

**Economic and Social Commission for Asia and the Pacific****Eightieth session**

Bangkok, 22–26 April 2024

Item 4 (d) of the provisional agenda*

Review of the implementation of the 2030 Agenda for Sustainable Development in Asia and the Pacific and issues pertinent to the subsidiary structure of the Commission: disaster risk reduction**Scaling up the use of early warnings for preventive actions through the implementation of a regional strategy****Note by the secretariat***Summary*

According to the *Asia-Pacific Disaster Report 2023: Seizing the Moment – Targeting Transformative Disaster Risk Resilience*, existing risk hotspots are intensifying and new hotspots are emerging. In recognition of growing climate adaptation needs, the Economic and Social Commission for Asia and the Pacific, in its resolution 79/1, committed itself to take actions to combat climate change and its impacts and develop early warning systems for all at the regional level. Subsequently, the Committee on Disaster Risk Reduction, at its eighth session, requested that the secretariat facilitate the implementation of a regional strategy for early warnings in Asia and the Pacific.

In line with the above decisions, in the present document, the secretariat highlights the implementation activities for a regional strategy to address unmet needs of early warnings in multi-hazard risk hotspots across Asia and the Pacific. In addition, it sets out how a regional strategy could be used to scale up the implementation of the Executive Action Plan on Early Warnings for All, 2023–2027. Global models cannot effectively generate the data needed for forecasting at the national and local levels unless information value chains are seamlessly integrated through regional and subregional value chains, and it is at those levels where critical gaps remain for high-risk, low-capacity countries that are disproportionately affected by disasters and climate change. Activities undertaken by the secretariat at the national, regional and global levels in support of those objectives are also highlighted.

The Commission may wish to take note of the present document and provide further guidance on the work of the secretariat in that regard.

* ESCAP/80/1.

I. Introduction

1. Asia and the Pacific remains the region the most affected by disasters worldwide, and climate change-induced disasters pose an increasingly serious threat to the implementation of the Sustainable Development Goals in the region. In 2023, 145 disasters claimed the lives of more than 54,000 individuals, affected 47 million others and inflicted economic damages estimated at \$45 billion, or 0.12 per cent of regional gross domestic product (GDP).¹ However, both disaster fatalities and economic losses are unevenly distributed across the Asia-Pacific region, with the impact particularly consequential in the least developed countries.

2. As shown in the *Asia-Pacific Disaster Report 2023: Seizing the Moment – Targeting Transformative Disaster Risk Resilience*, the cost of inaction as measured by the average annual loss for the region is expected to increase from 2.9 per cent of regional GDP under the current climate scenario to 3.0 per cent of regional GDP under a warming scenario of 2°C above pre-industrial levels, with significant implications for key sectors such as agriculture and energy. To protect people and development gains, transformative adaptation that cuts across the whole of society, the economy and environmental management is needed. That includes investing in disaster and climate risk-informed adaptation and risk reduction strategies such as early warning systems, which are far more cost-effective than post-disaster response and recovery. The Economic and Social Commission for Asia and the Pacific (ESCAP) notes that the investments needed for transformative adaptation are estimated to be 0.49 per cent of regional GDP.² In addition, for risk-informed decision-making, there needs to be a better understanding of loss and damage in the region, supported by the use of innovations in digital technology.

3. Early warning systems in particular are a key adaptation measure that saves lives and livelihoods and minimizes loss and damage. Countries with limited to moderate early warning coverage have a disaster mortality ratio that is eight times higher than that of countries with substantial to comprehensive coverage. At the twenty-seventh session of the Conference of the Parties to the United Nations Framework Convention on Climate Change, held on 8 November 2022, the Secretary-General unveiled the Executive Action Plan on Early Warnings for All, 2023–2027, which is aimed at ensuring that everyone on the planet is protected by early warning systems within the next five years.

4. The strategic objective of the Executive Action Plan is to mobilize unmatched coordination and collaboration among diverse organizations and funding mechanisms to work collectively to achieve the shared objective. Achieving global coverage has presented substantial challenges. Despite a doubling in coverage since 2015, half of the world remains without access to crucial warning mechanisms. That discrepancy is especially pronounced in vulnerable regions, where gaps in risk knowledge, preparedness and the establishment of multi-hazard early warning systems persist. Internet and mobile connectivity issues impede timely alerts, and funding coordination

¹ Data on the numbers of lives lost or affected are from the Centre for Research on the Epidemiology of Disasters, EM-DAT: The International Disaster Database. Available at www.emdat.be (accessed on 24 January 2024). GDP data are from World Bank, World Bank Open Data database. Available at <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD> (accessed on 20 June 2023).

² *Asia-Pacific Disaster Report 2023: Seizing the Moment – Targeting Transformative Disaster Risk Resilience* (United Nations publication, 2023).

remains underutilized despite significant investments. Thus, in the Executive Action Plan, there is a call for new targeted investments of \$3.1 billion between 2023 and 2027.

5. Under the Executive Action Plan, which encompasses the four pillars of early warning (see figure I), the global-level implementation is as follows:

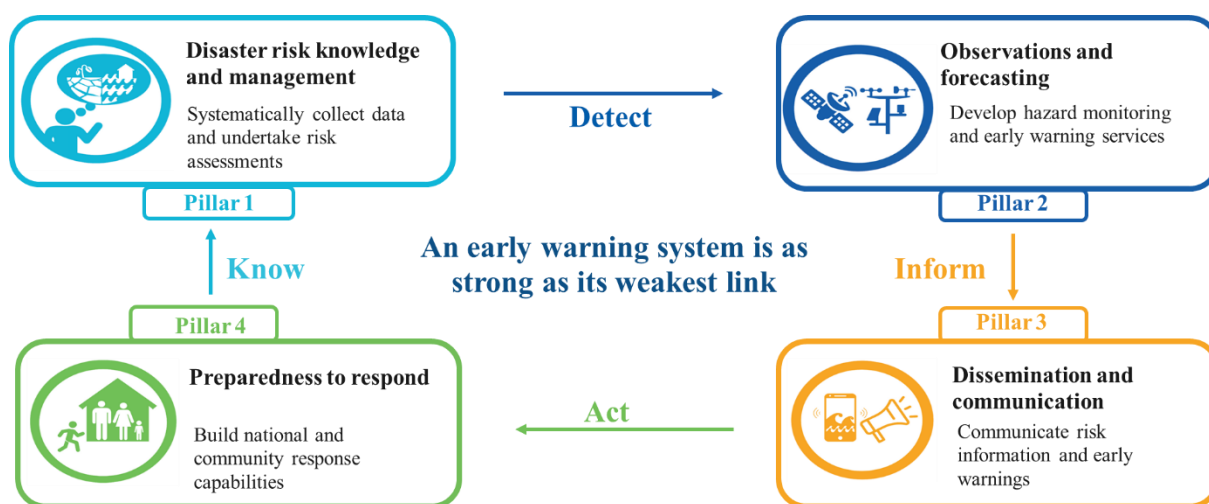
(a) Disaster risk knowledge and management (pillar 1), led by the United Nations Office for Disaster Risk Reduction;

(b) Observations and forecasting (pillar 2), led by the World Meteorological Organization (WMO);

(c) Dissemination and communication (pillar 3), led by the International Telecommunication Union;

(d) Preparedness to respond (pillar 4), led by the International Federation of Red Cross and Red Crescent Societies.

Figure I
Four pillars of an early warning system



Source: Based on Cyrille Honoré, “UN Early Warnings for All initiative”, presentation made at the ESCAP/WMO Typhoon Committee Integrated Workshop, Bangkok, 28 November 2023.

II. Early Warnings for All initiative in Asia and the Pacific

6. In 2023, the Group of 20 Working Group on Disaster Risk Reduction found that nowhere was the urgency to prioritize disaster risk reduction efforts more evident than in Asia and the Pacific.³ As temperatures continue to rise, new disaster hotspots emerge and existing risks intensify. More than 80 per cent of the population in the region is exposed to multiple hazards.⁴ Echoing the Secretary-General’s Early Warnings for All initiative, the

³ Group of 20 Working Group on Disaster Risk Reduction, “Early Warnings for All in Asia and the Pacific: opportunities for action”. Available at <https://g20drrwg.preventionweb.net/media/86863/download?startDownload=true> (accessed on 28 December 2023).

⁴ *Asia-Pacific Disaster Report 2023*.

Working Group listed the global coverage of early warning systems as priority 1.⁵

7. The outcome document of the Group of 20 Working Group on Disaster Risk Reduction, informed by the ESCAP “Compendium of multi-hazard early warning cooperation”, which had been launched at a side event for the meeting, contains a recommendation for the universal coverage of multi-hazard early warning systems to be enhanced and early and anticipatory action to be strengthened by promoting investment, taking into account the specific needs and contexts of different regions and employing a transboundary approach.

8. The Early Warnings for All initiative has recently entered the implementation phase, with planning and coordination, which are carried out by the four pillar leads and other implementing organizations, and practical on-the-ground execution. Of the 30 countries⁶ identified for fast-track implementation globally, 11 are in Asia and the Pacific. Selection was based on factors including existing programming, available funding, susceptibility to natural hazards and high-risk status (e.g. least developed countries, small island developing States and landlocked developing countries). In the region, the countries selected are Bangladesh, Cambodia, Fiji, Kiribati, the Lao People’s Democratic Republic, Maldives, Nepal, Samoa, Solomon Islands, Tajikistan and Tonga.

9. To support the operationalization of the Executive Action Plan at the regional level, in its resolution 79/1 ESCAP requested the Executive Secretary to encourage and collaborate with relevant United Nations bodies and specialized agencies, and regional and subregional organizations, as well as non-governmental organizations, to develop early warning systems for all at the regional level and support regional and subregional priorities to address climate-related challenges. In addition, the Committee on Disaster Risk Reduction, at its eighth session, recommended that the secretariat further develop a regional strategy to support the achievement of early warnings for all by 2027 by strengthening multi-hazard early warning systems in Asia and the Pacific in coordination with member States and relevant partners.⁷

III. Unmet needs for early warnings in multi-hazard risk hotspots across the subregions of Asia and the Pacific

10. In the report entitled *Global Status of Multi-Hazard Early Warning Systems: Target G*, WMO and the United Nations Office for Disaster Risk Reduction provide an analysis of the status of multi-hazard early warning systems, including a comprehensive analysis of the four elements of an early warning system, through their reporting mechanism on target G of the Sendai Framework for Disaster Risk Reduction 2015–2030.

11. In Asia and the Pacific, only 33 countries (57 per cent) have reported on the status of the availability of early warning systems, and only 15 countries have reported on all four target G indicators. The average composite score of

⁵ Group of 20 Working Group on Disaster Risk Reduction, “Roadmap”. Available at <https://g20drrwg.preventionweb.net/2023/g20-working-group-areas>.

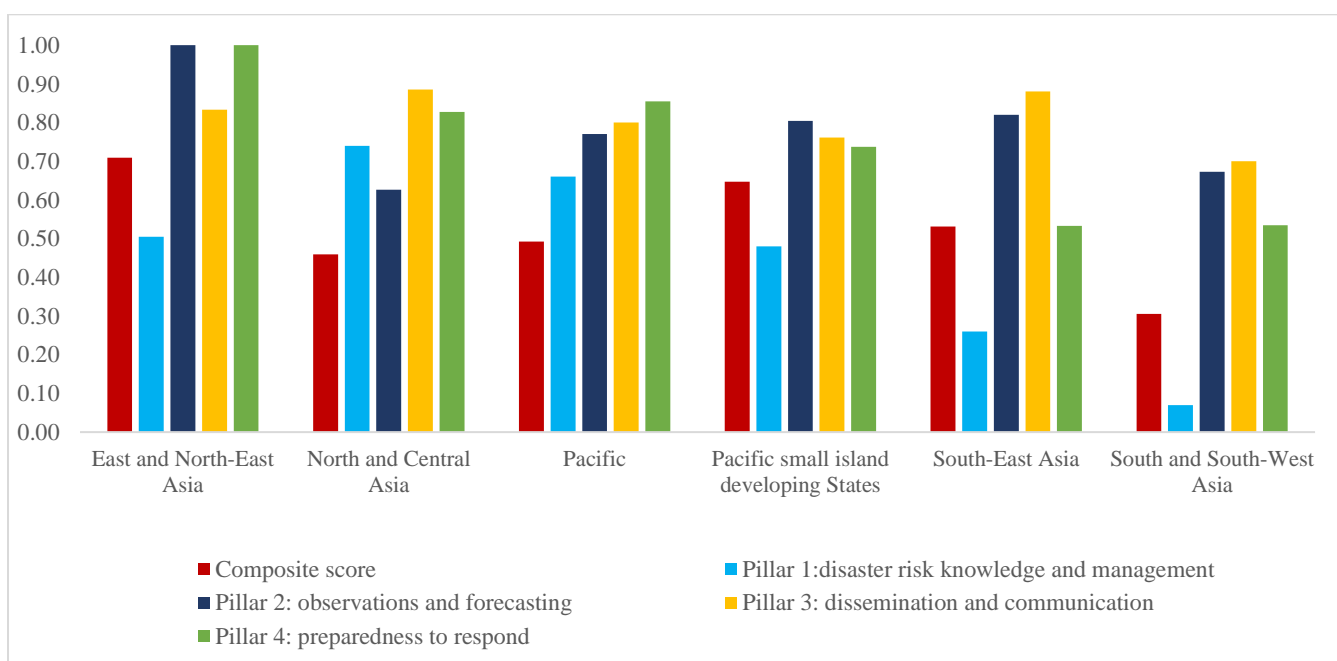
⁶ The countries are Antigua and Barbuda, Bangladesh, Barbados, Cambodia, Chad, the Comoros, Djibouti, Ecuador, Ethiopia, Fiji, Guatemala, Guyana, Haiti, Kiribati, the Lao People’s Democratic Republic, Liberia, Madagascar, Maldives, Mauritius, Mozambique, Nepal, the Niger, Samoa, Solomon Islands, Somalia, South Sudan, the Sudan, Tajikistan, Tonga and Uganda.

⁷ ESCAP/CDR(8)/6.

the 33 countries for target G, measuring the overall progress made towards having a multi-hazard early warning system, was 0.52 out of 1.⁸ A disaggregation of the target G scores by early warning system pillar shows the following: pillar 3 is the strongest in the region, where 31 countries reported on it with an average score of 0.81, followed by pillar 2 at 0.78 and pillar 4 at 0.75. However, the pillar that requires the most investment in the region is pillar 1. Only 17 countries reported on that indicator, with an average score of 0.47, which is significantly lower than that for the other pillars.

12. A further analysis of the report by WMO and the United Nations Office for Disaster Risk Reduction shows considerable gaps in early warning systems by subregion across Asia and the Pacific (see figure II). For example, in South and South-West Asia, six countries reported on target G. The reporting shows that the subregion has the lowest composite score, demonstrating the lowest coverage of multi-hazard early warning systems. The score for pillar 1 is particularly low compared with that for other subregions; however, that score is likely skewed, as only one country reported on that measurement. The strongest pillar in the subregion is pillar 3, and the highest number of countries reported on that indicator. Considering that approximately 50 per cent of the population of the subregion is affected by droughts, floods, heatwaves and surface winds,⁹ access to comprehensive multi-hazard early warning systems is critical.

Figure II
Target G scores in subregions in Asia and the Pacific



Source: ESCAP calculations based on data provided by the United Nations Office for Disaster Risk Reduction on 12 December 2023.

⁸ Explanation of weighting: 1 = comprehensive implementation; 0.75 = substantial implementation, additional progress required; 0.50 = moderate implementation, neither comprehensive nor substantial; 0.25 = limited implementation; 0 = no implementation or system does not exist. For further information, see United Nations Office for Disaster Risk Reduction, “Technical guidance for monitoring and reporting on progress in achieving the global targets of the Sendai Framework”, December 2017.

⁹ ESCAP/CDR(8)/4.

13. In North and Central Asia, seven countries reported on target G. Armenia reported on all four indicators, while Kyrgyzstan reported on three. Kazakhstan, the Russian Federation and Uzbekistan reported on pillars 3 and 4 only, but with scores of 1, the highest that can be reported. In the subregion, significant progress has been made by local and national governments in establishing adequate warning dissemination systems (pillar 3). Critical gaps remain, however, for pillars 1 and 2. Developing a multi-hazard early warning system that prioritizes droughts and heatwaves will be important, as will enhancing the capacity to monitor sandstorms and dust storms, which affect over one fifth of the population in the subregion.

14. Of the 11 countries in South-East Asia, only Indonesia, Malaysia, Myanmar, the Philippines and Thailand reported their target G score, with only Indonesia and Myanmar reporting on all four indicators in 2023. Of all the subregions, South-East Asia has the highest number of fatalities as a proportion of the population. One underlying cause may be the subregion's varying capacities under each of the early warning pillars, with notable gaps in providing disaster risk information at the national and local levels (pillar 1). However, the low rate of reporting on the implementation of the Sendai Framework makes it difficult to analyse subregional capacities.

15. Of the seven countries in East and North-East Asia, only Japan, Mongolia and the Republic of Korea reported their target G score. That represents the lowest response rate (43 per cent) of all subregions, which may mean that the average score does not accurately reflect the subregion as a whole. However, the subregion is best equipped in terms of multi-hazard early warning systems, thanks to strengths in local government planning (pillar 4) and observations and forecasting (pillar 2). Those efforts will need to be continued and further expanded, as 60 to 80 per cent of the subregion's population is heavily exposed to flooding and surface winds under the global warming scenarios at baseline and at 1.5°C and 2°C above pre-industrial levels.

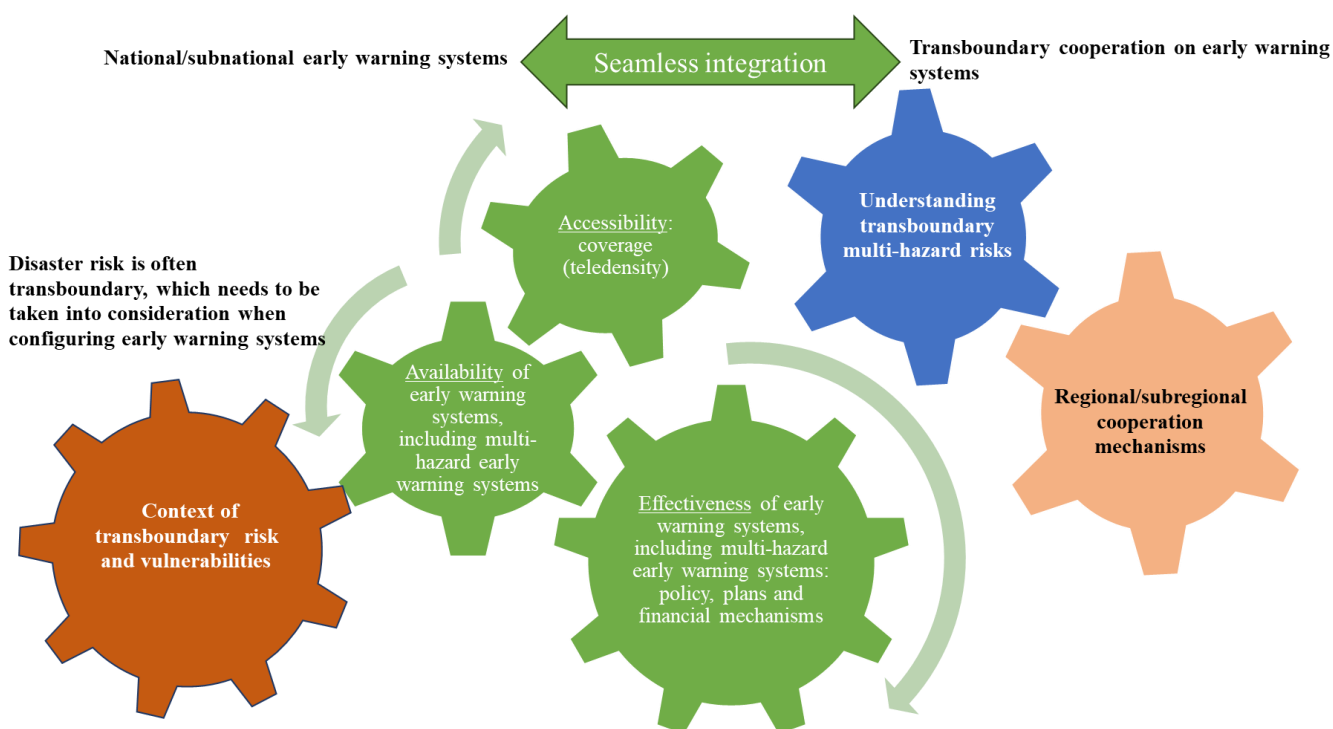
16. In the Pacific (including Pacific small island developing States), a total of 12 countries reported on the status of target G. While the subregion's average annual disaster-related GDP loss (8 per cent) is twice that of other subregions, the Pacific has achieved considerable improvements in its monitoring and forecasting systems (pillar 2), largely thanks to shared service modalities. There are major gaps, however, in disaster risk knowledge (pillar 1). For multi-hazard early warning systems to cover every person in the Pacific, tropical cyclone and flood early warning systems need to reach vulnerable populations (which account for 80 per cent of the total) in order to significantly reduce fatalities and the number of those affected by disasters.

17. Of the four pillars of early warning systems, pillar 1 is critical in the information value chain for supporting detection, information and action for the other pillars, while protecting people, livelihoods and assets. The significantly lower scores for the pillar across all subregions, and especially in small island developing States, least developed countries and landlocked developing countries, show the existence of a critical gap in early warning information value chains and should be urgently addressed to ensure the effectiveness of multi-hazard early warning systems and to develop a strategy for early warnings in the region.

IV. Regional strategy for Early Warnings for All

18. In Asia and the Pacific, the implementation of a regional strategy would strengthen national and transboundary capacity to address unmet needs in terms of the availability, accessibility and effectiveness of multi-hazard early warning systems in order to protect at-risk people and their livelihoods. While doing so, the regional strategy would rely on closing the gaps in information value chains, in particular for pillar 1, at global, regional, national and local levels. Because disaster risk often has cross-border origins and impacts, multi-hazard early warning systems that seamlessly integrate information value chains must be configured at all levels in the framework of transboundary cooperation for early warning systems. Built on the understanding of shared risks and vulnerabilities, effective early warning systems across Asia and the Pacific can be enabled and amplified through regional and subregional cooperation mechanisms (see figure III).

Figure III
Regional strategy for multi-hazard early warning systems



Source: ESCAP, Information and Communications Technology and Disaster Risk Reduction Division, 2024.

19. For example, the ESCAP/WMO Typhoon Committee and the WMO/ESCAP Panel on Tropical Cyclones were established more than 50 years ago to save lives and reduce economic damage from transboundary tropical cyclone events through regular and coordinated subregional cooperation to build resilience (see box 1). Another example of a strategic regional and multilateral approach to early warnings is the Regional Integrated Multi-hazard Early Warning System for Africa and Asia (see box 2).

20. The regional strategy on early warning systems should support all the pillars of those systems, with a focus on establishing information value chains, building national capacities by investing in digital and geospatial innovations for multi-hazard early warning systems, and strengthening existing

mechanisms, such as the ESCAP multi-donor trust fund for tsunami, disaster and climate preparedness.

Box 1

Regional strategy of the WMO/ESCAP Panel on Tropical Cyclones and ESCAP/WMO Typhoon Committee

Cyclones Mocha and Biparjoy

The WMO/ESCAP Panel on Tropical Cyclones and the ESCAP/WMO Typhoon Committee established a regional strategy on early warning systems covering the common areas of the Indian and Pacific Ocean basins. They are associated with the Tropical Cyclone Programme of WMO. Those intergovernmental platforms have served to successfully track and monitor countless tropical cyclones from formation to landfall through cross-border collaboration involving real-time data-sharing and risk information exchange. The platforms played a role in early warning in connection with two recent cyclones and Pacific typhoons, highlighting their effectiveness in improving outcomes.

On 14 May 2023, Cyclone Mocha hit the Bay of Bengal, making landfall in Myanmar close to the border with Bangladesh. With sustained winds of 180–190 km per hour, violent gusts, torrential rainfall and flooding, the cyclone made landfall in a most vulnerable context, compounding poverty, inequality and environmental degradation. However, the impact differed significantly from the devastation caused by Cyclone Nargis in 2008, a storm as powerful as Cyclone Mocha, which had resulted in the loss of over 138,000 lives in Myanmar.

After forming over the Arabian Sea, Cyclone Biparjoy, with wind speeds of 140 km per hour, made landfall on 16 June 2023 in densely populated Gujarat State in India, close to the border with Pakistan. No deaths were recorded.

The experiences of the Mocha and Biparjoy cyclones exemplify the power of pinpoint accuracy of early warnings, which triggered the timely evacuation of tens of thousands of at-risk communities. The Regional Specialized Meteorological Centre, based in New Delhi, monitors cyclones across the Northern Indian Ocean and collaborates with the WMO/ESCAP Panel on Tropical Cyclones to provide early warning products and services relating to tropical cyclones with transboundary origins and impacts.

Pacific typhoons in 2023

Regionally coordinated action among the member countries of the ESCAP/WMO Typhoon Committee helped to mitigate the impacts of strong typhoons in the Western Pacific (namely, Sanvu, Mawar, Doksuri, Talim and Bolaven) in 2023. Similarly, the WMO Regional Association V Tropical Cyclone Committee for the South Pacific and South-East Indian Ocean carried out specialized activities for the analysis, tracking and forecasting of severe tropical cyclones in the South Pacific (namely, Judy and Kevin). Regional specialized meteorological centres based in Tokyo and in Nadi, Fiji, monitor cyclones across the North-West Pacific and the South Pacific, respectively. Both collaborate with member countries of the ESCAP/WMO Typhoon Committee and the WMO Regional Association V Tropical Cyclone Committee for the South Pacific and South-East Indian Ocean to provide early warning products and services relating to typhoons with transboundary origins and impacts.

Box 2

Regional Integrated Multi-hazard Early Warning System for Africa and Asia

The Regional Integrated Multi-hazard Early Warning System for Africa and Asia, established with the support of the ESCAP multi-donor trust fund for tsunami, disaster and climate preparedness, is an intergovernmental institution administered by its member States. It is an early warning system aimed at generating and communicating information and at capacity-building.

While the Regional Integrated Multi-hazard Early Warning System has built its own institutional capacities, it benefits from surplus, quality computing facilities in India (under the Ministry of Earth Sciences) and the European Centre for Medium-Range Weather Forecasts. Yet another important role that it has been playing is to convey the observations made by global institutions and organizations to national and/or local networks and vice versa, especially in low-capacity developing countries, least developed countries and small island developing States, which are often missed in the WMO Global Telecommunication System.

An early product of the platform was a 1-to-10-day flood forecasting system for Bangladesh, created in 2007 by the European Centre for Medium-Range Weather Forecasts and other parties. In an effort to boost regional capacity, responsibility for the flood forecast modules was transferred to the Bangladesh Flood Forecasting and Warning Centre in 2009. However, the large volume of data generated by those modules proved to be too difficult for the Centre to handle. As a result, responsibility was transferred to the Regional Integrated Multi-hazard Early Warning System to improve the time range of forecasts to 10 to 15 days for the basin of three major rivers, namely, the Ganges, the Brahmaputra and the Jamuna. Special efforts were made to reach communities: voice message broadcasting tools were used, often to overcome literacy barriers, and agrometeorological and livestock advisories were issued. More than 50,000 Bangladeshi beneficiaries received advisories through the platform.

During monsoon flooding in 2020, a 15-day flood forecast system, part of the Regional Integrated Multi-hazard Early Warning System, proved its efficacy. Flooding was successfully detected 14 days ahead, and a post-monsoon assessment carried out in the flood-affected areas revealed that more than 97 per cent of the beneficiaries had received forecast-based advisories through the System. With a lead time of more than five days to protect themselves and their resources, most of the population had been able to take early action. For example, people had been able to move their cattle to a safer area or to stop planting certain types of seeds before the flooding.

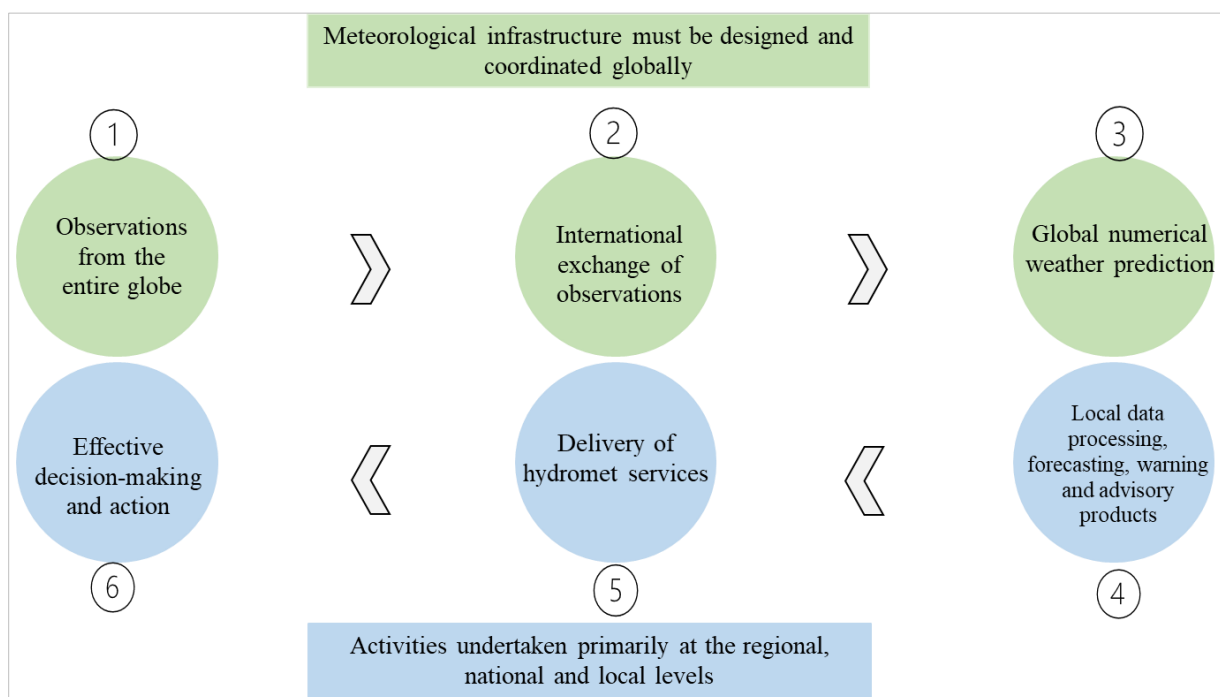
Owing to the high demand for services spanning the full early warning system value chain, membership in the Regional Integrated Multi-hazard Early Warning System has steadily increased, from 10 member countries from Asia in 2008 to 48 member countries and collaborating States across Asia, the Pacific and Africa, most of which are least developed countries, small island developing States and high-risk developing countries.

A. Information value chains of multi-hazard early warning systems

21. Weather and climate services generated by a meteorological value chain and the effectiveness of early warning systems depend on all links working seamlessly. The first three links in the value chain constitute the global meteorological infrastructure and rely on a global collaborative approach. In contrast, the last three links are typically implemented nationally (see figure IV for the six links). In addition to a prediction horizon of 24 to 36 hours, global

observational data and global models are needed to underpin predictions in any location. The global-to-local link in early warning systems is especially critical not only for addressing transboundary hazards and achieving economies of scale but also for ensuring that at-risk communities are reached. That is where the regional and subregional levels of the global-to-local early warning information value chain assume particular significance. Moreover, it is at those levels where there are critical gaps in high-risk countries with low capacity, small island developing States, least developed countries and landlocked developing countries.¹⁰ Global models cannot effectively generate the data needed for forecasting at the national and local levels unless information value chains are seamlessly integrated through regional and subregional value chains. All countries therefore share an interest in the first three links in the chain, while the last three are mostly managed individually.

Figure IV
Meteorological value chain



Source: Adapted from Alliance for Hydromet Development, *Hydromet Gap Report 2021* (Geneva, 2021).

22. To close the gaps in the information value chain, a regional strategy must include state-of-the-art information from the technical platforms of key stakeholders. For example, regional climate outlook forums are platforms that bring together climate experts and sector representatives from countries in a climatologically homogeneous region. Those forums provide consensus-based climate predictions and information with input from global, regional and national meteorological and hydrological services, with the aim of gaining substantial socioeconomic benefits in climate-sensitive sectors.¹¹ With regional and subregional strategies in place, the forums have become one of the vehicles for developing user-driven products and services and communicating them to users at the regional and national levels. In total, 19 such forums are regularly held in many parts of the world, serving mainly developing and least developed countries. Forums in Asia and the

¹⁰ Alliance for Hydromet Development, *Hydromet Gap Report 2021* (Geneva, 2021).

¹¹ WMO, *Regional Climate Outlook Forums* (Geneva, 2016).

Pacific include the Association of Southeast Asian Nations (ASEAN) Climate Outlook Forum, the East Asia Winter Climate Outlook Forum, the Forum on Regional Climate Monitoring, Assessment and Prediction for Asia, the North Eurasian Climate Outlook Forum, the Pacific Islands Climate Outlook Forum and the South Asian Climate Outlook Forum.

23. Beyond having to cope with gaps in the information value chain related to climate hazards, many countries also face gaps across the information value chain with regard to geophysical and seismic hazards. Taking into account the success of the transboundary tsunami warning systems that were established to cover the Indian and Pacific Ocean basins, a similar approach may also be considered to strengthen the mitigation of earthquake impacts. As a result of smartphone technology increasing the density of seismic observation networks, earthquake warning systems have advanced to be able to provide citizens with life-saving alerts just seconds before a catastrophic earthquake event. Similarly, in an effort to minimize economic damage, many countries now employ automated shutdowns of industrial and other activities, which are triggered by seismic activity of a certain magnitude. A reinvigorated transboundary effort to advance earthquake detection and alert systems would prove catalytic in reducing fatalities and economic losses due to earthquakes across the region, especially in those countries with high seismic risk and low capacity.

24. The Pacific subregion has proactively adopted a subregional strategy. Strong political support for a more inclusive and actionable multi-hazard early warning system was mobilized at the Asia-Pacific Ministerial Conference on Disaster Risk Reduction, the Pacific Ministerial Meeting on Meteorology, and the 2050 Strategy for the Blue Pacific Continent. The Weather Ready Pacific programme serves as the key strategy to further strengthen multi-hazard early warning systems in the subregion, with close collaboration among partners in the Early Warnings for All initiative, as well as regional stakeholders and Pacific Governments (see box 3).

25. To further secure investments in the global and regional information value chain, it is essential to translate early warnings into effective decision-making and action at the local level. In that regard, anticipatory action is taken ahead of an anticipated disaster in an attempt to minimize disaster impacts. In order to carry out anticipatory action, it is necessary to have access to reliable risk information, accurate forecasts and established early warning systems. At the regional level, the Asia-Pacific Technical Working Group on Anticipatory Action, of which ESCAP is a member and which is co-led by the Food and Agriculture Organization of the United Nations and the International Federation of Red Cross and Red Crescent Societies, is a key regional partnership for evidence-based information-sharing, standard setting,¹² joint coordination and advocacy to address gaps in early warning systems through anticipatory action at the local level. At the subregional level, South-East Asia has emerged as a frontrunner in the fields of drought management and anticipatory action. At the thirty-seventh ASEAN Summit, held in 2020, ASEAN member States adopted the ASEAN Declaration on the Strengthening of Adaptation to Drought. That milestone paved the way for the development of the ASEAN Regional Plan of Action for Adaptation to Drought 2021–2025, along with renewed commitments to create similar action plans at the national level. Building on those efforts, the ASEAN Framework on Anticipatory

¹² For information on technical standards, see Asia-Pacific Technical Working Group on Anticipatory Action, *Technical Standards on Anticipatory Action in Asia and the Pacific* (Bangkok, 2023).

Action in Disaster Management was launched in 2022, creating a favourable policy environment for transforming the subregion’s approach to drought management from a reactive to a more proactive and preventive stance, thus enhancing drought resilience in the subregion. Working through the Asia-Pacific Technical Working Group on Anticipatory Action and in close partnership with the Food and Agriculture Organization of the United Nations and WMO, the secretariat has been supporting ASEAN to align concrete actions between the ASEAN Regional Plan of Action for Adaptation to Drought 2021–2025 and the ASEAN Framework on Anticipatory Action for Disaster Management. During the joint regional workshop held in December 2023, with the theme “Bracing for El Niño: getting ready for dry years in ASEAN countries with enhanced early warnings and anticipatory action”, ASEAN member States supported the development of a comprehensive El Niño anticipatory action vision. Some of the key aspects included enhancing risk information, early warning and forecasting systems, improving the design and delivery of anticipatory actions and streamlining pre-arranged financing.

Box 3

A distinct subregional approach for implementing the Early Warnings for All initiative in Pacific small island developing States

Five countries in the Pacific, namely, Fiji, Kiribati, Samoa, Solomon Islands and Tonga, are among the initial 30 countries to receive targeted support under the global roll-out of the Early Warnings for All initiative.

The roll-out of the Early Warnings for All initiative in the Pacific will be implemented differently than in other subregions, as there are already early warning system programmes, initiatives and frameworks in place or under development at the subregional level. The Weather Ready Pacific programme^a was endorsed by Pacific leaders in 2021 and its implementation plan was presented for adoption at the Pacific Islands Forum Leaders Meeting in November 2023. In addition, at the sixth Pacific Meteorological Council meeting, held in August 2023, Pacific ministers responsible for meteorological services adopted the Namaka Declaration,^b in which they concluded that the Weather Ready Pacific programme would be the key vehicle for Early Warnings for All delivery in the Pacific.

It is key for global early warning system initiatives to be aligned with initiatives at the regional and subregional levels. Pacific pillar leads are helping to shape how Early Warnings for All can complement and supplement activities being carried out under the Weather Ready Pacific programme. The roll-out of the Weather Ready Pacific programme at the national level is likely to start in April or May 2024. Meanwhile, there have been numerous assessments, stakeholder mappings and consultations related to the status of national early warning systems, gaps and needs, including those reported on in the *Asia-Pacific Disaster Report 2023*, the *Asia-Pacific Disaster Report 2022: Pathways to Adaptation and Resilience in Pacific SIDS* and the *Global Status of Multi-Hazard Early Warning Systems*, that refer to target G-3 of the Sendai Framework.

Source: United Nations Office for Disaster Risk Reduction and WMO, *Global Status of Multi-Hazard Early Warning Systems, 2023* (Geneva, 2023).

^a For further information, see Pacific Meteorological Council, “Weather Ready Pacific”. Available at www.sprep.org/sites/default/files/30-SPREP-Meeting/Officials/Eng/WP_8.1.2.Att_1-Overview-Weather_Ready_Pacific_Decadal_Program_Investment.pdf.

^b See www.pacificmet.net/sites/default/files/inline-files/documents/ENDORSED-Namaka_Declaration-PacificMinistersMeeting_Meteorology.pdf.

B. Building national capacities by leveraging digital innovations for multi-hazard early warning systems

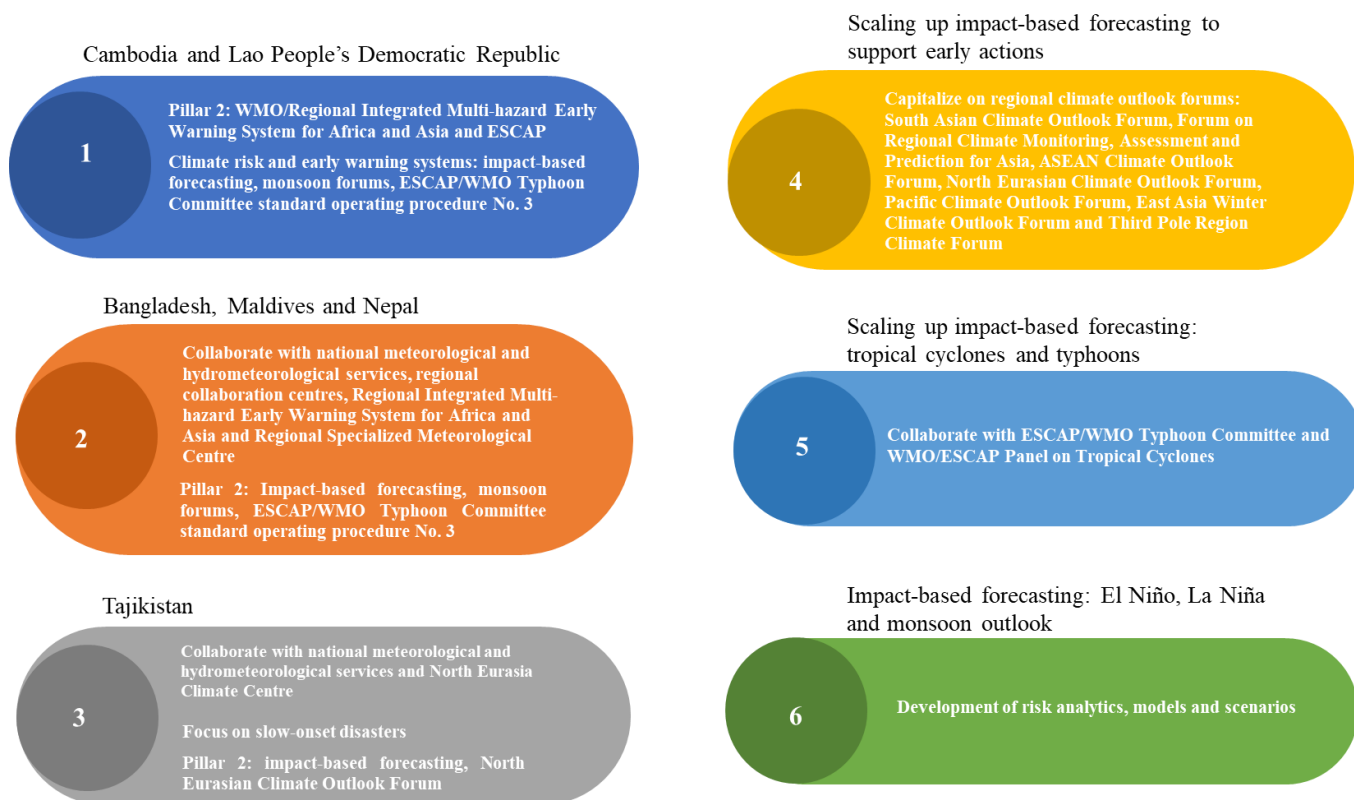
26. Digital technologies and data science provide transformational opportunities to leverage innovations for people-centred, end-to-end multi-hazard early warning systems. In particular, data ecosystems and the scaling up of digitalization can strengthen the inclusivity of early warning products and services and better ensure delivery to at-risk communities living in risk hotspots.

27. The Risk and Resilience Portal, for example, has emerged as a powerful tool to address critical gaps in early warning system components, in particular with regard to pillars 1 and 2. Equipped with the latest data from Coupled Model Intercomparison Project 6, the Portal offers a unique way to visualize current and future climate scenarios at baseline and at 1.5°C and 2°C above pre-industrial levels. Through the Portal, risk hotspots can be identified and a multi-hazard risk profile for the region is provided. Such foresight is crucial for understanding the evolving risks of floods, droughts, heatwaves and tropical cyclones, allowing for early warnings in a changing hazard landscape and thus triggering anticipatory actions. In addition, in the context of pillar 2, the Portal supports the forecasting component of early warning systems through its impact-based forecasting methodology. That methodology provides a deeper understanding of forecast impacts on socioeconomic variables and specific sectors, thus also enhancing the effectiveness of early warnings.

28. Those analytics have supported the implementation of early warning elements, including in Maldives. Small island developing States face challenges in disaster risk knowledge and in determining hazard and climate risks owing to the coarseness of global data sets. In conjunction with the Asia-Pacific Climate Change Adaptation Information Platform, the Portal's analytical and visualization framework was used, in support of an effort to downscale climate projection data to a 5-km grid, to provide impact analysis that could serve as an early warning system tailored to local conditions. The Portal can also be used to identify hotspots, assess the vulnerability of climate-sensitive sectors and provide adaptation solutions for multiple climate scenarios.

29. ESCAP, with the support of the relevant resident coordinators, participated in and contributed to all the national consultations held in 2023 for the country roll-outs in Bangladesh, Cambodia, the Lao People's Democratic Republic, Maldives, Nepal and Tajikistan. It also plans to contribute to the roll-outs in the Pacific in 2024. Driven by its regional strategy, the secretariat provided technical support that was channelled through six strategic actions (see figure V). Furthermore, following the template used in Maldives, the secretariat is working with the relevant global leads, United Nations country teams and national-level agencies to complement and address the gaps in disaster risk knowledge (pillar 1) and impact-based forecasting (pillar 2). In addition, the secretariat is developing tools and methodologies and providing decision-making support for the impact-based forecasting of transboundary hazards such as El Niño, La Niña and the Asian monsoon.

Figure V
Technical support provided by the secretariat for six strategic actions in the roll-out of the Early Warnings for All initiative



Source: ESCAP, Information and Communications Technology and Disaster Risk Reduction Division, 2024.

C. Geospatial innovations

30. Geospatial innovations, driven mainly by emerging digital technologies and the increased availability of big Earth data as analysis-ready data through data cubes, also present new opportunities for countries to improve all components of multi-hazard early warning systems. To date, nearly 300 good practices from over 30 countries and territories captured in the ESCAP Geospatial Good Practices Database and Dashboard,¹³ an online regional knowledge-sharing platform, demonstrate how space applications, geospatial information and digital innovations are already being used in countries to support disaster risk reduction and resilience-building.

31. In follow-up to ESCAP resolution 79/9 on the implementation of the Jakarta Ministerial Declaration on Space Applications for Sustainable Development in Asia and the Pacific, the secretariat, in collaboration with partners, is demonstrating the operational applications of digital innovation, such as using large language models in geospatial data analysis to enhance the accuracy and timeliness of flood risk assessments and early warnings. A prototype flood-risk mapping tool has been developed to provide historical and near-real-time assessments of flood-affected areas. Furthermore, the secretariat, through the Subregional Office for South-East Asia, organized a three-part webinar series to provide the most up-to-date information on the

¹³ For more information, see www.unescap.org/our-work/ict-disaster-risk-reduction/geospatial-good-practices-database-and-dashboard.

ongoing 2023 El Niño/Southern Oscillation, which is potentially among the top five strongest El Niño on record.

32. In addition, a 10-hour open online course entitled “Introduction to geospatial data analysis with ChatGPT and Google Earth Engine” was rolled out in December 2023 to build the capacity of participants to use large language models for flood risk hotspot mapping, covering both physical and socioeconomic dimensions. As at the end of December 2023, 2,000 participants from 110 countries were participating in the course. In collaboration with the Subregional Office for North and Central Asia, the secretariat demonstrated the various applications of that new capability for early warning systems in Central and South-East Asia, with support from China, India, Indonesia, Japan, Kyrgyzstan, the Philippines, the Republic of Korea, the Russian Federation and Thailand, as well as the United Nations Satellite Centre. In 2023, the Central Asia drought information system in Kyrgyzstan was operationalized. The cloud-based platform leverages big Earth data, cloud computing and geospatial information to significantly improve drought monitoring and management in countries in Central Asia.

33. In 2024, the secretariat will continue working with the United Nations University, the United Nations Satellite Centre and other partners in Asia-Pacific countries to develop operational tools to improve early warning systems, in particular in high-risk developing countries, least developed countries and small island developing States on the front lines of climate change.

D. Funding a regional strategy: ESCAP multi-donor trust fund for tsunami, disaster and climate preparedness

34. In addition to channelling the necessary funds to the local and national levels to achieve early warnings for all, countries must ensure that there are pooled funds dedicated to realizing regional and subregional early warning system solutions in Asia and the Pacific. Acknowledging that the approach to regional cooperation has been successful in meeting the requirements for regional early warning systems, the Committee on Disaster Risk Reduction, at its eighth session, encouraged members and associate members to make financial and in-kind contributions to the ESCAP multi-donor trust fund for tsunami, disaster and climate preparedness as a means of accelerating efforts to achieve early warnings for all in Asia and the Pacific. As the only regional funding mechanism supporting shared learning on disaster preparedness in the region, the trust fund is uniquely positioned to serve as a catalyst for action in the region to advance early warnings for all by 2027 and build transboundary synergies.

35. Almost 20 years after the Indian Ocean tsunami struck, ESCAP, through the trust fund, is continuing to mobilize support to implement a regional strategy to achieve early warnings for all. At the twenty-fifth meeting of the advisory council on the trust fund, members commissioned two strategic studies to further collective learning about investments in early warning systems.

36. The first study, to be carried out in collaboration with the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization, will be a tsunami preparedness capacity assessment encompassing the Indian and Pacific Oceans. The progress made in tsunami warning systems during the last 20 years will be highlighted, and technical and policy gaps in tsunami

preparedness will be identified. The second study will compose a review to seek to evaluate and quantify the socioeconomic benefits of 20 years of investments in early warning systems through the funding mechanism. The findings of both studies will be used to anchor a new strategic framework for the trust fund for 2025–2030, to be launched at an event commemorating 20 years since the Indian Ocean tsunami. The strategic framework will be centred on the implementation of a regional strategy on early warnings for all, will build on over 18 years of achievements and learning, and will be aimed at continuing to address, through regional cooperation, unmet needs relating to multi-hazard early warning systems.

V. Issues for consideration by the Commission

37. It is critical to ensure that everyone is covered by early warning systems by 2027 in multi-hazard risk hotspots of Asia and the Pacific, especially those in high-risk developing countries, least developed countries, landlocked developing countries and small island developing States. The Commission may wish to take note of the present document and provide further guidance on the work of the secretariat, including with regard to the following:

(a) Implementation of a regional strategy on the operationalization of early warnings at the country, subregional and regional levels;

(b) Scaling up investments in the early warning value chain, notably through the ESCAP multi-donor trust fund for tsunami, disaster and climate preparedness, under the new strategic framework for 2025–2030.
