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When COVID-19 and Natural Hazards Collide: Building Resilient Infrastructure in South Asia

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ABSTRACT Countries in South Asia, before COVID-19, were already battling critical socioeconomic vulnerabilities and a deluge of extreme weather events brought about by a changing climate. The pandemic has demonstrated how disasters can cascade and converge to threaten lives, livelihoods, and economic and social systems. Yet, governments in the region have been slow to incorporate a multi-hazard, multi-sectoral perspective into their preparedness management and infrastructure systems. This brief describes these complex challenges and outlines key priorities for governments to rebuild better from the current crisis.

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INTRODUCTION

Many countries in South Asia are reaching a tipping point beyond which disaster risk, fueled by climate change, will exceed their capacity to respond.[1] Disasters in the region are closely linked, interact with, and feed into inequalities of income and opportunity. The substantial impacts of the COVID-19 pandemic have added to the expanding disaster risks to the region.[2] As the pandemic spread during the first half of this year, the virus interacted with the natural disasters in the cyclone and monsoon season, creating significant challenges for critical infrastructure such as hospitals, safe shelter and housing, utilities, water and sanitation, and transport.[3]

It has long been known that biological and natural hazards intersect and increase the complexity of impacts on populations and economies. Yet, disaster preparedness has rarely addressed these compounded risks from biological hazards.[4] In particular, critical infrastructure such as hospitals, schools, and evacuation shelters play a significant role in disaster response, but many South Asian countries have not operationalised an integrated system of risk analytics for health and disaster management. Indeed, the disaster management and the public healthcare systems in many South Asian countries, remain siloed.[5]

The COVID-19 pandemic quickly demonstrated the serious systemic gaps in multi-hazard disaster preparedness and has forced countries to recognise that the demarcations between natural, biological, and other hazards are arbitrary at best.[6] Even as the risk transmission pathways of biological hazards like COVID-19, and those of natural disasters are different, they share the same geographical space and time, and thereby pose parallel threats on populations and livelihoods. With the increasing number and intensity of weather extremes foreshadowed by climate change, another pandemic could decimate the already feeble social systems including those related to health and disaster management. The region has to now be prepared to confront converging disasters. Institutions and infrastructure related to natural disasters, climate, health and technology need to be linked up for rapid mobilisation to ensure that the inroads made in the Sustainable Development Goals (SDGs) do not regress, particularly those related to poverty (SDG 1), inequality (SDG 10), and infrastructure (SDG 9 and SDG 11).[7]

THE CASCADING IMPACTS OF COVID-19 AND CLIMATE EXTREMES

The consequences of converging natural and biological disasters became apparent for South Asia when amidst the pandemic, super-cyclone Amphan and cyclone Nisarga hit land in May and June 2020, respectively, in West Bengal, Odisha, Bangladesh, and Maharashtra, with floods from the monsoon season following closely. The simultaneous impacts did not prepare authorities for the challenge of imposing social-distancing measures in packed cyclone shelter facilities in the affected areas. A principal issue was that the typical evacuation areas such as cyclone shelters, community buildings and schools, had already been converted to quarantine facilities before the disaster. They housed those who had returned home from cities and states during the lockdown periods and were undergoing mandatory quarantine. Considering the more than six million evacuees in the affected Indian states, increasing space requirements from 3.5 square meter per person to 5 square meters for social distancing has been extraordinarily challenging.[8]

The intersection of these events revealed challenges for other infrastructure as well. For example, during Cyclone Amphan, migrants returning to Odisha were exempted from institutional quarantine in cyclone evacuation shelters to make space for cyclone victims—potentially increasing infection risks for migrants.[9] Elsewhere, evacuees made homeless by the cyclone were also exposed to an increased risk of infection as they were forced to share cramped shelter spaces. In Kolkata, during cyclone Amphan, hospitals that were already working at full capacity because of COVID-19 patients faced a second wave of disruption. As the cyclone battered internet and mobile phone lines, the hospitals could not contact patients' families nor deliver test reports in time.[10] Some of the districts of West Bengal that were worst hit by the cyclone would eventually be listed as COVID-19 "red zones" for their high rates of increase in infections.[11] In Odisha, in addition to the overstretching of healthcare capacities due to the simultaneous impacts of Cyclone Amphan and COVID-19, nearly 100,000 hectares of farmland were destroyed, exacerbating food insecurity in the region. [12] In Mumbai in early June, cyclone Nisarga damaged roads and power lines, cutting off medical supplies to remote villages and districts. Large parts of Maharashtra are now showing that a potential impending arrival of heatwaves will also likely increase hospitalisations.[13]

To be sure, India, Bangladesh, and other countries in South Asia are no strangers to climate extremes. Indeed, over the many years of learning from past experience, these countries have managed to develop state-of-the-art hydro-meteorological systems and risk warning capabilities, build cyclone shelters, and strengthen their buildings—all measures recommended in the Global Commission on Adaptation's *Adapt Now* report.[14] Only 50 years ago, cyclone Bhola killed 300,000 people in Bangladesh; decades of investing in preparedness measures in the country have brought down the number of deaths to a few dozen during Cyclone Amphan.[15] In India, West Bengal, Odisha, and similarly at-risk states have made comparable strides in building preparedness and strengthening their disaster management strategies and infrastructure. Cyclones Amphan and Nisarga would have taken a higher toll if not for the preciseness of early warning systems and large-scale evacuations in the affected places.[a] While local authorities

a There were 6 reported deaths from Cyclone Nisarga and 118 reported deaths from Cyclone Amphan adapted to the challenges of COVID-19 management—allowing for shelters to be half-full to facilitate social distancing, and operating shelters at full capacity with preventive measures where possible—the disaster-related disruptions in social distancing also increased the number of COVID-19 infections.[16]

The challenges from these cascading events show that the critical infrastructure in much of South Asia is not ready for another crisis of the degree and impact of COVID-19. Rapid and unsustainable urbanisation will only increase the emergence of novel infectious diseases,[17] as climate change brings about climate-related disasters and recurring biological diseases.[18] Thus, current discussions around the call to "building back better" will have to ensure that communities and economies are made resilient to multiple hazards.

"Build Back Better": From Rhetoric to Reality

In April, as some countries began preparations for reopening their economies, the United Nations (UN) urged governments to "build back better" by incorporating sustainability goals in their recovery plans.[19] Since then, the UN's call has resonated in many countries across the globe. Indeed, the notion of "building back better" is an ingrained concept in disaster risk reduction and has been noted as one of four priority areas in the global agreement on disasters, the Sendai Framework for Disaster Risk Reduction of 2015.[20] The disaster risk reduction community therefore has for some years now established certain competencies and strengths in understanding the mechanics of "building back better". Even prior to the Sendai Framework, the risk reduction literature in the past two decades has focused on understanding the nature of risks, hazards, vulnerabilities in order to recover and build forward. The idea is that whether the risk is a flood or a pandemic, understanding the systemic nature of risks will ultimately lead to better recovery.

Lessons learned from disaster risk reduction actions during past disasters have called for building resilient infrastructure, strengthening early warning systems, accelerating climate action for resilience, and making financing risk-informed before, during, and after a disaster.[21] These can now also offer a window of opportunity to advance wider development agendas and priorities in rebuilding from COVID-19 and the cyclical natural hazards, and their simultaneous and cascading impacts.

First*, building resilient critical infrastructure that can cope with emergent and multiple hazards should be a public good in the "build back better" approach.*

Making infrastructure investments risk-informed has long been a priority in the field of risk reduction.[22] Across the Asia Pacific region as a whole, and in most countries in South Asia, much of the infrastructure still needs to be built and is estimated at upwards of $600 billion. Therefore, hazards risks assessments for this future infrastructure planning will now need to think about multiple, integrated, and complex risks. They should not only incorporate risks from earthquakes, floods, cyclones, saltwater intrusion, and tsunamis, but also build complex scenarios of simultaneous disasters—i.e., what happens when a flooding event happens at a time of a virus outbreak? What are the spatial requirements for building a hospital or an evacuation shelter that will have enough provisions to implement social distancing measures? Where are the hotpots of critical infrastructure where endemic risk drivers of poverty and inequality overlap with emergent and cascading disasters? How can the public sector plan for cities with efficient and integrated ecosystems? Traditional disasters risk assessments for public infrastructure projects have just started to incorporate climate change parameters and will quickly have to pivot to incorporate emergent hazards like pandemics and other biological hazards with the traditional ones.

While this requires a rethinking of how societies understand disaster risks, the silver lining is the incredible benefits of resilient infrastructure, if done properly. The *2019 Global Adaption Report* notes that making new infrastructure resilient to disasters, especially critical infrastructure like hospitals, schools, community centres, and evacuation shelters, provides a benefit-cost ratio of 5 to 1.[23] This can support the resilience of the most vulnerable populations who are socioeconomically affected by the converging risks.[24] Therefore, a new and more integrated approach for risk analysis is crucial to build resilient infrastructure that these populations rely upon in their daily lives.

Both disaster risk management and the health sector have established systems of risk analytics and modelling techniques to project death and damage estimates and to find the root causal variables related to risk reduction measures. Both disciplines also use next-generation geospatial techniques and technological innovations to provide more accurate indicators and early warnings. The common elements in risk analytics can be integrated to construct comprehensive scenarios for informed investments decisions. These include:

- The presence of common, causal root factors to construct different risk expressions;
- Applying the disaster risk formula and its components to understanding social risk construction associated with the pandemic (i.e., risk = hazard * exposure * vulnerability), and subsequent modelling of the projected short-, medium- and long-term impacts;
- Understanding feedback loops between hazard, exposure, and vulnerability in constructing different risk contexts for building critical infrastructure;
- Using risk indexing and risk management categories in understanding needs for

resilient infrastructure investments; and

- Applying early warning systems to reduce short-term risk conditions for existing infrastructure.

To demonstrate the operationalisation of this new and integrated risk matrix, existing risk indices from both the disaster management sector and the health sector can be used for complex scenario planning. One key metric from the disaster management sector is that of the multi-hazard average annual loss risk (AAL).[25] It provides countries with consistent and comparable estimates of their 'riskscape'. While the AAL metric supports countries in making risk-informed decisions in public investments and captures the economic and social 'riskscape' from natural disasters, it does not yet include analysis of pandemics.

The AAL calculates the average loss per year from natural hazards, including drought, floods, cyclones, and tsunamis with different hazard return periods. However, the risk is still underestimated if biological hazards like the COVID-19 pandemic are not considered. These hazards, if classified with a return rate period and integrated into the current AAL analysis, can support the next generation of resilient investments. Work is underway to develop these pandemic loss models for integration.[26] The expanded average annual loss can be used to determine critical infrastructure at highest risk from natural, biological, and socioeconomic risks.

To produce such integrated metrics, South Asia must overcome several challenges. While some data is available for these calculations,[b] they are fragmented, heterogenous, and non-standardised. Here, data interoperability is an immediate imperative and easily achievable. Moreover, risk analytics and methodologies have to integrate reliable and accurate disaster impact data with physical sensing data (such as satellites and UAV) as well as authoritative data (such as census data or terrain data) to identify the critical hotspots where additional investments in infrastructure resilience will ensure the most efficient use of the limited resources.

Second, *disaster risk financing needs to expand from single hazard to a multi-hazard approach which includes both natural and biological hazards.*

Disaster risks from both natural and biological hazards are outpacing resilience in South Asia. Thus, integrated solutions for financing cascading disasters are critical in building long-term resilience of economies and livelihoods, to smoothen the cost of disasters over time, and ensure the timely availability of post-disaster funding.[27] Incorporating emerging risks

b For disaster resilience, the data can come from a wide variety of sources. These include satellite imagery, aerial imagery, videos from unmanned aerial vehicles (UAVs), the internet of things and sensor webs, airborne and terrestrial light detection and ranging, simulations, crowdsourcing, social media, mobile global positioning system (GPS) and call data records (CDR).

such as climate change and pandemics into risk financing of infrastructure is critical for resilience.[28] South Asia has had considerable success in this area and has used technological innovations in remote sensing, modeling, and GIS-based applications to propel understanding, management, and pricing of disasters risks. These models need to be scaled up for multiple, concurrent, and cascading disasters.

The Economic and Social Commission for Asia and the Pacific (ESCAP) policy study, 'Investing in innovative solutions to manage cascading disaster risks in South Asia'[29] notes successful cases of deploying parametric insurance to build resilience to cascading disasters. For example, the state of Nagaland in India has developed index-based solutions for multiple hazards including drought, hailstorm, humidity, and floods. The government partnered with insurance providers such as Tata AIG and Swiss Re to provide a parametric insurance disaster risk financing mechanism that covers the entire state for multiple hazards during the monsoon season.[30] These index-based products for natural hazards can also potentially be combined with pandemic insurance to support an integrated solution to both types of disasters. For example, the agriculture sector in India has taken a hit where the dual impacts of cyclones and the COVID-19 lockdowns have resulted in the destruction of agriculture infrastructure and missed harvesting and sowing seasons,[31] which can in turn lead to large-scale food insecurity and malnutrition. In lieu of the risks from floods, cyclones, and COVID-19, expanding innovative insurance programmes will have positive effects on the development goals and will also contribute to poverty reduction in South Asia.

The pandemic, therefore, provides unprecedented opportunities to strengthen linkages between DRR financing mechanisms and pandemic financing mechanisms. For example, disaster management relies on national disaster funds, contingent credit lines, insurance products and regional risk pools such as the Pacific Catastrophe Risk Insurance, the Caribbean Catastrophe Risk insurance facility, among others.[32] Some of these have already been used to respond to COVID-19. In parallel, existing financial relief systems are also available for pandemics. These include the IMF's Catastrophe Containment and Relief Fund[33] which extends catastrophe debt relief to both health emergencies and natural disasters, and the World Bank Pandemic Emergency Financing Facility.[34]

However, integrated funding facilities have not gained traction so far, mainly due to the enormity and disparities of COVID-19 impacts in economic, social, and political contexts, which are beyond those seen in previous crises. Therefore, the quick establishment of dedicated funding for the pandemic is necessary for immediate response. Moving forward, the focus to build back better should shift towards an integrated disaster funding system. After all, while the risk transmissions of various hazards are different, they largely affect and impact the most vulnerable populations.

Along with extending the scope of disaster risk financing mechanisms, there is a need to expand the regional and sub-regional cooperation for risk-informed infrastructure investments. Disaster risk reduction and financing are two sides of the same coin: if risks are not mitigated, financing and financial systems can get overwhelmed. Fortunately, a series of innovations in disaster risk reduction in the past few decades have revolutionised the cost-effectiveness of disaster risk financing mechanisms. Innovations such as catastrophe risk modelling and advances in modeling parameters of parametric insurance instruments have made it possible to transfer larger volumes of natural hazard risk to global markets more cheaply and effectively. These innovations should now be extended to include pandemics and other biological hazards. Using these innovations, multi-state and multi-country risk pooling can be scaled up to augment social safety nets and support governments' short- and medium-term response to the entire range of disasters for vulnerable countries in the South Asia.

Third*, deepening regional cooperation for overall disaster risk reduction and early warning systems must be prioritised.*

In South Asia, risks are not only systemic but also shared among the neighbouring countries. With climate change, the probability of increases in climate-related natural and biological hazards, including floods, drought, cyclones, and water and vector-borne diseases, is inevitable. These simultaneously will impact critical infrastructure which, in turn, will have cascading effects on access to resources for the most vulnerable populations.[35]

The recent monsoon floods in August 2020 in many Indian states such as BIhar[36] amidst the COVID-19 peak, shows the need for increased regional cooperation and ESCAP with partners has begun to operationalise the framework in this area. ESCAP's Asia-Pacific Disaster Resilience Network (APDRN) serves to mobilise expertise and resources to establish multi-hazard early warning systems and is now building partnerships with various stakeholders including the World Meteorological Organization (WMO), United Kingdom Meteorological Office and the Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES) to establish a multi-hazard approach to manage cascading risks and impacts of multiple disasters.[37]

CONCLUSION

The need for systemic resilience in the infrastructure sector to various disasters has been made clear by the COVID-19 crisis. The challenge is critical as the investment choices made now will lock-in for decades either a network hazard-resilient infrastructure or a collection of exposed assets that will make social and economic activity vulnerable to multiple risks. Delivered effectively, risk-resilient infrastructure planning can save lives and livelihoods, especially in highly vulnerable countries.

This brief offers three pivotal solutions towards risk-resilient infrastructure: mainstreaming hazard and climate risk data and analytics into mainstream financing; expanding focus from single hazard to multiple hazards for disaster risk financing; and using regional cooperation to share expertise in building infrastructure resilience through better early warning systems and overall disaster risk reduction.

Given the current disaster risk complexities, a paradigm shift in overall policy response is urgent—where all economic and social sectors including infrastructure begin accounting for the systemic and emergent risks stemming from all hazards. The recovery process from the current cascading disasters provide an opportunity for integrating isolated systems of disaster, health, infrastructure, and financing sectors. Reimagining responses, whether global, regional, or national, should always prioritise people. If the region adequately internalises and operationalises the lessons from the current crisis, there are tools available that can support better infrastructure management to benefit all communities. The most potent of these instruments are the SDGs, the Sendai Framework, and the Bangkok Principles for the implementation of the health aspects of the Sendai Framework.[c] ORF

c The 'Bangkok Principles' place strengthened coordination at the heart of efforts to reduce risk from biological hazards. They call for an inter-operable, multi-sectoral approach to promote systematic cooperation, integration and, ultimately, coherence between disaster and health risk management.

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ENDNOTES

1 ESCAP. Asia Pacific Disaster Report 2019, https://www.unescap.org/publications/asia-pacific-disaster-report-2019

2 Investing in innovative solutions to manage cascading disaster risks in South Asia: Key takeaways for stakeholders, ESCAP. (2020), https://www.unescap.org/resources/investing-innovative-solutions-manage-cascading-disaster-risks-south-asia-key-takeaways

3 When crises converge: responding to natural disasters in South Asia during COVID-19. ESCAP. (2020), https://www.unescap.org/resources/policy-brief-22020-asia-pacific-disaster-resilience-network-when-crises-converge

4 Roots for Resilience: A health Emergency Risk Profile of the South-East Asia Region. World Health Organization. Regional Office for South-East Asia, https://apps.who.int/iris/handle/10665/258766.

5 Madhurima Sarkar-Swaisgood, "COVID-19 reveals urgent need for resilient infrastructure", Blog posted March 26 2020, Accessed September 26, 2020, https://medium.com/@UNESCAP/covid-19-reveals-urgent-need-for-resilient-infrastructure-20489f722655.

6 Attanyake,"The dual risks of natural hazards and COVID-19", *PreventionWeb*, 6 May 2020,https://www.preventionweb.net/news/view/71687

7 Asia and the Pacific SDG Progress Report 2020. ESCAP. (2020), https://www.unescap.org/publications/asia-and-pacific-sdg-progress-report-2020

8 "What impact will Cyclone Amphan have during COVID-19 times", *The Free Press Journal*, May 19, 2020, https://www.freepressjournal.in/india/what-impact-will-cyclone-amphan-have-at-covid-19-times

9 . (2020). Hemant Rout, "Revised thrice, quarantine protocol still lacks clarity in Odisha", *The New Indian Express*, May 25, 2020, https://www.newindianexpress.com/cities/bhubaneswar/2020/may/25/revised-thrice-quarantine-protocol-still-lacks-clarity-in-odisha-2147636.html

10 Prithvijit Mitra,"Kolkata: After Covid, cyclone Amphan derails hospital operations", *The Times of India*, May 24, 2020, https://timesofindia.indiatimes.com/city/kolkata/after-covid-amphan-derails-hospital-ops/articleshow/75928722.cms

11 Michael Boyland and Charlotte Adelina, "COVID-19, Cyclone Amphan and building back better", SEI, June 2, 2020, https://www.sei.org/perspectives/covid-19-cyclone-amphan-and-

building-back-better/

12 Ashis Senapati,"Cyclone Amphan hit 100,000 ha farmland", *Down To Earth*, May 22, 2020, https://www.downtoearth.org.in/news/agriculture/cyclone-amphan-hit-100-000-ha-farmland-odisha-minister-71321

13 Giriraj Amarnath, "When COVID-19, climate collide: how south Asia can prepare itself", *Down to Earth*, April 27, 2020, https://www.downtoearth.org.in/blog/climate-change/when-covid-19-climate-collide-how-south-asia-can-prepare-itself-70707

14 Global Commission on Adaptation. *Adapt now: A global call for leadership on climate resilience*, 2019, https://reliefweb.int/report/world/adapt-now-global-call-leadership-climate-resilience#:~:text=The%20report%2C%20Adapt%20Now%3A%20A,them%20more%20resilient%20and%20productive.&text=Recent%20events%20have%20shown%20that%20climate%20change%20affects%20people%20everywhere.

15 "What impact will Cyclone Amphan have during COVID-19 times", *The Free Press Journal*, May 19, 2020, https://www.freepressjournal.in/india/what-impact-will-cyclone-amphan-have-at-covid-19-times

16 Sanjay Srivastava, "Indexing risk to recover from COVID 19" Blog posted 15 May 2020, Accessed 20 Sepetember 2020, https://medium.com/@UNESCAP/indexing-risk-to-recover-from-covid-19-b93c8cb49ae7.

17 C-J Neiderud, "How urbanization affects the epidemiology of emerging infectious diseases", *Infect Ecol Epidemiol* (2015), v5.

18 World Health Organization. Roots for Resilience: A health Emergency Risk Profile of the South-East Asia Region. World Health Organization, Regional Office for South-East Asia. (2017), https://apps.who.int/iris/handle/10665/258766.

19 Department of Global Communications, "Climate change and COVID-19: UN urges nations to recover better" United Nations COVID-19 response, 2020, https://www.un.org/en/un-coronavirus-communications-team/un-urges-countries-%E2%80%98build-back-better%E2%80%99

20 UNDRR Sendai Framework for Disaster Risk Reduction 2015-2030. UNDRR, 2015, https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030

21 Global Commission on Adaptation. (2019). "Adapt now: A global call for leadership on climate resilience"

22 Asian Development Bank, *Assessing the enabling environment or disaster risk financing: a county diagnostics toolkit*, ADB, 2020, https://www.adb.org/publications/disaster-risk-financing-country-diagnostics-toolkit

23 Global Commission on Adaptation. (2019). "Adapt now: A global call for leadership on climate resilience"

24 ESCAP, *Socio-economic response to COVID-19: ESCAP Framework*, ESCAP, 2020, https://www.unescap.org/resources/socio-economic-response-covid-19-escap-framework

25 ESCAP. Asia Pacific Disaster Report 2019, https://www.unescap.org/publications/asia-pacific-disaster-report-2019

26 WHO. "Pandemic risk: how large are the expected losses", Bulletin of the World Health Organization, 2020, https://www.who.int/bulletin/volumes/96/2/17-199588/en/

27 Asian Development Bank, *Assessing the enabling environment or disaster risk financing: a county diagnostics toolkit*, ADB, 2020, https://www.adb.org/publications/disaster-risk-financing-country-diagnostics-toolkit

28 Department of Global Communications, "Climate change and COVID-19: UN urges nations to recover better", United Nations COVID-19 response, 2020, https://www.un.org/en/un-coronavirus-communications-team/un-urges-countries-%E2%80%98build-back-better%E2%80%99

29 ESCAP, "Investing in innovative solutions to manage cascading disaster risks in South Asia: Key takeaways for stakeholders"

30 Yvonne Lau, "Swiss Re, Tata AIG partner in India for catastrophe scheme", *Insurance Asia News*, June 18, 2020, https://insuranceasianews.com/swiss-re-tata-aig-and-india-partner-for-nat-cat-parametric-scheme/

31 Ashis Senapati, "Cyclone Amphan hit 100,000 ha farmland"

32 ESCAP. *Disaster risk financing: opportunities for regional cooperation in Asia and the Pacific*, ESCAP, 2018, https://www.unescap.org/sites/default/files/Disaster%20Risk%20Financing%20Oportunities%20for%20Regional%20Cooperation%20in%20Asia%20and%20the%20Pacific.pdf

33 International Monetary Fund. *Catastrophe containment and relief trust*, IMF, 2020, https://www.imf.org/en/About/Factsheets/Sheets/2016/08/01/16/49/Catastrophe-Containment-and-Relief-Trust

34 The World Bank. (nd). "Pandemic emergency financing facility", the World Bank Group, https://www.worldbank.org/en/topic/pandemics/brief/pandemic-emergency-financing-facility

35 Global Commission on Adaptation. (2019). "Adapt now: A global call for leadership on climate resilience"

36 ReliefWeb. "Dual calamity as floods hit India's Bihar state amid pandemic", *ReliefWeb*, September 16, 2020, https://reliefweb.int/report/india/dual-calamity-floods-hit-india-s-bihar-state-amid-pandemic

37 ESCAP, "Investing in innovative solutions to manage cascading disaster risks in South Asia: Key takeaways for stakeholders"

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