A Systems Approach to Building Resilience to Natural Disasters at a Local Level in Pacific Island Nations

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This paper uses systems methodology to examine how risks from natural disasters are addressed in Pacific Island Nations, particularly those risks from storm related hazards. It is argued that the common top-down approach to dealing with risk in these communities using vulnerability analyses is not effective, and that a bottom-up approach may be preferable. While such an approach is not new, it is considered important to highlight the need for such communities to take possession of the problem of reducing risk, and it is suggested that the means for reducing risk should be sought not just in modern technologies, but in a systems based blend of modern and traditional methodologies.

Introduction

Vulnerability of Pacific Island Nations to weather & climate change

While Pacific island nations are vulnerable to many kinds of natural disasters, they are particularly vulnerable to weather related events, such as cyclones and droughts. Their close association with a highly dynamic ocean-atmosphere interface and their high ratio of shoreline to land area mean that the impacts of storms can be especially severe. The low topography of Pacific atoll states, such as Kiribati and Tuvalu, means that they are at exceptional risk from a rise in sea-level due to the effects of global warming (Brookfield 1989, Nurse et al 1998).

Most models of global warming predict an increased risk of more extreme weather events, including more persistent droughts, and higher intensity wind storms. As the destructive power of wind storms is very sensitive to the peak wind velocity (SwissRe, 1997), the effects on Pacific Island Nations are likely to become more and more severe as global warming takes effect.

Typically, Pacific Island Nations are resource poor, have narrow economic bases that depend on primary production, and are sensitive to global markets for attracting foreign exchange. The fragility of these economies is illustrated by noting that the inflation-adjusted agricultural commodity prices (in a sample of 18 major export commodities that are important in Asia and the Pacific) decreased by an average of 57% over the period from 1980 to 2004 (quoted in Dawe, 2006, based on data from IMF, 2006).

Russell (2007) notes that, while some of the more populous countries in the World have suffered losses equivalent to 10% of their Gross Domestic Product (GDP) from extreme disasters, Pacific Island Nations have sometimes suffered losses of more than 100% of their GDP. Similarly, the percentages of the populations affected by disasters in the Pacific region have been far greater than in most other countries of the world. The nations themselves typically have tenuous central control, poor communications and limited infrastructure. It is not surprising, therefore, to find that the capacities of Pacific Islands to cope with disasters are limited.

How they became vulnerable

Ever since the Pacific islands were colonized by Europeans, the islanders' reliance on traditional knowledge and coping mechanisms have been degraded. The European focus on making profits has resulted in unsustainable developments of cash crops, loss of forest cover, massive soil erosion and other forms of environmental degradation (Clarke and Thaman, 1993). Forests continue to be degraded today through rising urbanization and population growth, local demands for building timber and fire wood, new agricultural developments, growing industrialization and the global demand for commercial logging.

A survey of beach mining on South Tarawa, Kiribati (Webb, 2005), for instance, shows that nearly all of South Tarawa's present erosion problems could have been avoided if humans had not altered or destroyed the natural defence systems of the land. These human activities include beach mining, poorly located or conceived coastal development, reclamation, and causeway construction.

Critically, the responsibility for most of the infrastructure in Pacific Island Nations belongs to the central governments (Freeman and Warner 2001). In normal circumstances they often have more immediate priorities than reducing the vulnerabilities of distant communities. However, in times of emergency it is often impossible for them to cope with the scale of a disaster and they turn to the international community for aid. Foreign aid agencies are mainly interested in relieving the immediate threats to human life, and don't see it as their responsibility to stay with the communities to build their capacities over the long term. "Humanitarian assistance grants generally have short time limits and strict criteria that do not allow expenditure on anything other than meeting urgent needs" (Twigg, 2004). This means that the long term coping capacities of the islanders are not improved through disaster relief, and indeed they are often eroded further. As the costs for dealing with disasters escalates, in an environment of relatively flat economic growth in funding, fewer dollars are available for reducing the vulnerabilities and increasing the resilience of the communities of the Pacific Islands to natural hazards (Shah 2007).

Much has been written on the need for consultation in assessing hazards and vulnerabilities to disasters at all levels, however, engagement with the people at risk is still minimal (Pelesikoti, 2007). There is a lack of quality information about hazards, a lack of the means for communicating information, and a lack of emergency plans and coordination of actions to be taken in the event of a hazard event.

Different Viewpoints

The top-down view

While it is not the intention here to discuss the politics of aid and development in Pacific Island Nations, it is important to understand the context. According to Sydee (2004) current strategies for dealing with the effects of climate change emphasise adaptation and sustainable development. While these objectives form the basis for much needed monetary assistance from aid agencies, they support a top-down model for development. In effect, the donor countries influence the course of development in the developing countries through their vetting of the projects that will be funded. Donor countries perpetuate the myth that any growth in monetary wealth facilitates adaptive capacity. Barnett (2001), however, argues that the social policies that result from aid packages and unequal trading arrangements "undermine adaptive capacity rather than fostering it." Fry (1997) argues that the offers of aid to the Pacific Island Nations are often inappropriate to the Island people's needs, and are perhaps "outright damaging to the coping capacity of the people."

According to Sydee (2004) the traditional strengths in Island communities, such as kinship structures, reciprocity, migration, and the financial remittances from extended ex-patriot communities abroad, are under-recognized in scientific assessments and policy development. In addition, the whole concept of treating Pacific Island Nations as "vulnerable" communities tends to work against their cause. Foreign investors are loath to commit resources to such countries, and the islanders themselves are not persuaded to work towards sustainable development if they believe they might ultimately have to leave their homes when the islands are consumed by the sea. Campbell (2003) argues that a 'vulnerability label' indicates a weakness within communities, and while their natural resilience is left unrecognized, the vulnerable entity itself becomes identified as the problem.

The bottom-up view

This dilemma was discussed by Russell (2007) in an attempt to understand the main issues for rural communities in Pacific Island Nations facing increasing risks from hydro-meteorological (weather related) hazards. As a first step, Russell drew a 'rich picture' diagram (in the terminology of Checkland, 1981) of a rural community, reproduced in Figure 1. This picture suggests that the remoteness of the community from the central government, and the providers of infrastructure and other social benefits, means that the central governments do not see the resilience of their distant rural communities as 'their problem'. The only other option is for the communities themselves to take possession of the problem. This supports a bottom-up view of building resilience, rather than the more common top-down approach.

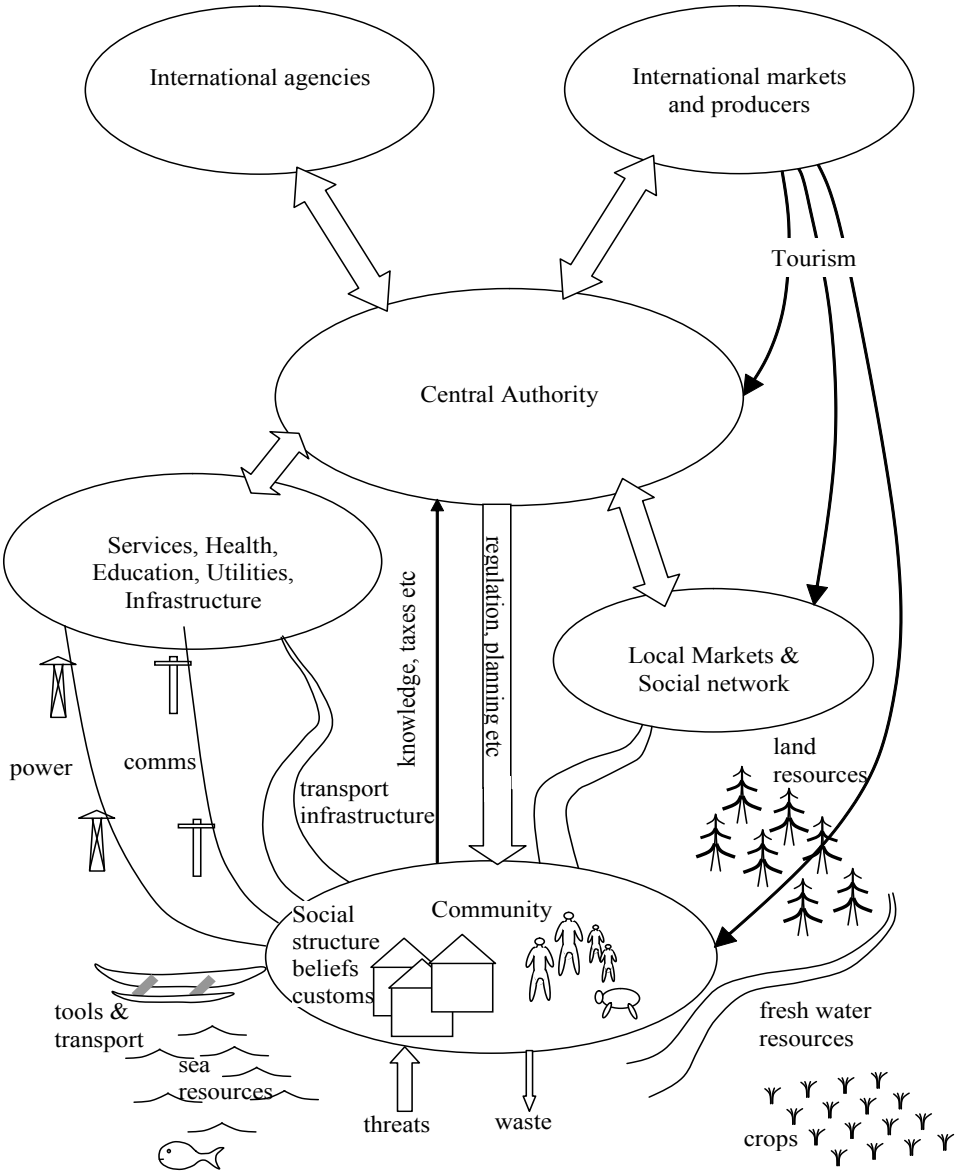

Figure 1 *'Rich Picture' diagram of a rural community in a Pacific Island Nation, from Russell (2007)*

Traditional Resilience

The potential for traditional resilience

Campbell (2006) showed that traditional communities were able to deal with natural hazards before the intrusion of European influences. They satisfied all the elements of resiliency proposed by Wildavsky (1988), including fragmented land use, to ensure that the loss of any one piece of land did not mean the total failure of crops; a diversity of cropping, both within a single island, and between different islands; the tending of forest gardens that were protected from strong winds by the surrounding trees; the maintenance of strong contacts with other communities on the island and on neighboring

islands through familial connections, celebrations, and feasts; and the storage and preservation of excess food in times of plenty against times of want. The houses they built were more resilient to cyclones than present day houses, as they avoided the gaps and windows that allowed a dangerous build-up of pressure between the inside and outside of a house.

Mercer (2005) suggests that many of the traditional methods for building resilience may still be relevant in the environments of today. The knowledge of specific coping strategies may be kept alive through spoken histories, and still be known to a knowledgeable few. If the knowledge could be recovered, perhaps through semi-structured interviews or eliciting the oral histories, not only would it be a valuable resource for increasing resilience in communities, but it would add to the cultural heritage of the community, the nation, and ultimately the world.

Before such steps are carried out, it is necessary to determine the potential for improving resilience through the elicitation of suitable traditional practices. It is by no means certain that traditional practices would be of benefit to the communities themselves. For instance, the environment may be too different from the past; modern technologies may render the traditional methods obsolete; there may be impediments from current land ownership regulations; it may be difficult to work within the confines of the rules and practices of the central administrations and aid agencies; or the youth who currently see urban environments as their only hope for a future, may see no value in implementing traditional methods in the rural community. Moreover, the knowledge holders may not be willing to pass on their knowledge.

Traditional agroforestry

Agroforestry is considered here as an example of the contrast between modern and traditional practices, and the state of the environment that most Pacific Island Nations face. According to the FAO (the United Nations Food and Agricultural Organization – Clarke and Thaman, 1993) "*agroforestry* is a collective name for all land-use systems and practices in which woody perennials are deliberately grown on the same land management unit as crops and/or animals."

There are two approaches to *agroforestry* – modern and traditional. Modern practices rely on field experimentation in crops, trees and animals in various combinations and conditions to determine the highest overall yields. Traditional approaches rely on native trees and familiar combinations that have been worked out over hundreds of years of experimentation. While the traditional methods may not return maximum yields, they are adapted to local conditions and promise more dependable yields.

In the opinion of Campbell (1985), the most significant modifications to the social, economic and political cultures of Pacific Island Nations have been the 'replacement of resilient and diverse agro-ecosystems with mono-cropping for commercial agriculture'. Thaman (1989) argues that the institution of government sponsored coconut plantations in Kiribati has lead to the gradual elimination of a wide range of culturally important tree species. Clarke and Thaman (1993) say that the fixation of governments on mono-cultural cash crops has

meant that most indigenous wild species and the wide range of *cultivars* (plants cultivated for their useful properties) have received little attention. Many of those that survive today do so in small niche environments or in household gardens. There is so little knowledge of these crops that nobody has the basis for promoting their expansion or maintenance.

This goes to the heart of the problem, as the belief in the central authority is so pervasive that even the bearers of traditional knowledge tend to believe their knowledge is inferior (Sillitoe, 1998). This attitude is extremely dangerous, since it puts at risk the vast bodies of traditional knowledge acquired by indigenous populations over the centuries, not just about crops, but about all ways of coping with hazards (Rouhban, 1999). Indeed, it is still rare today to find instances of the actual transfer of traditional knowledge and understanding of risks and hazards from indigenous communities to the developed world (Quarantelli, 1992).

That is not to say that there is no value in modern methods and technologies. However, the focus on modern solutions needs to shift towards giving due consideration to traditional methods. There needs to be a blending of modern and traditional methodologies, and a disentanglement of what is sustainable in the long term from what is profitable in the short term.

Systems Methodology

The Livelihood Model

In terms of a systems methodology, it is necessary to understand the actual needs of the communities and the stakeholders involved, including the central governments, and determine the requirements that will satisfy those needs. This can be approached through the 'Livelihoods Model' of Blaikie et al. (1994), where individuals in each household have access to various resources and assets (e.g. land, water, fauna and flora, labour etc), choose from possible income opportunities according to their 'access qualifications' (money, resources, skills, knowledge, health etc), and decide how to apportion the income between consumption, storage and investment. This occurs within an environment (including risk factors), with inputs from social relations (group, network etc) and inputs from the 'structure of dominance' (class, gender, ethnicity, age, disability, power, politics, international influences).

A simplified version of the model of Blaike et al. is shown in Figure 2 (from Russell, 2007).

However, this only represents 'normal life'. When a hazard event strikes the communities must cope using resources they have available or which become available. This applies not only to the immediate concerns of the emergency, but well into the future until a new equilibrium is established.

Human coping strategies can be viewed in terms of Maslow's (1970) hierarchy of human needs – where the needs that are higher up the hierarchy, like love and self determination, must wait for the satisfaction of needs lower down, such as food, water, shelter and sleep (Wisner et al. 2004). Indeed, in the International Karakoram Project, Miller (1981) discovered that villagers in the area of study in Pakistan, "whilst totally aware of the hazardous environment

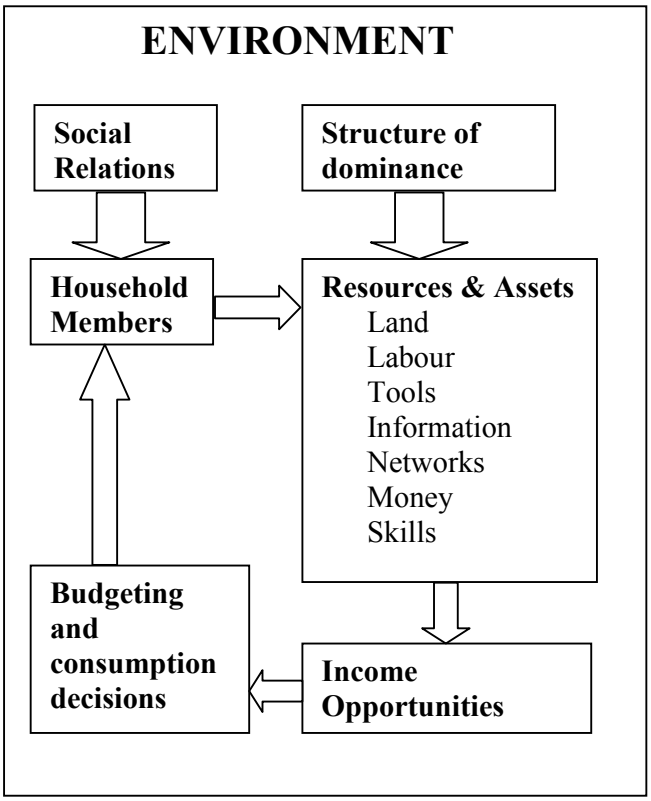

Figure 2 *A simplified version of the livelihood model of Blaike et al. (1994)*

that surrounded them, knew that they could do nothing to control floods, mud flashes and avalanches and consequently were prepared to build their homes on the worst land, however dangerously situated, so that the best land could be cultivated."

Communities adapt to hazards as best they can, and it is important to understand their perspectives. Local tracks, for instance, are often seen as more important by communities than the main roads provided by the government. Women, in particular, use the tracks for hours each day fetching and carrying water and fuel. Tracks and bridges can be severely disrupted even by small hazard events, affecting the wellbeing of the whole community, so assistance in maintaining or improving local-level transport infrastructure is important, but often overlooked (Twigg, 2004).

In the sustainable livelihoods analysis of (Ashley & Carney, 1999), people rather than resources, facilities or services, are the main concern. This means identifying livelihood-related constraints and opportunities across all sectors, areas, and social groups; recognizing how the various factors change with time; understanding the factors that influence people; recognizing and including the relevant stakeholders (from individuals, to community based organizations, to international bodies); and acknowledging the strategies that people and the various groups adopt to achieve the goals that they pursue.

The goal of achieving sustainable livelihoods involves building livelihoods that are sustainable in the face of shocks and stresses, independently of unsustainable external support. If a community is to be sustainable, it must base its livelihood on the maintenance of the long-term productivity of available resources, natural or otherwise. This implies, for instance, that any dependence on cash crops that are subject to the vagaries of global market prices, are in the end, unsustainable. Dependence on cash crops results in steadily decreasing income with time for a given effort, as well as the displacement of traditional land use patterns to achieve the diminishing returns.

Also, it is vital that no one community achieves sustainable livelihoods at the expense of another. Water resources, for instance, will become a more important issue with time, as global climate change causes more droughts. It is, therefore, not sustainable for one community to take all water resources upstream, leaving none for those lower down.

A comparison with vulnerability analysis

Sustainable livelihood analysis has some overlaps with local-level vulnerability analysis (Twigg, 2004), however their goals are different. With vulnerability analysis, the goal is to gather an understanding of what vulnerabilities exist, and reach consensus on how to reduce the highest priority vulnerabilities. It involves using modern technologies in the form of mapping technologies, but also seeks to derive advice from locals through interviews or recording oral histories and stories. Ideally, the knowledge gained is used not only to reduce vulnerabilities by taking concrete action (as in literally pouring concrete), but also to advise the communities on how they should act before, during and after times of emergency.

While many of the outcomes from vulnerability analyses can be highly beneficial, they focus on the 'vulnerability' as the object of analysis. If the behavior of the community members is not changed, then all the good intentions may be for nothing. It is precisely at this point that sustainable livelihoods analysis may assist in achieving better outcomes.

Moving towards resilience

In the sustainable livelihood model the focus is to change the behavior of the community members to achieve more resilient practices and ways of life. Just as short term diets for overweight adults don't tend to lead to long term weight loss, so too in the case of communities the focus needs to be on long term changes to livelihoods to achieve resilience.

The process for achieving change, while it is not prescribed here, can be judged against three criteria (Checkland and Scholes, 1990): its efficacy (whether it actually works); efficiency (whether it uses least resources); and effectiveness (whether it achieves the longer term aims of the government). Any analysis needs to show that the chosen methods work (whether they are traditional, modern or a combination of both); that they use fewer resources than other methods; and that by achieving more sustainable livelihoods in individual communities in a Pacific Island Nation, the whole nation benefits.

The intention is not to prove or enhance the model, but to improve the problem situation. As human activity systems are complex, there will never be total agreement between all parties, so the objective is to seek an accommodation between different interests.

Conclusion

In conclusion, it is suggested that it is not effective for Pacific Island Nation communities to depend on central governments and foreign aid agencies to mitigate the risks they face from natural hazards. These hazards, particularly weather related hazards, are only likely to increase in the future due to global warming. It is essential, therefore, to empower the communities to take possession of the problem of risk mitigation for themselves.

The means of reducing risks in relatively isolated communities should not focus just on applying modern technologies, nor on simply reducing vulnerabilities. The means should involve the application of traditional methods in combination with appropriate modern technologies to encourage community members to change their lifestyles in ways that will improve their long term resilience to natural hazards.

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