Application of an Integrated Assessment and Action Methodology to address Climate Change, Climate-induced Natural Disasters and to Facilitate Community-based Sustainable Development

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**ABSTRACT**

Although warming and cooling periods are typical of the cycles of nature, both the speed and extent of the current warming are too ‘extreme’ to be dismissed as normal and their correlation to changes in atmospheric greenhouse gases (GHG) considered merely a coincidence. The latest assessment report (AR4, 2007) of the Intergovernmental Panel on Climate Change (IPCC) has confirmed that warming of the climate system is unequivocal. In a warming world, reported climate disasters such as cyclones and sea-surges are on a rising trend. During the last decade, an average of 350 climate disasters was reported each year affecting some 272 million people annually. Since natural disasters are closely linked to development status of a region, effective precautions are needed to mitigate future disasters and to adapt to the unavoidable. Ascertaining the full impacts of climate change and implementing suitable adaptation measures remain a major challenge for resource poor rural communities. In this paper a new Integrated Assessment and Action Methodology for such adaptation which uses the predictive skills of scenario generators and the practicality of development driven new adaptation approaches, as detailed in UNDP’s Adaptation Policy Framework is described within the context of an AusAID funded “Community based climate adaptation implementation project” piloted in Fiji, for the South Pacific region.

1. **INTRODUCTION**

All current climate scenarios place Pacific Island Countries (PICs) amongst the most vulnerable to the projected impacts of climate change (IPCC AR4, 2007, Koshy, 2006). The vulnerability of these countries is exacerbated by their smallness, remoteness and the overall lack of capacity to address challenges of such vast temporal and spatial consequences as climate change. Current experiences in the Pacific relating to the impacts of ENSO (El-Nino Southern Oscillation) related droughts and cyclone related floods in the Pacific provide a useful window to the changing world of tomorrow. A good starting point to cope with these changes would be an assessment of the current climatic variabilities and the resulting vulnerabilities, followed by the implementation of ‘win-win’ or ‘no regret’ adaptations (Koshy et al., 2006). In this paper a new Integrated Assessment and Action Methodology for climate change, climate-induced natural disasters and community-based sustainable development, referred to as the “PACE-SD Methodology”, will be described. This methodology is developed by the Pacific Centre for Environment and Sustainable Development (PACE-SD) and the Institute of Applied Sciences of the University of the South Pacific, for adaptation implementation which uses a combination of the predictive skills of climate scenario generators and the practical utility of traditional knowledge, as envisaged in UNDP’s
Adaptation Policy Framework, (UNDP, 2004), with special reference to an AusAID funded climate adaptation project implemented in six community sites in Fiji.

2. BACKGROUND

Climate change: the global context: Climate change is a problem with unique characteristics. It is global, long-term and involves complex interactions between climatic, environmental, economic, political, institutional, social and technological processes. All climate sensitive sectors of the economy such as agriculture, water, coast and health, are projected to suffer adverse impacts. This may have significant international and intergenerational implications in the context of broader societal goals such as equity and sustainable development.

Emissions of greenhouse gases and aerosols due to human activities continue to alter the atmosphere in ways that are affecting the global climate system. Between 1970 and 2004, global emissions GHGs such as CO2, CH4, N2O, HFCs, PFCs and SF6 weighted by their global warming potential have increased by 70%. According to AR4, anthropogenic warming has had a discernible influence on many physical and biological systems. Eleven of the last twelve years (1995-2006) rank among the 12 warmest years in the instrumental record of global surface temperature. By mid-century, annual average river run off and water availability are projected to increase by 10-40% at high latitudes and in some wet tropical areas, and decreases by 10-30% over some dry regions at mid-latitudes and in dry tropics. Over the course of this century approximately 20-30% of plant and animal species assessed so far are likely to be at increased risk of extinction if increases in global average temperature exceed 1.5–2.5°C. Increases in the frequency of droughts and floods are projected to affect local production of food, fibre and forest products negatively. For these impacts adaptation is the only appropriate response (IPCC AR4, Policymakers Summary, 2007, GRID Arendal, 2009), especially for the small island countries.

Climate change: the Pacific context: Climate in PICs is influenced by several contributing factors such as Trade Winds, South Pacific Convergence Zones (SPCZ) and El Niño Southern Oscillations (ENSO) as the dominant sources of year to year climate variability while Madden-Julian Oscillation play a major role in climate variability on time scales of 30 to 70 days. Recent studies in the southern pacific region show that the annual and seasonal sea surface and island air temperatures have increased by 0.6 to 1°C since 1900 and projection for an estimated rise of at least 2.5°C by 2100. The models simulate only a marginal change (±10%) in annual rainfall over most of the small islands in the region. In a warming world it is very likely that the cyclone frequencies and ferocities could increase substantially by 2050 with an associated increase in the precipitation rate of about 25 percent (Lal 2004). Rising sea levels, salt-water intrusion and large-scale inundation of the coastal areas due to storm surges will accompany temperature increase in PICs making vital infrastructure and major concentrations of settlements to be at great risk, given their low elevation and their proximity to the coast. In a World Bank report, Alfred Simpson, one of the report’s authors, says that Pacific island countries rank among the most vulnerable in the world to natural disasters. Although the region - excluding Papua New Guinea - is relatively sparsely populated, natural disasters have directly affected more than 3.4 million people and led to more than 1,700 reported deaths since 1950 (World Bank, 2000).

3. CLIMATE CHANGE-DISASTER LINK

Global and Pacific Situation: Climate change will have a range of consequences, both in the long-term, such as sea level rise, loss of glaciers and spread of diseases as well as short-term in the form of extreme variations in precipitation resulting in disasters such as floods and droughts. These could also generate secondary impacts such as land slides, avalanches and forest fires. From 1900 to 2005, precipitation increased significantly in parts of the Americas, northern Europe and Asia and so did areas affected by drought since the 1970s (Anderson, 2006).

The International Federation of Red Cross and Red Crescent Societies report (World Disaster Report 2007) that the number of people in Oceania affected by climate and weather-related
disasters has increased almost ten times over the past 30 years. Droughts make up one of the largest components of such disasters and experience during the 1997-1998 El Niño events highlights the significant consequences that such climate-related extreme events can have for Pacific Island communities.

The National Disaster Management Office in Fiji has recorded an increase in the frequency and intensity of cyclones over the years. While from 1941-1980, 5 severe tropical cyclones at an intensity of 80-90 knots were experienced, there were 6 severe tropical cyclones with an average intensity of 70-140 knots between 1985 -1990, a span of just 5 years. In general, climate change and natural disasters have a very high impact on the sustainable development aspirations of the Pacific. (Nunn, 2007)

4. PACIFIC RESPONSES

*Mitigation and Adaptation:* The Pacific responses to climate change and climatic extremes have had two major foci: (i) Mitigation and, (ii) Adaptation. It is well accepted that the small island developing states, with their total contribution of only 0.03% to the 1990 global GHG emission, are not the major cause of the climate crisis. On the mitigation side, therefore, they have been on the forefront of diplomatic efforts to persuade developed countries to reduce their emissions. In addition they have ratified the Kyoto protocol and have been implementing energy efficiency and diversification initiatives and formulating strategies and policies to mainstream climate change into their national sustainable development strategies (Koshy, 2008).

PICs have been ardent advocates of adaptation all along. The measures they have taken so far range from ‘soft’ options such as process based measures to discrete engineered structures. There is substantial indigenous capacity to cope with normal weather related extremes but when super-imposed on a changing climate these extremes are beyond the coping range of most local communities. An integrated approach that blends traditional knowledge with modern tools and methodologies has a much better chance of acceptance and success in the region given the fact that we are entering a no analogue period in human climate experience.

All the CROP (Council of the Regional Organisations of the Pacific) agencies and the University of the South Pacific (USP) in particular, have been very active in supporting the PICs to respond effectively to the threats posed by climate change and disasters. The Comprehensive Hazard And Risk Management (CHARM, www.sopac.org) strategy of the PICs developed by the regional organization SOPAC (Pacific Applied Geoscience Commission) is expected to assist member countries to achieve one of the fundamental priorities of the ISDR (International Strategy for Disaster Reduction) strategy, which is to proceed from protection against hazards to the management of risks through the integration of disaster risk reduction into sustainable development. USP being the premier regional training institution has been focusing on building the necessary regional capacity to facilitate strategic and cost effective adaptation.

5. THE INTEGRATED ASSESSMENT AND ACTION METHODOLOGY

*Rationale for the development of an applicable methodology:* The need for an integrated approach to manage climate change and associated disasters is very clear from the above discussion. Stress induced by present climate variations and future climate change on rural communities and their key livelihood sectors such as water and coastal zone is additional to the stresses caused by non-climatic factors such as rapid coastal developments, land-based pollution, haphazard farming practices and deforestation. Therefore, it is imperative that vulnerability assessments and adaptation initiatives for rural communities on the outset should take on an integrated approach to capture these complex interactions.

In 2006, USP and the Fiji Department of Environment secured funding from the Australian Agency for International Development (AusAID) to implement a pilot project on climate
change adaptation in six rural communities focusing on the coastal zone and its ecosystems and water resources.

6. THE PACE-SD METHODOLOGY
The Different Components: While the earlier vulnerability and adaptation assessments to climate change impacts were based mainly on IPCC’s scenario-driven methodology (IPCC 2001b), referred to as the standard approach, practical requirements now demand a stronger focus on adaptation in a policy context to promote sustainable development. Rather than trying to adapt to model based scenarios of the future, often with large uncertainties, the current thrust is to learn to adapt to the vulnerabilities of the present climatic extremes and other natural disasters. Such approaches, if continued incrementally, will help abate the need for drastic and more expensive adaptations that may become necessary with changing climatic conditions. The PACE-SD methodology is developed with this strategy in mind and it has three inter-linked components, (i) integrated project cycle (Figure 1), (ii) procedural framework (Figure 2) and (iii) strategic adaptation framework (Figure 3).

(i) The PACE-SD Integrated Project Cycle: Component 1, (Figure 1 and Table 1) depict a seven-step integrated project cycle, which forms the basis of developing and implementing an adaptation project. The objectives and expected outputs of each component are shown in Table 1. Through an integrated and consultative process the vulnerability and adaptive capacity of the community and the adaptation options for the community are identified and assessed. The selected adaptation options are then implemented with community participation. The progress of the project is continuously monitored and evaluated using specific indicators for the time horizons - short, mid and long-term.

![Figure 1: Steps in the project cycle](image)

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<thead>
<tr>
<th>Steps</th>
<th>Objectives/ Outputs</th>
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<tbody>
<tr>
<td>1. Formulation</td>
<td>Defines project objectives, policy context, scope &amp; design.</td>
</tr>
<tr>
<td>2. Coordination</td>
<td>Administrative, financial and secretarial support set-up, facilitator, advisory &amp; technical team set-up, the rules of engagement &amp; Terms of References (TOR’s) and, overall coordination.</td>
</tr>
<tr>
<td>3. Consultation</td>
<td>Initial advisory team &amp; community consultations, site screening &amp; selection. Raising awareness on CC, natural disasters, sustainable</td>
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development and other relevant issues.

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<tr>
<td>5. Planning</td>
<td>Development of implementation plans; stakeholder consultation &amp; community endorsement of implementation plans. Formulation &amp; endorsement of community vision &amp; sustainable development plan</td>
</tr>
<tr>
<td>6. Implementation</td>
<td>Implementation of endorsed adaptation plan. Implementation of sustainable development plan (depends on availability of resources)</td>
</tr>
<tr>
<td>7. Monitoring &amp; Evaluation</td>
<td>Evaluation of the major stages of the project and monitoring the effectiveness of the implemented adaptation measures.</td>
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**(ii) The PACE-SD Procedural Framework:** Component 2, (Figure 2), the procedural framework ties components 1 and 3 and more importantly represents a departure from typical V&A methods applied so far in PICs. The premise of departure is a two pronged approach with a strong and equal emphasis on (i) community-based approaches using participatory tools and (ii) facilitator-based approaches using technological/scientific tools and methods to assess vulnerability and adaptation options.

After Consultation 1, the method is divided into two separate but interconnected streams of activities. As depicted in the procedural framework, the left portion denotes community based activities whilst the right portion denotes facilitator based activities. These activities are linked by two main consultation forums, namely consultation 2 and consultation 3. The main purpose of the consultations is for presentation of findings, discussion of V&A assessment and endorsement of adaptation plans. It should be noted that depending on the circumstances on the ground, the activities of both streams may be merged onwards from consultation 2. In this way the community understanding of what is happening and their ownership of the process are enhanced. This will ensure that the required community capacity is developed to continue the formulated adaptation programme even beyond the life time of the externally funded project.

**(iii) The PACE-SD Strategic Adaptation Framework:** Component 3 (Figure 3), the adaptation framework, is strategic in three ways. First, the assessment and plans are based on a firm understanding of the current socio-economic, cultural and environmental problems faced by the community. Secondly, it addresses critical problems related to climate change currently faced by the community, before sequentially addressing other aspects of climate change within the short, medium and long term. In the context of climate change, these three time frames neatly correspond to climate extremes, climate variability, and climate change. Thirdly, it sets in motion a process that would initiate and catalyse community actions that would enable them to develop in a sustainable manner.

In addition to sequentially addressing the various aspects of climate change, projects are also categorized into a three tier project classification system, viz. project level 1, 2 and 3. Within the strategic adaptation framework, project level one would mainly focus on soft measures for communities to follow to address issues under A to F, (see Figure 3). Project level two would focus on soft measures related to issues under A to F and discrete measures related to issues under B to E. Level three would focus on both soft and discrete measures related to issues under A to F. This will also involve initiatives that address sustainable development challenges of village communities. In this schematics, the USP project is classified as Level 2, as it incorporates both process based and discrete measures and is limited to two sectors - coastal and water.

Furthermore, within the framework there is scope for addressing other pressing environmental issues. For instance, the entry points for addressing biodiversity under the United Nations Convention on Biodiversity (UNCBD) and land degradation under the United Nations Convention to Combat Desertification (UNCCD) are represented by C, D & E (Figure 3).
Problems &
Opportunities
[Situation Analysis
Technique]

Most prominent
problem/s faced by
community
related to CC

A

Typology of Project
Project Level 1: “Soft” measures & relevant management plans
Project Level 2: “Soft and Hard” measures & relevant management plans
Project Level 3: “Soft and Hard” measures & relevant management plans
plus relevant plans and programmes for “A” and “F”

B

C

D

E

F

Figure 2: Procedural framework

Figure 3: Strategic Adaptation Framework
7. **ASSESSMENT TOOLS AND TECHNIQUES**

Within the methodology, various participatory tools and field assessment techniques can be used to elucidate the specific vulnerabilities and possible adaptation measures. In the community stream of activities, it is anticipated that participatory tools such as seasonal calendars, historical time lines, resource mapping, face-to-face dialogue and the use of simple analysis and prioritization schemes would be the dominant tools. The facilitator's team may use expert judgment, qualitative and quantitative assessments, and interviews of key informants within and outside of the community. More scientifically rigorous technical assessments using standard techniques pertinent to the sector(s) in consideration should be utilized including the use of climate change modeling outputs.

8. **APPLICATION OF THE METHOD IN FIJI**

The above methodology has been applied in six village community sites in Fiji: (1) Votua (Nadroga Province), (2) Bavu (Nadroga Province), (3) Buretu (Tailevu Province), (4) Navukailagi (Gau Island), (5) Korotasese (Cakaudrove Province) and (6) Druadrua Island (Macuata Province). Using the financial support provided by AusAID, several planned adaptation options have been implemented in all the sites, as the project is nearing completion. This methodology is particularly useful for communities which own or use a large proportion of the natural resources for their livelihood and thus have a stake in its sustainability. Although developed to address climate change and climate-induced natural disasters, the methodology described above is generic, flexible and inclusive in scope to accommodate any other types of natural disasters, where village community and all its stakeholders' participation are required.

9. **ACKNOWLEDGEMENT**

The financial assistance from the AusAID programme for this entire project is gratefully acknowledged. The work reported here is the collective effort of the USP team (with the lead author as the research supervisor and the co-author as the principal researcher) and a variety of stakeholders who assisted in the implementation of the project. As a stakeholder owned project, nothing substantial could have been achieved and sustained without the active participation of the village communities.

10. **REFERENCES**


Koshy K, (2005), Sustainable Development and the Pacific island Countries, PACE-SD, The University of the South Pacific, Suva Fiji.


