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Cyclones and disaster management

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सार — आपदा प्रबंधन एक दीर्घावधि, बहु-क्षेत्रक जिम्मेवारी माना जाता है, जो कि पारम्परिक रुप में राष्ट्रीय विकास को प्रभावित करता है । आपदाओं के लिए जनसमुदायों की संवेदनशीलता के मूल कारणों के साथ इसका घनिष्ठ संबंध होना चाहिए । ये मूल कारण, अनिवार्य रूप से, विकास कार्यक्रमों के लक्ष्य हैं । चक्रवातों के अध्ययनों से ग्रहण किया गया विशेष ज्ञान आपदा प्रबंधन के लिए प्रासंगिक ही नहीं है, अपितु यह इसका एक महत्वपूर्ण घटक है और इसकी सफलता के लिए निर्णायक भी है । इस लेख में कुछ ऐसी आपदा प्रबंधन युद्धनीतियों की रुपरेखा, प्रस्तुत की गई है, जिन्हें हम सब क्रियान्वित करना चाहेंगे, ताकि चक्रवातों से क्षति की संभावना कम हो । इस लेख में, इन युद्धनीतियों में से प्रत्येक के लिए चक्रवात संबंधी अध्ययन के महत्व को, उचित संदर्भ में, दिखाया गया है।

ABSTRACT. Disaster management needs to be a long-term, multi-sector responsibility which interacts with, and contributes significantly to, national development. It should be intimately concerned with the root causes of community vulnerability to hazards, and these root causes are inevitably the targets of development programmes. Expert knowledge gained through studies of cyclones is not only relevant to disaster management, but is an important component and crucial to its success. This article outlines some of the disaster management strategies that all of us should be trying to implement so that cyclones have less potential for harm. The article also shows the importance of cyclone related studies, in the proper context, to each of these strategies.

Key words — Disaster, Cyclone, Development, Hazard, Vulnerability, Programme.

1. Introduction

Most readers of this journal are familiar with tropical cylones. No doubt you have more than a passing acquittance with cyclone frequency, locations, tracks, eye diameters, annular rings, pressure gradients, wind speeds, outer boundaries, wave interactions, shearing effects, and other associated subjects. When invited to contribute to this issue, I realised that I was not very familiar with these. Perhaps some of you are equally less familiar with the subject of disaster management, which is often associated exclusively (though incorrectly) with those actions taken after a cyclone has had damaging effects on people and their habitats. Disaster management is not about responding to serious circumstances when they occur. Disaster management instead must be viewed as a comprehensive system of coordinated efforts aimed at reducing the probability of serious circumstances occurring in the first place, as well as effectively responding when they do occur.

I am honoured by the invitation to contribute, specifically on disaster management, to this special issue of "Mausam". Given the dimensions and complexity of comprehensive disaster management and its relationship to almost every fibre of a nation's being, this article is a superficial look at a deep and

wide-ranging subject. Interested readers who want to know more will find there is a substantial amount of literature on various aspects of the subject, with many aspects still subject to a lot of research and development.

I hope to show readers that effective disaster management needs to be a long-term, multi-sector responsibility which interacts with, and contributes significantly to, national development. As we have seen throughout the world on many occasions, and as we continue to see, disasters can severely curtail a country's rate of development, and can even result in its reversal. Disaster management should be intimately concerned with the root causes of community vulnerability to hazards, and these root causes are inevitably the targets of development programmes.

I hope also to convince readers that expert knowledge gained through studies of cyclones is not only relevant to disaster management, but is an important component and crucial to its success. The article does not discuss cyclones themselves in any detail. I am sure other contributors will do that adequately. Instead, it outlines some of those strategies that all of us, through activities known collectively as disaster management, should be trying to implement so that cyclones have less potential for harm. The article also shows the importance of cyclone related studies, in the proper context, to each of these strategies.

2. What is Disaster Management?

2.1. *Misconceptions*

(a) *About Hazards*

A common misconception, frequently stated, is that cyclones, floods, earthquakes and other significant natural events are disasters. These natural phenomena however, *are not disasters*. They are *hazards* whose associated characteristics *may*, in certain circumstances, have the *potential to contribute* to situations which *could* end up as a disaster. What we should be referring to as a disaster is an outcome of a combination of circumstances. One of these is a hazard which has manifested itself and impacted on a community. Another is the community having a degree of vulnerability to the characteristics of the hazard. Disaster occurs when this interaction of hazard characteristics and vulnerability is such that the community *cannot reasonably cope with the results using its integral societal and material resources.*

(b) *About Disaster Management*

Another common misconception associated with disaster management is the belief that it is something separate from normal government and community business, involving only professional emergency response agencies when something serious occurs. In reality, disaster management should extend at all times across all government, non-government sectors and industry, from the highest international levels down to individual people, and it affects every facet of society. Everybody, no matter who, and every organisation or agency, no matter which, has some role to play. Disaster management is a business of continual activities and programmes, with actual response to situations occurring only sporadically.

(c) *About Terminology*

These common misconceptions can be attributed partly to terminology. "Disaster management" is inaccurate as a description of what should happen. As an expression, it seems to imply that "disasters" are "managed" whenever they occur, and otherwise gives little indication of what needs to be done to avoid them. Where this perception is held, there is little attention paid to the causes of vulnerability. Vulnerability to hazards remains high, and hazard impact on vulnerable populations results in disaster with disheartening frequency.

2.2. *Reality of Disaster Management*

Sound disaster management should be the effective application of holistic management techniques to hazards and their relationship with vulnerability. In other words, it is the effective application of *risk management* techniques to hazards and vulnerability at community level. In this context, "communities" can apply to localities, villages, towns, cities, districts, provinces, countries, and regions.

In disaster management, we should apply all available and practical reduction measures, as far away in time and/or distance as possible, to the hazard and to the vulnerability of communities, thereby reducing the actual risk of hazard impact resulting in a disaster. This means that whenever a hazard looks as though it might impact on us, we should have already done all we can reasonably do, even before it actually starts to threaten, to reduce the potential results of its impact down to something with which we are able to cope.

If we have done all we can, then when impact occurs we have a better chance of achieving the ultimate aim of disaster management, and that is to *manage circumstances in such a way that they do not result in a disaster.*

We can therefore describe disaster management as a system of coordinated programmes and activities designed to achieve all of the following :

(*i*) We attempt *prevention of hazards, and vulnerability* to them as much as is feasible.

(*ii*) Because complete hazard and vulnerability prevention is usually not feasible, then we mitigate the potential results as much as possible, by activities designed to *reduce hazards and vulnerability* to them.

(*Note : Hazard and vulnerability prevention and reduction is often referred to as prevention/mitigation. There are no clear- cut distinctions and some activities fit under these categories as well as they fit under preparedness*).

(*iii*) Because in most cases we cannot reduce these to zero, then we make sure our *preparedness* is adequate to deal with potential results should the hazard impact on those in vulnerable situations.

(*iv*) On those occasions the hazard does impact, then we *respond* effectively to alleviate the results.

(*v*) We then take action to *recover* the affected (region, nation, community, system) to a less hazardous and less vulnerable situation than that which resulted in the hazard impact and the extent of its results.

We will need to respond to hazard impact on occasions, but proper disaster management means the vast majority of our time will be devoted to continual programmes and activities on hazard and vulnerability reduction, as well as establishing and preparing systems for response and recovery should they be needed. If these coordinated programs and activities are effective, hazards may continue to impact, but disasters as we perceive them should *result* far less frequently, and only then when the event is of an order of magnitude beyond any reasonable anticipation. This means that the rate of overall development will suffer much less from the effects of hazard impact, and that development activities will be more focused on addressing root causes of vulnerability.

3. Disaster Management and Cyclones

As readers are well aware, cyclones as a hazard cannot be prevented. As much as we are able, we observe and measure their locations, their duration, their tracks, and their severity, but we cannot influence cyclones or alleviate their characteristics in any practical way. A cyclone has *potentially* destructive characteristics which include storm surge, wave effects, strong winds, and heavy rains. As we have already seen, these by themselves will not produce a disaster. The characteristics are part of the phenomena and will still be present if a cyclone crosses an uninhabited coastline, or stays away from land, or does not otherwise threaten populations. However, if the cyclone impacts in circumstances where populations are particularly vulnerable, then there is a real risk of a disaster.

3.1. *Risk and Vulnerability*

Risk might be defined simply as the probability of the occurrence of an undesired event. In disaster management, the "undesired event" is often taken to mean an event such as a cyclone. In certain situations however, such as when associated rain is needed for seasonal crops, cyclones may not always be "undesirable events". It is more realistic therefore, to view the "undesirable event" as being the cyclone impacting in a detrimental way; in other words, impacting on a vulnerable community in a way which exceeds its coping capacity - a "disaster".

Vulnerability can be described as the degree of community coping capacity, or inherent protection, against cyclone characteristics. The degree of vulnerability is a function of varying combinations of circumstances and involves many aspects of the way a country manages its affairs. High levels of vulnerability can result from a lack of community morale and economic resilience in adversity, a lack of physical protection against hazard characteristics, a lack of preparedness by communities and their managers, and a lack of knowledge overall about the threat and what could happen.

Risk, in regard to cyclones, may therefore be described as the probability of a cyclone *contributing* to a *potential* disaster, and involves consideration of cyclone incidence and characteristics, and the vulnerability of communities to them. When high degrees of vulnerability are combined with frequent

cyclones, the risk of disaster is likely to be high. Cyclone incidence, and severity of cyclone characteristics, are well-known as areas for continued research. In regard to vulnerability however, we need to do much more study than at present, and we must give more recognition to it as a factor in contributing to disasters.

3.2. *Hazard Assessment*

While it is not possible to give long-term forecasts of precisely when and where cyclones will occur, it is nevertheless feasible to make some assessment of particular locations and their relation to cyclone incidence and characteristics. Accurate analysis of cyclone records can provide an indication of how often a country or region might expect to experience a cyclone, from which direction it might come, how often the winds might be expected to exceed a given strength, how often the associated rainfall might be expected to exceed specified amounts, and how often severe storm surges might be expected to occur.

Further analysis of these records might indicate which particular areas are likely to experience specific cyclone characteristics, how often, and how severe. From such analyses we should produce relatively detailed hazard maps, which can and should be used in development planning as well as disaster management activities.

3.3. *Hazard Reduction*

Whenever possible in disaster management, we must look for ways to reduce the incidence of the hazard, and the severity of its characteristics. In the case of cyclones, if any reader knows of ways we can control the hazard I am sure the world will beat a path to your door, and it would be a development project of world importance. However, until we can influence cyclone behaviour in a real way, we must concentrate much of our disaster management efforts on reducing our vulnerability to them.

3.4. *Vulnerability Assessment*

In an ideal world we would be sure to prevent hazard impact by locating anything we value (such as people, facilities, crops, infrastructure, etc.,) away from areas where cyclones might occur. Patently this is impossible, and there are numerous and unchangeable reasons why we must live and work in regions subject to cyclones. Because we do, there exists a continual possibility that they will impact on us, and we need to closely examine all our relevant circumstances to see what actions we can take to reduce our vulnerability to them. The first step is to assess just how vulnerable we are.

Clearly, an assessment of community vulnerability needs quality input from, and interaction with, studies on cyclone incidence and characteristics. But we must look more widely than the natural phenomena itself. We need to study the particular combinations of community circumstances which make cyclones destructive in one place and merely annoying in another. We need also to study what combinations of circumstances can help a community improve its capacity to cope with cyclone impact.

Many studies have been conducted, and many more will be necessary, on structural issues such as wind speeds, engineering, storm-tide levels, sea-wall protection, crop protection, building construction, and so on. These studies however, have not always resulted in change for the better. People cannot always afford the physical protection they need to have, nor can authorities always afford to provide it.

Sometimes they are unaware of the need for such protection. Even when there are adequate levels of physical protection, the post- impact situation can still become a disaster if appropriate response activities are not planned before the event, or if resources are insufficient, or if there is no mechanism for managing the situation. If all this isn't enough, there are even more vulnerability factors to consider.

The socio-economic status of communities, social networks, community spirit and resilience in adversity, poverty levels, the way communities are governed, the level of access to resources and services, the demographics, and the standards of health and education, are just some of the areas subject to development projects. *All these issues however, contribute in a significant manner to the way communities can cope with hazard impact.* We, therefore, need to examine development from that perspective. Firstly, will the project decrease community vulnerability to hazards or increase it? Secondly, is the project itself vulnerable to hazards? If we look at the reality of disaster management, and how it needs to address vulnerability, we can see that disaster management activities and

development activities need to be closely intertwined.

Studies of cyclones and their characteristics are clearly the provenance of appropriate experts, as are studies on vulnerability and development issues. Effective disaster management must ensure that these studies are integrated, in order to assess the true levels of vulnerability.

By doing this we will be taking a *comprehensive* approach to vulnerability assessment, and will have a better chance of identifying the true level of vulnerability. This highlights the multi-sector and multi-level nature of disaster management, shows the necessity of an holistic view, and emphasises the importance of cyclone studies in a proper context.

3.5. *Vulnerability reduction*

Strategies for community vulnerability reduction are as many and as varied as the communities themselves. There are, however, a few basic considerations common to all sensible strategies.

(*i*) The approach must be comprehensive, must be based on an assessment of *true* vulnerability, and must aim at *all* vulnerability factors. Comprehensive vulnerability reduction measures can ensure longterm development success for the community as a whole.

(*ii*) Vulnerability reduction measures for cyclones must be compatible with measures for other natural hazards, and these must be compatible with vulnerability reduction measures for technological hazards, and vice versa.

(*iii*) Vulnerability reduction measures must be designed to achieve the most effective combinations for a particular situation, and will be most effective when based on government- community-industry partnerships.

(*iv*) We must recognise and accept that choices exist, and people will exercise their options, but those who knowingly choose to assume greater risk must also accept responsibility for that choice.

One useful and obvious application of a vulnerability assessment is in planning for land use and similar development activities, ideally leading to the location of communities and vital infrastructure in those areas of least cyclone frequency. In many cases, however, this is not easy to achieve. There are many situations where we have no choice but to locate in areas where cyclones impact regularly. Many agriculture and supporting industries are dependent on rains produced by periodic cyclones and associated weather patterns. Much of commercial fishing and its supporting industries needs to be based on coastal areas, and there are other similar situations. Often enough, there are simply no other options available for consideration.

Mostly, therefore, some sort of compromise results. If such compromises are to the best available, they need to be selected from the results of sound cost/benefit analyses, which should be based on comprehensive assessment of vulnerability to cyclone characteristics. These analyses will help us determine what we see as *affordable and acceptable risk.*

Our decision on affordable and acceptable risk will indicate what appropriate precautions may be necessary in future construction of homes, factories, power stations and other vital infrastructure, and what may need to be done with existing structures. Without such analyses, it is possible we may take too few precautions, or even too many. Our infrastructure should be developed so that it does not suffer unduly from weak cyclones, but neither should we waste resources by taking expensive measures against exceptionally strong cyclone effects that may occur only once in a thousand years.

Cyclone studies provide a vital input into decisions on what is affordable and acceptable risk by giving us accurate information on the hazard.

After reaching such decisions, we need to develop programs which reduce vulnerability to the level we have decided is acceptable. These programs, even though they address isssues as diverse as poverty, community morale, community health, sea level construction and building construction, are all aimed at the same thing, which is reducing vulnerability, and therefore must be conducted in concert with each other. In this way, we can see that national development itself is a disaster management activity, and that disaster management. activities can be called development activities.

To be successful, vulnerability reduction programmes need high level co-ordination and the support of the entire community. The sheer costs involved, let alone the importance to national development, means that they should focus on activities that produce

repetitive benefits over time, while still being adaptable to changing circumstances.

Vulnerability reduction programs, however, are only part of our comprehensive approach to disaster management. No matter how effective they are, and no matter how effectively we make development and disaster management part of each other, we must accept that we can never completely reduce vulnerability to zero. Once we have done all we can, appropriate to our circumstances, to reduce our vulnerability to a cost/benefit acceptable level, we must then prepare for the inevitable situations when cyclone will impact on our communities.

3.6. *Preparedness*

Preparedness activities are mostly *preparing for response*. However, these activities must not wait until a cyclone forms and looks threatening, but must be a continuing part of our disaster management approach. The problems which could result from cyclone impact are numerous. Therefore our philosophy must be that *a series of co-ordinated activities* will be necessary in response. If these are to be effective when we need them, we must plan and prepare them well.

The possible problems we may have to confront include :

(*i*) The necessity to evacuate people, either before or after impact. Hopefully our level of preparedness will ensure we are not surprised by the magnitude of impact, and we will have evacuated where necessary beforehand. However, we cannot always foresee what will happen; nor can we be sure all preparations will be done to the degree necessary.

(*ii*) Even our best efforts at vulnerability may be less than completely successful, so in our preparedness planning we need to allow for the possible loss of services. Cyclone effects can cause severe damage and disruption to roads, bridges, power sources, seaports, airports, communications, transport, medical facilities, and so on. These may be destroyed or damaged and therefore unavailable at the very time we need them most.

(*iii*) Flooding may occur, crop destruction or damage may happen, lives may be lost, industry disrupted, and any number of other circumstances may confront us as a result of cyclone impact.

All of these potential problems mean that there are many preparedness activities we need to undertake in order to reduce the chance of the problems occurring, to lessen their severity, and to better deal with them when they confront us. When we consider the importance of getting these activities properly organised, it becomes clear that we need to undertake them well in advance of any possible cyclone impact. Some of the more important of these preparedness measures are discussed briefly below.

(a) *Warning System*

The importance of an effective cyclone warning system cannot be overstated. The warning system triggers us into action, into implementing the response activities we have carefully designed, and it can give us some breathing space. It also gives us vital information about the particular cyclone, information which we need in order to take appropriate actions in response to the specifics of the threat. How much time it gives us, and how much accurate information it provides, and therefore how appropriate is our reaction, depends on the effectiveness of the warning system.

In some countries there is still a degree of misunderstanding about what constitutes a cyclone warning system, and where forecasting fits into it. Forecasting involves meteorological activities which track and predict cyclone movement, and which also measure and predict cyclone characteristis. *Forecasting on its own, however, does not constitute a warning system.* A warning system, includes forecasting, but it also involves translating meteorological information into meaningful messages so that appropriate actions can be taken. Meteorologists play a part in making the information meaningful, but so do disaster management systems.

A warning system also includes ensuring that useful and meaningful information reaches all the appropriate agencies and organisations, as well as the public, in time to allow appropriate actions to be taken. It also involves the actions themselves, for if we produce detailed and appropriate warnings and get them to the right people in time, but the appropriate actions are not taken, can we claim to have an effective warning system? Awareness/education activities are, therefore, a vital contribution to an effective cyclone warning system, because they can assist with ensuring appropriate actions resulting from the information provided.

In summary, a warning system, therefore, involves cyclone forecasts, translation of the forecasts into useful information, dissemination of the information and the resulting actions.

(b) *Community Awareness/Education*

If the population is to participate effectively in response, they need to be aware of the disaster management system and how it operates. They need to be aware of cyclones and their characteristics, what impact effects they might produce, and how warning systems operate. They need to be educated on what action is required of them before, during and after a cyclone.

Awareness and education campaigns must be planned and executed using a mix of strategies based on a sound knowledge of the community, what it is that prople need to be aware of, and what it is they need to be educated on. Such campaigns should not wait until cyclones are threatening, because that will leave insufficient time. They also need to be regular and periodic, because people soon forget what happened in an earlier cyclone. Experts with knowledge of cyclone effects can play an important role in the design and execution of these campaigns.

(c) *Response Mechanism*

Response situations are stressful, and usually involve actions related to saving and protecting lives and property under difficult circumstances. We must do whatever we can to ensure that we are as ready as possible, as far ahead of the response situation as possible. An established mechanism for co-ordinating the various response activities and resources, at all levels, is essential if response is to be effective. The mechanism needs a structure with authority, it needs plans, it needs trained people, it needs practised and tested procedures, and it needs operation centres from which control and co-ordination of the response can be effected.

This response mechanism must be able to activate and begin response operations in the minimum time possible. Therefore, we should look carefully at ensuring that it can activate, and begin operations, without having to wait for policy-making bodies to discuss issues about the business of saving lives and property. It is much too late to be designing and testing this mechanism when we are warned of the existence of a particular cyclone, so the response mechanism must be established and maintained as part of continual preparedness activities.

(d) *Cyclone Response Plan*

Cyclones are fairly specific hazards with potentially severe effects. With the prospect of numerous resulting problems, and therefore the necessity for a variety of co-ordinated activities in response, we need a response plan to ensure we know what these activities might be and how we will manage them. *This plan must be documented, validated, tested and rehearsed.*

A cyclone response plan should bring together all the appropriate resources and activities to respond to the threat of cyclone impact. With cyclones we usually become aware of their formation, we become aware of their movement, and we become aware of their likely impact area. A cyclone response plan should therefore logically include a phasing or staging of activities which are commensurate with the cyclone activity, and with its level of threat. This will ensure, when a cyclone has formed, that we will be ready for increases in the threat it might pose, but it also ensures that we do not take unnecessary and expensive actions.

The plan must incorporate our designed response mechanism and it must result from an effective planning process involving all concerned agencies. It must reflect the agreements we reach on roles, responsibilities, response actions, resources and procedures. It must also be flexible in its approach, because we can never predict the detail of what might happen, and the situation after cyclone impact is always confusing to a degree. We will never completely avoid this confusion, but sound planning can reduce it to a manageable level.

(e) *Supporting Evacuation Plans*

Where people live and work in areas likely to be affected by cyclone effects, there is likely to be a need to move them to a safer place. This safer place might be a strong local shelter or an entirely different geographic location. Shelters and their management need planning, and in many cases this can be done as part of the cyclone response plan. Complete evacuations are more complex operations and need to be planned in detail. If there is a reasonable likelihood of evacuations of significant numbers of people, they may need to be the subject of a specific plan.

(f) *Communications*

When a cyclone impacts on a community, normal communications are almost always lost for a time. We must, therefore, look at what we can prepare in the way of emergency communications, and how we can restore normal communications as a matter of priority. Effective communications are essential during response as they convey information, and information is the life-blood of the operational decision-making process.

(g) *Resource Management*

While making our preparations, it is important that we know what resources we might need in all aspects of response, and this includes people and expertise as well as materials. The best time for determining these issues is when we are setting up preparedness programmes and activities. We need to know where things and people are, and how we obtain them and use them in emergency conditions. In addition, we must keep such information up to date and continually monitor its relevance to changing circumstances.

(h) *Mutual Aid Agreements and International Assistance*

National level response efforts will always take a certain amount of time to be fully implemented, because of the necessity for determining the broad damage picture so that we can set priorities. If cyclone damage turns out to be widespread and varying in severity, there is a possibility that districts and localities will need to assist each other in the initial response. For this to be effective, adjoining areas should co-ordinate and plan any possible mutual aid.

The international community is always willing to provide assistance after cyclone damage, but usually wants certain assurances. The potential relief providers will want to know the extent of damage, the type and extent of needs, what the affected government can meet from its own resources, what would, therefore, be welcome as international relief, and what are the methods of getting that relief to the affected people. Our cyclone response planning, particularly where it covers damage/needs assessments and relief distribution systems, can do much to make this knowledge and assurances available quickly.

International relief assistance, and the requests for it, need to be co-ordinated so that we do not get too much of one thing and not enough of another, and that we get it in time. These days, donor funds for prevention/mitigation and preparedness activities are becoming more readily available. The international community is becoming more aware that such activities enhance the effectiveness of development, and will reduce the amount of relief necessary after a cyclone has impacted.

3.7. *Response*

As part of our comprehensive approach to disaster management, we should have established a system which ensures that we have done all we can to be ready for a cyclone impact, and that we maintain an adequate level of preparedness. When a cyclone forms, and there is some indication it might pose a threat to us, our preparedness is put into action. What we should actually be doing is operationally implementing an effective cyclone response plan, doing so in circumstances where we have an aware and educated community, and using tested and rehearsed systems.

Response actually starts with detection of a possible cyclone formation. If it is within our area of interest, an increase in general readiness becomes our first action in response. There is no need to activate every component of our system, but we should at least inform appropriate agencies of the possibility of a cyclone, especially those agencies whose activities need to start as early as possible.

As the cyclone develops and moves, and begins to threaten our location, our readiness increases as more systems are activated in accordance with the plan. Warning systems are put into action, planned evacuation activities are prepared if necessary, resources are activated, and the response system generally goes to a higher state of alert.

By the time the cyclone impacts, if indeed it does, the whole response system should be in a state of complete or almost complete state of readiness. Once impact occurs, we could find ourselves conducting rescue, emergency evacuations, flood fighting, and a host of other activities. Prepared damage and needs assessment systems will be activated, relief supply systems will be put into operation, evacuation arrangements may be implemented, emergency power and other utilities may need restoring, and the whole response mechanism will be at work. This highlights

the need for preparedness programmes and activities. During the life of an actual cyclone it is simply too late to organise many of these.

When our urgent operational activities start to wind down, we must analyse what we did, how we did it, and how effective we were. We must conduct operational debriefings and analysis, and *use the lessons learned in our future prevention, mitigation and preparedness activities.*

When does response end? There is no simple answer. If we count recovery, discussed briefly below, as part of response, then we can say that responding to cyclone impact may take anything from months to years. In disaster management, however, response is often referred to as that time from the first increase in readiness until we have conducted our debriefings. This usually means that emergency measures have reverted to normal, the cyclone response plan has been deactivated, and that recovery is being conducted more or less through normal government channels, even if a special reconstruction/rehabilitation body is operating on behalf of government.

3.8. *Recovery*

Recovery covers two issues : reconstruction of affected infrastructure and rehabilitation of affected people. We must remember, however, that despite those words beginning with "re-", it is more than bringing an affected community back to the situation it was in before impact. *It is bringing that community to a less hazardous and less vulnerable situation than before.* For if we do not improve the situation, we are inviting another cyclone to cause as much damage and distress as the one from whose impact we are recovering. We must use our experience, *and indeed the opportunities presented during recovery*, to further reduce hazard and vulnerability. Though tragedy and suffering almost always accompany cyclone impact, we should realise that the effective management of recovery presents us with opportunities to "build a better world". In this way disaster management is once more interacting strongly with development, because as we have seen, development, is intimately concerned with root causes of vulnerability.

Recovery-related activities start when we set up the systems and mechanisms as part of continuing and comprehensive disaster management. It is then that we need to decide on recovery roles and responsibilities, and decide on recovery policy regarding a range of issues. These issues include:

(a) *Financial Considerations* - What is the role of insurance? How much direct financial support will come from government? How will international financial assistance be managed and allocated?

(b) *Resettlement/Reconstruction* - Is it feasible to resettle communities in less hazardous areas, or reconstruct *in situ*? What compensation or assistance should be provided in either case? What are the traditional and cultural factors in these decisions?

(c) *Management* - What systems must we have ready to deal with these problems? What part should development donor agencies play?

These are just some of the issues which we need to consider, at least in a broad policy sense, during our establishment of disaster management strategies, rather than when we are confronted with a multitude of problems requiring early resolution.

Our actual recovery begins with damage and needs assessments, and these will dictate much of the early recovery activities. As these are dictated in turb by what actual consequences resulted from cyclone impact, and as they are part of response activities, we can see that response and recovery need to be integrated, at least until emergency operations come to an end. This in turn requires a smooth transition to the longer term recovery programmes and activities. These activities may take from months to years, and as they will inevitably link with development activities, it points out once again the need for the integration of disaster management and development, and leads us to consideration of how we might ensure such an integration can be effected.

4. Requirements for Disaster Management

So far this article has addressed, albeit briefly, disaster management issues as they relate to tropical cyclones. Unfortunately, countries exposed to the possibility of cyclone hazards will always have other hazards which can threaten national development. Many of these are natural hazards, but as urbanisation increases and infrastructure development continues, our communities are becoming increasingly vulnerable to technological hazards. They are also becoming more

vulnerable to situations where natural and technological hazards pose a combined threat.

If we are to establish effective disaster management as explained in this article, we must therefore ensure that we have a disaster management system which deals with all hazards equally well. While there are a number of useful models in existence, there are certain characteristics of effective disaster management common to all of them. Disaster management in developing countries of the South Pacific has progressed well over the last few years, and the strategies employed in establishing disaster management there reflects these characteristics to a large degree.

4.1. *National Policy and Commitment*

Effective disaster management does not just happen, and it cannot be confined to a particular sector. It involves all sectors and levels within a country, and through vulnerability issues, is pertinent to every aspect of good governance. It follows, therefore, that there must be an embracing national policy which integrates all aspects of disaster management. Effective disaster management includes a wide range of short and long term activities involving many different services, levels and skills. All these must blend well so that the system can function smoothly. If one part of the system fails the remaining parts may be seriously affected, and the integrity of the whole system's effectiveness will be challenged. Policy must, therefore, take a comprehensive approach.

Such a policy cannot be implemented effectively unless there is bi-partisan commitment. If all sides of the political spectrum support overall sensible and sustainable development, and surely they do, then they must realise that disaster management is an important part of it, and cannot be subject to political considerations. Some cynics, and some realists, say that "all disasters are political events". This may be true, but disaster management is about *avoiding disaster* and should have the full support of all sides of politics.

4.2. *Legislation*

Disaster management covers all sectors, and many of these will have supporting legislation which relates to vulnerability, whether or not they are currently perceived as such. There may be legislation related to building codes, land use zoning, industrial regulations, environmental management, resource management, urban development, public health, and so on. In addition, there is a need for arrangements to deal with the special circumstances emanating from hazard impact, such as emergency communications, appropriation of resources, emergency powers, maintenance of public order, restriction of public movement, resettlement/ relocation, and so on.

Disaster management policy must embrace the national approach to such issues, and needs comprehensive legislation to support it. This legislation may be a single piece, which would be complex and voluminous, or it may be an "umbrella" piece which shows the relationship and precedence of all relevant legislation. Either way, it is not a simple task to develop it, but the effort is worthwhile and must be made.

4.3. *Programmes and Activities*

Because we are interested in effective disaster management, we must have a range of programmes and activities operating in concert. We must continually attack all aspects of hazard and vulnerability prevention and reduction, we must establish all our preparedness in a comprehensive and continual way, and we must keep examining recovery issues as they relate to development. We must ensure that all these programmes and activities are integrated and co-ordinated for best effect, and we must ensure that they are an integral part of development, and vice versa. We cannot achieve this state of affairs without an effective disaster management organisational structure.

4.4. *Organisational Structure*

The structure through which these programmes and activities are effected must operate smoothly across all sectors and down/up all levels. At the top, overall authority should not be centred in a particular sector or ministry, but rather with at least cabinet or equivalent. Many countries place this responsibility with their highest political leader, using cabinet or equivalent in support. Next, there should be a body, often called a national disaster management committee/council, to develop/maintain policy and have national oversight of disaster management programmes and activities on behalf of the national authority. Again, a multi-sector and bi-partisan approach is most effective. Representatives should be at the highest level and should not

only come from key government agencies but also from NGOs, community-based organisations, and the private sector. Because of their importance in hazard and vulnerability assessment, as well as to warning systems, meteorological services should always be represented.

We cannot realistically expect such a body to be involved in the day-to-day practical implementation of the strategies outline in policy, so we need each involved agency to carry out that function in its particular sector. With a wide range of sectors, programmes and activities, we need a national disaster management focal point as a co-ordinator. This focal point, often called a National Disaster Management Office (NDMO), should be answerable to the national body, though it may reside in a particular sector.

Some countries, even those who view disaster management as more than just reaction to hazard impact, have done all these things and then found that the effectiveness they desired is not there. In the main, this is usually because the NDMO is simply not adequately staffed for its co-ordination role. In the South Pacific a system to beat this problem has been established, and it may be unique. It is also a system which could provide a useful model elsewhere.

In support each NDMO has a national working group consisting of middle management representatives from all key government and non-government sectors. These working group representatives are the focus of regional disaster management training, and as a group they design and co-ordinate relevant programmes and activities. They are not full-time, but are able to give sufficient attention as a group to the necessary activities. It has proven to be most effective in quickly establishing sustainable disaster management systems. Credit must be given to the countries in supporting the establishment and maintenance of these working groups, but it must also be given to the UNDHA South Pacific Programme Office which is implementing the South Pacific Disaster Reduction Project. Within the project Mr. Ian Rector is the disaster management advisor for in-country technical assistance. The concept and establishment of these multi-focus working groups, now the vehicle for much of the project, is a particular and significant contribution he has made to sustainability.

If a country has levels of government between national and local, it may be useful for them to mirror these national arrangements at the other levels, scaled appropriately and within normal government relationships. At community level, activities and programmes should also reflect national arrangements in an appropriate way. At the community level, however, we are looking at actual implementation of activities, not just designing them. It is, therefore, important that communities have a voice at national level in that design. This voice may be through NGOs and community-based organisations on the national body, or it may be through actual community representation. When the programmes and activities are being implemented, it is vital that the higher levels of the disaster management structure keep a close working relationship with community level. In this way they can keep track of progress and can keep up with changing needs at this, the most important, level.

4.5. *Plans*

The disaster management organisational structure will not be effective without a range of interlocking plans and procedures, extending from national to local levels, through which disaster management is effected.

In the South Pacific region the plan for managing a country's overall disaster management system is known as its National Disaster Management Plan (NDMP). The NDMP is a plan for overall management and co-ordination of the strategies, programs, mechanisms and activities which reflect the country's intended way of contributing to national development with effective disaster management.

Plans for responding to particular hazards such as cyclones, volcanoes, earthquakes, tsunamis, floods etc., are known as operational Support Plans because they are supporting the strategies for response as outlined in the NDMP, and are related to specific hazards.

Operational Support Plans require certain organisations to carry out various activities in a co-ordinated way to assist the affected communities as effectively as possible. It is, therefore, vital that these organisations are able to actually do what is expected of them, that limitations are identified, and that planning proceeds on a realistic basis. The organisations need to plan for their roles, and the results of their planning are known as Organisational Plans.

As well as Organisational Plans for operational Support Plans, some organisations produce other

Organisational Plans to ensure they can fulfill the non-response role allocated to them in the NDMP. In addition, organisations may decide to produce a plan for continuity of business, such as when the organisation is physically affected by the hazard impact.

At community level there are usually response plans and/or procedures which reflect the strategies and arrangements of higher plans.

5. Summary and conclusion

As stated at the beginning, this article is a superficial look at a wide-ranging subject. There are unfortunate misconceptions about hazards, disasters and disaster management which hinder the establishment and maintenance of effective disaster management. It needs to be a series of integrated and co-ordinated programmes, which aim at contributing to national development by the prevention and reduction of hazards and vulnerability, and which also provide proper response and recovery on those occasions that hazard impact occurs. It is about avoiding disasters. Disaster management as applied to cyclones is no different in concept, and in many practical applications, than when it is applied to other hazards.

Within a disaster management system, properly contexted studies on the incidence and characteristics of natural phenomena, such as cyclones, can make a significant and important contribution to the effectiveness of the system.

The development and application of effective disaster management is not an easy task, but no country should be daunted. There are many lessons learned over the years which can help countries avoid the pitfalls into which others have fallen. The "profit" available to an effective disaster management "business", in other words *enhanced national development*, make that task worthwhile and indeed essential.