SPECIAL FOCUS

Challenges and Strategies for Climate Change Adaptation Among Pacific Island Nations

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ABSTRACT

Few regions of the world are at higher risk for environmental disasters than the Pacific Island countries and territories. During 2004 and 2005, the top public health leadership from 19 of 22 Pacific Island countries and territories convened 2 health summits with the goal of developing the world's first comprehensive regional strategy for sustainable disaster risk management as applied to public health emergencies. These summits followed on the objectives of the 1994 Barbados Plan of Action for the Sustainable Development of Small Island Developing States and those of the subsequent Yokohama Strategy and Plan of Action for a Safer World. The outputs of the 2004 and 2005 Pacific Health Summits for Sustainable Disaster Risk Management provide a detailed description of challenges and accomplishments of the Pacific Island health ministries, establish a Pacific plan of action based upon the principles of disaster risk management, and provide a locally derived, evidence-based approach for many climate change adaptation measures related to extreme weather events in the Pacific region. The declaration and outputs from these summits are offered here as a guide for developmental and humanitarian assistance in the region (and for other small-island developing states) and as a means for reducing the risk of adverse health effects resulting from climate change.

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Key Words: climate change adaptation, minority health, health disparity, public health emergency, disaster risk reduction

Disaster risk reduction is considered an integral part of climate change adaptation.[1] Disaster reduction has emerged as a core element of sustainable development.[2] The 2002 World Summit on Sustainable Development concluded that "An integrated multi-hazard, inclusive approach to address vulnerability, risk assessment and disaster management, including prevention, mitigation, preparedness, response and recovery, is an essential part of a safer world in the twenty-first century."[3] Reducing risk requires long-term engagement in the development process.[4] Disaster risk reduction is largely a task for local actors (in this case, Pacific Island health ministries), albeit with support from national and international organizations, particularly when undertaking humanitarian actions.[1] The United Nations International Strategy for Disaster Reduction defines *disaster risk management* as the "systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies, and improved coping capacities in order to *lessen the adverse impacts of hazards and the possibility of disaster.*"[5] This term is an extension of the more general term *risk management* to address the specific issue of disaster risks. Disaster risk management aims to avoid, lessen, or transfer the adverse effects of hazards through activities and measures for prevention, mitigation, and preparedness.[5] Reducing vulnerability is a key aspect of reducing climate change risk.[4] A disaster risk management plan, then, selects appropriate controls or countermeasures to manage each risk. The risk management plan should propose applicable and effective controls for managing the risks as applied to the reduction of both hazards and human vulnerability. A good risk management plan should contain a schedule for control implementation and list the people responsible for those actions.

Few regions in the world are at higher risk for environmental disasters than Pacific Island countries and territories (PICTs).[6,7] During 2004 and 2005, the public health leadership from 19 of 22 PICTs developed the first comprehensive regional strategy for sustainable disaster risk management as applied to public health emergencies. These summits followed on the objectives of the 1994 Barbados Plan of Action for the Sustainable Development of Small Island Developing States[8] and those of the subsequent Yokohama Strategy and Plan of Action for a Safer World.[9] PICTs have developed a risk management plan that, if implemented, would guide regional disaster risk management activities for health during the next decade. This plan was developed in the form of a regional declaration and a set of comprehensive project proposals that would implement the 10-year plan. The following describes the process methodology used to develop a consensus document in the form of a regional declaration.

PROCESS METHODOLOGY
First Pacific Health Summit for Sustainable Disaster Risk Management

In June 2004, the Centers for Disease Control and Prevention (CDC) hosted the first Pacific Health Summit for Sustainable Risk Management in Honolulu, Hawaii. This summit was attended by Pacific Island health ministry leaders of 16 PICTs and by representatives from 15 international and regional preparedness and response organizations. With the assistance of an experienced facilitator, the participants achieved consensus in prioritizing issues relevant to the Pacific and in developing a 10-year plan of action. Together, they produced the Declaration of the Pacific Health Summit for Sustainable Disaster Risk Management.[10] The declaration describes the challenges of the Pacific; presents the current status of the Pacific in regard to 4 categories: preparedness, response, mitigation, and recovery; and proposes a Pacific plan of action comprising 8 regional objectives for each of the 4 categories.[11] See http://www.pacifichealthdialog.org.fj/Volume%2013/No1/Declaration%20of%20the%20Pacific%20HS%20for%20SDR%20Management.pdf for more information regarding the 2004 Summit declaration.

Second Pacific Health Summit for Sustainable Disaster Risk Management

In June 2005, CDC hosted the second Pacific Health Summit for Sustainable Risk Management in Sigatoka, Fiji. The goal of this summit was to advance the declaration from the 2004 summit into workable planning proposals and projects. Pacific Island public health officials from 19 nations and representatives from 13 international and regional organizations met to achieve this goal. Sixteen concept papers for risk management projects were developed from the objectives of the 2004 Declaration of the Pacific Health Summit. The table contains a description of project objectives. See http://www.pacifichealthdialog.org.fj/index.php?option=com_content&view=article&id=87 for more detailed information regarding the 2005 Summit projects.

The following is a transcript of the entire Declaration of the 2004 Pacific Health Summit for Sustainable Disaster Risk Management, as written by 19 health ministers and health secretaries of the Pacific region.

DECLARATION OF THE 2004 PACIFIC HEALTH SUMMIT FOR SUSTAINABLE DISASTER RISK MANAGEMENT
I. PREAMBLE
A. Challenges of the Past

We, the family of Pacific nations, claim as our home over 1/3 of the world's surface spread across 10 time zones of Pacific expanse. We are 32 million people living in 22 separate island nations connected by water.

Pacificans carry the highest environmental disaster burden in the entire world. Pacific populations lead the world in mortality rates, per capita disaster costs, and proportion of total people affected by environmental disasters, understanding that all disasters, particularly in the face of poverty, have a greater adverse impact on sustainable development for all Pacificans.

Some of our Pacific challenges include:

1. The Pacific tectonic plate is the most seismically active in the entire world and volcanic eruptions and tsunamis are frequent occurrences;

2. During the International Decade of Natural Disaster Reduction (1990–1999), the top 10 earthquakes (in terms of Richter scale seismic data) in the world occurred in the Pacific;

3. The 1998 US Institute of Medicine Report identified serious deficiencies in the Pacific related to health care, the medical workforce, and health facilities;

4. Studies and experience have revealed high vulnerability to disaster hazards among Pacific health sectors;

5. Most of the world's nations threatened by rising sea levels as a result of global warming are located in the Pacific; Global warming may also have other impacts such as rising rates of malaria;

6. The El Nino phenomenon dramatically affects the Pacific Islands through prolonged drought and increased danger of forest fires;

7. The Pacific basin is the site of the numerous and frequent cyclonic storms;

8. Pacificans simultaneously suffer heavy burdens from both communicable and non-communicable diseases; and

9. Reliance upon air and shipping transport increases vulnerability to transportation delays and mishaps.

As many of us live on isolated Pacific islands, our health suffers disproportionately (when compared to other areas of the world) when confronted with disasters, because of the disparity between the magnitude of the disaster and our limited resources and capabilities to cope.

Here in the Pacific, we routinely suffer from disasters such as cyclonic storms, tsunamis, floods, earthquakes, volcanic eruptions, drought, landslides, and rising sea levels resulting from global warming. While progress has been made in the control of some infectious diseases, others like HIV/AIDS, malaria, and TB, are serious problems in the Pacific. The alarming increases in prevalence of non-communicable diseases, road injuries, and substance abuse are disasters of a more insidious nature that also threaten the sustainable development of our island nations.

Scarce resources, which are earmarked to meet daily needs, must often be diverted in an emergency fashion to deal with dramatic disasters. Because of the rule of rescue in the face of such emergencies, resources available for mitigation and preparedness are used to respond to episodic disasters. For developing nations, the baseline normal capacity to address essential daily health care needs would be considered inadequate and unacceptable by most developed nations and according to the widely accepted Sphere Project minimum standards for disaster response. Even in the best of times, there is wide disparity

TABLE

Concept Paper Topics From the 2005 Pacific Health Summit for Sustainable Risk Management

Landslide Hazard Mapping—A Lifesaving Tool: A Concept Proposal for Preparedness in Chuuk, Micronesia	The overall goal of the 1-y landslide hazard map implementation. A project in Chuuk is to build on existing knowledge and apply preexisting basic hazard-mapping tools, existing hazard maps, and landslide vulnerability assessments to develop evacuation plans and procedures and raise awareness in the community.
Analysis of Tsunami/Storm Surge Hazards in Saipan of the Northern Marianas Islands and Landslide Hazards in Kosrae of the Federated States of Micronesia	This 5-y Natural Hazard Analysis Project aims to reduce the loss of life and the rate of injury to islanders by (1) performing systematic analyses of the hazards that affect these populations—the storm surge and tsunami hazard on Saipan in the Northern Marianas Islands and the landslide hazard on Kosrae in the Federated States of Micronesia, and (2) constructing hazard maps for those islands.
Reducing Vulnerability of Communities in Tuvalu and Tokelau to Health Risks During Disaster Emergencies Through Community Empowerment	A project to reduce vulnerability of the isolated communities in the 2 Pacific Island countries Tuvalu and Tokelau through improved preparedness and community empowerment in health disaster management. One objective is to produce replicable models and materials for use on other islands.
Strengthening the Resilience of Health Facilities to Emergencies/Disasters	A project to ensure fully functional health facilities that will provide continuity of services to patients and the community in times of emergencies and disasters.
Pacific Learning From Emergencies and Disasters	A project to strengthen health disaster management in Pacific Island countries and territories through evaluating efforts undertaken and disseminating lessons learned.
Empowering Community with Training on Psychosocial Support: A Pilot Project in Pohnpei, Federated States of Micronesia	This 2-y project will be conducted by and sustained in local communities on the island of Pohnpei. The overall goal of the project is to build the capacity of the communities to deal with the psychosocial impact of disasters.
Disaster Risk Management Training in Health in the Pacific	A project to train disaster risk managers in health for the Pacific who, as public health managers, will provide the leadership role in addressing all health aspects of Pacific disasters, including mitigation, preparedness, response, recovery, and the ability to identify needs, available resources to address those needs, and manage both internal and external assistance.
Develop Community Capacity to Support Inclusion of Health Issues in Establishment and Management of Emergency Settlements	A project to raise awareness and empower communities to address key health issues in the establishment of emergency settlements in 22 Pacific Island countries and jurisdictions in a 2-y period. These emergency settlements are expected to provide the necessary support for affected populations during the process of recovery from a natural disaster until they can move back to their homes.
Strengthened National Influenza Preparedness	A project to build on existing efforts and strengthen national and regional capacity to prevent, prepare for, respond to, and recover from outbreaks of influenza (eg, severe acute respiratory syndrome).
Developing Resilience and Reducing Vulnerability in the Pacific: A Head Start on Health Disaster Risk Management Through Pacific Schools	A project to gather available information and materials, including traditional knowledge, and incorporate these in the development of a curriculum in health disaster risk management and strengthen related teaching capacity for schools in the region.
The Pacific Health Team: Establishment of Regional Surge Capacity Among Medical and Public Health Personnel in the Pacific	A project to develop the capacity in the Pacific to respond to health emergencies and natural disasters through training of health personnel in a variety of specializations and maintenance of a rapid response roster to ensure that qualified personnel are available.
Pacific Regional Network for Training and Support in Disaster Risk Management	A project to reinforce the awareness of and preparation for health emergencies in the Pacific islands. Regional teamwork will improve the capacity of national health systems to take action on and respond to specific requirements in relation to disasters. The Regional Network for Training and Support in Disaster Risk Management will develop training activities for national and local risk managers.
Pacific Public Health Emergency Operations Planning	A project to introduce standardized public health emergency operations planning and hazard assessment formats throughout the Pacific region. The project will support the millennium development goals by developing global partnerships for emergency operations planning that promote environmental sustainability and sex equality, combat disease outbreaks, and reduce mortality.
Pacific Health Risk Communication and Information Management	A project to develop the knowledge and skills of disaster managers to address issues of risk communications and disaster information management that will help public health officials and public health communication professionals effectively prepare for and respond to public health emergencies.
A Project to Prepare a Manual on Health Emergency Response for the Region	A project to develop an emergency response manual for the region that acknowledges the differences in culture developed and used in the 22 Pacific Island countries and territories.
Establishment of Community Disaster Recovery in Health for Communities in 22 Pacific Islands and Territories	The overall goal is to empower local communities to manage the primary and public health problems associated with the recovery phase of natural disasters and develop the capability to reduce and minimize any negative effects. This project will address the training needs through a series of regional, national, and local level training events that will transfer skills and enable local recovery health committees to identify their own needs and use available resources and local knowledge to address their own unique primary and public health problems.

between the need for health care services and locally available resources.

B. A Pacific Plan of Action for the Future

In spite of these challenges, many Pacific nations are making progress in identifying and utilizing local and regional resources to improve our readiness for disasters. Notwithstanding the progress made thus far, we are mindful that additional resources are required to enhance our capacity to lessen the impact of disasters particularly through mitigation and preparedness initiatives.

Our aim is to improve the core capacity of our public health and medical systems to deal with both routine health needs and chronic emergencies. Improved core capacity will enhance our ability to deal with episodic disasters and catastrophes as they arise. Therefore, local disaster mitigation, preparedness, response and recovery capacities must be built on the existing public health and medical care systems. It is imperative to strengthen existing systems that can then respond appropriately to daily needs as well as to unpredictable disasters.

During the 2004 Pacific Island Health Summit for Sustainable Disaster Risk Management a Pacific-appropriate strategic plan was developed, which, when fully implemented, will accomplish this overall goal. This plan includes:

- a situational analysis of current readiness,
- realistic objectives,
- assessment of current resources, and
- identification of additional resources needed to fully implement a sustainable health risk management plan.

We believe that this plan builds upon the past contributions of previous international conferences to promote sustainable development and disaster reduction. It is designed to be the health component of the broader Pacific Regional Action Plan facilitated by the South Pacific Applied Geoscience Commission (SOPAC) and will be presented at the Second World Congress for Disaster Reduction in Hyogo, Japan in January 2005.

C. Our Approach

Our approach to improving the health of Pacific populations will include a comprehensive model for disaster risk management involving mitigation, preparedness, response, and recovery. Our actions will address the full range of hazards that we face, including the causes and effects of both natural and technological disasters.

II. MITIGATING HEALTH DISASTERS

A. The Current Status of Disaster Mitigation in the Pacific

The current conditions in the Pacific region in the area of disaster mitigation show both successes and challenges. Among the accomplishments of the past two years are: the ongoing conduct of community disaster awareness campaigns; the enhancement of regional emergency management support as a backup

for individual countries; initial steps have been taken to train and develop professional expertise to support the institutionalization of disaster mitigation; and, assessments of health and medical vulnerabilities have been completed in six PICTs. However, much more remains to be done.

The economic support base is currently not diversified enough for mitigation to adequately reduce the public health dangers associated with the range of potential hazards. Very little is being done to train local communities to prepare for disasters. Existing government disaster management planning efforts often do not include mitigation strategies and insufficient training for those responsible for disaster planning and management hampers planning efforts. In addition, donor mitigation planning processes do not complement existing national plans. Donor organizations and agencies do provide support in emergency situations, but often donors establish their own independent priorities. These priorities not only determine what kind of support they provide, but also which jurisdictions they are willing to assist.

While political commitment to disaster management does exist, efforts to mitigate the effects of disasters are overshadowed by other concerns. For example, locally appropriate building codes are not always in place and, where building codes do exist they are not being adequately enforced. Locally appropriate building materials may not be available in sufficient quantities at affordable prices to assure that disaster-resistant structures are constructed.

Adding to the complexity of the situation is the presence in some places of unresolved political, societal, and military conflicts. Insufficient work is being done to analyze the root causes of conflict and to identify appropriate measures to prevent or resolve conflict.

B. Disaster Mitigation Objectives

To improve the disaster mitigation situation, especially as it relates to improving mitigation in the area of public health, the delegates to the Pacific Health Summit for Sustainable Disaster Risk Management identified an overall objective for disaster mitigation in the region and nine specific objectives to address the issues identified above. The overall objective is: All countries have effective, integrated, culturally appropriate and adaptable disaster mitigation plans in place. To achieve this overall objective, mitigation-specific objectives were identified and will be pursued over a ten-year period.

1. Politicians, both in the Pacific and in donor countries are well informed and commit resources for disaster mitigation related to health.

2. Mitigation is part of government policy at the national level with allocations in national budgets.

3. Mitigation criteria are applied to all long-term health sector planning and development efforts and include donor/recipient coordination of long-term disaster mitigation planning and implementation.

4. Training is provided for those involved in building trades and the enforcement of building codes; and the quality of building materials is standardized and their availability increased for the health sector.

5. National and local economies are diversified.

6. All disaster assistance complements local and national disaster mitigation policies.

7. Emergency relocation areas are designated and included in land-use planning and management efforts in all countries.

8. Communities are empowered and play an active role in emergency health management within the "Healthy Island" approach

9. Risk management training is fully implemented among the health sectors.

10. Conflict mitigation strategies are incorporated in development planning efforts.

III. PREPARING FOR HEALTH DISASTERS

A. The Current Status of Disaster Preparedness in the Pacific

A number of noteworthy accomplishments have been made in the area of disaster preparedness in the Pacific in the past two or three years. These include:

1. Hazard maps have been developed for Chuuk following the Chata'an Cyclone in 2002.

2. Cyclone evaluation plans have been included in the telephone directories.

3. The Centers for Disease Control (CDC) Pacific Emergency Health Initiative (PEHI) has been launched and is providing support to the Pacific community. Examples of the support provided by PEHI include: The publication of an issue of the regional public health journal dedicated to emergency health; four international conferences on public health preparedness have been conducted; a simultaneous regional emergency drill has been performed by 4 PICTs; public health evaluations have been conducted in 6 Northern and 2 South Pacific countries; public health emergency plans have been developed in 7 PICTs and an automated tool for public health disaster planning has been tested in 3 PICTs.

4. Weather monitoring systems have been developed or are being developed.

5. A warehouse for medical equipment and supplies has been established in Fiji.

6. The Pacific Public Health Surveillance Network has developed a network of Public Health Laboratory services, LabNet, and a network of national/territorial response teams, EpiNet, to be prepared to respond to epidemic communicable diseases affecting the Pacific Island region.

7. Airport emergency drills have been conducted.

8. Emergency drills have been conducted in a number of PICT Hospitals.

Although these accomplishments have contributed significantly to improved preparedness in the region, there are a number of key issues and concerns that remain to be addressed. Five general issues cut across all aspects of disaster preparedness. The number of qualified emergency management personnel is limited and does not approach the number required to prepare for and manage natural and human-made disasters. Disaster management information is not adequately disseminated throughout the region. The capabilities and vulnerabilities of local communities have not been assessed and communities have not been empowered and equipped to participate effectively in disaster preparedness and response efforts. Coordination among external actors, national and local government agencies and organizations, and local communities is not well established and where established, is often not effective. The lack of effectiveness is directly linked to the absence of clearly defined and mutually agreed roles and responsibilities. Emergency management plans, systems and tools are not adequate to meet the existing needs in the region. Where plans do exist, there have been few efforts to conduct local or national emergency exercises to test the viability of the plans. Hazard warning systems are not widely available and those that do exist are not being upgraded and tested. Emergency preparedness planning and capacity building efforts are not adequately linked to the public health sector. Information on the types and quantities of resources required in emergency situations is either not readily available or easily accessible. Related to the above, data collection and analysis capacities need to be improved so that information gathered in emergency assessments is linked to emergency management decision-making processes. Finally, hazard maps have not been prepared for most PICTs.

B. Disaster Preparedness Objectives

To improve the disaster preparedness capacity in the region, especially as it relates to improving preparedness in the area of public health, the delegates to the Pacific Health Summit for Sustainable Disaster Risk Management identified an overall objective for disaster preparedness in the region and specific objectives to address the issues identified above. The overall preparedness objective is: Public health is protected and promoted through the development of a comprehensive disaster preparedness framework. To achieve this overall objective, specific preparedness objectives were identified. These objectives, which are stated below, will be pursued over a ten-year period.

1. Hazards maps and "capability and vulnerability assessments" are produced and utilized to reduce public health risks.

2. Plans are developed, implemented, and evaluated at all levels with health as an integral factor.

3. Functioning, multi-sectoral systems are in place with clearly defined and mutually agreed roles and responsibilities at all levels.

4. Information is used to promote and protect the public's health.

5. Adequate human and material resources are available to ensure optimal preparedness.

6. Warning systems are enhanced and utilized to protect the population's health against all hazards.

7. Response mechanisms ensure broad-based cooperation and coordination.

8. Regular exercises and drills are conducted to exercise and enhance the health response to disasters.

IV. RESPONDING TO HEALTH DISASTERS
A. The Current Status of Disaster Response in the Pacific

A number of accomplishments and a range of issues that remain to be addressed characterize the current disaster response situation in the Pacific region. Among the accomplishments of the past two or three years are: establishment of a regional center for emergency health education in Palau; over 400 Pacificans trained in public health and medical emergency response; and, a fire protection training exchange program established.

While these accomplishments indicate that interest in improving emergency response is high, a number of issues and concerns remain. There are no regional emergency management teams available in the Pacific. Some inadequacies include: poor communication, lack of policy, procedures and training, inadequate monitoring and evaluation, and limited coordination at all levels.

Traditional groups exist in some countries, which are capable of providing psychosocial support for disaster victims. There are regional institutions and existing infrastructure to build upon, for example SOPAC and the Secretariat of Pacific Communities (SPC). Emergency operation centers are not optimally developed.

Emergency relief is frequently ad hoc and lacking coordination. Supplies, storage facilities and distribution methods are limited even in baseline conditions. Given the extreme geographical isolation in the region, supply chain management is even more critical. Externally available medical supplies may not be appropriately packaged, identified, dated, matched to the local need, or available in a timely manner. Plans are not drafted and understood by all stakeholders including vulnerable populations. The management of the emergency response supply chain is inadequate. Training in planning skills is needed and this training should include the use of implementation checklists and other tools. There are no transition strategies (response to recovery) included in disaster response actions at the national level. Operation manuals are necessary to facilitate implementation of plans.

Care is limited for medical and psychosocial needs that are likely to be increased by disasters. Limitations in the area of psychosocial support include: lack of understanding of and linkage to traditional coping mechanisms, religious groups and family structures, limited staff, insufficient delivery mechanisms, limited awareness, and the limited availability of high quality training programs. Psychosocial needs of the emergency responders are also poorly addressed, if they are addressed at all. Search and rescue capacity for casualties and mortuary services is extremely limited and must be strengthened to reach the level of need. Assistance received from external sources is often not relevant to the local needs. Security requirements often increase in a disaster situation and adequate security personnel may not be available through local resources.

Existing logistical transport and supply services are often inadequate to meet the needs of a disaster situation. Improved planning for alternate or augmented means of transport, storage and distribution is essential and required. Local communication is insufficient to allow for adequate coordination. Local support and local volunteers are available but the number is limited and volunteers need training.

The vast distances of the Pacific create the necessity to have good communication systems. Technology is mismatched to local conditions and hard to maintain. Planning of communication systems needs to be improved. Proper protocol for channels of communication is not widely understood. Warning and alert systems need to reach a greater proportion of the population. Health information systems and management information systems, if they exist, are not often integrated. Trained personnel and/or qualified professionals are required for emergency information management including survey design, data collection, analysis, and dissemination.

Due to extended response times from external rescue agencies, search and rescue needs to be performed locally. Local rescue teams do not have adequate numbers of qualified personnel, regular training or equipment. Public education regarding debriefing, self-protection and hazard-avoidance are not widely available.

Options for large evacuations of people are particularly limited for the Pacific islands. Evacuation plans are rare and frequently do not include identification of hazards, routes for evacuation, staff support, or known safe havens. Plans may not be validated through drills and exercises. Public awareness about emergency evacuation is inadequate. Options for shelter and re-settlement are restricted by failure to properly identify hazards, inadequate training and resources for mass care, including social management. The size of the Pacific islands limits options for re-settlement sites and safe havens, thus requiring the identification of unique and creative solutions. In some cases, monitoring and warning systems for evacuation are inadequate.

B. Disaster Response Objectives

To improve the disaster response capacity in the region, especially as it relates to improving responsiveness in the area of public health, the delegates to the Pacific Health Summit for Sustainable Disaster Risk Management identified an overall objective for disaster response in the region and specific objectives to address the issues identified above.

The overall response objective is: The relevant national disaster management authority is primarily responsible for emergency response, including coordination at the local level. Qualified regional teams are available to strengthen and support national emergency management efforts. To achieve this overall objective, specific response objectives were identified and will be pursued over a 10-year period.

1. Relief plans and staff development processes are culturally relevant and incorporate all components of medical/public health supply chain management.

2. Standardized assessment formats and procedures are developed and serve as the bases for training of emergency personnel.

3. Psycho-social support builds upon existing traditional mechanisms and includes referral systems and debriefing processes for relief workers.

4. Emergency logistics support systems include storage and transport systems, which build upon local capacity and resources.

5. Search and Rescue capabilities and equipment are available, regularly tested and backed-up to assure effective performance when required.

6. Health Information Systems, Management Information Systems, and Health Evidence Reporting are fully developed, reliable, integrated, and updated regularly by qualified personnel.

7. All communities, which are subject to hazards requiring evacuation, locate essential structures in hazard free zones and have designated evacuation sites and routes. Evacuation procedures are regularly rehearsed.

V. RECOVERING FROM HEALTH DISASTERS

A. The Current Status of Disaster Recovery in the Pacific

Disaster recovery, which includes physical reconstruction, and social and individual rehabilitation, is not a strong feature of emergency management in the Pacific Region. Nonetheless, a number of accomplishments can be cited in the last couple of years. These include the fact that after Hurricane Iniki in Hawaii, houses were reinforced with hurricane-proof roofing. A new bridge with increased security features was built in Palau after the first one collapsed. Also, in some countries, improved water supply systems have been put in place as a result of El Nino occurrences.

These accomplishments notwithstanding, there are a number of issues and concerns that remain to be addressed. Damage assessment lacks standardized methods. Tools and systems are not transparent and rarely include community input. Health capacity assessments are often inadequate or not done at all. Recovery planning and decision making is hampered by limited coordination among governmental and nongovernmental organizations (NGOs). There are some provisions for income generating activities, eg, restoration of public infrastructure, agricultural and forest restoration, and rebuilding of the subsistence economy, but resources vary significantly among nations.

B. Disaster Recovery Objectives

To improve the disaster recovery capacity in the region, especially as it relates to improving recovery in the area of public health, the delegates to the Pacific Health Summit for Sustainable Disaster Risk Management identified an overall objective for disaster recovery in the region and specific objectives to address the issues identified above. The overall recovery objective is: Effective recovery capacity is operational with coordi-

nation among all stakeholders to ensure full and rapid recovery and remediation. To achieve this overall objective, specific recovery objectives were identified and will be pursued over a 10-year period.

1. Comprehensive, impartial and transparent assessment of social and physical damage includes procedures, which are developed and standardized for public health and medical systems.

2. Appropriate capacity assessment systems are in place with trained personnel, and public health and physical resources to facilitate recovery.

3. Disaster recovery is managed by a formally designated body with authority to coordinate recovery and remediation activities of government, NGOs, donors, and communities.

4. Income Generating Activities (IGA) are identified, well established, and fully supported as part of all recovery plans for health and medical systems. IGAs support the existing medical system.

5. IGAs are directed toward rebuilding local self-reliant and subsistence economies.

DISCUSSION

The outputs of the 2004 and 2005 Pacific Health Summits for Sustainable Disaster Risk Management provide a detailed description of current challenges and accomplishments of the Pacific health ministries, and they establish a Pacific plan of action based upon the principles of disaster risk management. Although the conference is somewhat dated, there is a growing relevance and an urgency to disseminate this declaration because it provides a unique precedent for implementation of a locally derived, evidence-based approach for climate change adaptation in the Pacific. In addition, sources for accessing the Declaration are now lost because the local medical journal, *Pacific Health Dialog*, has ceased publication.[11] The declaration and plan of action are unique in that they establish a strategy for disaster risk reduction for an entire region; however, implementation has been slow. To date, only 1 of 16 proposed projects has been funded. Awareness of the declaration and its outputs needs to be improved, especially within the setting of climate change. The declaration should be considered as a guide for developmental and humanitarian assistance in the region and as a means for reducing the risk of adverse health effects caused by climate change. The Pacific plan of action, if implemented, would guide regional disaster risk management activities for health during the next decade. As such, this plan was developed in the form of a regional declaration and a set of comprehensive project proposals that would implement the 10-year plan.

The Pacific as a Hazard-Prone Region

The risk for disasters occurs when vulnerable populations are exposed to environmental hazards (eg, extreme weather events associated with climate change). Pacific Islanders carry the highest environmental disaster burden of nearly any other region in the world. Figures 1 to 3 illustrate that from 1990 to 2007, Pacific Islanders led the world in the number of disasters per capita.[6,7] This high incidence of hazard exposure translates into
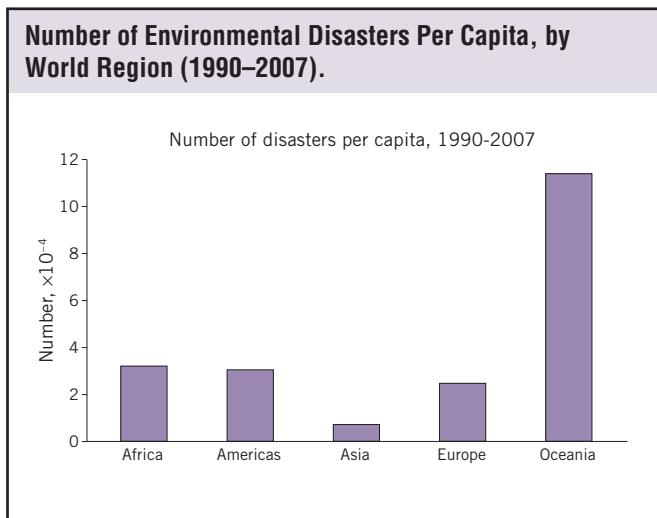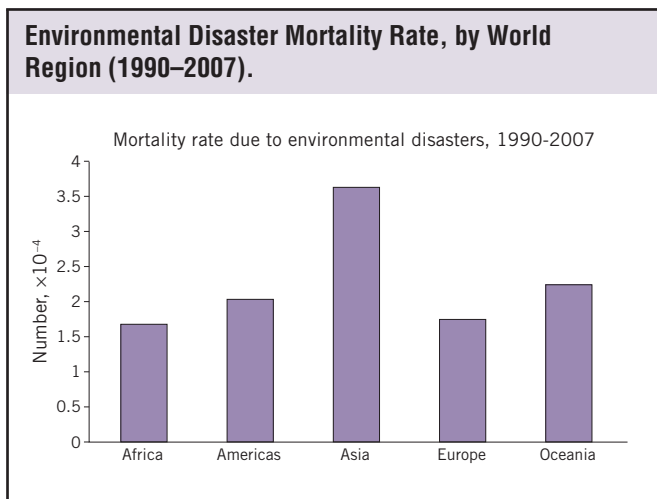
FIGURE 1

Number of Environmental Disasters Per Capita, by World Region (1990–2007).

Number of disasters per capita, 1990-2007

FIGURE 2

Environmental Disaster Mortality Rate, by World Region (1990–2007).

Mortality rate due to environmental disasters, 1990-2007

FIGURE 3

Per Capita Losses Resulting From Environmental Disasters, by World Region (1990–2007).

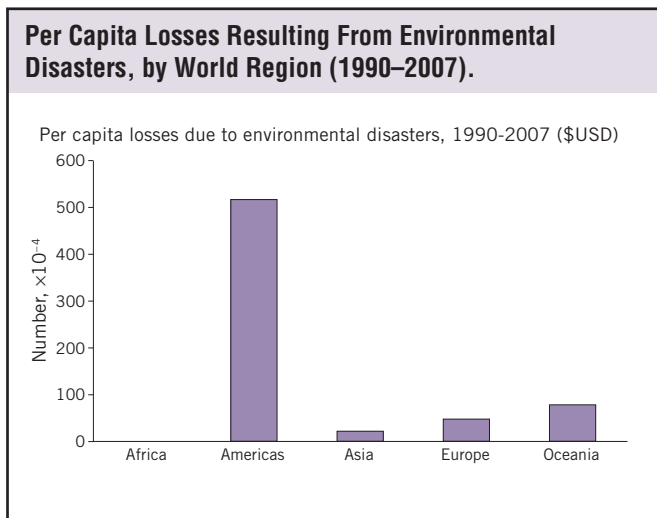Per capita losses due to environmental disasters, 1990-2007 ($USD)

a high human and economic burden on Pacific societies. From 1990 to 2007, the disaster-related mortality rates in Oceania were second only to Asia. During this period, the Democratic People's Republic of Korea (North Korea) experienced a catastrophic famine and more than 200 000 people died in the 2004 Indian Ocean earthquake and tsunami.[6,7] Per capita disaster losses resulting from environmental disasters in Oceania were second only to the Americas, which experienced Hurricanes Andrew, Mitch, Katrina, and Rita during this time frame.[6,7]

Global warming is predicted to have a significant negative impact on the health of Pacific Islanders.[12] Disasters, including more severe and frequent droughts, typhoons, floods, landslides, wildfires, and crop failures, are expected to increase. The United Nations predicts that American Samoa and the Federated States of Micronesia will be among the worst affected areas in the world.[12]

Vulnerable Populations

Along with a relatively high burden of disaster hazards, Pacific Islanders also experience a high degree of public health and medical vulnerability. The 1998 Institute of Medicine report *Pacific Partnerships for Health: Charting a Course for the 21st Century* identified serious deficiencies specific to the quality and accessibility of health care, medical workforce training, availability, and health facility maintenance and management among US-associated Pacific Island nations. These deficiencies have not been rectified.[13] Infants in the US-associated Republic of the Marshall Islands have a mortality rate that is 5 times higher than their US counterparts.[13] The US-Associated Pacific Islands comprise some of the most geographically isolated populations among all US states, territories, and tribes. Nearly all of these islands are located several thousand miles from even the closest university or schools of public health and medicine. As an added challenge to effective aid, organizational and technological solutions to environmental emergencies developed in industrialized nations are not practical for any small island where human and technological resources are scarce and expensive.

Lessening the Risk of Disaster

Many believe that measures directed toward the underlying macrolevel causes of climate-change vulnerability should be integrated into development policy, not into explicit adaptation strategies that respond only to the consequences of climate change.[14] According to a United Nations report, "Climate change adaptation needs to become part and parcel of comprehensive risk management."[9] Risk management, as applied to disasters, first seeks to assess disaster risk in terms of hazards, vulnerability, and capacity.[15] Once this assessment is completed, informed decisions can be made regarding how best to manage the risk in a cost-effective manner. Risk may be prevented, treated, transferred, or retained in a more sustainable manner. Disaster reduction has emerged as a core element of sustainable development.[2] Sustainable communities are "where people and property are kept out of the way of natural hazards,

where the inherently mitigating qualities of natural environmental systems are maintained, and where development is designed to be resilient in the face of natural forces"[16] As one workgroup put it, "Critically important for effective climate change adaptation will be factors that directly shape the health of populations such as education, health care, public health prevention, and infrastructure"[17]

CONCLUSIONS

The outputs of the 2004 and 2005 Pacific Health Summits for Sustainable Disaster Risk Management provide a comprehensive, consensus-based 10-year plan for disaster risk management for health throughout the Pacific region. The Pacific declaration provides a detailed evaluation of current challenges and accomplishments in the Pacific with respect to disaster risk management. This indigenous plan of action should guide future international developmental and humanitarian assistance as a means of reducing the risk of human health effects caused by climate change. The document may equally apply to similar at-risk island nation-states in other regions of the world.

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Hard copies of the Declaration of the Pacific Health Summit for Sustainable Disaster Risk Management and project concept papers are available free of charge by e-mail request to Mark Keim at mjk9@cdc.gov.

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