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Changing geography and intensification of disaster risks in the Asia-Pacific region

Summary of the Asia-Pacific Disaster Report 2019

Note by the secretariat

Summary

The present document is based on the findings of the *Asia-Pacific Disaster Report 2019,* in which a new regional risk landscape, or "riskscape", was revealed. The 2017 edition of the *Report* included information on how disaster risk was outpacing resilience as disaster losses continued to outpace the region's economic growth. In the present edition of the *Report*, it is revealed – for the first time – that when slow-onset disasters are added to the region's riskscape, annualized economic losses quadruple to an annual average loss of $675 billion.

The new riskscape is aggravated by the greater complexity of disasters. In the *Report*, the secretariat shows how disasters in the past two years were beyond what the region had previously experienced in terms of probability, intensity and behaviour. In this regard, four regional hotspots characterized by a convergence of risk drivers are identified. A high concentration of the poor exposed to fragile environments, multiple hazards and high disaster losses create a perfect storm of intersecting risks and vulnerabilities with major implications for poverty reduction.

Building on these findings, information is provided on how governments can address disaster risk by implementing a comprehensive portfolio of sectoral investments and policies to deliver disaster risk reduction for those left behind. While this will require additional financing, the additional annual investments required are lower than the average annual losses. They will also deliver co-benefits, through better education, health, social and infrastructure services and higher income and agricultural production. The *Report* also contains evidence of how emerging technologies are empowering people and promoting inclusive communities across the riskscape.

The *Report* ends with three policy action points, including unlocking the potential of regional cooperation through the Asia-Pacific Disaster Resilience Network of the Economic and Social Commission for Asia and the Pacific.

The Committee on Disaster Risk Reduction is invited to deliberate on the issues in the present document, to propose ways to operationalize the Asia-Pacific Disaster Resilience Network and to provide guidance on the future work of the Commission and the secretariat.

* ESCAP/CDR/2019/L.1.

I. Introduction

1. The present document is based on the *Asia-Pacific Disaster Report 2019*.[1] The *Report* provides an overview of disaster trends and impacts in Asia and the Pacific, and, by including slow-onset disasters, for the first time a comprehensive estimate of annualized economic losses due to disasters was calculated. The *Report* also contains information on how disasters and exposure to multiple hazards play a significant role in reversing the social development of the region and will continue to widen various inequality gaps unless enhanced efforts and investments are made to reduce the risks and impacts.

2. By employing an economic model and conducting a policy review of the many disaster risk reduction interventions already underway in the region, the secretariat was able to highlight policy options for breaking the cycle between disasters, poverty, inequality and disempowerment. The *Report* also contains highlights of opportunities arising from the technologies that have emerged in the fourth industrial revolution to create a pathway to empowering and including the poorest and most vulnerable people.

II. The new regional riskscape

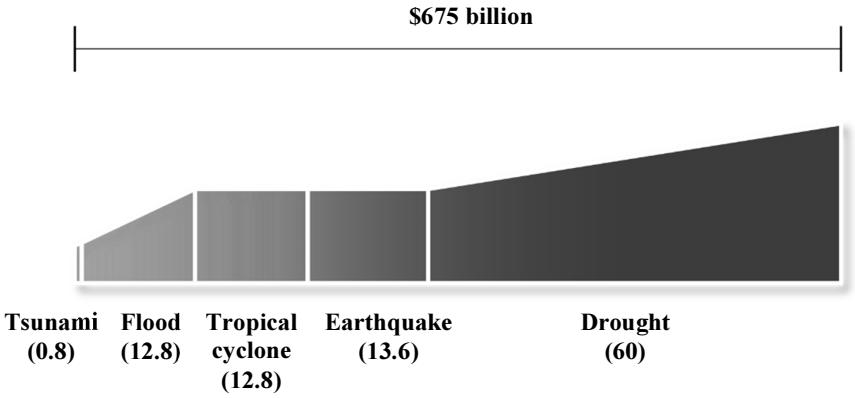
A. Annualized economic losses more than quadruple when slow-onset disasters are added to the region's riskscape

3. In the *Asia-Pacific Disaster Report 2019*, the secretariat utilizes a probabilistic risk model to estimate the risk of earthquakes, tsunamis, floods, tropical cyclones and storm surges, as well as slow-onset hazards, such as droughts. 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" or regional risk landscape, which captures absolute average annual loss in United States dollars based on each hazard type. The key takeaway is that the 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 average annual loss for the region is $675 billion, of which $405 billion, or 60 per cent, is drought-related agricultural losses, particularly in rural economies (figure I).

4. The riskscape also captures the uneven geographical distribution of average annual loss for individual hazard types. Of the region's total earthquake-related average annual loss, 64 per cent is in Japan and 14 per cent is in China. For tropical cyclones, approximately 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 average annual loss, 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.

[1] The executive summary for policymakers and the full report will be available at www.unescap.org/publications/asia-pacific-disaster-report-2019 on 16 July 2019 and 26 August 2019, respectively.

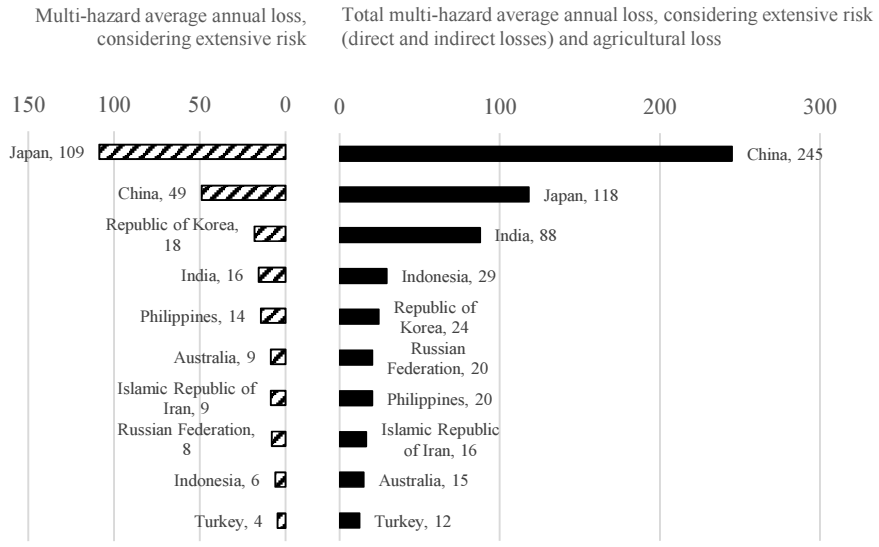
Figure I
Asia-Pacific regional riskscape (average annual losses)
(Percentage)



Source: *Asia-Pacific Disaster Report 2019* (United Nations publication, Sales No. E.19.II.F.12).

5. Countries can also be ranked in terms of multi-hazard average annual loss. On this basis, the five countries at greatest risk of rapid-onset disasters are Japan, China, the 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 II). The inclusion of slow-onset disasters therefore substantially changes the understanding of the geography of risk in the region, as populous countries move up the ranking.

Figure II
Riskscape in numbers: average annual loss
(Billions of United States dollars)



Source: *Asia-Pacific Disaster Report 2019*.

6. The analysis of the Economic and Social Commission for Asia and the Pacific (ESCAP) of populations and economies at risk from future disaster losses indicates that Pacific small island developing States such as Palau, Tonga and Vanuatu are in the extreme range of at-risk populations and economies. A person in the Pacific small island developing States 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 and Nepal, have relatively large numbers of at-risk populations and economies, while Palau and Japan have the highest at-risk populations and Singapore has the lowest.

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

7. The Asia-Pacific region has long been affected by disasters. Since 1970, two million people have been killed in disasters – 59 per cent of the global death toll or 42,000 deaths a year. In the rest of the world, the average number of fatalities per year was 28,730. The principal causes of deaths due to natural hazards in the Asia-Pacific region were earthquakes and storms, followed by floods. In the rest of the world, the pattern differs, with the principal killer being droughts followed by earthquakes.

8. Since the 1970s, 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 gross domestic product (GDP), from approximately 0.1 per cent in the 1970s to approximately 0.3 per cent in recent decades. Furthermore, although fewer people have been dying from 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, the disaster risk gap between the Asia-Pacific region and the rest of the world is growing.

C. The year 2018 was a year of surprises but probably a sign of things to come

9. Despite the historical prevalence of disasters in the region, the year 2018 stands out. Almost half of the 281 natural disaster events worldwide occurred in the Asia-Pacific region, including 8 out of the 10 deadliest.[2] Although there were no mega-disasters, water-related disasters caught many by surprise, bringing new risks that were dynamically complex and challenging.

10. 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 country most prepared for disasters in the world, experienced unprecedented flooding, followed by an anomalous heatwave that killed more than 300 people in July 2018. In South Asia, Cyclone Ockhi developed near the equator. This was unusual especially since a cyclone had been recorded only three times in the Comorin area and the Kerala coast since 1891. Furthermore, the cyclone had a very long track, approximately 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, the Islamic Republic of Iran, Pakistan and North-West India.

[2] Centre for Research on the Epidemiology of Disasters, EM-DAT: The International Disaster Database. Available at www.emdat.be/ (accessed on 15 February 2019).

11. Recent developments and diagnostic analysis indicate several trends that suggest that 2018 may not be an anomaly but rather a sign of things to come. First, 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.

12. Second, economic losses continue to increase. Partly, this trend is due to rapid economic development which means that much more social, physical and information and communications technology infrastructure is exposed to natural hazards.[3] 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.

13. Additionally, there are growing concentrations of economic stock in areas with high geological hazards. Areas at risk of earthquakes, landslides and tsunamis are indicated in figure III. These include major economies along the Pacific Ring of Fire as well as smaller economies and coastal areas of the Pacific at risk of tsunamis, including India, Maldives and Sri Lanka, and the east coast of Australia. South-West Asia, Turkey and the western part of the Islamic Republic of Iran are exposed to earthquakes and landslides, which also threaten major cities in North and Central Asia, such as those in the southern parts of Kazakhstan, Kyrgyzstan and Tajikistan.

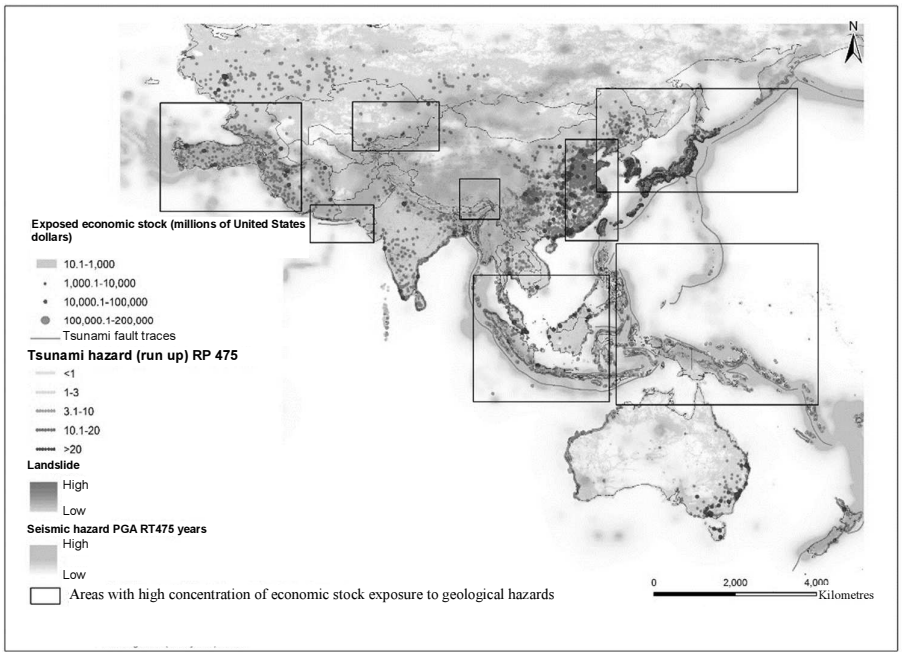
14. Third, the number of deaths from climate-related events is decreasing. This is probably due to advances in technology, as well as a growing body of experience with regard to climate-related disasters that provides the expertise needed for more effective early warning systems to save people's lives.

15. This complexity was evident, for example, in 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.

16. Climate change and the complexity of disasters are also creating deep uncertainty. While 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.

[3] ESCAP and United Nations Office for Disaster Risk Reduction, *Asia-Pacific Disaster Report 2012: Reducing Vulnerability and Exposure to Disaster* (ST/ESCAP/2639).

Figure III
Concentration of exposed economic stock to geological hazards



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: Asia-Pacific Disaster Report 2019.

Notes: PGA RT 475 years is the seismic hazard with a return period of 475 years expressed in peak ground acceleration. That means a level of ground shaking is expected to occur once in 475 years. RP 475 years is a tsunami hazard run-up height with a return period of 475 years.

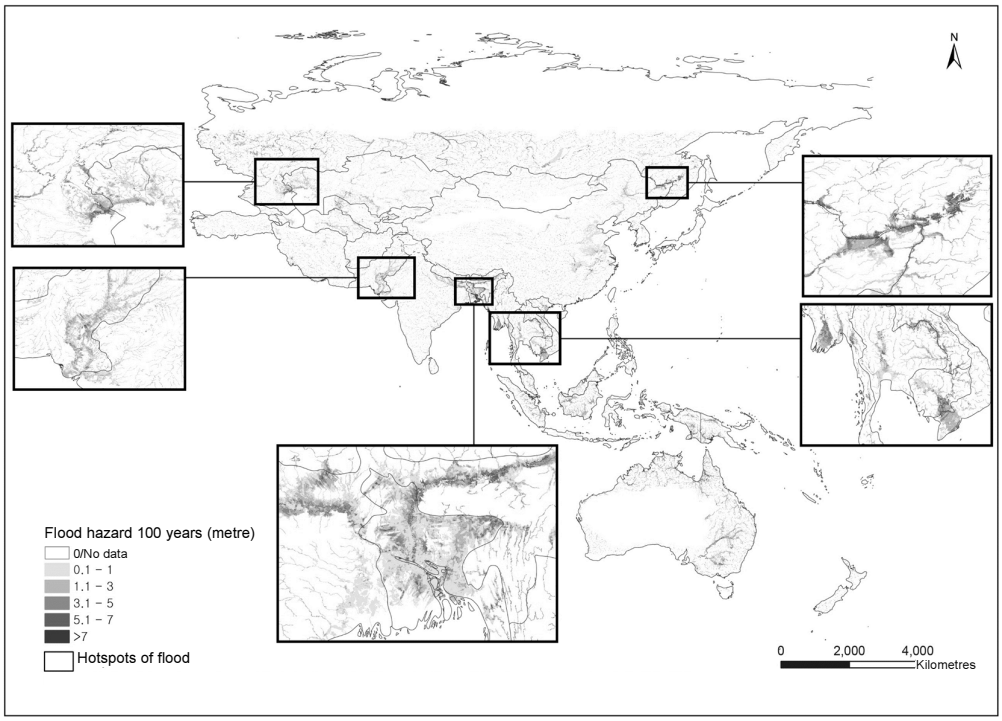
D. The Asia-Pacific region is facing disasters of greater complexity clustered around four hotspots

17. Analysis of these trends in the new normal shows that the region's complex and diverse risks are clustered around four hotspots. Here, fragile environments converge with critical socioeconomic vulnerabilities – thus making it much more likely that disasters will transmit poverty, marginalization and disempowerment across generations.

18. The first hotspot is centred around the region's major transboundary 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 (see figure IV). The Asia-Pacific region is home to 10 of the 15 countries in the world with the most people and GDP exposed to annual river floods.[4]

[4] Tianyi Luo and others, "World's 15 countries with the most people exposed to river floods", World Resources Institute, 5 March 2015.

Figure IV
Flood hotspots



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Source: *Asia-Pacific Disaster Report 2019*.

19. The region also has many transboundary river basins that are home to poor and vulnerable communities dependent on agriculture. Approximately 40 per cent of the world's poor – the largest global concentration of poor – live on or close to the major transboundary river basins in South Asia.[5] One of the most extensive is the Ganges-Brahmaputra-Meghna river basin shared by Bangladesh, Bhutan, Nepal and India.[6]

20. The second risk hotspot is along the Ring of Fire where critical infrastructure is vulnerable to earthquakes, tsunamis and other disaster related to volcanic eruptions. Especially in the emergency phases of disasters, smoothly functioning road networks, airports and ports are essential for evacuations and distribution of supplies. Energy failure in particular can have cascading impacts for health services and information and communications technology.

21. The third risk hotspot is Pacific small island developing States, many of which are vulnerable to tropical cyclones with populations and infrastructure that are exposed to their onslaught. Several areas have high concentrations of solar and wind power plants that are highly exposed to cyclones. Transport

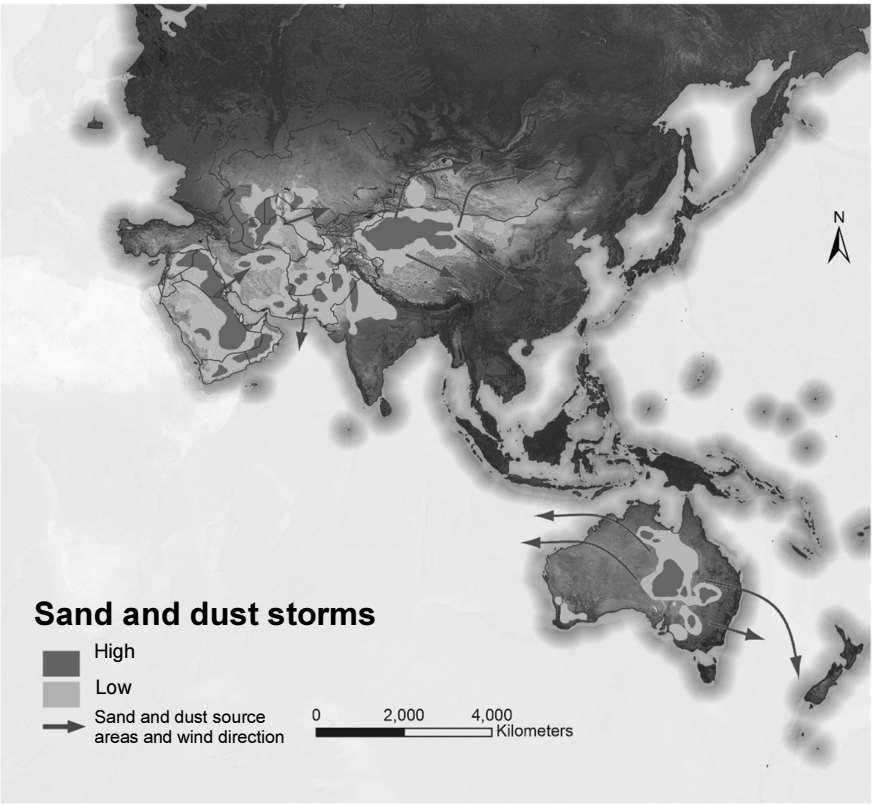
[5] World Bank, *South Asia Water Initiative: Annual Report from the World Bank to Trust Fund Donors – July 2014–June 2015* (Washington, D.C., 2015).

[6] Marufa Akter, "Conceptualizing environmental governance on the GBM basin", *Bandung: Journal of the Global South*, vol. 3, No. 1 (December 2016).

connectivity and infrastructure such as ports are vulnerable to climate-related hazards including tropical cyclones.

22. The fourth risk hotspot runs along the sand and dust storm risk corridors in East and North-East Asia, South and South-West Asia, and Central Asia, which are a consequence of land degradation, desertification, climate change, and unsustainable land and water use (see figure V).

Figure V
Sand and dust storm risk corridors in Asia and the Pacific



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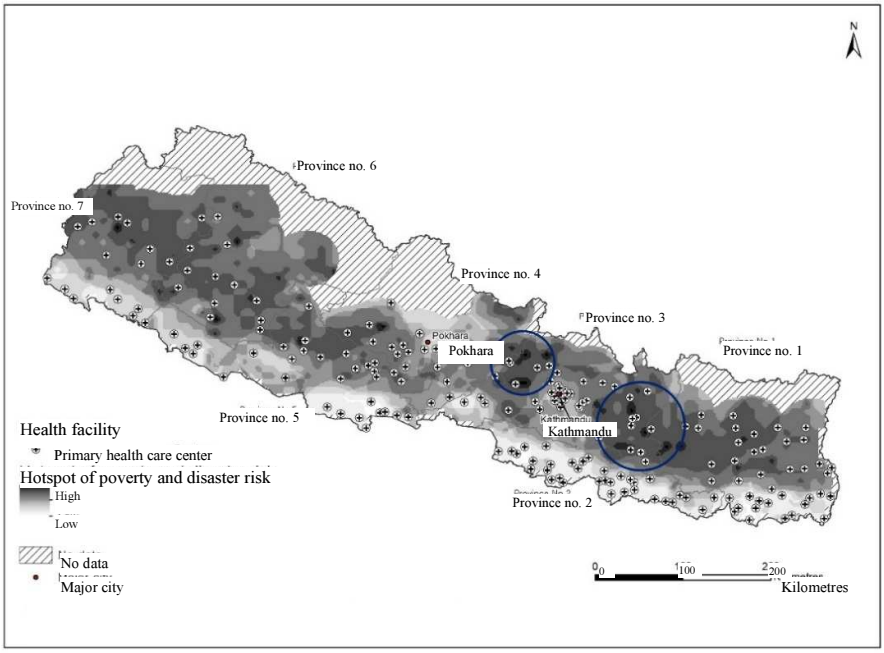
Source: Daniel R. Muhs and others, "Identifying sources of Aeolian mineral dust: present and past" in *Mineral Dust: A Key Player in the Earth System*, Jan-Berend W. Stuut and Peter Knippertz, eds., (Dordrecht, Netherlands, Springer, 2014).

23. While disaster hotspots are often transboundary, strategies that empower and include the poorest need to be designed to address the particular vulnerabilities of those most at risk.[7] For this purpose, it is useful to geolocate the most vulnerable communities using geographic information systems and demographic and health surveys. Figure VI illustrates this for Nepal, showing that the concentration of risk is greatest in the eastern parts of the country, where many primary care hospitals are situated. Building or upgrading this basic social infrastructure in a risk-sensitive manner and expanding their reach into the more

[7] Handicap International, "Empowerment and participation: good practices from South & South-East Asia in disability inclusive disaster risk management" (2014).

rural and remote areas can play a key supportive role in building resilience among the most vulnerable, both before and after disasters.

Figure VI
Mapping vulnerable communities and health facilities in Nepal



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

Source: Asia-Pacific Disaster Report 2019.

III. Disasters and inequality

A. Disasters widen inequalities in outcomes and opportunities and slow down poverty reduction

24. 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. 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 post-disaster support. Moreover, disasters often have permanent impacts on their education and health, thereby locking people into intergenerational poverty traps.[8] 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 shows that in countries that can expect inequality to fall by 2030, the decrease will be lower in those hit by disasters. These countries include China, Malaysia, Papua New Guinea, the Philippines and Turkey.

25. 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

[8] Stephane Hallegate and others, *Unbreakable: Building the Resilience of the Poor in the Face of Natural Disasters* (Washington, D.C., World Bank, 2017).

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 meagre wealth and assets they have.

26. Model simulations in the *Asia-Pacific Disaster Report 2019* reveal how disasters could affect poverty rates by 2030 among those countries where more than 5 per cent of the population lives in poverty. For most countries, the projected poverty rates would be reduced if disasters did not happen.

B. Disasters contribute to health and education inequalities

27. The analysis in the *Report* shows that countries with high annual average disaster losses also have high inequality of opportunities, particularly in health and education. Furthermore, when disasters hit, their greatest impacts are on the social sector. Data for 247 provinces across 18 countries in the Asia-Pacific region show that a 1-percentage-point increase in exposure to climate-related hazards leads to a 0.19-percentage-point increase in malnutrition among children under five, while a similar increase in exposure to geological hazards increases the malnutrition rate by 0.24 percentage point.

28. Other measures of health show more direct disaster impacts. Floods, for example, can increase water-related infectious diseases such as diarrhoea, due to 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.[9]

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

30. People in areas with high multi-hazard risk 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 identifies groups that are most or least advantaged. For example, results for Bangladesh show that in areas with high multi-hazard risk within the bottom 20 per cent wealth group, older people (aged 50 to 64) are worse off than younger people and have lower rates of education. The algorithm uses additional branches to show that the same worst-off group comprises the poorer older populations, who have limited access to health care, are not empowered to make household decisions and work in agriculture.

IV. Investing to outpace disaster risk

31. As shown above, disasters slow down progress towards reducing poverty and inequality. Breaking this link requires additional financing that can also deliver co-benefits, including better education, health, social and infrastructure

[9] Srinivas Murthy and Michael D. Christian, “Infectious diseases following disasters”, Disaster Medicine and Public Health Preparedness, vol. 4, No. 3 (October 2010).

services and incomes and more sustainable and efficient agricultural production. This will also ensure better results for existing interventions for disaster risk reduction.

32. Computable general equilibrium modelling to explore the relationship between poverty, inequality and disasters across 26 countries shows that economic growth[10] from 2016 to 2030 is expected to lift 230 million people out of extreme poverty ($1.90 per day) by 2030. This would leave 53 million people in extreme poverty, but when disaster risk is incorporated into the model the number rises to 123 million.

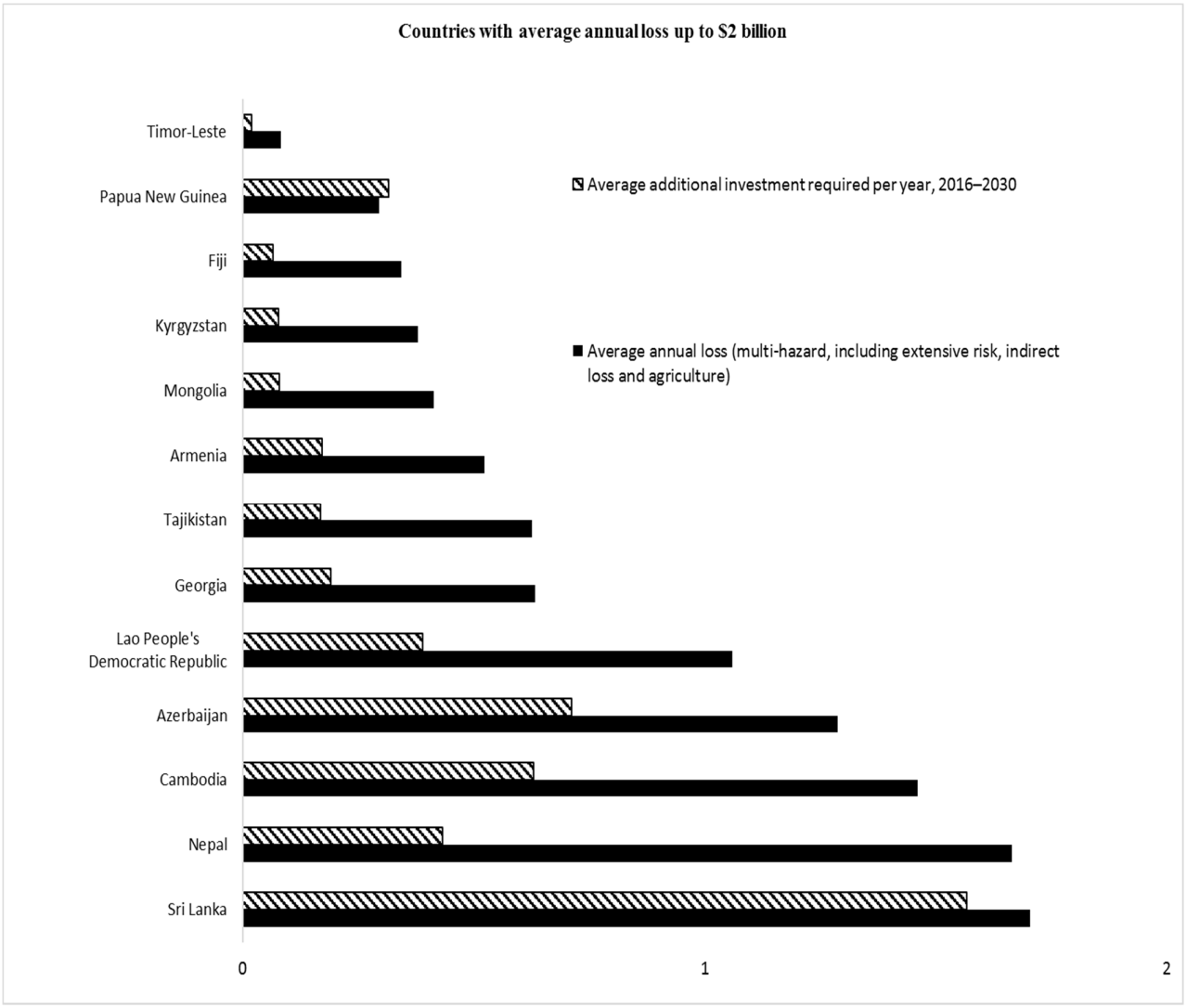
33. Nevertheless, this number can be reduced by increasing investments in key sectors to reach global averages of investments as a percentage of GDP. Investing at these levels in social protection, health and education would, respectively, bring the number of people left behind down to 56 million, 73 million and 83 million. Furthermore, increasing expenditure on infrastructure to 2 per cent of GDP would bring this number down to 100 million. Investments in social protection thus have the biggest impact on poverty reduction.

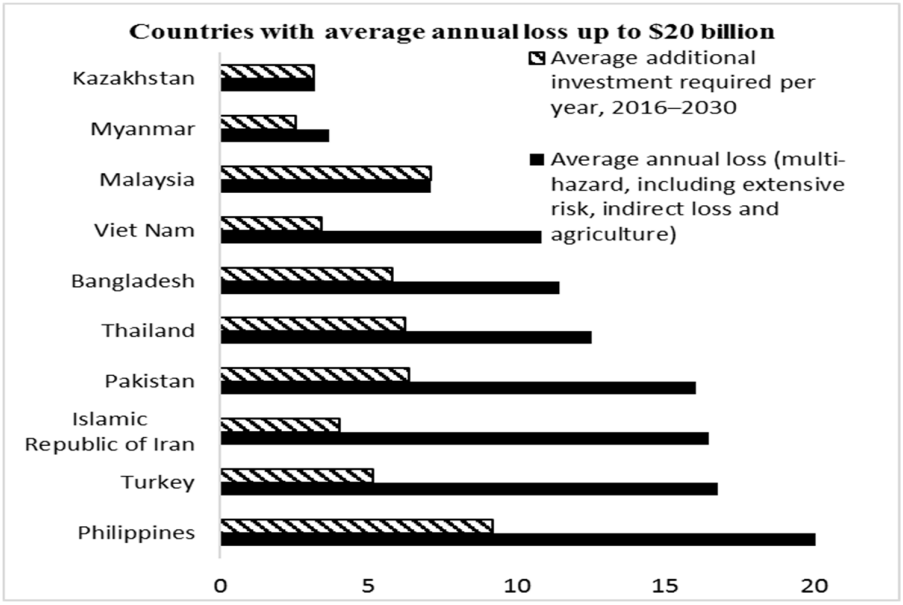
A. The required additional investments are small compared to the likely damage and losses from disasters

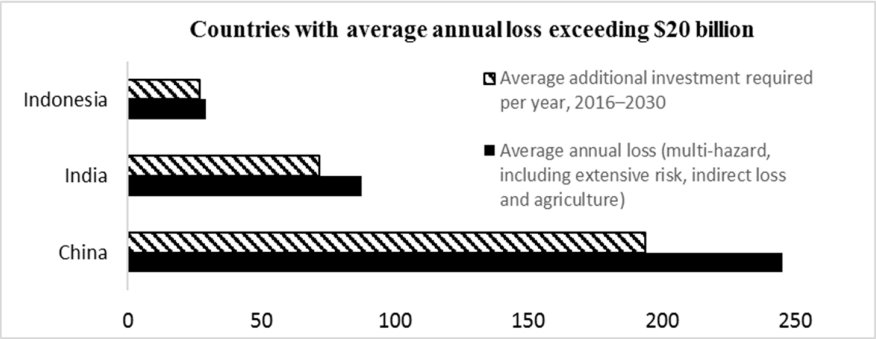
34. Increasing investments will require significant additional financing. While mobilizing the additional investments presents a significant challenge, the additional amounts are small compared to the costs incurred from the likely damage and losses from disasters. Figure VII shows a comparison of the additional investment needed to meet global averages with projected losses. The additional investments required per year are lower than the average annual loss 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 average annual loss.

[10] Assumed in the model to be the average GDP growth rate of the last five years.

Figure VII
Annual additional investment compared with average annual loss
(Billions of United States dollars)







Source: Asia-Pacific Disaster Report 2019.

35. The benefits of increased investment can only be amplified if Governments become more informed of risk 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 that can help them diversify their livelihoods. Larger shocks, however, will demand solutions that differ depending on the household. Wealthier households can access savings, credit and market insurance, while poorer households, who do not have these options would benefit from scaled-up ex ante disaster safety nets such as affordable universal health coverage, in addition to ex post social insurance financed by government reserve funds, insurance and international aid.[11]

36. 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, financing and decision-making structures. For example, many poor people are vulnerable due to their difficulty in accessing financial services that could provide them with a buffer from the impacts of disasters. Policymakers can address this by utilizing a range of instruments to expand access to traditional financial services, including microfinance, small loans, insurance and mobile banking.

B. Government ministries need to pull in the same direction to build resilience

37. 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 intervention 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. Together, these interventions can break the cycle of disasters, poverty and inequality and facilitate more risk-informed development. This will require coherent strategies, plans, budgets, financing, and monitoring and reporting systems, as well as intersectoral 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.

[11] Stephane Hallegatte and others, *Shock Waves: Managing the Impacts of Climate Change on Poverty* (Washington, D.C., World Bank, 2016).

V. Technology innovation for resilience

A. An unprecedented promise for inclusion and empowerment across the riskscape

38. 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.

39. 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- and post-disaster situations, using four types of analytics: descriptive, predictive, prescriptive and discursive.

40. Mobile phones, for example, can form part of sensor webs or wireless networks that use the World Wide Web.[12] 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. 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.

41. Flood and cyclone forecasting takes a different approach, typically using computer simulations coupling hydrologic and climate models. For flood forecasting, a relatively recent innovation is the use of large data ensemble prediction systems which can be used to generate a range of possible outcomes and increase the lead time of forecasting for many places. 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.[13]

42. Prescriptive analytics systems go beyond description and inferences to incorporate action. For example, they can be used for index-based flood insurance. In South Asia, a 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.[14] This improves the efficiency of decision-making and enhances the delivery speed of insurance payouts to farmers.

43. Empowering and including the most vulnerable communities requires good baseline data that can help policymakers count and identify people. Such data need to be disaggregated by gender, age, disabilities, income profiles and

[12] John Soldatos, “Internet of things tutorial: IoT devices and the semantic sensor web”, KDnuggets, January 2017.

[13] Yossi Matias, “Keeping people safe with AI-enabled flood forecasting”, Google, The Keyword, 24 September 2018.

[14] Giriraj Amarnath, “Investing in disaster resilience: risk transfer through flood insurance in South Asia”, presentation made at the Training Workshop on Addressing Disaster Risks Specific to South and South-West Asia, Kathmandu, October 2017.

asset ownership, among others. Such data are often scarce or completely missing. But with advances in geostatistical interpolation techniques such as the Empirical Bayesian Kriging method, it is now possible to integrate disaggregated geospatial data into traditional sampling frames. In Nepal, for example, statistical geospatial data have been combined with Demographic and Health Survey data to estimate the poor's exposure to disaster risks.[15]

44. Globally, approximately 2.4 billion of the poorest and most vulnerable populations lack formal identification records such as identity cards or birth certificates, which makes it more difficult to access vital services and entitlements,[16] 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 the public and private sectors to deliver services and create a foundation on which to build new systems, services and markets.[17,18]

45. Increasingly national digital identity cards have been used for delivering a variety of services, including social welfare programmes, to people at risk. Improved social protection should use information on risk, be sufficiently flexible and adaptable in order to reach specific vulnerable groups, and should be scaled up during times of disasters. Evidence is emerging that during disasters, digital identity cards have helped Governments to improve their response in various ways, including the following:[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.

46. 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.

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[15] Eric Krause, "Empirical Bayesian Kriging – robust Kriging as a geoprocessing tool", presentation made at the 2013 Esri International User Conference, San Diego, California, July 2013.

[16] World Bank, *World Development Report 2016: Digital Dividends* (Washington, D.C., 2016).

[17] World Bank, *World Development Report 2019: The Changing Nature of Work* (Washington, D.C., 2019).

[18] World Bank, "The role of social protection systems in preparing for and responding to disasters", in *Proceedings from the 2018 Understanding Risk Balkans Conference*, Anne Himmelfarb, ed. (Washington, D.C., 2018).

[19] Ibid.

[20] Ibid.

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. Opportunities for action

47. The Asia-Pacific region is now in the fourth year of implementing the 2030 Agenda for Sustainable Development. Progress has been mixed. While the region has become an economic powerhouse, this has come at a great cost. According to evidence gathered for the *Asia and the Pacific SDG Progress Report 2019*, for the cluster of Sustainable Development Goals related to inequality and environmental degradation, the region is moving backwards. Furthermore, voluntary national reviews show that while the bottom 10 per cent income group in the region has doubled their income since 1980s, the pace of their income growth is slower than that of the middle 40 per cent and of the top 10 per cent, and much slower than the top 1 per cent income group. An important contributing factor with regard to these disparities is the impact of recurring disasters.

48. On 23 September 2019, the Secretary-General will host the Climate Action Summit in New York in order to accelerate action to implement the Paris Agreement. Nine tracks will be discussed at the Summit; track 6 is resilience and adaptation, which focuses on bringing adaptation action to a global scale through a fundamental shift in investments and behaviour as well as cross-sectoral commitment at the highest level. These concerted actions will go a long way towards achieving the Sustainable Development Goals in the Asia-Pacific region, given that 86 per cent of the average annual loss is due to hydro-meteorological disasters such as droughts, floods and cyclones.

49. While there are many outstanding challenges, the *Asia-Pacific Disaster Report 2019* includes highlights of the emerging opportunities for strengthened disaster resilience that include and empower all, wherever they are located on the riskscape. Action is required across three broad areas.

50. **Implement risk-informed policies and investments**. Implementing risk-informed policies and investments requires a focus on the poorest and most vulnerable, with interventions that increase inclusion and empowerment. Multiple policies must converge 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. Breaking this link requires transformative change. Including and empowering the most vulnerable across the riskscape requires a shift in the focus of disaster risk reduction from addressing only the disaster impacts towards a more coherent approach that addresses the drivers of disaster vulnerability. It will be important to guarantee risk-informed social protection, education and health services together with more disaster and climate resilient agriculture and infrastructure. The *Report* shows that of 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 sand and dust storm corridors where land degradation, climate change, and unsustainable land and water use converge to create large swaths of sand and dust storm corridors, disaster risk is closely linked with environmental vulnerability. In this case, policies and investments need to be focused on environmental protection and ecosystem restoration.

51. **Capitalize on new technologies**. Disaster risk reduction should be grounded in a seamlessly integrated system that comprises big data, risk analytics and digital identity. Also, it will be important to tailor the framework to address disaster response and resilience-building measures in an inclusive and participatory manner.

52. **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, the Committee on Disaster Risk Reduction established the Asia-Pacific Disaster Resilience Network, in 2017. The Network comprises three interrelated pillars, namely the regional platform for the multi-hazard early warning system, regional space applications for disaster risk reduction, and a regional hub of knowledge and innovation.

53. 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 implement disaster risk reduction actions. The Asia-Pacific Disaster Resilience Network can help countries in Asia and the Pacific to strengthen regional cooperation by promoting best practices and the use of innovative technologies and measures for smart resilience. At the national level, all ministries and departments should consider how they can work together in a more integrated way, to utilize new opportunities that identify the populations most at risk of disaster and to support and empower them in building sustainable and resilient livelihoods.

VII. Matters for consideration by the Committee

54. The Committee may wish to take the following actions:

(a) Comment on the findings and recommendations of the *Asia-Pacific Disaster Report 2019*, as summarized in the present document;

(b) Share insights into how the changing geography and intensification of disasters is manifesting at the national and local levels;

(c) Highlight experiences and lessons learned in dealing with the constantly changing dynamics of disaster risk;

(d) Consider calling on the Commission to scale up regional cooperation to complement national efforts in reducing disaster risks.