

THE DISASTER RISKSCAPE ACROSS ASIA-PACIFIC

PATHWAYS FOR RESILIENCE, INCLUSION AND EMPOWERMENT









The shaded areas of the map indicate ESCAP members and associate members.*

The Economic and Social Commission for Asia and the Pacific (ESCAP) serves as the United Nations' regional hub promoting cooperation among countries to achieve inclusive and sustainable development. The largest regional intergovernmental platform with 53 Member States and 9 associate members, ESCAP has emerged as a strong regional think-tank offering countries sound analytical products that shed insight into the evolving economic, social and environmental dynamics of the region. The Commission's strategic focus is to deliver on the 2030 Agenda for Sustainable Development, which is reinforced and deepened by promoting regional cooperation and integration to advance responses to shared vulnerabilities, connectivity, financial cooperation and market integration. ESCAP's research and analysis coupled with its policy advisory services, capacity building and technical assistance to governments aims to support countries' sustainable and inclusive development ambitions.

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PATHWAYS FOR RESILIENCE, INCLUSION AND EMPOWERMENT

Asia-Pacific Disaster Report 2019

EXECUTIVE SUMMARY FOR POLICYMAKERS

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This executive summary contains the overview from *The Disaster Riskscape Across Asia-Pacific: Pathways for Resilience, Inclusion and Empowerment. Asia-Pacific Disaster Report 2019.* A PDF of the final full-length publication, will be available at https://www.unescap.org/publications/asia-pacific-disaster-report-2019. Please use the final publication for citations, reproductions and adaptation purposes.

Foreword

The Asia-Pacific region continues to be hit by a relentless sequence of disasters: cyclones, earthquakes, tsunamis, floods, droughts, dust storms and heatwaves. These disasters can strike anyone, anywhere, but they do their greatest damage in the poorest communities — often those of minority groups, or of people living in remote areas, or in the fragile marginal zones of the region's rapidly expanding cities.



Countries across the region have committed themselves to the Sustainable Development Goals (SDGs) by 2030—to ensure that 'no one is left behind'. But they cannot achieve many of the SDG targets if their people are not protected from disasters that threaten to reverse hard-won development gains. This means not just building resilience in the priority zones but doing so across the entire 'riskscape'—reaching the most marginal and vulnerable communities.

This Asia-Pacific Disaster Report shows that more of today's events are linked to environmental degradation and climate change. This is generating disasters of increasing complexity and uncertainty. Taking slow onset disasters into account, economic losses due to disasters quadruple as compared to estimates in previous editions. The report shows key hotspots emerging where fragile environments converge with critical socioeconomic vulnerabilities — thus making it much more likely that disasters will transmit poverty, marginalization and disempowerment across generations. In these hotspots, disasters are closely linked to poverty and inequality of income and opportunity.

The report gives empirical evidence of how disasters impact health, employment, and education of the most vulnerable populations leading to a vicious downward cycle. However, this is not inevitable. Governments can break this vicious cycle by investing to outpace disaster risk and the report shows that investments will inevitably be large, though far smaller than the damage and losses from unmitigated disasters. Moreover, these same investments will deliver co-benefits — in the form of better education, health, social and infrastructure services, and higher agricultural production and incomes.

Disaster resilience can also benefit from rapid advances in technology. Even the poorest countries can be empowered by smart digital technologies. Artificial intelligence and big data techniques, for example, can build a live picture of rapidly developing events by merging satellite imagery with data from mobile phones. At the same time, digital identity systems can offer more ways to deliver essential social protection services, before, during and after disasters.

This report also points out that many of the region's disaster hotspots extend across national boundaries. Dust storms can easily sweep on to neighbouring countries, and floods in one country can soon rush on to others downstream. This underlines the importance of regional cooperation both to monitor the evolution of disasters and to work together across the riskscape to mitigate the impacts and build cross-border resilience. For example, partnership between ESCAP and ASEAN is mobilizing member States towards the development of an ASEAN strategy on drought resilience to reduce the impacts of drought, protect the poorest communities and foster harmonious societies.

We hope that this *Asia-Pacific Disaster Report* will illuminate and inform this critical effort — demonstrating the scale of this important task, but also identifying the wide range of potential solutions.

Armida Salsiah Alisjahbana

Under-Secretary-General of the United Nations and Executive Secretary of ESCAP

Main findings

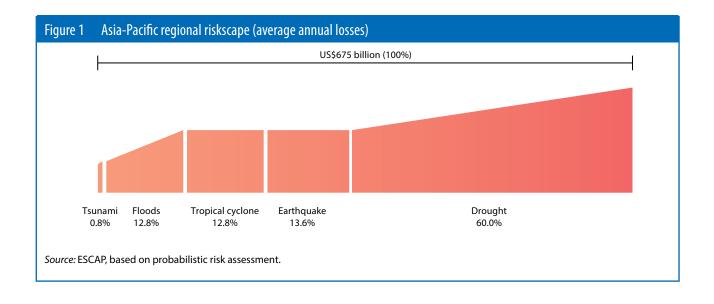
I. Annualized economic losses more than quadruple when slow onset disasters are added to the region's riskscape

The Asia-Pacific Disaster Report 2019 utilizes a probabilistic risk model that estimates the risk of earthquakes, tsunamis, floods, tropical cyclones and storm surges, as well as slow-onset hazards such as drought. The inclusion of slow onset hazards has, for the first time, shown the full extent of disaster risk in the region. This is presented as a regional 'riskscape', which captures the absolute average annual loss (AAL) in US dollars based on each hazard type. The key takeaway is that economic losses due to disasters are larger than previously estimated with most of this additional loss linked to the impact of slow onset disasters in the agricultural sector. Multi-hazard AAL for the region is \$675 billion, of which \$405 billion, or 60 per cent, is drought-related agricultural losses, particularly in rural economies (Figure 1).

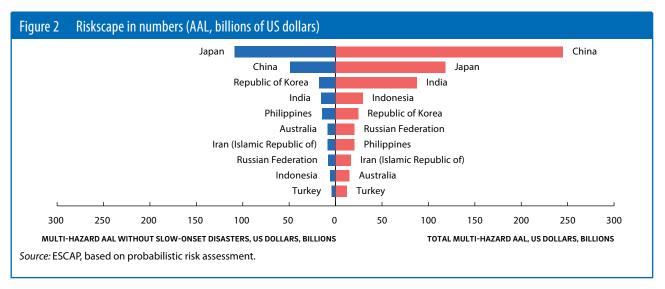
The riskscape also captures the uneven geographical distribution of AAL for individual hazard types. Of the region's total earthquake-related AAL, 64 per cent is in Japan and 14 per cent is in China. For tropical cyclones, around half the damage is in Japan, followed by 16 per cent in the Republic of Korea, 14 per cent in the Philippines and 13 per cent in China. For flooding, China represents 28 per cent of the AAL, and India 13 per cent, followed by the Russian Federation at 9 per cent and Australia at 7 per cent. For tsunamis, almost all damage is found in Japan.

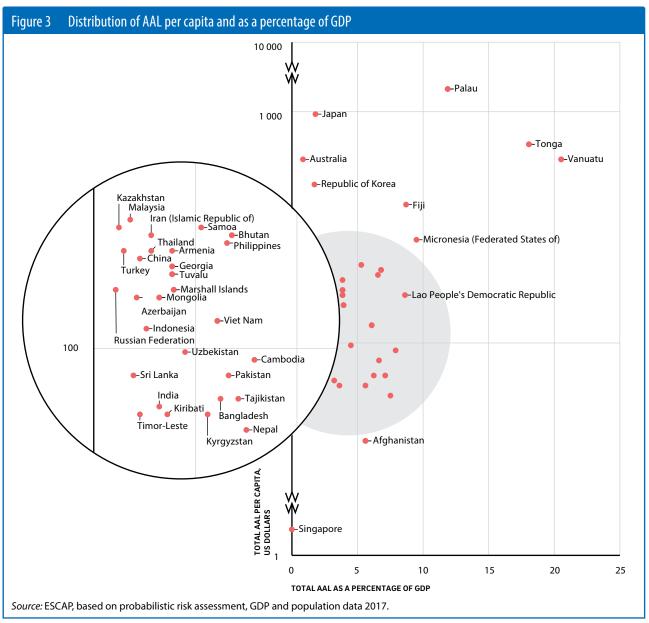
Countries can also be ranked in terms of multi-hazard AAL. On this basis, the five countries at greatest risk of rapid onset disasters are Japan, China, Republic of Korea, India, and the Philippines. However, the picture changes when slow-onset disasters are added. The new order is led by China, followed by Japan, India, Indonesia, and the Republic of Korea (Figure 2). The inclusion of slow onset disasters therefore substantially changes the understanding of the geography of risk in the region.

Figure 3 presents at risk populations and economies from future disaster losses. The analysis indicates that the Pacific Small Island Developing States (SIDS) such as Palau, Tonga, and Vanuatu are in the extreme range of population and economies at risk. A person in Pacific SIDS is three to five times more at risk than a person in South-East and South Asia. Most of the least developed countries, such as Bangladesh, Bhutan, Cambodia, Nepal etc., have relatively large numbers of both; at risk population and economies.



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II. The intensification and changing geography of disaster risks are the 'new normal'

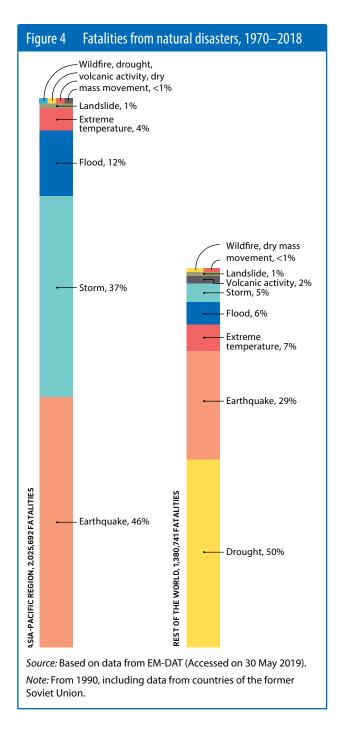
The Asia-Pacific region has long been affected by disasters. Since 1970, they have killed two million people — 59 per cent of the global death toll or 42,000 casualties a year. In the rest of the world, the average number of fatalities per year was 28,730. As indicated in Figure 5, the principal causes of deaths from natural disasters in the Asia-Pacific region were from earthquakes and storms, followed by floods. In the rest of the world, the pattern differs with the principal killer being drought and then earthquakes.

Throughout this period, the cost of damage has been rising partly because, as countries develop economically, there are more physical assets at risk. However, disaster impacts have been outpacing the region's economic growth — rising as a proportion of GDP, from around 0.1 per cent in the 1970s to about 0.3 per cent in recent decades. Furthermore, although fewer people have been dying from natural disasters in Asia and the Pacific, there has been an increase in the number of people affected who require immediate assistance during a period of emergency. In both cases, as shown in Figure 5, the gap between the Asia-Pacific region and the rest of the world is growing.

2018 — A year of surprises...

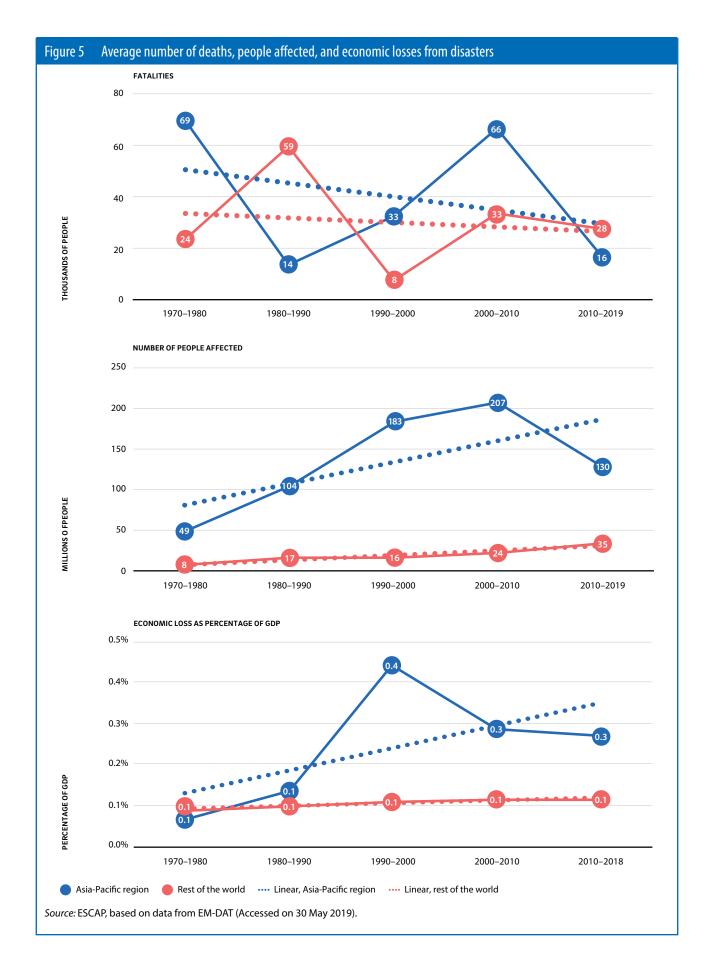
Despite the historical prevalence of disasters in the region, 2018 stands out. Almost half of the 281 natural disaster events worldwide occurred in the Asia-Pacific region, including eight out of the ten deadliest. Among these, although there were no mega-disasters, water-related disasters caught many by surprise, bringing forward new risks that were dynamically complex and challenging.

Indonesia alone was hit by the three deadliest disasters of the year. Two tsunamis and one earthquake in quick succession resulted in nearly half of the region's deaths. Even Japan, perhaps the most disaster prepared country of the world, experienced unprecedented flooding, followed by an anomalous heatwave that killed more than 300 people in July 2018. In South Asia, tropical cyclone Ockhi



developed near the equator. This was unusual especially since a cyclone has been recorded only three times in the Comorin area and the Kerala coast since 1891. Furthermore, the cyclone had a very long track, about 2,540 kilometres, and it developed from a depression to a cyclonic storm in just 24 hours. In South-West Asia, a dynamic storm corridor of sand and dust collided with heavy thunderstorms and rain that brought widespread and cascading impacts as hundreds died, and livestock and livelihoods were decimated across Afghanistan, India, the Islamic Republic of Iran and North-West India.

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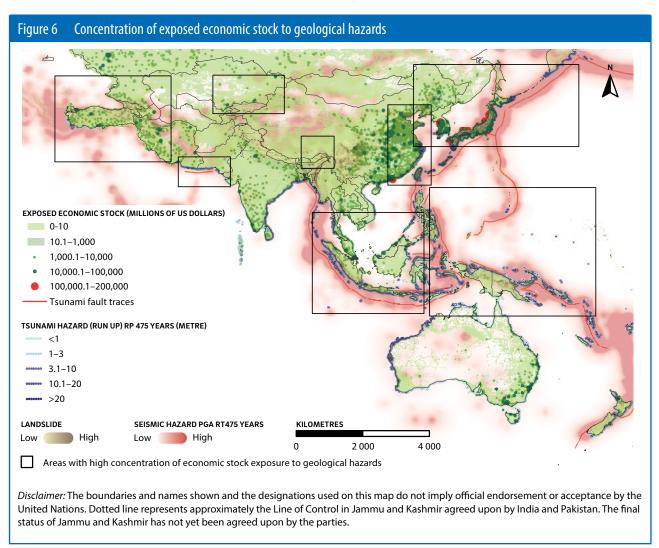


...but probably more a sign of things to come

Recent developments and diagnostic analysis indicate several clear trends that suggest that 2018 may not be an anomaly but rather a sign of things to come. Firstly, climate-related disasters (droughts, extreme temperatures, floods and storms) have begun coming to the forefront. The overall increase in the number of disasters in the region is largely due to the increase in climate-related events connected with environmental degradation. In 2018, these were responsible for 42 per cent of total deaths, and 96 per cent of the number of people affected. In fact, extreme weather is becoming the 'new normal'. On the other hand, the number of deaths from climate-related events is decreasing. This is probably due to advances in technology, as well as increasing experience with climaterelated disasters that provides the expertise for better early warning systems and effective measures to save people's lives.

Greater economic impact

Economic losses continue to increase. Partly, this is due to rapid economic development which means that much more social, physical and ICT infrastructure are exposed to natural hazards.2 Coastal regions, for example, are exposed to cyclones and storm surges that affect infrastructure — notably in the coastal areas of China, Japan, and the Republic of Korea. Additionally, there are growing concentrations of economic stock in areas with high geological hazards. Countries at risk of earthquakes, landslides and tsunamis are indicated in Figure 6. These include major economies along the Pacific Ring of Fire as well as smaller economies along with coastal areas of the Pacific at risk of tsunamis including Sri Lanka, India, Maldives, and the east coast of Australia. South-West Asia, Turkey, and the west of the Islamic Republic of Iran are exposed to earthquakes and landslides which also threaten North and Central Asia's major cities such as those in the southern parts of Kazakhstan, Kyrgyzstan, and



More complex risks and deeper uncertainty

The Asia-Pacific region is also facing disasters of greater complexity. This was evident, for example, in the experience with the 2018 Indonesian tsunamis. The biggest — and most unexpected — killer during the Sulawesi tsunami was soil liquefaction: intense tremors caused saturated sand and silt to take on the characteristics of a liquid. Also, the 2018 Sunda Strait tsunami was triggered by a huge volcanic eruption, submarine explosions, and a rapidly sliding volume of soil that was not captured by tsunami early warning systems configured for seismic origins.

Climate change and the complexity of disasters are also creating deep uncertainty. Whilst enhanced technology and greater data availability allow many disasters to be predicted with greater accuracy, disasters triggered by climate change deviate from the usual tracks. It is therefore increasingly difficult to determine which areas should prepare for what kinds of disaster.

Disaster risk hotspots

Drawing from these 'new normal' trends, the region's complex and diverse risks are clustered around four hotspots. Figure 7 illustrates the hotspots classification based on assessment of multi-hazards and exposure to population, economy, and critical infrastructure such as energy power plants, transport infrastructure—road, airports and ports, and ICT infrastructure. Here, fragile environments converge with critical socioeconomic vulnerabilities—thus making it much more likely that disasters will transmit poverty, marginalization and disempowerment across generations.

The first hotspot is centred around the region's major river basins in South and South-East Asia, where pockets with persistent poverty, hunger and undernourishment co-exist with the risks of floods and droughts (Figure 8). The Asia-Pacific region has ten of the top 15 countries in the world with the most people and economies exposed to annual river floods.³



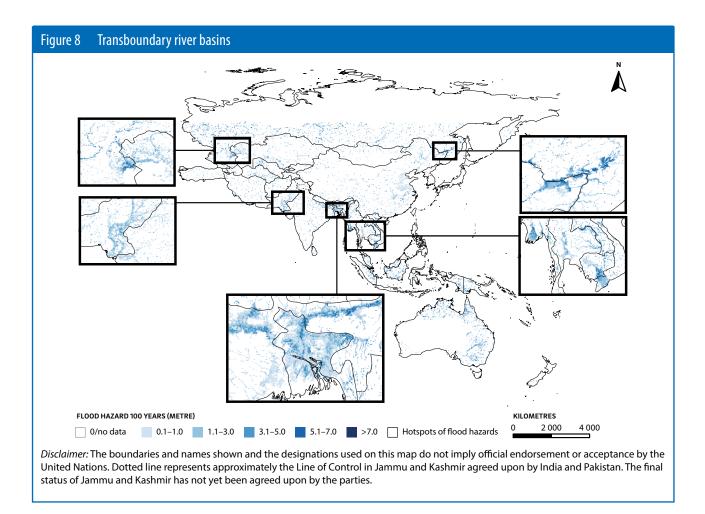
The region also has many transboundary river basins that are home to poor and vulnerable communities dependent on agriculture. Around 40 per cent of the world's poor live on or close to the major transboundary river basins in South Asia.⁴ One of the most extensive is the Ganges-Brahmaputra-Meghna river basin shared by Bangladesh, Bhutan, Nepal and India.⁵

Second, there are many critical infrastructure that are exposed and vulnerable to disasters (Figure 9). Especially in the emergency phases of disaster, well-functioning road networks, airports and ports are essential for evacuations and distribution of supplies. Energy failure in particular can have cascading impacts on health services and ICT.

Third, many Pacific SIDS are hotspots for cyclones where populations and infrastructure are exposed to the onslaught of these storms. Several areas have high concentrations of solar and wind power plants that are highly exposed to cyclones. Transport connectivity and infrastructure such as ports are vulnerable to climate-related hazards including tropical cyclones.

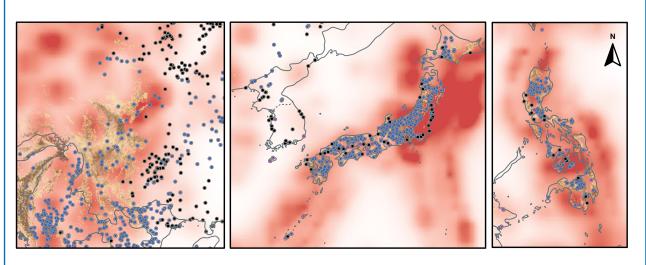
The fourth risk hotspot runs along the corridors in East and North-East Asia, South, South-West, and Central Asia which is a consequence of land degradation, desertification, climate change and unsustainable land and water use (Figure 10).

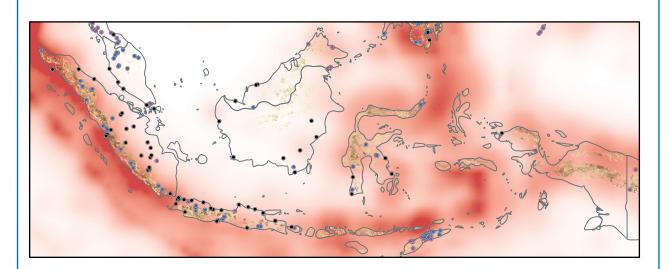
While disaster hotspots are often transboundary, empowering and including the poorest needs strategies that are designed to address the particular vulnerabilities of communities that are at the most risk.⁶ For this purpose, it is useful to identify the most vulnerable communities using geographic information systems, demographic and health surveys. Figure 11 illustrates this for Nepal, which shows that the concentration of risk is greatest in the eastern parts of the country, where many primary care hospitals are situated. Building or upgrading these in a resilient and risk-sensitive manner and expanding their reach in more rural and remote areas can support the most vulnerable populations during disaster shocks.



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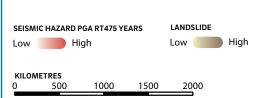






ENERGY INFRASTRUCTURE (POWER PLANTS)

Coal

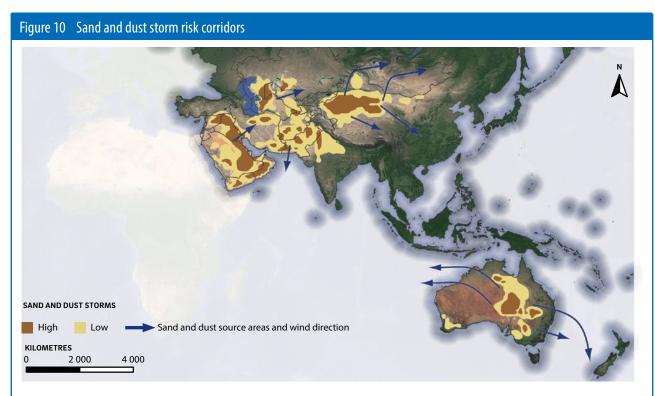


Hydropower

Sources: ESCAP, based on: Global Assessment Report on Disaster Risk Reduction (GAR) Risk Atlas 2015, Global Risk Data Platform 2013, Global Landslide Hazard Distribution v1 2000, ESCAP ICT Infrastructure 2017.

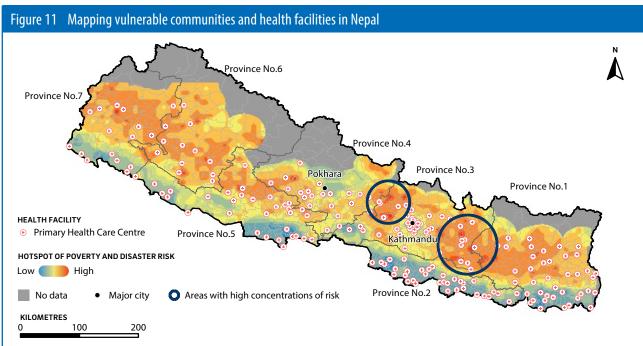
Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

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Source: Muhs, and others (2014).

Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations. Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.



Source: ESCAP, based on DHS Programme Household Survey and Service Provision Assessment Survey for Nepal, and multi-hazard data from Global Assessment Report on Disaster Risk Reduction (GAR) Risk Atlas 2015.

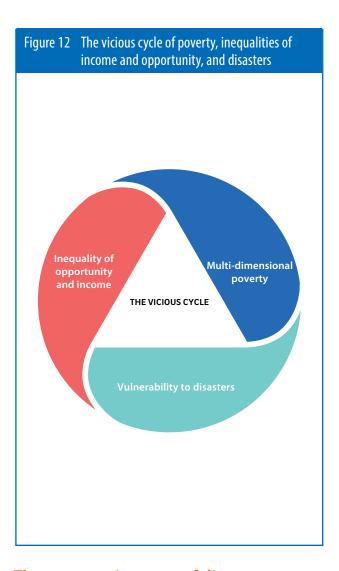
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III. Disasters widen inequalities in outcomes and opportunities and disempower at-risk communities

To effectively reduce disaster risk for the poorest and most vulnerable, Governments must understand not only how risk is geographically distributed, but also the many pathways through which disasters, inequality, and poverty reinforce each other. These interactions lead to a vicious cycle as demonstrated in Figure 12. Poor populations typically lose more because they are overexposed to disasters and have less ability to cope and recover, especially if they have little social protection or postdisaster support. Moreover, disasters often have permanent impacts on their education and health thereby locking people into intergenerational poverty traps.7 Similarly, areas with greater inequality — as captured by the Gini coefficient, are typically those most vulnerable to disasters. For example, ESCAP analysis using a comparative static computable general equilibrium model (CGE) shows all countries which can expect inequality to fall by 2030; the decrease will be lower in countries hit by disasters. These countries include China, Malaysia, Papua New Guinea, Philippines, and Turkey.

Wealthier individuals are better able to protect their assets and well-being because they can avoid disasters. The poor, on the other hand, are more exposed to disasters often living in more marginal areas such as steep hillsides and low-lying areas exposed to flooding. Thus, it is the poor who are disproportionately more likely to be repeatedly hit by disasters and risk losing what wealth and assets they have.

Figure 13 shows how disasters could affect poverty rates among 17 Asia-Pacific countries in 2030. For most countries, without disasters, the projected poverty rates would fall. But if disaster shocks and their impacts are unmitigated, poverty rates will fall less.

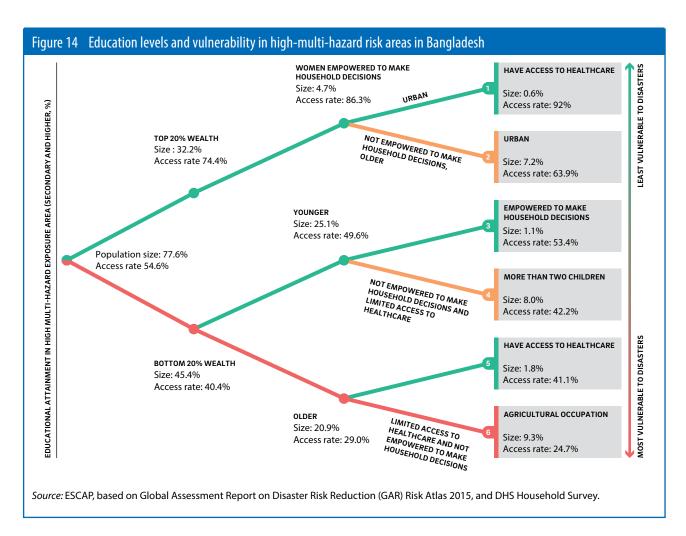


The greatest impacts of disasters are on social sectors such as health and education opportunities

The analysis in this report shows that countries with high annual average disaster losses currently have high inequality of opportunities particularly in health and education. Furthermore, when disasters hit, their greatest impacts are on the social sector. Using data available for 247 provinces across 18 countries in the Asia-Pacific region, the report found that while there was no significant relationship between disasters and country-level GDP, a 1 percentage point increase in exposure to climate-related hazards led to a 0.19 percentage point increase in malnutrition among children under five, while a similar increase in exposure to geological hazards increased the malnutrition rate by 0.24 percentage point.

Figure 13 Percent reduction in extreme poverty rates in 2030 with and without disasters in selected countries (baseline poverty rate=2016) LAO PEOPLE'S **PAKISTAN** ARMENIA CAMBODIA **DEMOCRATIC REPUBLIC** 100% 100% 100% 100% 65 35 56 **PHILIPPINES** NEPAL **KYRGYZSTAN** MYANMAR 100% 100% 100% 33 86 65 100 **IRAN (ISLAMIC REPUBLIC OF) BANGLADESH** INDIA **GEORGIA** 100% 100% 100% 100% INDONESIA **PAPUA NEW GUINEA VIET NAM SRI LANKA** 100% TIMOR-LESTE 2030, with no disasters 2030, with unmitigated disasters

Source: ESCAP calculations based on CGE model simulation.



Other measures of health show more direct impacts of disasters. Floods, for example, can increase water-related infectious diseases such as diarrhoea, caused by water contamination and damage to water systems. Floods and cyclones also increase the number of breeding sites for mosquito vectors and facilitate transmission of diseases such as leptospirosis.⁸

There is a similar impact on education; a 1 percentage point increase in exposure to hydrometeorological and geological hazards decreases education rates by around 0.2 percentage point. Moreover, within high-multi-hazard risk areas, women are less likely to have secondary or higher education. This suggests that while there has been progress towards reaching the targets for SDG 3 and 4, work still needs to be done to build resilience.

Discrimination and exclusion — who will be left behind when disaster hits?

People in high multi-hazard areas often face discrimination based on gender, age, ethnicity, religion and other divisions. Groups that are left behind can be profiled using a 'classification tree', a predictive model commonly used in data mining and machine learning. This methodology uses an algorithm to split values for each variable (access rate to opportunity) into significantly different population groups based on shared circumstances. In each iteration, the classification tree ascertains groups that are most or least advantaged. Figure 14 illustrates this for education in Bangladesh, showing that in high-multi-hazard risk areas within the bottom 20 per cent wealth group, older people (50-64) are worse off than younger people, and have lower rates of education. The algorithm determines additional branches for the tree branch, to show that the same worstoff group are the poorer, older populations who have limited access to healthcare, are not empowered to make household decisions, and work in agriculture.

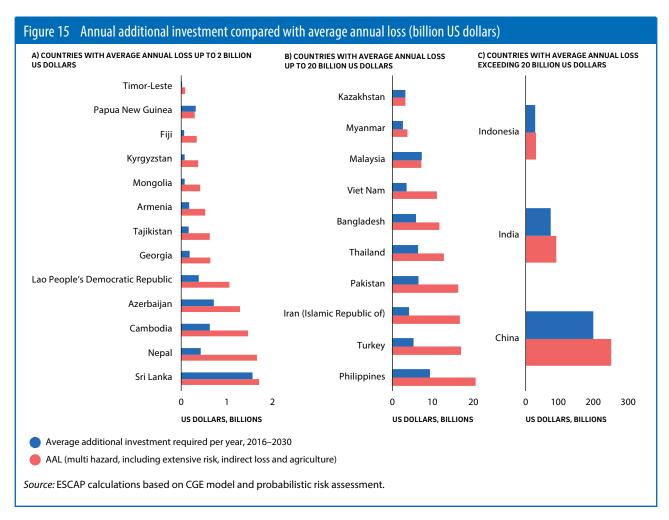
IV. Investing to outpace disaster risk

Disasters slow down any progress made in the attempt to reduce poverty and inequality. Governments can break this link with a comprehensive portfolio of investments and policies. This will require additional finance that will also deliver co-benefits, including better education, health, social and infrastructure services, more sustainable agricultural production, and incomes. This will also ensure better results for existing interventions for disaster risk reduction.

The report uses general equilibrium modelling to quantify the relationship between poverty, inequality and disasters. Across 26 countries, economic growth from 2016–2030 is expected to lift 220 million people out of extreme poverty (\$1.90 per day) by 2030.9 Whilst this would leave 52 million people in extreme poverty, the number rises to 119 million when disaster risk is incorporated into the model.

Nevertheless, this number can be reduced by increasing risk-informed investments in key sectors to reach global averages as a percentage of GDP. Investing in line with global averages would reduce the number of people in extreme poverty to: 80 million with investments in education; 69 million with investments in health; and 53 million with investments in social protection. Furthermore, increasing investments in infrastructure to 2 per cent of GDP will reduce the number of people living in extreme poverty to 96 million.

Increasing investments will require significant additional finance. While additional investments present a significant challenge, the additional amounts are small compared to the costs incurred from the likely damage and losses from disasters. Figure 15 compares the level of additional investment needed to meet global averages with the level of losses. It shows that the additional investments required per year are lower than the AAL in 24 of the 26 countries displayed. Further, for 16 out of 26 countries, the additional investment required is even less than 50 per cent of the AAL.



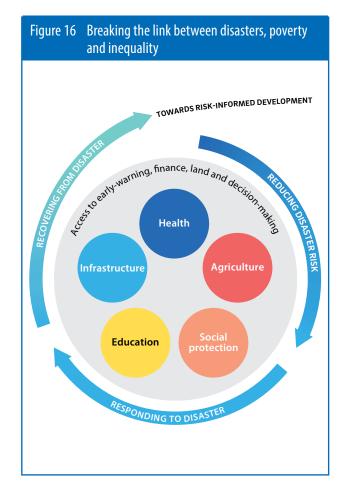
The additional investments will also deliver benefits that cannot be captured only by assessing disaster damage and losses. Improvements in social protection, health and education services, as well as infrastructure, will improve the lives of everybody in society.

The benefits of increased investment can only be amplified when Governments are more risk-informed in their decision making. This requires a comprehensive portfolio of sectoral investments combined with interventions for climate change adaptation and disaster risk reduction. The portfolio will need to be tailored to reach particular groups. For example, for small shocks, most households will be more resilient if they are supported by basic social protection and can diversify their livelihoods. Larger shocks, however, will demand solutions that differ depending on the household. Wealthier households can access saving, credit and market insurance, while poorer households, who do not have these options, would benefit from ex-ante disaster scaled-up safety nets such as affordable universal health coverage, besides ex-post social insurance financed by government reserve funds, insurance, and international aid.10

Policymakers can also enhance the quality of investments by applying empowerment and inclusion approaches, to ensure that poor and vulnerable groups are not excluded from the benefits of investments due to barriers in accessing land, reliable early warning systems, finance, and decision-making structures. For example, many poor people are vulnerable due to their difficulty in accessing financial services that could buffer them from the impacts of disasters.

Even with sufficient investment, some residual risk shall remain. Policymakers can address this by utilizing a range of instruments to expand access to insurance, and traditional financial services, including microfinance, small loans, and mobile banking. Insurance must be seen as one part of a comprehensive risk management strategy, in which households have different support available for different shocks. Governments should support this using a layered approach to disaster risk financing. This provides flexibility to use different mechanisms to respond to different severities of events on different timescales, and will likely include various forms of insurance, as well as sovereign reserves, contingent credit, budget reallocation and sovereign debt.

All of these interventions cut across a range of issues including health, education, social protection, insurance, infrastructure, urban planning, housing, land tenure, agriculture and livelihoods, that no government ministry can address in isolation. Individually, each offers an entry point for breaking the link between disasters and poverty. However, the overall approach will be most effective when Governments consider the potential interactions between each intervention. Figure 16 demonstrates how such interventions interact over the time phases of disaster management, to strengthen disaster resilience of those most likely to be left behind. Together, these interventions can break the cycle of disasters, poverty and inequality and facilitate more risk-informed development. This will require coherent strategies and plans, budget and financing, monitoring and reporting systems and inter-sectoral coordination, in order to ensure that all government ministries pull in the same direction to build the resilience of those most likely to be left behind.



V. Emerging technologies offer unprecedented promise for including and empowering people across the riskscape

Even the poorest countries can be empowered by smart digital technologies that are interconnected and autonomous and can communicate, analyse and use data to drive intelligent action for disaster resilience.

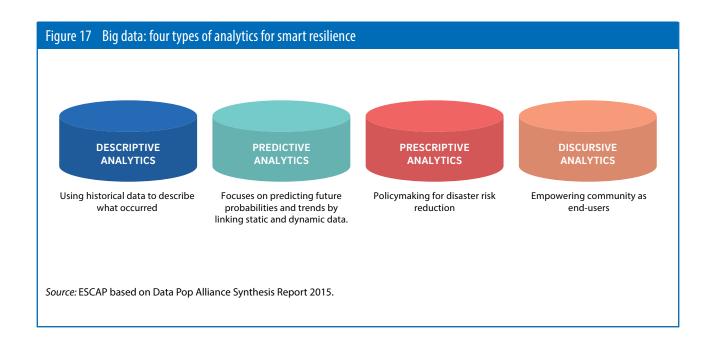
Big data refers to the computer analysis of very large data sets, from mobile phone tracking, for example, to reveal patterns, trends, and associations. Big data can help in all phases of disaster management by filling in gaps in information flows during pre-response and post-disaster situations, using four types of analytics: descriptive, predictive, prescriptive and discursive (Figure 17).

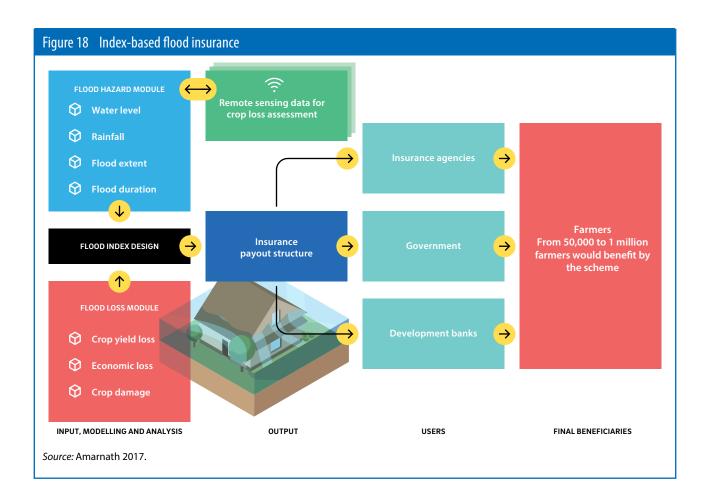
Mobile phones, for example, can form part of sensor webs or wireless networks that use the World Wide Web.¹¹ These sensors can be embedded in a wide variety of objects from buildings to household appliances and many other smart objects that form part of the rapidly expanding Internet of Things (IoT). Data from these sensor webs can be combined with satellite data and other sources to help

predict extreme events. For example, in the deep ocean, tsunamis can be detected by installing sensors that detect pressure changes on fibre optic telecommunication cables that run along the sea floor.

Flood and cyclone forecasting takes a different approach, typically using computer simulations coupling hydrologic and climate models. For flood forecasting, a recent innovation in climate modelling is the use of ensemble prediction systems which offers the ratio scenarios of forecasting indicating the range of possible outcomes. Machine learning can also be used to create better forecasting models. Such a pilot was tested in the city of Patna in Bihar, India which lies at the centre of the third risk hotspot, as discussed above, during the September 2018 floods. The models incorporated a variety of elements, from historical events to river-level readings, to the terrain and elevation of a specific area, in order to accurately predict the location and severity of floods.¹²

Prescriptive analytics goes beyond description and inferences to incorporate action. This can be used for index-based flood insurance. In South Asia, once again for the flood risk hotspot, these systems use satellite data and computer-based flood models to assess the location, depth and duration of flooding and indicate when and where flooding reaches the threshold at which damage is severe enough to warrant compensation.¹³ This improves the efficiency of decision making and enhances the delivery speed of insurance pay-outs to farmers (Figure 18).



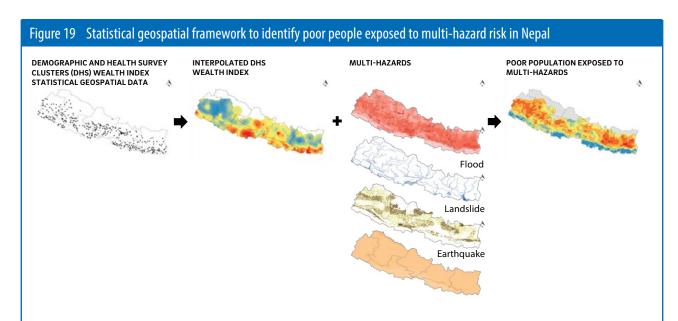


Empowering and including the most vulnerable communities calls for good baseline data that can help policymakers count and identify people. Such data needs to be disaggregated by gender, age, and disabilities, income profiles, asset ownership, amongst others. Such data are often scarce or completely missing. But with advances in geo-statistical interpolation techniques, it is now possible to integrate the disaggregated geospatial data into traditional sampling frames.¹⁴ In Nepal, for example, statistical geospatial data have been combined with DHS data to estimate the poor's exposure to disaster risks (Figure 19).¹⁵

Globally, around 2.4 billion of the poorest and most vulnerable populations lack formal identification records such as identity (ID) cards or birth certificates, which make it more difficult for them to access vital services and entitlements. To address these issues, Governments have, with increasing success, taken advantage of digital identity systems which offer greater choice and convenience. Digital identity systems strengthen the capacities of public and private sectors to deliver services and create a foundation on which to build new systems, services, and markets (Figure 20). Tr. 18

Increasingly, national digital IDs have been used for delivering a variety of services to people at risk, including social welfare programmes. Improved social protection should be risk-informed and sufficiently flexible and adaptable to reach specific vulnerable groups and should be scaled up during times of disaster. Evidence is emerging that digital IDs during disasters, have helped Governments to improve their response in various ways:¹⁹

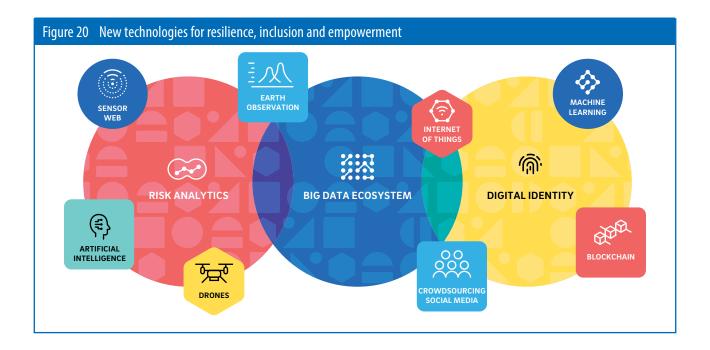
- Vertical expansion: Increasing the benefit value or duration for existing beneficiaries
- Horizontal expansion: Adding new beneficiaries to an existing programme
- Piggybacking: Using existing social protection administrative mechanisms to deliver assistance for a separate shock-response programme
- Parallel operation: An additional aligned humanitarian programme
- Refocusing: Changing the beneficiaries of a social protection programme in response to new patterns of vulnerability



Source: ESCAP, based on DHS data, Global Assessment Report on Disaster Risk Reduction (GAR) Risk Atlas 2015, Global Risk DataPlatform 2013.

Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Note: DHS interpolation by using Empirical Bayesian Kriging method.



All these advances can be integrated into a big data ecosystem using data-driven machine learning models that require no user inputs and can produce impact outputs at high spatial resolutions within minutes. There are however inherent risks, including algorithmic bias and issues of privacy and cybersecurity that will

need to be addressed at the outset as these techniques become mainstream.²⁰ Also, new technology does not automatically increase resilience. Results need to be communicated in ways that promote effective action and allow people to benefit from this rich new source of information and knowledge.

VI. There are key opportunities for action

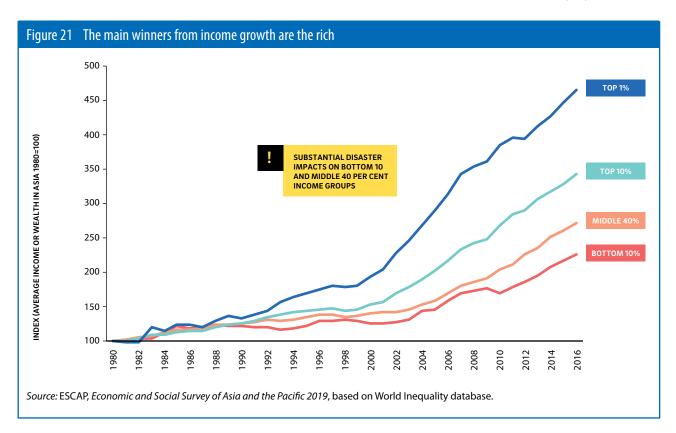
The Asia-Pacific region is now in the fourth year of implementing the 2030 Agenda for Sustainable Development. Progress has been mixed. The region has become an economic powerhouse however, this has come at a great cost.²¹ For the cluster of goals related to inequality and environmental degradation, the region is moving backwards. This is based on evidence from the ESCAP *SDG Progress Report 2019*,²² and narrative evidence from voluntary national reviews²³ show that for the bottom 10 per cent income group in the region, their income has doubled since 1980s. However, the pace of their income growth is slower than that of the middle 40 per cent, the top 10 per cent, and much slower than the top 1 per cent income group.²⁴ An important contribution to these disparities is the impact of recurring disasters (Figure 21).

On 23 September 2019, the Secretary-General of the United Nations will host the Climate Action Summit in New York to accelerate action to implement the Paris Agreement. Track six of the Secretary General's Climate Action is 'the Resilience and Adaptation Pact' aiming for a fundamental shift in investments and behaviour, and

seeking cross-sector commitment at the highest level to bring adaptation action to a global scale. These concerted actions will go a long way towards achieving the 2030 Agenda for Sustainable Development in the Asia-Pacific region, given that 86 per cent of the AAL is due to climate-related disasters such as droughts, floods and cyclones.

This Asia-Pacific Disaster Report 2019 illustrates the outstanding challenges but also the emerging opportunities for strengthened disaster resilience across the riskscape. Including and empowering all groups in society will require action across three broad areas.

1 Implement risk-informed policies and investments: This requires a focus on the poorest and most vulnerable, with interventions to increase inclusion and empowerment. Multiple policies must be combined to address different local circumstances. In the four risk hotspots identified in the report, high disaster risk and high levels of poverty and inequality compound each other. Here it will be important to guarantee risk-informed social protection, education and health services along with more disaster and climate resilient agriculture and infrastructure. The report shows that among all the investments in infrastructure, health and education, it is investments in social protection that will have the greatest impact on the reduction of extreme poverty by 2030. In the



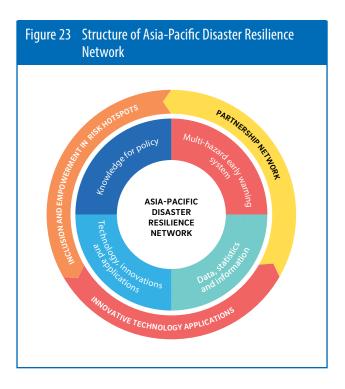


fourth hotspot of land degradation, desertification, climate change and unsustainable land and water use, disaster risk is also closely linked with environmental vulnerability. In this scenario, policies and investments need to be coupled with environmental protection and ecosystem restoration. Overall, this requires transformative change. Including and empowering the most vulnerable population across the riskscape requires a shift in the focus of disaster risk reduction; from addressing only the disaster impacts toward a more coherent approach that addresses the drivers of disaster vulnerability.

- 2 Capitalize on new technologies: Disaster risk reduction should be grounded in a seamlessly integrated system that comprises big data, digital identity, risk analytics and geospatial data (Figure 22). Also, it will be important to tailor the framework to address disaster response and resilience-building measures in an inclusive and participatory manner.
- 3 Unlock the potential of regional cooperation: Asia and the Pacific has some of the world's most extensive transboundary disaster hotspots. To unlock the potential of regional cooperation to address transboundary hotspots, ESCAP's intergovernmental committee on disaster risk reduction established the Asia-Pacific Disaster Resilience Network (APDRN), in 2017, comprising four inter-related pillars concerning data, early warning systems, policy coherence and new technologies (Figure 23).

The Asia-Pacific region has considerable experience in reducing disaster risk. Yet, it will be difficult to stay ahead of the curve as climate change, expanding disaster hotspots, inequality and environmental degradation cumulatively create a more complex riskscape in which to assert disaster

risk reduction actions. Countries in Asia and the Pacific will need to forge stronger commitments and actively seek multilateral and regional cooperation to address transboundary disasters as well as share best practices and innovative technologies and measures, in order to build more resilient development in the face of the complex dynamic of disaster risk. At the national level, all ministries and departments should consider ways to work together in a cohesive and integrated manner. New opportunities should be utilized to identify the populations that are most vulnerable to the harmful impacts of disasters. Furthermore, such populations need to be supported and empowered so they can build sustainable and resilient livelihoods.



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- 4 World Bank (2015).
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The Asia-Pacific region faces a daunting spectrum of natural hazards. Indeed, many countries could be reaching a tipping point beyond which disaster risk, fuelled by climate change, exceeds their capacity to respond.

This Asia-Pacific Disaster Report 2019 shows how these disasters are closely linked to inequality and poverty, each feeding on the other and leading to a vicious downward cycle. It assesses the scale of losses across the disaster 'riskscape' and estimates the amounts that countries would need to invest to outpace the growth of disaster risk. It shows the negative effects of disasters on economies in the region and where investments are more likely to make the biggest difference.

While this will require significant additional finance, the report shows the amounts are small compared to the amounts that countries in the region are currently losing due to disasters. The report demonstrates how countries can maximize the impacts of their investments by implementing a comprehensive portfolio of sectoral investments and policies that jointly address poverty, inequality and disaster risk. It showcases examples from the region of innovative pro-poor disaster risk reduction measures and risk-informed social policies that are breaking the links between poverty, inequality and disasters. Similarly, it explores how emerging technologies such as big data and digital identities can be used to ensure the poorest and most vulnerable groups are included in these policy interventions.

Ultimately, the report argues that countries will have to invest more in the measures appropriate to their own circumstances, but that they should also work more closely together to unlock the potential of regional cooperation.

