

DISASTER RISK REDUCTION/ ADAPTATION TO CHANGING CLIMATE

1. INTRODUCTION

The Pacific Islands Forum has recognised the importance of strong approaches to both disaster risk reduction and adaptation to changing climate for countries in the region. There is strong evidence that communities will be exposed to increasingly extreme events of one or more of the following kinds:

- Major cyclone events,
- Flooding from extreme rainfall
- Sea inundation – whether by storm surges, by tsunami or as a consequence of any rise in sea level.
- Earthquakes
- Volcanic eruptions

As well as the net cost to a country of repair or restitution of damaged assets, the most at-risk communities from an economic and social viewpoint are often located in the highest risk areas for such events, are least likely to be insured, and thus suffer proportionally the greatest hardship.

As a consequence most countries in the region have adopted a centralised approach to disaster risk reduction (DRR) and adaptation to changing climate (ACC). Successful approaches recognise and use all the diverse skills in a community, including those of engineers. In this paper suggestions are made to gain greatest benefits from the local engineering community.

2. ROLES OF ENGINEERS

Engineers have a primary role to provide and maintain efficient and reliable infrastructure and facilities for their communities – water supply, waste water treatment, storm water management, roads, electricity, telecommunications, transport fuel, ports and airports, buildings and community amenities (such as lighting and sports grounds).

Historically in many nations the major infrastructural services were provided through State agencies motivated by the public benefit. However, as has happened elsewhere in the world the public infrastructure is now at least part owned by the private sector, and even for State-owned assets the design and construction supervision has been procured from the private sector. The role of the State in utilising engineers to assist with DRR and ACC has therefore had to change.

These days, the State needs to establish outcomes-based standards and form networks amongst infrastructure owners and critical occupational groups such as engineers to ensure there is adequate preparation for DRR and planning for ACC.

3. NETWORK APPROACHES TO DRR

Network approaches to DRR recognise the need for diverse parties to be brought together in a co-ordinated fashion, united by a clear vision and a sense of shared responsibility. Each party can then undertake activities either alone or collaboratively which collectively lead to a more resilient nation. The State has a central co-ordinating role e.g. through a DRR Committee, but from such a committee needs to emerge clear statements of the responsibilities and expectation on other parties. A policy decision on the acceptable likelihood of an event exceeding the level of preparedness is a required first step as it sets the level of risk mitigation required from those parties.

The expectations might be formulated as minimum technical standards to be met in construction of artefacts, or as service levels for restoration of services (e.g. 99% restoration within a certain time period), or as requirements for holding reserve capacity (e.g. of food supplies, potable water). There may also be requirements in terms of the capacity of emergency services to be maintained able to be dispatched (e.g. fire services, human rescue, medical, law and order). Broadly speaking, the required capacity of such services reduces when higher engineering standards to minimise the impact of a natural hazard event are adopted. An important role of a DRR Committee is to find the optimum balance.

Having set up the expectations on parties there then needs to be consistent mechanisms for self-review and reporting back in a manner that assists adherence to the desired level of preparedness and risk reduction.

4. ADAPTATION TO CHANGING CLIMATE

Changing climate has the effect of making more or less likely natural hazard events over a certain size. For example, if there is sea level rise then coastal inundation may get higher, the general water table in coastal regions rise and so on. Cyclone events of greater intensity may happen more often.

A first impact is on planning. Suitable uses for at risk areas of land might have to become more limited. There may be land areas where the approach of isolating a community from a hazard might still be appropriate, but in others, there may be permitted only uses which can live with the hazard and recover quickly. Other areas might be required to be restricted e.g. limited land clearance to avoid creating events such as landslip and erosion.

The development of hazard maps allows the land topography to be understood so that the potential inundation zones arising from either tsunamis, or from storm surge generation can be identified. Inundation zones from rainfall-induced flooding also need to be considered. Many countries have an urgent need to define at risk zones through investment in mapping – even identifying all areas that are (say) less than 10 metres above sea level and treating these as risk areas would be a major advance.

When creating infrastructural assets an essential approach to address the issue of future change is to set the technical standards of the day against the worst reasonably expected event across the lifetime of an asset. If an asset is expected to have a service

life of 50 years, then it needs to be designed to withstand a design level event in the 50th year every bit as much as the first, even if (say) the sea level is quite different, or the once in five years cyclone has higher peak wind speeds than in earlier decades.

Both in the planning and in the technical standards development there are critical roles for engineers. The best policy will consider acceptable levels of risk to human safety, acceptable levels of economic damage, and acceptable levels of damage to the physical environment after considering the cost of creating solutions to make communities and assets more resilient. Engineers are vital contributors to the analysis, communicating the findings to communities and decision makers and giving effect to the outcomes.

5. INTERDEPENDENCY AND CASCADE FAILURE

A critical success factor in both DRR and ACC is to recognise the interdependency of services. Loss of power might lead to loss of other services such as telecommunications or even a hospital, bridges often carry cables and pipes as well as vehicles, services are often buried close together in a road so if one is damaged there may be effects on others. Cascade failure is when a failure of one service causes failure of another, which in turn might affect a third and so on.

Engineers have an important role in identifying interdependency and designing to avoid cascade failure. As an example, critical bridges, road sections and transmission lines should be sited away from these risky zones. Because bridges often carry other services like water and wastewater pipes it is particularly critical that special attention be given to their siting. Even if embankments leading to or from them are damaged, the bridge and the services it carries should not be at risk through inundation. If siting within an inundation zone cannot be avoided then strengthening and protection works need to be considered.

It is particularly important to recognise the critical elements of infrastructure and ensure these have the highest levels of readiness. These include backup generation plant (e.g. for hospitals and to keep the airport operational so supplies can arrive).

6. THE CRITICAL ROLE OF ENGINEERS

It is vital that governments involve their local engineering community actively in the DRR and ACC activities. It can do this by working co-operatively with the national professional engineering body.

Government need not be the direct employer of all the engineers involved. The national engineering body can have a major role in facilitating suitable arrangements.

7. DISCLAIMER

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