

SIXTH INTERNATIONAL WORKSHOP on TROPICAL CYCLONES

Topic 5.3 : **Mitigation Strategies and Community Capacity Building for Disaster Reduction**

Rapporteur: Linda Anderson-Berry
Bureau of Meteorology, Australia

Email : l.anderson-berry@bom.gov.au

Working Group: David King, Hilda Lam, Terry Hart, Mike Bergin

5.3.1 Introduction

Tropical cyclones, like all other naturally occurring hazard events have the potential to severely affect the lives and livelihood activities of people in the communities they impact. Human suffering and social, economic and environmental loss continue to be an almost inevitable outcome of land-falling tropical cyclones. Alarming over time, and despite ever-improving technological solutions for forecasting, detecting, identifying the physical dimensions and monitoring development and movement of tropical storms, and communicating warnings messages, this loss continues to increase. Additionally, in the face of changing global climate regimes and the likelihood of more frequent, and possibly more intense, tropical cyclones, coupled with growing populations in tropical coastal regions, it is likely that more people in the tropical regions will be in harms way and levels of loss and suffering will continue to escalate.

To mitigate such loss, warnings systems have been developed throughout the WMO community in the context of a *total warning system*. This extends the concept of warnings from the simple delivery of a message about impending severe weather conditions to a process that begins with using the best science available to predict and monitor the development and progress of, for example, a tropical storm, to the production and delivery of a timely and accurate message to a receptive, prepared and resourced community in a format that is understood. Thus, empowering society – at all levels of social aggregation, from central governments down to individuals in households to make informed risk minimizing decisions and that appropriate loss protective and defensive actions.

Simply stated this means that the warning can only be considered to have been successfully delivered when the community on which it is focused has had the capacity to respond.

Understanding and supporting the building of community capacity has evolved as a dominant theme in disaster mitigation. Strategies and research emphases for understanding natural hazards, such as tropical cyclones, and their effect on human communities with an ultimate view to mitigating loss has seen a paradigm change over time. Until the early 1990's emphasis (and research effort) was focused on understanding the hazard itself – an essentially and predominantly physical science approach. This emphasis began to change throughout the 1990's - the International Decade for Disaster Reduction – IDNDR when the focus shifted towards attempting to understand the *impacts*. Research and practice to this end saw an inclusion of research from within the social sciences and an investigation of mitigation and adaptation strategies. Identifying, understanding and reducing community vulnerabilities was seen to be important and disaster mitigation solutions began to be based on the development of social policy as well as engineering defences. This direction was reflected in presentations at IWTC-V.

Following on from the IDNDR has been the United Nations initiated International Strategy for Disaster Reduction (ISDR). This strategy has overseen the development and implementation of the Hyogo Framework for Action 2005-2015 – *Building the Resilience of Nations and Committees to Disasters* and

the Platform for the Promotion of Early Warnings (PPEW). Community capacity building has become a dominant theme of ISDR, particularly in relation to disaster risk reduction, developing strategies to mitigate loss of life and property in the event of natural disasters and developing early warning systems. The goal is to support a 'bottom-up' approach to strengthening and building resilient communities with the capacity to prepare for, mitigate, respond to and recover from natural hazard events.

In the case of hazards of meteorological hydrological and oceanographic origin this has supported the building of strong partnerships between the weather services that have primary responsibility for developing and delivering warnings to the full range of stakeholders in government, emergency services, educational services, community management and citizens (individually and collectively)

In this summary paper – disaster mitigation strategies in the context of community capacity building will be discussed – with the support of case study examples

Capacity building

Capacity building – both as a term and a principal is widely used but perhaps not so widely understood, and is rarely clearly defined. The United Nations Development Programme (UNDP) defines Capacity – in the development context as:

- the ability of individuals, organisations and societies to perform functions, solve problems and set and achieve goals. And
- its development entails the sustainable creation, utilization and retention of that capacity in order to reduce poverty, enhance self reliance and improve peoples lives

For the purposes of this paper community capacity building in support of disaster mitigation is defined as “..... strategies that enhance or build the ability of the human population to make effective risk minimizing decisions and take effective risk minimizing actions that will increase the levels of safety. This includes building human capacity to interact with and utilize the technology as well as supporting the development of strongly networked cohesive communities.”

NMHS's generally support community capacity building and serve their 'user' communities as effectively as is possible through the very strong partnerships and close and interlinked working relationships they have developed with their various stakeholders among government agencies, community service providers and particularly the emergency management community.

5.3.2 The Australian experience - Partnerships with Government and non-Government Agencies

Queensland Tropical Cyclone Coordinating Committee

The Queensland Tropical Cyclone Coordination Committee (QTCCC) was established in 1995 to provide advice to the State Government's Disaster Mitigation Committee on measures to mitigate the effects of tropical cyclones on Queensland communities. The QTCCC's role encompasses disaster mitigation research, policy development, disaster risk assessment (hazards and vulnerabilities of communities), mitigation measures, community preparedness and post disaster assessment in relation to tropical cyclones.

The QTCCC's functions are to: enhance community safety, mitigation and prevention capability across all Queensland communities in relation to the impact of tropical cyclones; contribute to the National, State and local strategic policy framework relating to the impact of tropical cyclones; advise on roles, responsibilities and priorities of entities involved in the management of tropical cyclone impacts; and review tropical cyclone impacts to assess mitigation processes.

The Committee is jointly chaired by the Director of the State Government's, Disaster Mitigation Unit in

the Department of Emergency Services (DES) and the Regional Director, Australian Bureau of Meteorology (BoM). Committee membership includes representatives from State Government Departments of Health, Transport and Local Government and Planning, Sport and Recreation; the Environmental Protection Agency; Queensland; Queensland Police Service; the Institute of Public Works Engineers Australia, Queensland Division; the Planning Institute of Australia; Tourism Queensland; Insurance Disaster Response Organisation; Queensland Local Government Association; Emergency Management Australia (Australian Government); and researchers from Geoscience Australia and James Cook University's Centre for Disaster Studies and Cyclone Testing Station other specialist advisers are invited as required. The Committee develops and maintains a three-year rolling strategic plan and annual work plan for each year. One of its major activities is the coordination of the annual pre-season public awareness and preparedness education campaign when Collectively and cooperatively just prior to the beginning of the Tropical Cyclone the Bureau and its partner agencies present a series of interactive demonstrations, workshops and meetings during an annual 'road-show'. The Bureau's Queensland Regional Director, senior forecasters, hydrologists, together with key executive staff from the Emergency Management Queensland' State and regional offices and other partner agencies travel to major townships and cities in tropical cyclone prone northern Queensland to provide information about seasonal forecast, tropical cyclone warning products, and a holistic public education campaign to local and regional emergency services, local government groups, schools, community services groups and the general public. This annual direct interaction with residents in cyclone-prone communities has proved to be a powerful tool in raising community awareness and building community trust and confidence in the weather and emergency services.

5.3.3 The Hong Kong experience - Coordination with emergency services and public education activities

To strengthen the community's capability to withstand tropical cyclone (TC) hazards, the Hong Kong Observatory (HKO) recognizes the importance of good coordination with the emergency response units as well as a long-term programme for public education and outreach.

To ensure good coordination between HKO with other government departments and non-government agencies so as to trigger fast response actions in TC situations, a contingency plan for natural disasters is in place in Hong Kong stipulating the triggering mechanism of the warning system, the responsibilities of various agencies in responding to natural disasters. The HKO also holds annual liaison meetings with key departments such as the education, transport, drainage and geotechnical control authorities to review arrangements for emergency response. Government-wide seminars are also conducted every year to enhance understanding and cooperation of government emergency response staff.

The HKO organizes public education and outreach activities such as public talks and lectures, school visits, exhibitions, TV documentary series and publicity campaigns to raise public awareness of disaster risks. Through these activities, the following information is provided to facilitate better understanding of the TC phenomena and warning service: meaning of the TC warnings; issuance and cancellation criteria; advisories and precautionary measures; rationale behind criteria and recommended actions; explanations of the nature of TC and its impacts; descriptions of cases of extreme events, both local and worldwide; information about the effectiveness of precautionary actions; challenges in tropical cyclone forecasting.

Public education and outreach activities are scheduled throughout the year:

- ◆ In the quiet season, visits to the observatory by students, open day, exhibitions in public venues and outreach visits by Observatory staff to homes for the elderly and schools, campaigns to raise awareness, including various related contests involving particularly students are organized.

- ◆ Prior to the start of the tropical cyclone season, the Director of the Observatory appeals to the public to be prepared for natural hazards. Regular announcements on TC through TV and radio are broadcast. The HKO also meets with stakeholders to refresh their memories and advise them about service enhancements.
- ◆ During the tropical cyclone season, broadcasts of announcements through TV and radio are stepped up. The HKO meets with those users hardest hit to understand their problems to identify quick fixes and long-term solutions.
- ◆ After the tropical cyclone season, HKO meets with users to discuss enhancements to services, organize training courses for the public and special user groups.

In 2004, HKO organized a Symposium on Natural Disaster Planning and Preparedness which provided an opportunity for meteorologists, disaster managers and academics in the region to exchange experience and strengthen co-operation in disaster preparedness and mitigation. In 2005, the HKO and other government departments as well as NGOs jointly organized a year-long public education campaign, called “Safer Living – Reducing Natural Disasters”, to promote public awareness and understanding of natural hazards. The year-long campaign includes a four-episode TV programme on safer living, a meteorological series TV programme, a tropical cyclone naming contest, popular science lectures, bookmark design contests, a seminar on natural disaster reduction and a large exhibition with rescue drill demonstrations. The “TC Name Nomination Contest” which invited the public to nominate names for tropical cyclones in the northwest Pacific and the South China Sea attracted more than 20,000 entries. HKO is also keen in identifying collaboration partners for public education such as the Hong Kong Education City for which the target audience are students and teachers. Web pages for educational resources and publicity materials on TC are developed to facilitate the spread of the knowledge in the education sector. Partnership with the media contributes to the effective promotion of public education on the hazards of TCs to a wide range of audience.

Through a sustained programme of education and outreach, the public and all emergency response units involved can gain a better understanding of the characteristics of the hazardous phenomena, where vulnerability lies, and what their respective actions should be on receiving warnings, thereby enhancing the resilience of the community to TC hazards.

5.3.4 The Fiji Experience - Capacity Building in the Pacific – supporting infrastructure and training

Over the past few years RSMC Nadi has suffered from staff shortages that has resulted in a staff shortages during the very active cyclone season and staff not able to be released for training. The Bureau of Meteorology Australia has been able to assist with attachments of staff for periods of 12 months or more – supported largely by Australia’s aid agency AusAID through its Pacific support projects aimed at providing support through infrastructure and training to build local capacity. Australian tropical cyclone and severe weather forecasters from the RSMC Darwin have provided forecasting support in RSMC Nadi. They have also assisted with training in Fiji and the Pacific Island nations of Vanuatu, Tonga, and Samoa. Infrastructure support has been provided with the implementation of Tropical Cyclone module that is used in forecasting operations in Australia. The TC Module is able to ingest NWP tracks and produce a consensus forecast which then can be modified. Graphical warning products that indicate past and forecast tracks and threat areas can then be generated. These have significant advantages over text products in conveying information to the public. Australia has successfully sought additional funding through AusAID to build on this capacity building initiative and extend support for the region, including the development of the TC Module, in the broader framework of Disaster mitigation planning recently adopted by the leaders of the Pacific Island countries

WMO is developing severe weather projects to demonstrate an end-to-end approach from the NWP

and other numerical guidance products available from global and regional centers through the national meteorological services to end users such as emergency service organizations. One of these projects is specifically related to tropical cyclones. The concept is to explore both current and new types of NWP products that could assist end users particularly in extending the outlook period of their planning (eg through medium-range ensemble products that can give advance warning) WMO Region V through the Chair of its TC Committee expressed interest in participating in such a project. The initial phase, however, will be conducted for the south-east Asia region with the Pacific later.

5.3.5 Ranet

Ranet (radio internet) is a project concerned with communication of TC (and other hazard) education and warning information to the local community level. The primary aim has been to build community capacity by ensuring information is delivered to 'the-last-mile'. This was initiated by NOAA Office of Global Programs in Africa and has been extended to South east Asia and the Pacific with contributions from the US, UK, New Zealand and Australia. The implementation has explored affordable and sustainable communications options and is focusing on:

- Use of local FM radio stations that can broadcast to local communities
- Digital HF to allow connection from a central site to communicate with remote communities within a country and also for long distance international communication (eg for the transmission of observations onto the GTS where this has not previously been possible), and
- The WorldSpace digital satellite broadcasts which is providing a oneway data broadband capability for countries able to receive its transmission; the broadcast currently includes web pages and meteorological data including the EMWIN content and warnings. There is scope to include other types of community education material such as health and agricultural advice and warnings.

Australia's aid agency continues to support this highly successful capacity building project. Future developments will link with and be boosted by the telecommunications technology that is being implemented for the tsunami warning system (both data collection and transmission of warnings) for the Pacific region.

In October 2005 at the South Pacific Forum the leaders of the Pacific Island Countries endorsed the Pacific Regional Disaster Risk Reduction and Disaster Management Framework 2006-2015 as part of the Pacific Plan. This represent the highest possible endorsement within the Pacific region of the disaster mitigation approach (implicit in this is capacity building) that underpins ISDR. The forum requested that regional policies and plans be implemented by the end of 2008 and asked for progress reports in 2006 and 2007. As meteorological, hydrological and oceanographic hazards (particularly tropical cyclones are the major component of natural hazards it is expected that NMHS's will have a significant role to play in the implementation of the framework. The South Pacific Applied Geoscience Commission (SOPAC) is the regional representative of the ISDR – to which the Bureau and WMO are strongly committed.

5.3.6 Understanding and evaluating community capacity – the value of Post-impact data collection and evaluation

a) Tropical Cyclone Zoe Solomon Islands December 26-29, 2002

One of the outcomes of the WMO IWTC V, Cairns December 4-13, 2002, was a raised awareness of the need for scientists from all disciplines, specialising in tropical cyclones, to cooperatively and collectively evaluate the effectiveness of tropical cyclone warning systems and the impact of land-falling severe tropical cyclones on coastal communities. It was agreed that this should ideally be achieved through the conduct of (internationally) cooperative, multi-disciplinary post-impact case

studies. Within weeks Severe Category 5 Tropical Cyclone Zoe impacted the tiny Solomon Islands communities of Tikopia and Anuta. Between December 27 and 29, 2002 these tiny remote islands with a combined population of less than 1800 village dwellers and essentially subsistence economies and virtually 'modern' infrastructure were subjected to sustained hurricane force winds for periods in excess of 30 hours. Warnings were issued through the Solomon Islands Weather Service with the support of the Australian Bureau of Meteorology. However, the islanders had been without 2-way radio communication for several weeks and their ability to receive warnings via short wave radio was unknown. The force of the storm was relentless, dwellings and food crops were for the most part destroyed, canoes for fishing and near island travel were lost and the environment was devastated. National and international concern for the welfare of the islanders was high but due primarily to the absolute remoteness of the islands, it was almost 2 weeks before direct contact could be made, the fate of the people known. As part of the first phase of assistance provided to the Tikopian and Anutan communities a multi-agency team (that included representatives of the Solomon Islands Weather Service and the Bureau of Meteorology Australia) carried out an holistic post impact assessment. Miraculously, no-one had died and there were no serious injuries but the people were mostly without food, housing and clothing. It seemed that the ability to sustain life on the islands into the future was limited at best. However, village communities typically enjoyed strong cohesive family and societal networks that were based on a long history of adherence to customary practices and belief systems, they were also strongly networked with communities of Tikopians and Anutan's that were currently living away from their home islands. Levels of 'social capital' in these communities were high and with support coming from within and from outside, these resilient communities have demonstrated a remarkable capacity to recover and slowly rebuild from what seemed to be an impossible situation. A full discussion of this study will be presented at IWTC-VI

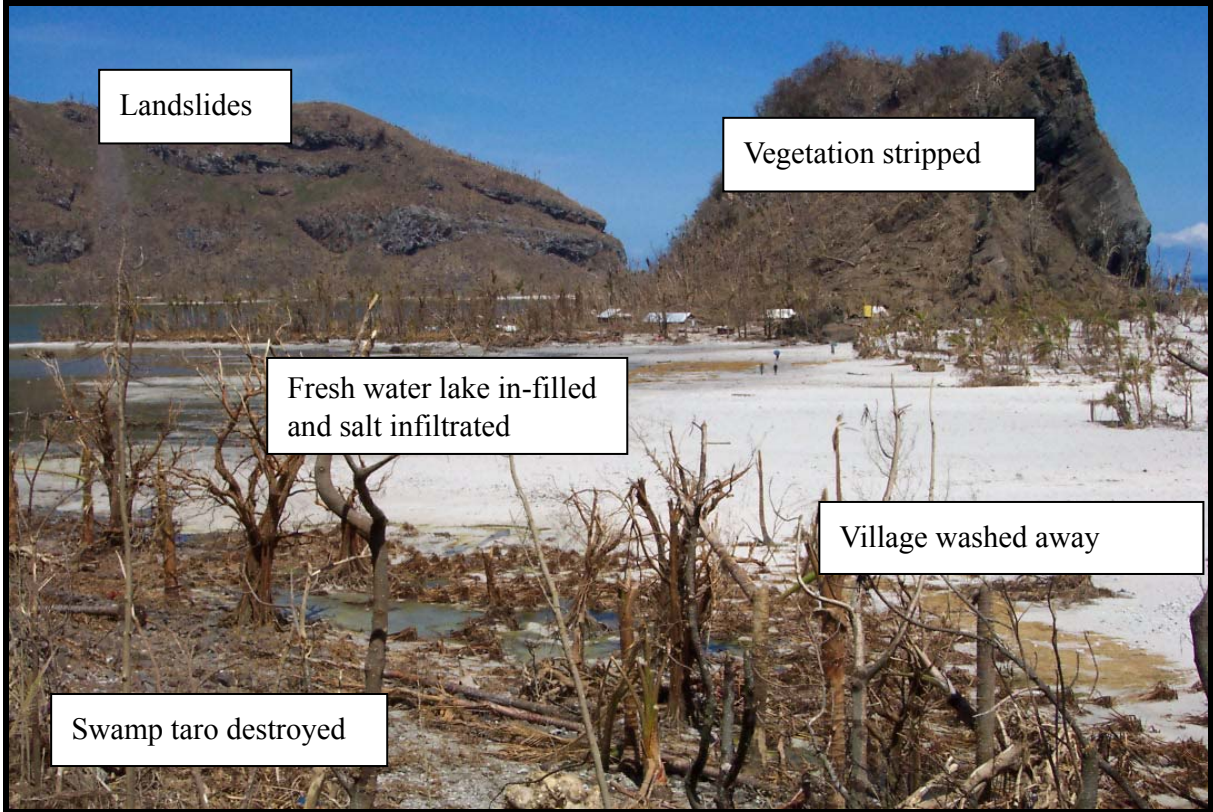


Fig 5.3.1 FTikopia – Ravenga Village area

b) Tropical Cyclone Larry March 20 2006 Northern Australia

Tropical Cyclone Larry was a Category 4 Tropical Cyclone that impacted the economically significant Innisfail region in Far Northern Queensland. It was the most destructive land-falling tropical cyclone to impact a populated Australian coastal community in more than 30 years. Several post-impact assessments have been carried out to measure impact for response and recovery support purposes, to measure the environmental and societal impact and to evaluate warnings effectiveness. Miraculously, despite widespread devastation, there were no deaths and only minor injuries. Post impact assessments discovered evidence of sound preparation amongst strong, well networked rural and small town communities. People sheltered in their own homes, of which approximately 20% were totally destroyed. The population in the storm surge zone was advised to evacuate prior to the storm and with levels of community trust in the weather and emergency services generally high, most people did as they were advised, finding shelter with friends and relatives, mostly in the same area, but back inland from the storm surge zone. Post disaster surveys showed that most of the adult population had experienced previous cyclones and were generally aware of the tropical cyclone risk. The communities were cohesive and strongly networked. People behaved sensibly, did the right things and sheltered inside their houses as advised to do so. It was an example of a prepared and experienced community with high levels of social capital and the capacity to fare very well. A more complete review of Tropical Cyclone Larry impact will be presented at IWTC-VI.

5.3.7 Summary

'Community capacity' is increasingly being recognised as a reliable indicator of how human populations are likely to respond to and recover from the impact of hazard events. However, understanding and measuring community capacity presents a challenge. Weather Services, community and emergency managers, academics and hazard research centres are all increasingly investing in research and activities aimed at investigating community capacity, and ultimately applying strategies to build community capacity in support of disaster mitigation. This summary paper has provided an overview discussion of capacity building, supported with examples provided by various case studies. It has considered capacity building in the context of supporting high-level Government and multi-agency policy forums such as QTCCC, and public education strategies such as those delivered through HKO. It has considered community capacity building in terms of infrastructure support and training with examples from the Pacific region and Ranet. Discussion has also focussed on identifying situations, in both a developed and developing world context, where high levels of social capital and strong community capacity has proven to support community resilience and disaster mitigation in the broadest sense. A fuller discussion will be provided through presentations at IWTC-VI.

Land-falling tropical cyclones can destroy lives and livelihoods, devastate the environment, and crush local and even national economies. Impacts can be somewhat mitigated, and NMHS's are dedicated to achieving the highest levels of disaster mitigation possible through the delivery of effective tropical cyclone warnings in the holistic context of a *total warning system*. To achieve this NMHS's work in partnership with their emergency management stakeholders to build and support communities with the capacity to take actions that will minimise loss of life and suffering.

Bibliography

Anderson-Berry L. and King D. 2005. "Mitigation of the Impact of Tropical Cyclones in Northern Australia through Community Capacity Enhancement". Special issue of **Mitigation and Adaptation Strategies for Global Change** (2005) 10: 367–392 ed. E.Haque.

Anderson-Berry L, King D & Crane G. 2002. Assessment of the Effectiveness of Various Methods of Delivery of Public Awareness Information on Tropical Cyclones to Queensland Coastal Communities.

Report on Project 05/2001 for Emergency Management Australia.

Davidson, J. and M.C. Wong, 2005: Guidelines on Integrating Severe Warning into Risk Management (PWS-13), WMO/TD No. 1292.

Hoogenraad, Wouter, van Eden Ronald & King David. 2004. "Cyclone Awareness Amongst Backpackers in Northern Australia." **AJEM**. Vol 19 No 2.

King D. 2006. (In press: accepted 11/05)"Organisations in Disasters." Special issue of **Natural Hazards** edited by R. K. Chadha

King D. 2006. (In press). "Planning for Resilience". Chapter in Paton, D. & Johnston, D. eds. **Disaster Resilience: an integrated approach**. Pub. Charles C. Thomas, Springfield, Illinois

King D. and Gurtner Y. 2005. "After the Wave: A Wake Up Warning for Australian Coastal Locations". **Australian Journal of Emergency Management**, Vol. 20 No. 1.

King D., Cottrell A., Goudie D. and Cunliffe S. 2005. "Community Hazard Awareness and Resilience in Northern Australia". In **Know Risk: UN/ISDR**. Official publication of UN WCDR, Kobe, January 2005. Published by Tudor Rose, Leicester, UK

King D. 2004. "Understanding the Message: Social and Cultural Constraints to Interpreting Weather Generated Natural Hazards". **International Journal of Mass Emergencies and Disasters**. Vol 22 No 1 pp 57-74

King D. 2006. Post Cyclone Monica Survey. Centre for Disaster Studies & Bureau of Meteorology

King D. & Goudie D. 2006. Cyclone Larry Post Disaster Survey. Centre for Disaster Studies & Bureau of Meteorology

King D., Cottrell A., Anderson-Berry L., Cunliffe S., MacGregor C., McLachlan E and Antrobus J. 2001. Cyclone and Natural Hazard Vulnerability in Remote and Indigenous Communities of North Queensland: Final Reports. Centre for Disaster Studies, James Cook University. Emergency Management Australia

Lam, C.Y., 2005: Disaster Risk Management – the Weather Perspective, presented at the Asian Conference on Disaster Reduction, Beijing, China, 27-29 September 2005.

Rogers, D., 2005: Turning Crisis Management into Risk Management – The Role of Weather Forecasting, presented at the *Seminar on "Safer Living – Reducing Natural Disasters"*, Hong Kong, China, 17 October 2005.

<http://www.unisdr.org/wcdr/public-forum/reports/WS007.pdf#search=%22CAPACITY%20BUILDING%22>

<http://www.unisdr.org/wcdr/thematic-sessions/presentations/session5-3/ocha.pdf#search=%22CAPACITY%20BUILDING%22>

<http://severe.worldweather.wmo.int/>

<http://www.sere.ucar.edu/>

<http://www.unisdr.org/eng/hfa/hfa.htm>

<http://www.ccb.ucar.edu>

<http://www.tesag.jcu.edu.au/CDS/index.htm>