathway to a changing climate. Global warming and climate change are already affecting Nepal's gross domestic product. Increased flooding, heat stress on labor productivity and health, and heat stress on crops and livestock are expected to be a continual drag on growth. Women, indigenous people, and other marginalized groups are often excluded from mainstream development and suffer from cumulative and cascading impacts of climate change and disasters. Without comprehensive and scaled-up climate action, climate change will continue to jeopardize gains in Nepal's human development and poverty reduction.

To respond to this challenge, Nepal is already implementing steps to recalibrate its economy by adopting a Green, Resilient, and Inclusive Development (GRID) approach. Nepal has begun to put in place the necessary policy framework, such as the 2019 National Climate Change Policy, the 2022 Solid Waste Management Policy, the 2022 Forest Regulation and the 2022 Land Use Regulation. However, implementation of this reform agenda and prioritization of investments is incipient. Moreover, enhanced prioritization and efficiency of public expenditure are required to maximize climate and development benefits.

This Country Climate and Development Report outlines four priority system transitions that are fundamental to addressing the risks that climate change poses to Nepal while also providing opportunities for improving the quality and sustainability of economic development: (a) improving systemic resilience of rural landscapes including food, freshwater, and forest systems to boost adaptation, livelihoods, and food security; (b) harnessing Nepal's significant hydropower opportunities; (c) managing urbanization and environmental quality to build resilience and improve health; and (d) strengthening Nepal's low-carbon, resilient connectivity—particularly roads—to improve the country's growth and services.

This report also outlines three key enabling themes to help support the priority system transitions toward a greener future for Nepal: strengthening the resilience of people and community assets through early warning systems, shock-responsive safety nets, and access to quality skills training; embedding disaster risk management at all tiers of government and across all sectors; and prioritizing Nepal's funding needs by convening and coordinating financing for climate action.





Introduction

This report identifies ways that Nepal can achieve its overall development objectives while fostering its strategic ambition to transition to a greener, more resilient, and inclusive development pathway. It identifies the major risks and opportunities that climate change presents for Nepal's economic growth and poverty reduction and shows how investments in climate actions are good for sustainable development and vice versa. It proposes an overall framework to approach climate and development and recommends selected priority actions to enhance synergies and manage trade-offs. It also identifies areas for further analysis. **Chapter 1** summarizes Nepal's development trajectory, needs, and vulnerability to climate risks. **Chapter 2** analyzes Nepal's climate-related commitments, policies, and institutions. **Chapter 3** models the impacts of climate change on the macroeconomy and road transport systems. It also analyzes the links between climate change and air pollution, poverty, health, social inclusion, and human development and finds that climate change exacerbates inequities. **Chapter 4** presents pathways to resilience, including through integrated management of landscape systems comprising water, agriculture, and forests, as well as strengthening climate and disaster risk management (DRM) in the evolving federal system. **Chapter 5** analyzes the potential for domestic and regional hydropower and other opportunities for Nepal to build on and expand low-carbon activities. **Chapter 6** discusses the substantial investment needed to achieve Nepal's development and climate ambitions within the country's fiscal space limitations. **Chapter 7** presents a prioritization framework for the most transformational climate action with specific recommendations for how to move from analysis to large-scale action.



Nepal's recent progress on climate and development



Nepal has achieved significant development progress in recent decades. Over the past 10 years, Nepal's gross domestic product (GDP) growth averaged 4.9 percent per year, enabling the country to attain lower-middle-income status in 2020. Growth has been broad based, with multidimensional poverty in Nepal estimated to have declined from 30.1 percent in 2014 to 17.4 percent in 2019. About 81 percent of the population lives in rural areas, where the poverty level is significantly higher than in urban areas. Remittances remain the backbone of Nepal's economy at 22 percent of GDP, earning significantly more foreign exchange than goods exports, services exports, and foreign direct investment (FDI) combined.

Temporary labor outmigration from Nepal is likely to continue for generations, but its characteristics may change. In Nepal, as in other developing countries, migration supports household resilience by scaling up remittances when the migrant household suffers a shock. The top four destinations of Nepali workers are India, Saudi Arabia, Qatar, and the United Arab Emirates. Nepal should assess the potential impacts of rising temperatures in the Gulf and the rebalancing of energy away from fossil fuels on remittances.

The federal system established in 2015 provides both challenges and opportunities for translating economic prosperity, social justice, and climate and disaster resilience into a comprehensive development approach. Among other impacts, the transition has elevated public spending, leading to higher public debt, and reduced fiscal space to address shocks. Federalism has empowered local bodies with extensive fiscal autonomy. However, resource mobilization, management responsibilities, and coordination across sectors and governmental tiers remain inadequate.



While these challenges are to be expected in a newly established tiered government system, clarity on roles and responsibilities and establishment of missing legal mandates are all essential to respond to the development and climate challenges ahead.

Nepal has significant infrastructure investment plans, but to achieve sustainable returns on these investments, greater attention to climate resilience of public assets is needed. Large-scale infrastructure investments in transport, irrigation, and hydropower need to factor in climate-induced variability. Hydropower, which currently accounts for 91% of the country's total electricity generation, supports economic growth as electricity is a fundamental ingredient of most productive processes. As the period up to 2015 has demonstrated, power shortages can lead to a marked decline in GDP growth. Further enhancing the reliability and accessibility of electricity supply is expected to facilitate a shift of demand to cleaner energy services such as electric cooking.

Nepal's economic growth trajectory has suffered challenges in the past. Like many landlocked countries, Nepal has struggled to gain footholds in merchandise export markets. On the services side, while tourism generates jobs, the sector only earns around 10 percent of Nepal's total foreign exchange revenues. Migrant remittance inflows are the primary sources of revenue and will likely remain the key driver of growth in the future. In 2016, remittances peaked at 25 percent of GDP, but there is little evidence to suggest that they will return to those levels. Other sectors with foreign exchange earning potential in the medium to long term include hydropower, which has enormous potential for both Nepal and neighboring countries. Public sector investment in the energy sector also needs to consider investment needs for other public goods and services, given existing fiscal space constraints. Ensuring macroeconomic stability and a sustainable debt burden is critical when planning multiple and large scale infrastructure investments. It is also important to ensure that the current pipeline of hydropower and other infrastructure investments is socially and environmentally sustainable. This will lead to higher, more resilient, and inclusive growth than under a business-as-usual (BAU) approach. Project-level and strategic environmental and social impact assessment at the sector level can help reduce climate risks and manage trade-offs.



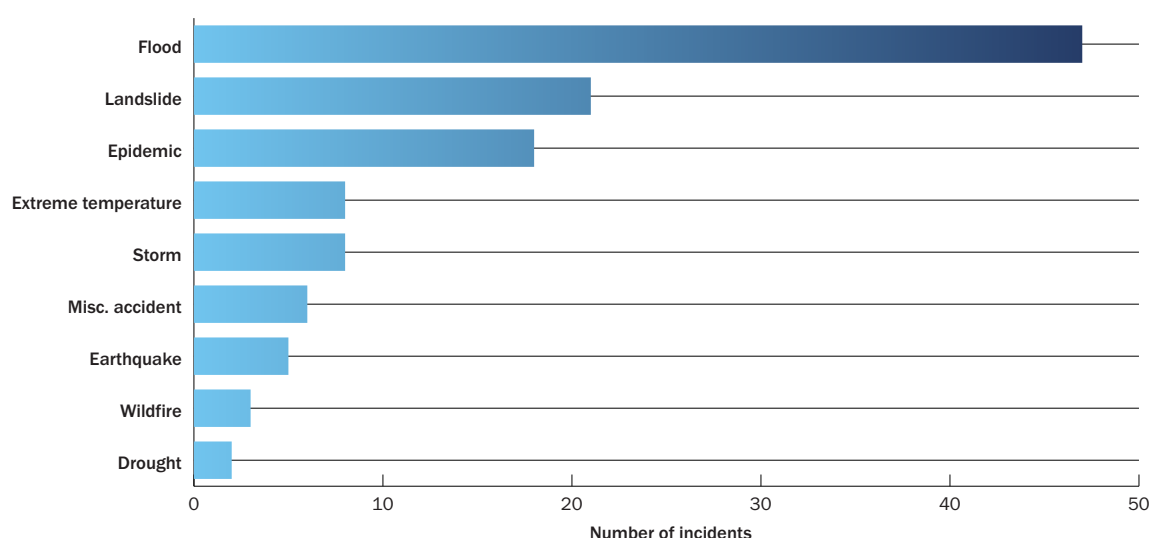
Impact of climate change on Nepal



As temperatures rise across South Asia, climate and disaster risks in Nepal are expected to increase further affecting people, the economy, the environment, and development gains. Nepal's temperature is projected to increase by about 0.9°C between 2016 and 2045 under a medium-range emissions pathway. Winters are projected to be drier and monsoon summers wetter, with up to a threefold increase in rainfall. The number of people in Nepal annually affected by river flooding caused by climate change could double to around 350,000 in 2030 (from 157,000 in 2010).

Climate variability is impacting the Nepali economy through lower agricultural productivity, road damage, and high energy imports during the dry season, among other impacts. Floods and landslides have been the most frequent hazards over the past 40 years; these events are expected to increase as climate change accelerates (Figure 1).

Figure 1: Average annual natural hazards occurrence in Nepal for 1980–2020



Source: World Bank Climate Change Knowledge Portal: Nepal, Vulnerability (World Bank Group), <https://climateknowledgeportal.worldbank.org/country/nepal/vulnerability>

Water resources are severely impacted. This asset is a precious resource for Nepal to meet its aspirations to grow hydropower capacity for exports and expand irrigation for food security and higher-value crop exports. While water is among Nepal's most abundant yet unharnessed natural resources, rising temperatures threaten the future of high mountain glaciers, which constitute a critical supply of freshwater to the region. Climate change will also likely increase the variability of rainfall. Nepal's water security is one of the lowest in all of Asia, due in part to the low level of water storage with only 0.5 percent of the estimated storage required to meet seasonal water demand. Unavailability of water affects small-scale hydropower and agriculture, with food security implications for many livelihoods, including indigenous peoples and those living at or just above subsistence.



Water for agricultural uses may not be sufficient at critical cropping times, with prolonged and more intense droughts resulting in crop failures and productivity losses.

Global warming combined with the increasing frequency of extreme weather events will impact economic activity through multiple channels. Extreme weather events that cause large-scale disruptions of supply chains could have lasting repercussions on production and transport networks. A persistent drought could cause food shortages and rising food prices with lasting impacts on farm incomes, nutrition, and poverty, possibly affecting other sectors of the economy. In addition, multiple climate events could take place simultaneously and climate-related risks could converge, creating a cascade effect. This report assesses three types of damages for impact under different warming scenarios: the impact of flooding events on infrastructure, the impact of heat on labor productivity and health, and the impact of heat on agriculture and livestock. By 2050, these combined impacts are estimated to drag growth lower each year in the most pessimistic warming scenario compared to the baseline projection. As a result, Nepal's economy is estimated to be 7 percent smaller by 2050 under this scenario relative to the baseline forecast. Some important impacts such as the impact of flood and drought on agriculture are not included in the projections. Likewise, the significant cost to human productivity and health due to air pollution, driven by many of the same forces that drive emissions, is not included in the macro climate analysis. Including these other important damages would drive GDP losses higher and hence, this modeling result can be seen as a lower bound estimate.

Climate variability is already a major driver of food and other insecurity and poverty in Nepal and warming temperatures exacerbate inequities across the country. While southern and urban municipalities are more likely to experience flooding and heat stress, northern regions are affected by increased erosion, landslides, water stress, and glacial lake overflow. The most vulnerable communities often live in the most extreme environments that are subject to climate impacts and lack social protection programs. Women, indigenous people, and other marginalized communities are disproportionately affected.

The interplay between Nepal's greenhouse gas and air pollutant emissions



While Nepal has low per capita emissions and is a negligible contributor to global climate change, agricultural and energy-related emissions are also a key source of air pollution, with major negative economic implications. Emissions come primarily from agriculture (54 percent) and energy (28 percent). Between 2012 and 2019, Nepal's emissions increased by 26.9 percent, primarily due to growing energy consumption in energy and industry accounted for 28.3 percent and 7.4 percent of Nepal's GHG emissions in 2019. Biomass, transport, open burning, and industrial activities also contribute significantly to air pollution, with sizeable negative impacts on health and productivity.

Nepal has one of the highest levels of air pollution in the world with more than 30,000 annual deaths associated with such pollution. Virtually the entire population is exposed to unsafe levels of fine particulate matter. This human exposure happens both outdoors (primarily due to dirty cooking and heating, mobility, manufacturing, and the burning of agricultural residues and waste) and indoors (due mostly to dirty cooking and heating). Health and cognitive performance are significantly impacted by air pollution, leading to reduced productivity and economic output. The yearly welfare losses of indoor air pollution have been estimated to be the equivalent of about 3.5 percent of GDP, and the welfare losses of ambient air pollution have been estimated to be the equivalent of about 3 percent of GDP.

Actions leading to better air quality would result in significantly improved human health and reduced GHG emissions. In Nepal, implementing measures to reach the World Health Organization's interim target 1 (35 ug/m³), would result in a reduction of premature deaths by almost 70 percent and significantly reduce morbidity. The required mix of air pollution abatement measures to improve air quality will also significantly reduce carbon dioxide and short-lived climate pollutants such as black carbon and methane. There are significant cost-effective opportunities for reducing air pollution and GHGs.

Transport, household biomass use, and industry are the main sources of urban air pollution. Nepal could realize health, air quality, and climate change mitigation benefits by increasing the density and management of air monitoring networks to enhance data and information. In addition, Nepal should issue air emission standards and updates for brick kilns and cement factories, improve and enforce vehicle and fuel emission standards, continue to electrify vehicles while harnessing its immense hydropower potential, and promote public transport and non-motorized transport.



Nepal's commitments on climate change and green, resilient, and inclusive development



Given Nepal's extremely low GHG emissions and high vulnerability to future climate impacts, the clear priorities are to invest in resilience and seize win-win opportunities to reduce GHG emissions and air pollution. Nepal is committed to addressing climate change and has built an enabling legal and regulatory framework to spur climate action. The Nepalese government has taken steps to integrate climate change into development planning and budgeting. Nepal's 2020 Nationally Determined Contribution (NDC) plans for a prosperous, climate-resilient society with ambitious adaptation and mitigation targets. The National Adaptation Plan (NAP) includes a comprehensive set of programs until 2050 that aim to boost adaptive capacity and resilience. The 2021 Long-Term Strategy (LTS) raised ambition by setting a 2045 net-zero mitigation target. The effective implementation of Nepal's climate ambitions is key, but significant challenges exist in terms of limited financial resources, a weak business environment, administrative inefficiencies, weak vertical and horizontal coordination among institutions, and low capacity, especially at local levels.

In 2021, Nepal adopted the Green, Resilient, Inclusive Development approach as a national long-term vision. The GRID approach involves a fundamental shift in managing risk and development: from a simple reactive response mode to a deliberate proactive recovery strategy for long-term green growth and sustainable development for all. The GRID approach is designed to build resilience to climate and other shocks that are barriers to Nepal's development ambitions. The country is identifying investments to scale up, enhancing policy, institutions, and the information base to plan for and implement GRID. The Kathmandu Declaration on GRID was endorsed by the government, the World Bank Group and 15 development partners in September 2021. It identifies over US\$7 billion over the next three to five years in existing and potential upcoming development partner funding to complement the domestic budget and private sector investment. The GRID Strategic Action Plan is currently under development to help prioritize, convene, and coordinate investment and policy action.

Despite Nepal's commitment to addressing climate change, the integration of climate strategies and actions into development plans, policies, programs, and budgets at all levels of government is still a work in progress. While sectors such as forests, agriculture, health, water resources, and energy have made good progress on climate action, other sectors are lagging. Vertical integration of climate strategies and actions provides a greater opportunity to foster low-carbon climate resilience development. State-owned enterprises have not prioritized climate action in their operations.

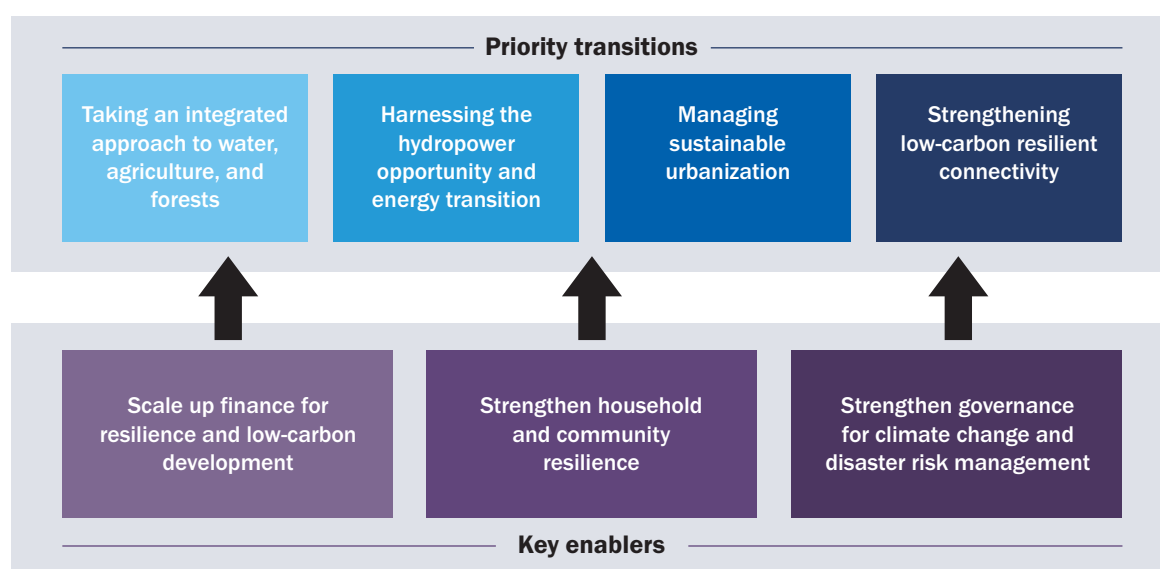
Climate action at the provincial and local government levels is lacking. However, there are opportunities to strengthen local climate action, including by operationalizing coordination mechanisms, developing a climate capacity building plan for all levels of government, and establishing a system to track progress toward NDC and NAP targets, supported by enhanced data generation at all levels of government.

Priority transitions and enablers for green, resilient, and inclusive development



To manage climate risk and achieve an integrated path toward GRID, Nepal should continue to pursue four priority transitions: (a) taking an integrated approach to water, agriculture, and forests; (b) harnessing the hydropower opportunity and energy transition; (c) managing sustainable urbanization; and (d) strengthening low-carbon resilient connectivity. To support these transitions, Nepal needs to prioritize three key enablers: scale up finance for resilience and low-carbon development; strengthen household and community resilience; and strengthen governance for climate change and DRM (Figure 2).

Figure 2: Priority action framework for a climate-adaptive development pathway



Source: World Bank

Taking an integrated approach to water, agriculture, and forests



Nepal's agriculture and forestry sectors together constitute 30 percent of GDP. These sectors provide the main source of livelihood for the poor, a trend which will continue for the next decade despite migration to urban areas and outmigration. Developments in these sectors will determine what happens to extreme poverty rates in Nepal. Agriculture will be hard hit by climate variability which strains forests, soil, water, and other natural assets in the rural landscape. Agriculture and land use together accounted for 62 percent of GHG emissions in 2019. Forest cover has expanded in recent years. This is largely due to Nepal's community-based forest management experience over several decades which now reaches over 18,000 communities managing 21 percent of Nepal's forests.

Nepal's forests and soils serve as an important carbon sink, counter-balancing emissions from agriculture, land use change, biomass burning, and other sources. Nepal has expanded its forest cover from about 29 percent in 1994 to more than 40 percent in 2015. Nepal's NDC aims to maintain forest cover at 45 percent. This will help Nepal reach its GHG emissions targets while delivering the resilience, adaptation, and local livelihood benefits.

To optimize economic benefits, build resilience, and adapt to a changing climate, Nepal's water, agricultural, forest, and energy sectors must approach resilience and sustainability in an integrated way. Integrated management of these natural resources in the landscape will strengthen resilient rural livelihoods and reduce climate risks across agricultural, hydropower, and water supply systems while reducing GHG emissions. Three key priority system-based recommendations are summarized to enhance adaptation, resilience, and disaster management across Nepal's rural landscapes:

- **Enhancing water resource management.** Water storage enhanced with integrated watershed management is essential for the year-round reliability of irrigation and domestic water. Water storage investments should be enabled by enacting a well-designed umbrella act to regulate water resources at appropriate scales and across institutions.
- **Embracing climate-smart agriculture.** Nepal needs to prioritize climate-smart agriculture (CSA) practices to strengthen productivity growth and ensure resilience and food security. Policy reform to scale up climate-smart sector expenditures is vital to ensure future growth and poverty reduction in the sector. Expenditures need to better support commercial and subsistence farmer adoption of CSA technologies (such as agroforestry, inter-cropping, small irrigation, and soil and water conservation, building on Nepal's widespread experience in terracing). There is also a need for a financing and coordination framework to increase climate-smart investments by subnational governments and the private sector. Adjusting and repurposing agriculture public expenditures, including fertilizer and seed subsidy programs, would help to leverage financing for input supply, food processing, and exports. Crop wastage reduction can contribute to more efficient farming and land use. Small irrigation can be complemented by terraces at the plot level and watershed management at the landscape level to allow farmers to pursue higher-value and more climate-resilient crops.
- **Transitioning to sustainable forest management.** Nepal's large-scale success with community-based forestry and the new Forest Regulation 2022 form a solid basis to transition to sustainable forest management (SFM) for multiple economic, climate, and other environmental benefits for all. A key priority is pursuing SFM at local levels by implementing provincial and municipal SFM procedures. Such an approach would help the transition to a forest sector that sustainably and inclusively delivers firewood, forest products, and ecosystem services within the broader landscape such as erosion and flood risk reduction, water provisioning services, and micro-climate regulation.



Harnessing the hydropower opportunity and energy transition

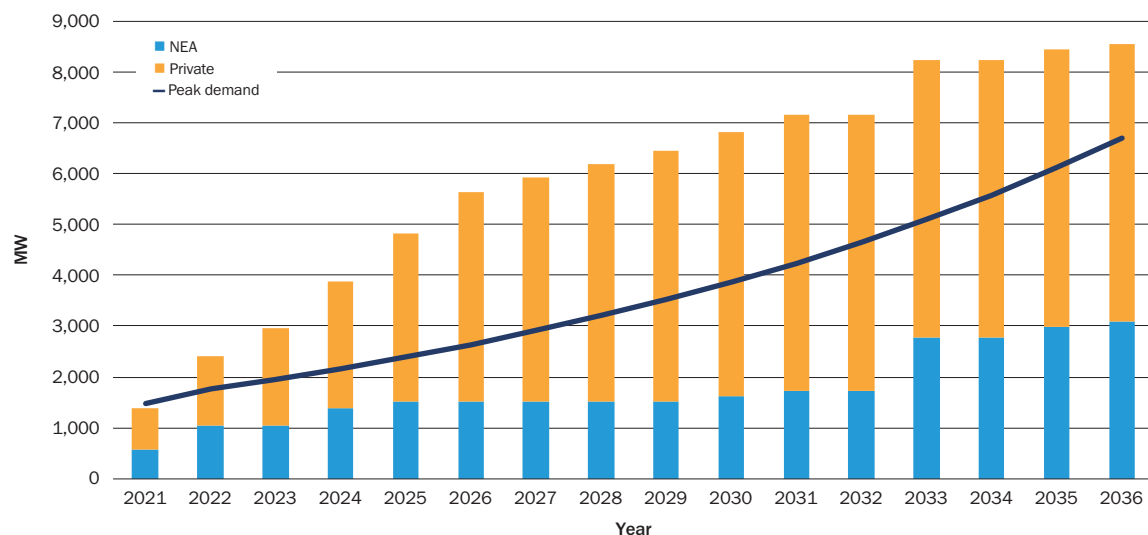


Nepal has among the world's largest hydropower resources with an estimated economically viable potential of 42 GW. This can enable Nepal's own decarbonization as well as that of its higher-emitting neighbors while meeting domestic demand and generating revenues and foreign exchange that can help fund other development priorities. Under current BAU projections, Nepal's installed hydropower capacity is expected to grow from nearly 1.4 GW in 2021 to over 7 GW in 2031, a fivefold increase requiring an investment of US\$5.5 billion. The private sector share of this installed capacity is expected to grow to about 78 percent by 2031 (up from 58 percent in 2021). Modeling done for this report suggests that if export purchase agreements are secured, an annual average of US\$200 million of additional export revenues could be generated from 2022 to 2025 from existing and new plants under construction. This is roughly equivalent to 0.4 percent of GDP and 4 percent of projected nonenergy exports each year. As Nepal expands its hydropower development, it will need to consult with affected communities and address livelihood impacts. The key short-term priority is to ensure environmental and social protections and planned benefit-sharing provisions. Demonstrating progress will pave the way for further scale-up later in this decade.

Nepal's hydropower development opportunity is fundamentally linked to exporting surplus during the monsoon season; realizing this will require securing offtake arrangements, upgrading storage, and ensuring investments are robust to climate risks. Nepal is projected to achieve 7 GW of hydropower capacity by 2031; this would represent about 15 percent of its estimated economically viable generation (Figure 3). This represents a significant longer-term opportunity for further exports to drive the local economy and support regional decarbonization. To prepare for this opportunity, further work is needed, including (a) a better understanding of and planning for the climate impacts on river flow and implications to manage climate risks; (b) addressing seasonality of hydropower generation by investing in storage projects; (c) developing regional demand and trade protocols and supporting infrastructure to firm up exports; (d) designing an appropriate mix of public and private participation and related sustainable financing strategies; (e) translating these strategies into new

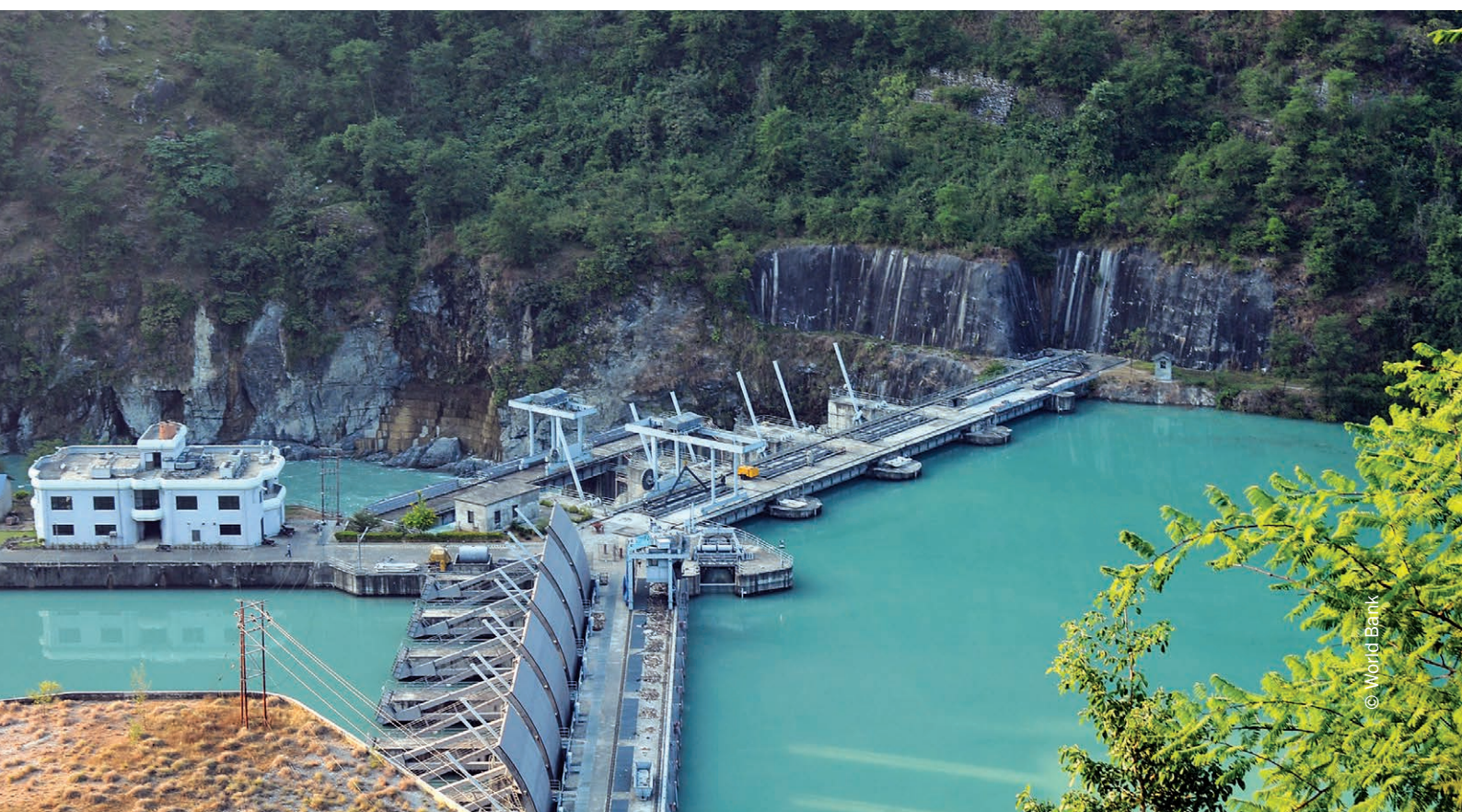
investment projects on a rolling basis; and (f) continuing to work with regional partners to develop the mechanisms for regional power trade.

Figure 3: BAU forecast of hydropower (installed capacity in MW) and projected electricity demand



Source: Based on World Bank staff analysis.
Note: NEA = Nepal Electricity Authority

Scaled-up hydropower also offers the medium-term potential to grow climate-smart energy solutions such as electric mobility and green hydrogen. This includes producing ammonia as a strategic product that displaces urea imports and has further potential for export to meet growing fertilizer demand. At the same time, Nepal could increase its installed solar power base by investing in agricultural irrigation through solar pumps, solar photovoltaics at public institutions, and solar home systems. This would free up more resources for exports. While these opportunities may not be realized in the near term, planning and preparation should start now.





To complement the focus on hydropower, economically viable applications could be developed to support the electrification of the economy to provide better and more sustainable energy services across Nepal. Despite the great strides that Nepal has made in the past decade in providing improved and additional energy services, including rapid electrification, most people are still dependent on traditional and fossil fuels such as biomass, liquefied petroleum gas, and petrol to meet their everyday needs. Fossil fuels represent 28 percent of total energy use in the country.

Managing sustainable urbanization



Nepal is the fastest urbanizing country in South Asia, with urban growth rates up to 5 percent per year. Nepal's urban areas and cities can support its climate transition with innovation, job creation, and improved and more inclusive service delivery. The NDC includes specific actions to move Nepal toward greener, more efficient, and resilient cities. The country should enhance support for basic services for urban development at all levels of government. Nepal also needs to address gaps in the investment framework for urban municipalities, including the targeting of priority infrastructure investment requirements in strategic urban clusters. Finally, the government should support emerging urban systems by focusing on secondary cities as well as the Kathmandu Valley.

As Nepal's urban population grows rapidly, solid waste management (SWM), resilient buildings, and clean water supply present challenges and opportunities for climate action with development gains. Improved waste collection and disposal, including gas recovery and use and the prevention of garbage burning and dumping of building materials on roadsides, can reduce both particulate matter and GHG emissions and limit flooding risks and human capital losses from pollution. Nepal can create more resilient urban spaces by introducing green building codes, exploring partnerships with certification agencies for possible retrofitting of buildings including hotels, and applying new technologies for resilient housing solutions. Mainstreaming sustainability and efficiency in urban planning (including spatial planning), management, and construction is critical to helping Nepal achieve its 2045 NDC targets. Increased investments in climate-resilient water supply and sanitation facilities are also required.

Strategic urban planning can deliver climate and development benefits including advancing green urban transport in major cities and stimulating more efficient low-carbon trucking. In major urban areas, shifting to more sustainable multimodal public transport, including non-motorized transport, requires coordinated efforts between the public and private sectors and federal and local government levels. A comprehensive approach that combines measures to reduce energy consumption using non-motorized and shared modes promotes a technological transition to cleaner vehicles (particularly electric two-wheelers) and reduces inefficiencies in trucking is required. Providing high-quality multimodal public transport and prioritizing public transport and safe walking and cycling in the design of roads represent a key priority.

Strengthening low-carbon resilient connectivity



Nepal's transport sector is a key driver of economic growth but is vulnerable to climate-related hazards. As the primary form of transportation in the country, road transport infrastructure is critical to Nepal's economic and social development. Disaster-related closures and damage to roads lead to reduced access to jobs, health care, and education; lower profitability for businesses due to the spoilage of perishable goods; and increased food insecurity. The direct costs of climate to the transport sector are estimated at US\$25–50 million annually over the next 10 years; indirect impacts would add 50–75 percent to these costs.

To integrate climate resilience in transport, managing the trade-off between cost and risk management remains a challenge. Raising standards or building redundancy would increase resilience but doing so across the network would be prohibitively expensive. Cost-efficient resilience investments should be prioritized through a life-cycle approach, using risk-based planning to



identify the most critical transport links and increase funding toward climate-smart maintenance of vulnerable assets. Resilience measures are a priority for the most critical links of the network: the North-South and East-West corridors and other strategic roads linking major metropolitan areas. Increasing road network resilience in key transport corridors would only cost a fraction of the total new construction and maintenance costs but would reduce potential damage and diminish negative socioeconomic effects.

The decarbonization of transport in Nepal needs to include measures to reduce energy consumption using shared modes, promote a technological transition to cleaner vehicles, promote non-motorized transport, and reduce inefficiencies in trucking. A focus should be on building the enabling environment to define and implement the required policies and regulations to create better synergies at the municipal and central government levels, as well as between the public and private sector stakeholders in the urban transport sector. Efforts should be concentrated in major cities, including Kathmandu, and along strategic corridors. Decarbonizing logistics by facilitating the modernization of Nepal's trucking fleet will help speed the transport transition. Supporting the evolution of a modern, bankable industry that can absorb new clean technology as it becomes financially feasible is critical. Digital solutions that optimize the use of trucks and reduce empty miles (for example, ride-sharing platforms) can play a role in the transition. So too will decarbonizing passenger transport by encouraging the use of sustainable multimodal public transport and implementing more efficient land use regulations alongside transport planning.

Nepal's ambitions to digitalize its economy can help fill connectivity gaps and support low-carbon and climate-resilient development. Opportunities include integrating digital technologies into infrastructure to deliver transport, energy, and water services more efficiently and using digital innovations to monitor, predict, and respond to climate change and its effects. Strategic investments and policy and institutional reforms are needed to realize these opportunities.

Scale up financing for resilience and low-carbon development



Nepal's climate adaptation needs are substantial, but investment requirements need to be further defined and prioritized. The government estimates financing needs through 2050 of nearly US\$50 billion for its NAP, nearly US\$200 billion for its LTS, and US\$36 billion for its NDC until 2030. Detailed prioritized investment plans and costing are currently not available in key sectors. These initial assessments vastly exceed the country's fiscal resources and domestic savings mobilization. As a result, major efforts are needed to prioritize public investments and improve the regulatory environment to attract private investment. Development finance can help catalyze these necessary changes.

Nepal already faces the challenge of limited fiscal space, which is the result of consecutive wide fiscal deficits since FY18. Options to dramatically increase public revenue are limited, as domestic revenue mobilization is relatively strong at 22 percent of GDP. While there are opportunities to better target the fertilizer subsidy program, compared to other countries, Nepal does not have large inefficient subsidies that can be reallocated. It is therefore important to prioritize and improve the quality of spending.

Reprioritizing public expenditures can deliver high development and climate synergies. Limited public funds should be used in a strategic manner and need to be bolstered by other sources. Priorities include strengthening fiscal institutions, focusing public investment on interventions where it is harder to crowd in private finance (for example, resilient agriculture and water storage), and improving the business environment to encourage private investment in sectors such as renewable energy and clean transport.

Private finance and FDI are currently limited, and private investment flows are unlikely to materialize without significant improvements to the regulatory framework. In 2019, FDI inflows to Nepal and Bangladesh (0.54 percent of GDP) were the second lowest in South Asia, following Afghanistan (0.12 percent of GDP). To strengthen the framework for private sector climate engagement and long-term financing, Nepal should further improve its business environment. Poor infrastructure, governance challenges, and regulatory constraints have hampered private investment, including complex and often redundant regulatory compliance requirements, weak institutional capacity, lack of information transparency, and poor coordination among regulatory bodies. There is the potential to increase both FDI and domestic private finance and facilitate its deployment in climate-related activities, but this will require the implementation of key well-identified reforms. The recent reduction in the FDI threshold should be effectively implemented. The Nepalese government should consider amending the Foreign Investment and Technology Transfer Act to attract more foreign capital and reduce the negative list for FDI. Nepal also requires broad-based reforms to develop the capital markets to tap more long-term financing. There is also a need to introduce and scale up the regulatory framework to incorporate climate-related risks into financial markets and mandate greater disclosures.



In the near term, Nepal should focus on elaborating, costing, and implementing a more detailed and clearly prioritized pipeline of adaptation and mitigation investments. Nepal's planned investments in large-scale hydroelectric generation are estimated to require an additional US\$5.5 billion in financing through 2031, including both public and private investments. Priorities include balancing hydropower expansion with the hardening of built infrastructure, irrigation expansion with water storage and landscape management, and the provision of public services to respond to the challenges of a warming climate. These financing needs should be approached as climate-smart financing for development, that is, making planned investments in all economic sectors and themes resilient and low carbon.

Attracting investments in adaptation and resilience is particularly challenging, as such investments do not usually offer a revenue stream and are not immediately attractive to the private sector. There has been recent success in attracting private finance by de-risking through blended finance and credit guarantees. The government should continue to use these and other tools such as vendor financing, guarantee funds, warehouse receipts, and private equity capital. In addition to introducing appropriate financing instruments, the government should assess the challenges that businesses and households face in making climate-smart investments, such as lack of information, credit constraints, and adjustment costs, and consider how to address these constraints through targeted subsidies or loans, informational outreach, and/or advisory programs. Further, introducing climate change risk assessment methodologies into the financial system and the economy could enable financial markets to factor climate risks into the prices of their products, which would facilitate adaptation responses.



The government's call for concessional climate finance is well justified and efforts to mobilize and provide such finance should be strongly supported. However, more contingency plans are needed, given that expected grant and concessional lending flows likely will continue to be insufficient to address the country's ambition and needs.

Development finance can help. Development partners in Nepal are on board with the GRID approach and have identified more than US\$7 billion from current portfolios and pipelines over the next three to five years in support of this agenda. The GRID Strategic Action Plan currently under development will help prioritize, convene, and coordinate investment and policy action on climate resilience and low-carbon pathways. The quality of investment and implementation progress will also be important. While trying to expand and leverage private finance, Nepal should build on the momentum and support among the international community for its GRID approach.

Strengthen household and community resilience



Social protection can help build the resilience of poor and vulnerable households to prepare for, cope with, and adapt to climate shocks. Current social protection systems in Nepal are not sufficiently developed and have limited adequacy and coverage of the poor and vulnerable. Only about 55 percent of households in the bottom quintile receive any social transfer in Nepal compared to the South Asia average of 80.7 percent. Disaster response is often delayed, and not all who need assistance receive it. A key step is to institutionalize shock-responsive social protection; this includes establishing an integrated social registry and a policy and operational framework for shock-responsive social protection improving payment systems and expanding the coverage of the poor.

Communities are usually the first responder to disasters and play a key role in local climate and disaster resilience action. Strengthening weather forecasting, climate information systems, and improved early warning systems with last-mile connectivity is key to boosting resilience at local levels. Targeted interventions in labor-intensive climate adaptation and disaster risk reduction activities would provide much-needed jobs and economic opportunities in the short to medium term while reducing disaster risks through structural measures (for example, terraces, built infrastructure such as cross-drainage, small irrigation, and water storage) and nonstructural measures (for example, restoration of riverbanks, watersheds, forests, and other natural systems).

Nepal currently has limited ex ante financing instruments in place to respond to disasters. There is easy access to ex post humanitarian financing. In view of the recurrent climate-induced events of low to moderate impacts at local levels and delayed financing of recovery and reconstruction, developing and implementing a disaster risk financing (DRF) strategy through a risk-layered approach is imperative. This will support both ex ante and ex post financing and enable mechanisms for risk-based resource allocation and fiscal transfers/incentives to the most vulnerable provinces and local governments.

Human resources with relevant skills can be key factors in engaging communities in climate solutions. In this regard, the education sector can play an important role in strengthening climate adaptation and mitigation efforts. Green skills strategy and pathways to mainstream green skills into the education and training programs will need to be developed to ensure the availability of human resources and skillset (e.g., in resilient infrastructure, renewable energy, and low-carbon urban



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design) to support the country's transition to a green and climate-resilient economy. These efforts to increase climate awareness through education can accelerate widescale behavioral change to transition to a more resilient and greener economy.

Strengthen governance for climate change and disaster risk management



It is imperative to strengthen institutions in Nepal, particularly local and provincial governments that are on the front lines of integrating climate and DRM. There needs to be effective devolution of climate and disaster management responsibilities with adequate financing and technical support and improved implementation of disaster risk and climate financing mechanisms.

Addressing climate change and disaster risk demands a shift from the BAU approach in terms of knowledge and technical capacity to understand, assess, and plan for the changing climate and adapt to and mitigate risks effectively. However, the current capacity of the government is relatively low, particularly at the subnational level. Therefore, a capacity-building initiative for provincial and local governments on low-carbon climate-resilient planning needs to be developed and implemented. The capacity to plan for resilient actions is also constrained by the lack of adequate weather, water, and climate stations that cover the microclimatic variations across Nepal.




















Federalization of climate and DRM governance is imperative to effectively respond to climate and disaster risk across Nepal. It is imperative to delineate and devolve the roles and responsibilities of the three tiers of governments, state-owned enterprises, civil society organizations, and other stakeholders based on the type, scale, intensity, and characteristics of a disaster. In addition, strengthening the horizontal and vertical functional coordination mechanism across three tiers of government along with continuous and adequate financing and technical support is important.

From analysis to action: Toward a climate-adaptive development pathway

This report includes seven policy packages - one for each priority transition and each key enabler. These policy packages entail recommended policy changes (marked with a '📋' symbol) and investments (marked with a '💰' symbol) that will aid Nepal in making and enabling the transitions that are aligned with Nepal's climate commitments. If these policy packages are implemented, they can help Nepal meet the adaptation and resilience priorities identified in its NDC and NAP as well as its GHG emissions reduction targets. Table 1 provides a snapshot of the recommendations, which are further elaborated upon (including in terms of their impact and feasibility as well as challenges, synergies, trade-offs, and co-benefits) in Chapter 7 of the main report.

Table 1: Snapshot of the Nepal CCDR Policy Packages

Type	Action
Policy Package 1: Taking an integrated approach to water, agriculture, and forests	
📋💰	Adjust and repurpose agriculture public expenditures, including fertilizer and seed subsidies.
💰	Invest in integrated community-based local development programs for natural resource and watershed management and climate risk reduction.
📋	Develop the legal and institutional basis for integrated water resource management.
📋💰	Prioritize CSA support for agricultural growth by establishing an adequate financing and coordination framework to increase subnational and private sector investments.
💰	Expand year-round irrigation and domestic water supply.
Policy Package 2: Harnessing the hydropower opportunity and energy transition	
📋	Adopt policies and measures to support the shift of energy demand from traditional/fossil fuels to electricity, while rendering demand more energy efficient.
💰	Further develop hydropower in Nepal and Bhutan as the backbone of Bangladesh-Bhutan-India-Nepal trade.
📋	Prioritize the development of green, bankable, least-cost electricity generation.
Policy Package 3: Managing sustainable urbanization	
📋	Formulate a national integrated SWM program and accelerate regulatory reform to develop and strengthen standards and guidelines.
📋	Introduce a green building code and explore partnerships with certification agencies.
💰	Address the infrastructure gap and increase investments in climate-resilient urban water and sanitation facilities.
📋💰	Establish a sustainable financing mechanism for SWM and leverage the private sector.
📋	Regularize livelihoods and strengthen the private sector model based on the existing system of informal SWM workers.

Policy Package 4: Strengthening low-carbon resilient connectivity	
	Identify the most critical transport assets, implement nature-based engineering measures, adopt a climate-smart asset management approach, and protect assets with DRF instruments.
	Invest in resilience measures for key transit corridors and explore opportunities for leveraging the private sector for maintenance.
	Encourage and enable local governments to invest in resilience measures for key rural roads.
	Decarbonize passenger transport focusing on major urban areas.
	Identify the most important transport assets of the local roads network; institutionalize joint implementation mechanisms and collaboration for critical road links.
Policy Package 5: Scale up finance for resilience and low-carbon development	
	Formulate and implement an integrated national roadmap for private sector green finance.
	Introduce climate risk assessment into the financial system and the economy as a whole.
	Scale up carbon credit usage and deepen capital markets.
Policy Package 6: Strengthen household and community resilience	
	Develop policy guidelines for climate-smart education and adopt green/environmental-friendly and sustainable designs.
	Establish a mechanism for locally led climate action.
	Investigate the push and pull factors for internal migration and implications for sectoral policies around urbanization, balanced spatial development, and household food security.
	Enhance financing to cover climate-related health risks.
	Strengthen health information and surveillance systems.
	Improve overall health service delivery.
	Institutionalize shock-responsive social protection and expand programs' coverage.
	Develop pathways to mainstream climate education and green skills.
	Strengthen the government's ability to conduct environmental and social impact assessments and gender equality and social inclusion plans.
Policy Package 7: Strengthen governance for climate change and DRM	
	Federalize climate and DRM governance by strengthening existing climate change and DRM-related legal and administrative/procedural provisions.
	Scale up the technical, analytical, and implementation capacities at all levels of government.







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