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ENHANCING REGIONAL COOPERATION ON DISASTER RISK REDUCTION IN ASIA AND THE PACIFIC: EARLY WARNING AND PREPAREDNESS AT THE COMMUNITY LEVEL

(Item 5 (b) of the provisional agenda)

Note by the secretariat

SUMMARY

Despite the increasing accessibility of data, information, knowledge and expertise, such information has not yet effectively reached those who need it the most. This is especially true among least developed countries and small island developing States. The United Nations Global Survey noted significant inadequacies in existing early warning systems among least developed countries in terms of basic capacities of equipment, skills and resources.

In this context, the purpose of the present report is to examine the current status of community-level, people-centered early warning and assess global, regional and national efforts to put in place enabling policy and institutional frameworks for early warning as part of the implementation of the Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters in Asia and the Pacific. The report focuses on Pacific island countries, given their vulnerability to various natural disasters and limited communication infrastructure development. The report concludes with issues the secretariat wishes to bring to the attention of the Committee for consideration.

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Introduction

1. In the Global Survey of Early Warning Systems (A/C.2/61/CRP.1) prepared at the request of the Secretary-General in 2006 (see A/59/2005), and its associated meeting,[1] the key role that early warning systems have played in reducing casualties from disasters was reiterated.[2] Survey results showed, among other things, that early warning technologies are available for almost all types of hazards, and are in operation in most parts of the world. In some locations, useful forecasts or nowcasts are possible even for hazards such as flash floods and climate impacts.

2. This reflects the significant progress made in the availability of data, information and knowledge on disasters at the regional and global levels to anyone who has the relevant knowledge as to where to gain and connect to this information. For instance, operational storm tracking, watches and warnings are largely available from the Asia-Pacific Centre for Emergency and Disaster Information.[3] Weather forecasts from around the world can be found through portals such as that of the World Meteorological Organization (WMO).[4] Climate forecasts are available from Columbia University[5] and the National Oceanic and Atmospheric Administration (NOAA)[6] of the United States of America. Tsunami warnings are issued by the Pacific Tsunami Warning Center.[7] NOAA also provides volcanic ash warnings (of eruptions that can put aircraft at risk).[8] Earthquake information is available at the

[1] The meeting (www.ewc3.org) was attended by about 1,250 participants from 132 countries; about one third of the members and associate members of ESCAP sent official delegations to the meeting.

[2] Modern early warning systems might be considered to have begun with the advent of satellite meteorology in 1960, and the advent of the World-Wide Standardized Seismic Network in 1961.

[3] www.afap.org/apcedi/.

[4] http://worldweather.wmo.int/.

[5] http://iri.columbia.edu/climate/forecast/net_asmt/.

[6] www.cpc.noaa.gov/pacdir/ NCCA1.shtml.

[7] www.prh.nws.gov/ptwc.

[8] www.ssd.noaa.gov/VAAC/.

United States Geological Survey[9] and the European-Mediterranean Seismological Centre.[10]

3. Since the Indian Ocean earthquake-tsunami of 26 December 2004, considerable progress has been made in South-East Asia with regard to sharing seismological and other data in globally harmonized reporting archives. The tsunami warning systems of Australia, India and Thailand are being equipped with world-class computational, communication and technical support facilities,[11] although the maintenance and delivery of accurate data and information appears to be a challenge.[12]

4. Despite the increasing accessibility of data, information, knowledge and expertise, it is clear that, in many cases, such information has not yet effectively reached those who need it most, nor has it been maximized to mitigate disaster risk or to ensure preparedness to response to an early warnings. This is especially true among least developed countries and small island developing States. The Global Survey noted significant inadequacies of early warning systems in least developed countries with regard to basic equipment, skills and resources.

5. As illustrated in other background documents prepared for the Committee on Disaster Risk Reduction at its first session, the number of recorded natural disasters is on the rise and a significant number of people remain at risk. Disasters still cause significant casualties, economic and social damage, and disrupt development efforts in the region.

6. As part of the recommendations arising from the Global Survey, regional commissions and organizations concerned with disaster reduction, preparedness and early warning were called upon "to foster partnerships and prepare strategies and plans to support the development of early warning systems in their regions" (see A/C.2/61/CRP.1).

7. In the present document, the secretariat examines the current status of community-level, people-centered early warning and assesses global, regional and national efforts to put in place enabling policy and institutional frameworks for early warning as part of the implementation of the Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters[13] in Asia and the Pacific. The need for attention to the Pacific island countries as a result of their vulnerability to various natural disasters and limited communication infrastructure development is highlighted (see also E/ESCAP/CICT/1). Issues are raised for consideration by the Committee.

I. THE CURRENT STATUS OF EARLY WARNING

8. People-centered early warning is at the heart of the Hyogo Framework for Action. One of the objectives set out at the World Conference on Disaster Reduction in 2005 is "to increase the reliability and availability of appropriate disaster-related

[9] http://earthquake.usgs.gov/eqcenter/ recenteqsww/Quakes/quakes_all.php.

[10] www.emsc-csem.org/index.php?page=home.

[11] Shailesh Nayak and T. Srinivasa Kumar, "The first tsunami early warning centre in the Indian Ocean", in *Know Risk* (International Strategy for Disaster Reduction, 2005).

[12] The first Indian Ocean Deep-ocean Assessment and Reporting of Tsunami (DART) buoy station, operated by Thailand, is behind on its routine maintenance, while the second such station, operated by Indonesia, was not delivering data at the time of writing, as it was reportedly damaged in March 2008. (www.phuketgazett.net/news/index.asp?id=6727 and www.angkor.com/2bangkok/2bangkok/forum/showthread.php?p=22582). DART data are available at www.ndbc.noaa.gov/dart.shtml.

[13] A/CONF.206/6 and Corr.1, chap.1, resolution 2.

information to the public and disaster management agencies in all regions". Accordingly, one of the strategic goals listed in the Framework is "the development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards".

9. Broadly, the Framework recommends the inclusion of various considerations, such as a gender perspective, cultural diversity, age, and vulnerable groups, in the planning for disaster risk reduction. In particular, it contains a recommendation that "both communities and local authorities should be empowered to manage and reduce disaster risk by having access to the necessary information, resources and authority to implement actions for disaster risk reduction", with particular attention on disaster-prone developing countries, especially least developed countries and small island developing States. Five key areas of action were identified, including one addressing, among other things, early warning.

Figure 1. The four elements of people-centred early warning

RISK KNOWLEDGE Systematically collect data and undertake risk assessments **• Are the hazards and the vulnerabilities well known?** **• What are the problems and trends in these factors?** **• Are risk maps and data widely available?**	MONITORING AND WARNING SERVICE Develop hazard monitoring and early warning services **• Are the right parameters being monitored?** **• Is there a sound scientific basis for making forecasts?** **• Can accurate and timely warnings be generated?**
DISSEMINATION AND COMMUNICATION Communicate risk information and early warnings **• Do warnings reach all of those at risk?** **• Are the risks and the warnings understood?** **• Is the warning information clear and usable?**	RESPONSE CAPABILITY Build national and community response capabilities **• Are response plans up to date and tested?** **• Are local capacities and knowledge made use of?** **• Are people prepared and ready to act on warnings?**

Source: International Strategy for Disaster Reduction platform for the promotion of early warning.

10. The International Strategy for Disaster Reduction (ISDR) has defined the four elements of people-centered early warning systems (see figure 1). The Global Survey found that warning dissemination and preparedness to respond were the weakest element in early warning systems, caused by inadequate political commitment, weak coordination among various actors and lack of awareness and participation of the public. One of the gaps identified in the report in the context of monitoring of warning services was inadequate communication systems to provide timely, accurate

and meaningful forecasting and early warning information down to the level of communities.

11. This lack of access to information and communications technology (ICT) and connectivity is a major bottleneck in establishing end-to-end early warning systems in many parts of the world, including Asia and the Pacific. One report noted that the people most vulnerable to natural hazards tend to live in remote areas without reliable and extensive connectivity.[14] Gaps in ICT access and connectivity also prevent national disaster management agencies from receiving and analysing data and information made available by international and regional initiatives and networks. Accordingly, the development of ICT, in particular the new terrestrial and space-based wireless technologies, would help expand the reach of and analytical capabilities for disaster management efforts. Such ICT access at the community level should be linked to non-technical, institutional last-mile arrangements.

12. In this context, the present document focuses on how to enhance warning dissemination and preparedness as pivotal elements in more effective early warning at the community level, with particular attention to least developed countries and small island developing States. A status report, based on the reports submitted to the World Conference on Disaster Reduction, lists some of the progress members of ESCAP have made towards the achievement of the Hyogo Framework for Action objectives in the region, including the adoption of good practices.[15] While efforts in the area of early warning systems have been made by various key players, the report noted that member States usually focus those efforts on the most severe hazards faced by countries. Also, such hazards may be focused on separately by discipline-specific agencies (storms by meteorological departments, earthquakes by some other bodies). Thus, a comprehensive, end-to-end warning system is often lacking. Such a warning system could link global and regional data and information to local-level early warning efforts.

13. The status report cited several national efforts towards building end-to-end early warning systems, especially in the areas of capacity-building and improving the dissemination of timely and accurate information at the community level. In 2006, non-governmental organizations launched an initiative in Sri Lanka to provide training, very small aperture terminals (VSAT), telephone lines and hand radios to the tsunami-affected villages, marking the first field test of satellite radio for specialized disaster warning, response and recovery.

14. The Third International Conference on Early Warning in 2006 represented a global forum to provide a comprehensive overview of the current status of early warning and views of experts and stakeholders on challenges and opportunities in enhancing early warning, while showcasing innovative early warning projects.[16] Among various issues related to enhancing risk knowledge, the following key points were raised, keeping in mind the idea of implementing early warning at the community level:

(a) Improving access to reliable data, information and technology, regional repositories and more coordinated arrangements could assist the transfer of knowledge between developed and developing countries;

[14] International Strategy for Disaster Reduction, "Living with Risk: global review of disaster reduction initiatives" (available at www.unisdr.org/eng/about_isdr/basic_docs/LwR2004/ch5_Section5.pdf).

[15] Asian Disaster Reduction Center, International Strategy for Disaster Reduction, and Asian Disaster Preparedness Center, "Baseline Status Report on Disaster Risk Reduction (DRR) in Asia and the Pacific".

[16] "Early warning – from concept to action: the conclusion of the International Conference on Early Warning" (2006) (available at www.ewc3.org/upload/downloads/Early_warning_complete2.pdf).

(b) Effective communication systems to ensure warnings need to be understood and acted upon;

(c) Disseminating information and warnings to remote areas remains a challenge, which requires technical as well as non-technical methodologies and technologies;

(d) Existing community structures and systems must be utilized with the involvement of people and local authorities;

(e) Information and experiences must be collected and stored in databases, to serve as a basis for adapting models and early warning systems;

(f) Public information systems and communication infrastructure must be improved.

15. The conference report also emphasized that ICT infrastructure to enable the dissemination of warning messages must be operational and reliable 24 hours a day and reach the remotest areas of the country. Early warning should address various disaster threats and diverse needs of various societal groups. The Jamaican early warning system was cited as an example of a system that proved effective in disseminating hurricane and storm warnings, but not in dealing with flood warnings.

16. Overall, the report concluded that warnings do not reach all the people at risk due to limited ICT infrastructure and a lack of redundancy in information services (using various communication channels, to ensure people are reached even if one channel fails) in many countries. In more specific terms, the challenges in the area of dissemination and communication were highlighted as follows:

(a) Inadequate institutional arrangements;

(b) Need to strengthen telecommunication systems and technologies, in particular among least developed countries;

(c) Inadequately standardized nomenclature, protocols and standards, nationally and internationally;

(d) Proliferation of communication technologies and loss of single recognized authoritative voice (that people respect and respond to);

(e) Ineffective engagement of the media and private sector;

(f) Ineffective integration of lessons learned from previous warnings.

17. Thus, the challenge in enhancing early warning at the community level through better warning dissemination and community preparedness is “to integrate the knowledge and insight of relevant social and economic communities to the predominantly technically based existing systems” (see A/C.2/61/CRP.1). Furthermore, as regards building national people-centered early warning systems, the report of the Global Survey recommended, among other things: (a) conducting a systematic national survey of all early warning system needs; (b) developing a long-term national plan and strategy for warning dissemination; and (c) assessing community-based risk.

18. A number of instruments, guidelines and tools already exist to assist member States and other stakeholders in moving forward with more effective and

comprehensive early warning. For example, the outcomes of the Third International Conference on Early Warning included the document "Developing early warning systems: a checklist.[17] ISDR compiled a publication entitled *Words into Action: A Guide for Implementing the Hyogo Framework*, which listed recommended steps to be taken, as well as responsibilities, resources and good examples in the area of early warning.[18] The next step may be to apply these instruments in a systematic and sustainable way, with a focus on warning dissemination and community preparedness.

Box 1

Reducing casualties through early warning systems

One of the widely cited examples of an effective early warning system is the Cyclone Preparedness Program of the Government of Bangladesh and the Bangladesh Red Crescent Society, which institutionalized the dissemination of cyclone warning signals by the Bangladesh Meteorological Department to the community through its extensive radio network. Also, 33,000 volunteers deliver the messages using megaphones and sirens to villagers and help vulnerable groups of people get to cyclone shelters.[a]

Due to the effectiveness of the programme, the country has witnessed a dramatic decrease in deaths from disasters. In 1970, Cyclone Bhola, recorded as the deadliest cyclone in modern times, claimed up to 300,000 lives in the country. In 1991, Cyclone Gorky devastated the country, leading to an estimated 140,000 deaths. However, since the establishment in 2003 of the Comprehensive Disaster Management Programme, which compliments the Cyclone Preparedness Program, Bangladesh has significantly reduced loss of life to cyclones.[b] The deaths caused by Cyclone Sidr in 2007 are estimated to be 3,406.[c] Decades of design of response mechanisms, including shelters, have brought considerable benefits to communities in the country.

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[a] International Strategy for Disaster Reduction *Words into Action: A Guide for Implementing the Hyogo Framework* (Geneva, 2007).

[b] Maryam Golnaraghi, J. Douris and J.B. Migraine, "Saving lives through early warning systems and emergency preparedness", in *Know Risk* (International Strategy for Disaster Reduction, 2005).

[c] Bangladesh, "Cyclone Sidr in Bangladesh: Damage, loss and needs assessment for disaster recovery and reconstruction", Executive Summary (2005).

II. DISASTER EARLY WARNING IN THE PACIFIC

19. The United Nations Development Programme has reported that small island developing States are at a higher risk in the disaster context, and smaller countries in general had higher exposure to hazards, particularly in the case of cyclones, leading to high relative vulnerability.[19] The organization also highlighted the fact that isolation limits the choices of coping strategies, particularly for those who live in remote and rural areas. Furthermore, climate-change-related risks and limited capacity to manage these risks constitute serious challenges for small island developing States. ISDR estimates project that small island developing States will be

[17] See www.ewc3.org/unload/downloads/checklist.final_pdf.pdf.

[18] International Strategy for Disaster Reduction, *Words into Action: A Guide for Implementing the Hyogo Framework* (Geneva, 2007) (available at www.unisdr.org/eng/hfa/docs/Words-into-action/Words-Into-Action.pdf).

[19] United Nations Development Programme, *Reducing Disaster Risks: A Challenge for Development* (New York, 2004).

affected by floods, storm surges, erosion and other coastal hazards every year due to rising sea levels by the 2080s.[20]

Box 2

Cyclone Heta

Cyclone Heta of January 2004 was a major typhoon[a] that caused catastrophic damage to American Samoa, Niue, Samoa, Tonga and Wallis and Futuna, with winds up to 260 km/h. Although causing only one recorded death, it is blamed for over $150 million in damage, with many physical facilities destroyed or severely damaged. Development efforts were put on hold, and made considerably more costly, as lives and communities were rebuilt.

The Australian Foundation for the Peoples of Asia and the Pacific issued 11 reports on Heta from 1 to 7 January 2004.[b] The reports document the development and impact of the storm, as well as efforts by an established non-governmental organization to keep officials and the public informed. Each alert report linked to further information available from other sources. The first alert report noted that "a small cyclonic system" had formed between Apia and Tokelau that could impact Samoa, American Samoa, Tokelau, Tonga and Niue. That alert estimated that damage would be minimal, but advised that careful attention should be paid to the system over the following days as rapid intensification and movements were possible. Subsequent alert reports described increasing intensity, refinements of warnings, summary reports of damage to impacted island groups, and initial assessments of the effectiveness of preparations,[c] as the storm grew to a category 5 super cyclone, adding Wallis to the list of impacted communities.

The worst South Pacific cyclones recorded, such as Heta, have tended to impart catastrophic damage to buildings, infrastructure and crops where they hit, and have caused significant damage to the environment, such as the silting of coastal habitat and strewing of trash (including pollutants). High winds blow off roofs and do other damage to structures; rain causes flooding, erosion and land slope failures, and storm surges impact landscapes and coastal structures. Development and peoples' lives are severely disrupted (even if few lives are directly lost).

The Australian Foundation for the Peoples of Asia and the Pacific reports noted successes in preparations in American Samoa, Samoa and Tonga. However, despite extensive preparations, the severity of Heta when it struck Niue was such that severe to catastrophic damage was sustained, including the destruction of the hospital. Similarly, strong structures in Tonga were destroyed. Communications were quickly restored through the help of French Polynesia and others, and relief supplies were quickly provided.

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[a] East Pacific cyclones are called hurricanes, western Pacific cyclones are called typhoons, and Australian, South Pacific and Indian Ocean cyclones are called tropical cyclones.

[b] See www.afap.org/apcedi/archive/2004_01_01_archive.html.

[c] Preparations assessed included, among others, medium-term efforts of seawall development in Samoa, short-term preparations such as opening storm shelters and temporarily dismantling sensitive equipment such as satellite dishes, and the procedure of informing people with half-hourly radio bulletins.

[20] International Strategy for Disaster Reduction Briefing Note "Climate Change and Disaster Risk Reduction" (2008).

20. The above findings are particularly worrying when the status of ICT infrastructure development among the Pacific island countries is taken into account. Pacific connectivity has been identified as one of the region's major priorities in the area of ICT for inclusive development, given the limited ICT access and slow growth of connectivity in the subregion (see E/ESCAP/CICT/1). This general lack of community-level communication modalities, including disaster communication channels, makes countries and areas in the Pacific subregions some of the most vulnerable to disaster situations in the region.

21. In order to address the concern on ICT access, in particular, connectivity, the secretariat compiled a report entitled *Enhancing Pacific Connectivity*.[21] Some of the opportunities and progress identified within it, as cited below, could help national disaster authorities take advantage and maximize the use of available ICT resources, capabilities and bandwidth for disaster management in general, and for early warning at the community level in particular. Though cables might become increasingly affordable, satellites will likely be needed for universal service, and for vital backup and emergency communications for reliable dissemination of warnings.[22]

22. Connectivity has steadily improved for parts of the Pacific. Though most islanders face no (or little) choice in fixed or mobile phones, or in Internet service access, the situation is improving in some economies. The Office des Postes et Télécommunications (OPT) of French Polynesia reported in 2007 that it had achieved satellite connectivity to 47 islands by mid-2007, with expectations of coverage to 60 islands by the end of 2008. The submarine cable Gondwana 1 between Sydney and New Caledonia was officially commissioned in September 2008.[23] OPT New Caledonia is currently pursuing mobile phone coverage of 100 per cent of its population. Following the 2007 Pacific Islands Forum, officials revealed progress made on a digital connectivity plan, including a dedicated Pacific islands satellite system funded by Australia.[24]

23. At the local and individual levels, almost global universal connectivity is possible through solar-powered satellite mobile phones or similar means. A number of companies can each serve at least parts of the Pacific. Nevertheless, thousands of communities in Asia and the Pacific lack basic emergency management communications.[25] Broader satellite communication services are available from several companies which serve areas in the Pacific, although one company dominates current Pacific markets.[26]

24. Beyond the emergency communications systems normally considered, the global COSPAS-SARSAT search and rescue service has operated for over two decades, and current technology should be able to make such systems available to air-

[21] ESCAP, *Enhancing Pacific Connectivity* (United Nations publication, Sales No. E.08.II.F.14) (available at www.unescap.org/publications/detail.asp?id=1279).

[22] Affordability might be more likely to increase if creative installation service/cost models, such as first-generation cable redeployment and/or private-sector build-operate models are used instead of demanding that country nodes pay for landing stations. Satellite use is also more likely to be successful if new service and business models are offered, to reduce costs (in a manner that encourages more use, thus increasing net revenues).

[23] See www.eventpolynesia.com/newsroom/common/CO2_page_newsroom08063.htm.

[24] See http://findarticles.com/p/articles/mi_m0EIN/is_2007_Dec_20/ai_n27480963.

[25] A concerted effort has been made to (a) develop affordable multisystem satellite phones, and manufacture them in moderate quantities (for example 1-5,000, to start) and (b) have most or all Pacific States negotiate as a consortium for airtime from several satellite phone operators, with the understanding that sufficiently good prices will get more business.

[26] Some countries in the region, including Australia (at a 2007 meeting of the Pacific Islands Forum Secretariat) and China (at a 2006 meeting hosted by ESCAP) have proposed new approaches to satellite communications for the Pacific, and have at least tentatively offered their help.

and seacraft of even modest means. Yet, thousands of vessels are without access to such lifesaving systems. A concerted effort to produce hardware for affordable universal emergency management communications (via satellite phone and SARSAT) could help realize such a dream. Every year, the world witnesses tremendous tragedy that could be prevented through wider application of such systems.

25. A process of delivering forecasts and early watches/warnings should be responsive to how a people/culture tends to communicate, taking into account the need for redundancy and multiple means to reach the target groups. For example, in Bangladesh, hazard forecasts and early warnings utilize call-to-prayer loudspeakers in mosques as a widespread and respected means of communication. Forecasts could be broadcast on radio and television, posted in hardcopy in public places, and (as mobile phones become more commonplace in at least some Pacific countries) sent by mobile phone Short Message Service (SMS) or recorded message (perhaps on request by phone holders). Alternatively, where phones are commonly available, recorded messages for up-to-the-minute marine weather and fishing condition forecasts could be made available at a specified (and well-publicized) telephone number for anyone to call at any time. Public service loudspeakers could be placed in appropriate places in communities (for example, near the market area, municipal government building or religious activity centres) to broadcast news, weather forecasts, and (when necessary) emergency messages.

26. A variety of models are used to transmit warning messages to the community. Tonga is reported to have community alert systems, while other countries, such as India, are establishing Web-based centralized databases for issuing warnings (see A/C.2/61/CRP.1). In many countries, the warnings are communicated through public broadcasting media, which remain one of the most widely used means to reach people, although increasingly newer ICTs, such as SMS, have been tapped for early warning systems. Many of the early-warning issues faced by countries in the Pacific are also faced elsewhere in Asia. Thus, good delivery in the Pacific can be a stepping stone towards good delivery throughout the ESCAP region.

27. In addition to better dissemination of warnings through improved connectivity and multiple channels for delivering messages, community preparedness could be further enhanced by maximizing the use of available resources and facilities, such as telecentres. In parallel to the efforts being made by the disaster community, the ICT for development community has been actively involved in extending ICT access to rural areas in the Pacific. For instance, the Secretariat of the Pacific Community (SPC), the International Telecommunication Union (ITU) and other partners are collaborating to strengthen the Rural Internet Connectivity System.[27] That system, initiated by SPC in cooperation with its members, has been placing satellite communications-supported rural e-centres in several Pacific States. ITU has been providing funding for the placement of additional e-centres. These facilities could play a catalytic role in: (a) maintaining regular communication between national and local authorities and communities; (b) analysing and mapping hazards and past disasters; (c) consolidating local knowledge on disasters; (d) fostering community-level capacity-building; (e) supporting mitigation planning; and (f) simulating community response to multiple hazards, among other areas.

[27] See www.spc.int/corp/index.php?option=com_content&task=view&id=227&Itemid=1.

Box 3

Success in learning from the past: Papua New Guinea

In 1998, an earthquake of 7.0 on the Richter scale occurred 30 km off the coast of Papua New Guinea, claiming 2,200 lives in the subsequent tsunami. It was recognized that the past experiences of tsunamis had not been transferred to the new generation and the local knowledge on dealing with tsunamis had been lost. With the assistance from the Asian Disaster Reduction Center, the Government launched a massive information and public awareness campaign on responses to tsunamis. In 2000, another earthquake measuring 8.0 on the Richter scale and subsequent tsunami hit the country. While a significant loss of buildings was reported, there were no deaths.

Source: International Strategy for Disaster Reduction, *Words into Action: A Guide for Implementing the Hyogo Framework* (Geneva, 2007).

28. For many least developed countries, in particular small island developing States, the establishment and maintenance of sustainable, adequately resourced early warning systems at the community level is a challenge, particularly when considering the vast geographic areas covered by many Pacific countries. In addition, the need for strengthened ICT capabilities to manage multidisciplinary information sources and ensure appropriate communication and consultations with communities and various stakeholders has been consistently identified as a challenge in the Pacific context.[28] As countries pursue universal service in ICT, it is also timely to pursue universal service in usable early warning and assist communities in building response preparation for such warnings by creating synergies and enhancing collaboration between disaster and ICT authorities.

III. MAJOR HAZARDS IN THE PACIFIC AND HOW EARLY WARNING COULD BE IMPROVED

29. The major natural hazards which have caused damage to Pacific communities generally fall into the categories of cyclone, tsunami or volcanic eruption. This chapter will examine how the communications aspect of early warning could be improved to deal with these hazards. Although the limited ICT infrastructure and connectivity is a fundamental factor, associated non-ICT issues, such as inadequate institutional arrangements, could also play a key role to deliver warning messages.

A. Cyclones

30. Weather forecasts and early watches/warnings are available to anyone with appropriate connectivity, but they are often unavailable to many in the Pacific, in particular, and in Asia, in general. This lack of connectivity prevents such systems from maximizing response preparedness and minimizing loss. Such information relies on communications, yet large satellite communication dishes are often dismantled and stored safely prior to a storm (or damaged during the storm), and power cuts are common during disasters. It may be useful to keep a stock of satellite phones and radios ready for such a contingency, and to consider deploying additional such units before a cyclone hits, where cyclone watches recommend such deployment. Cooperation between SPC, the Australian Foundation for the Peoples of Asia and the Pacific, the Australian Foundation for the Peoples of Asia and the Pacific, ITU, ISDR,

[28] International Strategy for Disaster Reduction, *Living with Risks: A global review of disaster reduction initiatives* (2004).

ESCAP and the Pacific Island Telecommunication Association may help facilitate such capabilities.

B. Volcanoes

31. Although volcanic eruptions are usually considered local issues, if they release massive amounts of ash into the atmosphere, there is a significant impact on global climate change and terrestrial ecosystems.

32. Most volcanic eruptions give sufficient advance indication (of likelihood, but not timing), such that residents who could be affected can be notified in time, even if such warning must be delivered by someone travelling to a village that lacks electricity or electronic communications. While the monitoring systems of some volcanoes in Asia and the Pacific could benefit from improved local instrumentation to help forecast activity, the cost-effectiveness of any proposed enhancements would have to be considered. Community preparedness is probably the most important issue.

C. Tsunamis

33. Currently, warnings are available through secure message to official contact points, and to the public through the Pacific Tsunami Warning Center webpage.[29] However, the 2004 Indian Ocean earthquake and tsunami have motivated several countries to establish additional local and regional early warning capabilities for tsunamis, and to strengthen existing systems. Australia, India, Indonesia and Thailand, for example, have been developing their own versions of subregional systems. Although the list of contact points prepared by the United Nations Educational, Scientific and Cultural Organization and the Intergovernmental Oceanographic Commission omits many Pacific economies, early warnings can be sent from the Pacific Tsunami Warning Center to anyone. The Centre has also expanded its reach to include oceans beyond the Pacific, though local and subregional facilities, when proven reliable, should improve the global capability to develop and disseminate early warnings. Beyond this, the TsunamiReady programme[30] has been developed to help communities around the world better prepare for tsunamis. Geoscience Australia, the National Oceanic and Atmospheric Administration, and other national organizations which are improving their capabilities to serve their clientele are usually ready to share, when appropriate, their knowledge, experience and some capabilities in order to strengthen the region as a whole.

34. Good, reliable communications between warning centres, such as the Pacific Tsunami Warning Center, and countries, as well as good preparation and response planning, are required in order to reduce risk to life and infrastructure. Contacts have often been established with focal point individuals, but these have not always been maintained. Contacts should be “duty-post” to offices and there should be multiple backup contacts per country, to reduce risk of “single point of failure” syndrome. This needs to be done largely in-country, perhaps with regional help to design, review and support good planning and implementation.

D. Contact points: a preliminary assessment of gaps

35. In an initial assessment of 30 States in the Pacific (summarized in the table), the ESCAP secretariat found that various disaster management initiatives did not list national focal points for those countries. In some cases, such gaps may be a result of some Pacific economies not being formalized as members in some of the

[29] See www.prh.noaa.gov/pr/ptwc/.
[30] See www.tsunamiready.noaa.gov/.

international organizations. With this most fundamental level of contact lacking for the Pacific, it could be concluded that routine weather forecasts, weather risk watches and warnings, and tsunami watches and warnings may not reach national capitals in time—let alone well-prepared people at the community level.

Table. Analysis of contacts for fully operational disaster management in the Pacific

Natural hazard	Relevant international organization	Appropriate national contact	Status of contact list
Climate, weather	WMO NOAA	NDMO, meteorological office	WMO has 21 members with territory in the South-West Pacific, including Australia, New Zealand, the United Kingdom of Great Britain and Northern Ireland and the United States of America.[a]
Drought	WMO UNCCD[b] NOAA	NDMO, meteorological office, (cc Prime Minister's office)	UNCCD has posted the contact points for the following countries and areas in the Pacific: Cook Islands, Fiji, Indonesia, Kiribati, Marshall Islands, Micronesia (Federated States of), Nauru, Niue, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.
Tsunami	UNESCO/ IOC NOAA/ PTWC	NDMO, meteorological office, police (cc Prime Minister's office)	No contact list found.
Crosscutting	SOPAC	NDMO (cc Prime Minister's office)	SOPAC member countries can be found on the Commission website.[c]
	PDC	NDMO (cc Prime Minister's office)	No contact list found.
	PacificDisaster.net	NDMO	No contact list found.
	ISDR	NDMO (cc Prime Minister's office)	No national platform from small island developing States.

[a] See www.wmo.int/pages/members/region5_en.html.
[b] See www.unccd.int/main.php.
[c] See www.sopac.org/Member+Countries.

Abbreviations:

IOC	Intergovernmental Oceanographic Commission
ISDR	International Strategy for Disaster Reduction
NDMO	national disaster management office
NOAA	National Oceanic and Atmospheric Administration
PDC	Pacific Disaster Center
PTWC	Pacific Tsunami Warning Center
SOPAC	South Pacific Applied Geoscience Commission
UNCCD	United Nations Convention to Combat Desertification
UNESCO	United Nations Educational, Scientific and Cultural Organization;
WMO	World Meteorological Organization.

IV. EARLY WARNING TO COMMUNITIES: CONSOLIDATING EFFORTS IN THE PACIFIC

36. This chapter examines the challenges of building upon and strengthening institutions to enable them to better implement activities in the Pacific and provide communities with more sustainable services.

37. Pacific island States face similar natural hazards and challenges in coping with them. This has led to a common approach for regional cooperation.[31] Convened by the South Pacific Applied Geoscience Commission (SOPAC), and with the engagement of many other major stakeholders in disaster risk reduction and management in the Pacific, national disaster management officers meet annually. Created in partnership with SOPAC, the International Research Foundation for Development, the United Nations Development Programme, and the Office for the Coordination of Humanitarian Affairs, the virtual Pacific Disaster Risk Management Partnership Network (PacificDisaster.Net) was officially launched on 18 September 2008. Through such initiatives, the countries have enhanced efforts to increase awareness of and prepare for natural hazards, as well as formulate and implement strategies to reduce vulnerabilities at the community level, while leveraging regional cooperation mechanisms.

38. However, ISDR has stated that "in the [Pacific] region as a whole, disaster risk management has been generally regarded as either an environmental or humanitarian issue and this is reflected in a general lack of government policies, organizational structures and legislative frameworks to underpin disaster risk reduction in an integral, coordinated and programmatic manner".[32] In this light, there remains the question of how well local officials and community populations in the Pacific are served by the growing capabilities possible in disaster risk reduction, hazard risk forecasts, watches and early warnings.

39. Stakeholders in early warning systems for the Pacific met on 5 and 6 September 2005, and agreed on a draft strategy for enhancing early warning for Pacific island countries[33] which was endorsed at the thirteenth Regional Disaster Managers' Meeting on 28 June 2007;[34] it is in the process of being implemented. Most Pacific States have national disaster management offices and are developing or implementing action plans, with much support from SOPAC. The ESCAP secretariat has reviewed the available disaster management plans and strategies of some of the Pacific island countries; some are comprehensive in scope. However, many of the challenges identified in the Global Survey and other documents are faced by countries in the Pacific. The Disaster Risk Reduction and Disaster Management National Action Plan (2006-2016) of Vanuatu, for instance, reiterates concerns similar to those cited in the previous paragraph. Although the formulation of such national disaster management plans and strategies is a significant step forward in enhancing community-level early warning, the implementation of the plans and strategies and translating the national vision into action is equally important.

40. One gap in implementation can be found in human resources. Several Pacific island States are too small to support significant public service capacity in geographical information systems, including spatial-data development and

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[31] International Strategy for Disaster Reduction, *Living with Risks: A global review of disaster reduction initiatives* (2004).

[32] International Strategy for Disaster Reduction, *Disaster Risk Reduction: Global Review 2007* (www.preventionweb.net/files/1130_GlobalReview2007.pdf), p. 40.

[33] See www.sopac.org/data/virlib/MR/MR0604.pdf, pp. 23-30.

[34] See www.sopac.org/data/virlib/MR/MR0649.pdf, p. 11.

management, and the processing of such data into hazard risk assessments and hazard preparation and response plans. Similarly, with relatively small populations to support highly specialized fields such as the operational development and delivery of weather and climate forecasts, watches and warnings, small economies in particular may require strengthened regional cooperation.

41. Recognizing the limitations and constraints in available resources, Pacific island countries have been consolidating efforts and creating a regional framework for action. In June 2005, the twelfth Pacific Regional Disaster Management Meeting agreed on a framework for action 2005-2015.[35] In July 2008, the Pacific Disaster Risk Management Partnership Network organized its third Annual Meeting and urged members to identify concrete initiatives for greater immediate focus. One of the actions identified included implementing early warning and enhancing South-South partnerships.

42. In order to advance such an agenda, it is critical to strengthen existing mechanisms and institutions which can render sustainable services for such early warning generation and support services to Pacific States.

V. ISSUES FOR CONSIDERATION

43. In accordance with Commission resolution 64/1 of 30 April 2008, the secretariat reconfigured the Information, Communication and Space Technology Division to become the Information and Communications Technology and Disaster Risk Reduction Division, responsible for providing secretariat support to the Committee on ICT and the Committee on Disaster Risk Reduction. Early warning dissemination and community preparedness fall within the domains of both areas covered by the division. The ESCAP secretariat also believes that the Pacific could benefit from leveraging the approach that ESCAP promotes: multidisciplinary sustainable economic and social development and knowledge sharing at the regional level.

44. To pursue full sustainable access to early warnings and enhance warning dissemination and community preparedness at the community level, several issues require the urgent attention of the Committee in general and the member States of the Pacific subregion in particular, in two main areas:

(a) Sustainable services for Pacific Governments in the area of developing, optimizing, and implementing coherent early warning components of their national disaster management plans, supported through assistance to existing regional cooperation initiatives and organizations;

(b) Universal communication services to enable universal early warning throughout settled Pacific islands; such a goal would also make significant progress towards Millennium Development Goal 8, the measurement of which is the number of fixed-line and mobile phone users, and Internet users.

45. As regards the first area of action, the following recommendations for action could be pursued by the member States and the secretariat in cooperation with other United Nations organizations:

[35] "An Investment for Sustainable Development in Pacific Island Countries Disaster Risk Reduction and Disaster Management: Building the Resilience of Nations and Communities to Disasters: A Framework for Action 2005-2015", agreed to by officials attending the twelfth Pacific Regional Disaster Management Meeting, 6-8 June 2005, Madang, Papua New Guinea.

(a) Establish a sustainable list of contact points, such as duty-post, for various international and regional initiatives and networks and secure various means of fail-safe communication between service and information providers and national focal points, including active alarms to confirm that messages have been received on such lines;

(b) Where possible, provide support for established Pacific institutions that need to be strengthened and empowered, in pursuit of enhanced early warning;

(c) Support the strengthening of existing national disaster management offices, the formation of such offices where none exists, and the empowerment of national disaster management offices with information and knowledge resources, with a focus on early warning at the community level;

(d) Provide Governments with assistance in formulating, implementing and adapting their early warning policies, strategies and programmes;

(e) Conduct a systematic needs assessment of end-to-end early warning systems at the national and local levels as a basis for such policies, strategies and programmes;

(f) Analyse and propose sustainable means of receiving and disseminating forecasts, watches and early warnings with community involvement.

46. As regards the second area of action, the Committee may wish to consider the following recommendations for action:

(a) Conduct a review of ICT policies and programmes to integrate components of early warning into the development of ICT infrastructure, applications and initiatives to ensure universal communication services;

(b) Conduct an in-depth analysis of ICT access for early warning at the community level in the Pacific, with a view to consolidating available ICT facilities and resources for the delivery of warnings to all members of communities;

(c) Create a pilot for the implementation of early warning at existing research institutions, telecentres or other community centres for analysis and research, through such partnerships as Sentinel Asia;

(d) Initiate discussions and draft plans towards funding and implementing such universal connectivity services for emergency management communications and early warning;

(e) Provide support for public-private partnerships involving government, civil society and the private sector, to make available affordable satellite phones and SARSAT beacons, and/or other devices/systems towards sustainable and comprehensive early warning.

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