PACE-SD Guidebook: Participatory Assessment of Vulnerability and Adaptation

Group work in Tamakautoga village, Niue (Photo: Karen McNamara)

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1.0 Introduction

This Participatory Assessment of Vulnerability and Adaptation (V&A) is a core component of the overall PACE-SD V&A Assessment and Action Methodology. It is a comprehensive and participatory assessment that guides communities through a process in which to identify appropriate and sustainable activities to enhance their adaptive capacity to the impacts of climate change. Once a community has been identified to partake in climate change adaptation activities (based on the PACE-SD Rapid Assessment; see Limalevu, 2012), this V&A assessment is to be carried out. This implies that the project assessment team would have already visited the site during the process of site selection and would have some knowledge of the community and its vulnerability to the adverse impacts of climate change from the information gathered. This V&A assessment should take between a minimum of three to a maximum of five days per community to complete, depending on weather conditions, the combined experience of the assessment team, the complexity of the issues, and the availability of community members and leaders at the time of the visit.

Plate 1 showcases diverse images from around the Pacific, capturing the various resources that communities utilise to sustain their livelihoods. This is an important point to make early on in this guidebook as the vulnerability of communities or households to climate change can be influenced by the availability of and access to livelihood resources, adequate social services and government policies – rather than just climate itself. Therefore, this assessment holistically examines the status of and concerns relating to community and household resources as an important component of understanding vulnerability and adaptive capacity.

Plate 1: Typical house in Abaiang Island, Kiribati (left); household solar panels are a prominent feature in Arno Atoll, Republic of the Marshall Islands (centre); marine resources are a critical asset for community members in Piliura village, Vanuatu (right) (Photos: Karen McNamara)

1.1 Some Guiding Principles

This V&A assessment provides a step-by-step guide for climate change adaptation practitioners to use in ensuring that the knowledge, experiences and values of the community are at the core of the analysis and decision-making process. As detailed throughout this guidebook, the community is placed at the centre of the assessment. As such, this assessment is guided by the principles of Participatory Action Research, which places emphasis on participants' themselves to provide their opinions, experiences and worldviews (Pain and Francis, 2003; Chambers, 1994). Adopting such an approach ensures that local communities are directly involved in the assessment process, guaranteeing that they are active agents in making decisions about their future (Mercer et al., 2008). It is not a single prescribed method as such, it is an *approach* to ensure a shared and open dialogue between the facilitators (or assessment team) and local community. Much of the work undertaken on climate change adaptation has been top down in its approach (Reid et al., 2009), with little attention given to communities' experiences and knowledge of how to cope and adapt to these changing environments. Community participation is therefore a crucial guiding principle for this V&A assessment.

It is also important to flag at this point some key lessons from past climate change adaptation projects in the Pacific, as identified by a PACE-SD study (see McNamara, Hemstock and Holland, 2012). Based on a survey of 31 agencies that have implemented climate change adaptation projects in the region, four key lessons emerged as guiding principles for effective and sustainable projects in the long-term. The first lesson related to the need to ensure that raising awareness activities are locally and culturally appropriate. The second lesson related to the need for projects to actively integrate local community knowledge into the planning and implementation stages of the adaptation projects. The third lesson highlighted the importance of ensuring that community ownership is maintained throughout all project stages. The fourth and final lesson spoke of the need to utilise common sense strategies (that are guided by principles of sustainability) in lieu of specific climate change projections of local impacts.

1.2 Aims of the PACE-SD Participatory V&A Assessment

This V&A assessment is a more detailed assessment than the rapid assessment used for site selection. This assessment is designed to gain insights into the vulnerability and adaptive capacity of the community, drawing on their stock of and concerns about livelihood resources. As such, the desired outcomes and hence aims of this assessment are:

1. To develop an understanding of the level of community knowledge and attitudes towards climate change;

2. To explore the current status of livelihood resources in the community;

3. To identify the most prominent community concerns and propose appropriate solutions for long-term sustainability; and

4. To identify the most feasible and culturally appropriate adaptation measures, using the PACE-SD Strategic Adaptation Framework (detailed in **Appendix 6**) as an implementation strategy.

2.0 Methodology

This V&A assessment draws on the knowledge, experiences and aspirations of community members. It does so by undertaking field observations, along with a focus group discussion, field assessment and group workshop to collect both qualitative and quantitative data. In conjunction with these assessment techniques, this V&A assessment also consists of a climate change awareness session. In the process of developing this PACE-SD V&A assessment, we have drawn on and acknowledge the value of a number of carefully planned and effective V&A community assessments (see Dazé, Ambrose and Ehrhart, 2009; Nakalevu, 2006; Campbell and de Wet, 1999).

This guidebook is clear and practical. It leads communities through a logical process that: first, shares information about climate change (also drawing on local community knowledge) in an awareness session; assesses the current status of livelihood sectors/resources; lists problems and causes; identifies solutions and adaptation options; and finally, guided by the PACE-SD Strategic Adaptation Framework (Appendix 6; see also Limalevu et al., 2010), prioritises these options for implementation. This process is illustrated in Figure 1 below:

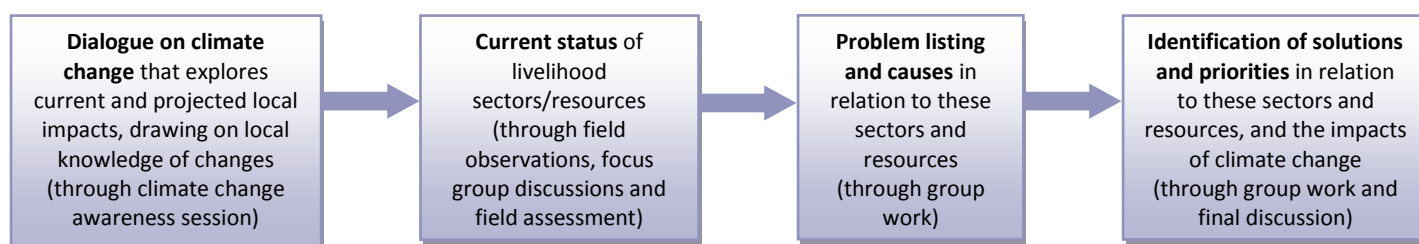| **Dialogue on climate change** that explores current and projected local impacts, drawing on local knowledge of changes (through climate change awareness session)	**Current status** of livelihood sectors/resources (through field observations, focus group discussions and field assessment)	**Problem listing and causes** in relation to these sectors and resources (through group work)	**Identification of solutions and priorities** in relation to these sectors and resources, and the impacts of climate change (through group work and final discussion)

Figure 1: Step-by-step guide of the V&A assessment process

This comprehensive and participatory process lends itself well to the collection of baseline data for **monitoring and evaluation** purposes. The data collected from the focus group, field assessment and group work should form the basis for baseline data. Once projects have been implemented, the assessment team should re-convene these community workshops and go through the same process and ask the same questions in the sectors/resource areas that were targeted by the implementation phase. This will then indicate any changes or improvements as a result of the project. In terms of baseline data on climate change knowledge and attitudes, a one-page survey (described in more detail below) should be completed by community members to gauge this information.

3.0 Step 1: Climate Change Awareness Session and Survey

This V&A assessment begins with a climate change awareness session (see Plate 2). This should be comprehensive in content but simplified to suit the current level of community understanding. Key tenants of this climate change awareness session should include causes, possible impacts and potential solutions. It is important for the assessment team to have an understanding of the level of climate change knowledge the community has prior to conducting this awareness session. This should have been ascertained during prior visits to the community. Also, the assessment team should ensure beforehand that the venue and facilities are ideal for conducting the awareness session.

If possible, it is important to gather meteorological information for these sites, most likely from the nearest meteorological station. Another useful source of information on climate change (current changes and projections) is the Australian Government's Pacific Science Climate Change Programme, which provides country-specific information (see Australian Bureau of Meteorology and CSIRO, 2011). There are other useful sources to access Pacific climate change information, including Barnett and Campbell (2010), Mimura et al., (2007), Preston et al., (2006) and the PACE-SD Climate Change Factsheets. The findings from these studies should be used as part of the climate change awareness session. They should also be used throughout the V&A assessment, especially when planning potential adaptation activities.

For the purposes of monitoring and evaluation, it is important that we understand the levels of climate change knowledge and attitudes prior to the implementation of a project. As such, community members should be asked to complete a one-page survey that gathers important information on their knowledge of and attitudes towards climate change. This **climate change knowledge and attitudes survey** is attached in **Appendix 1**.

Plate 2: PACE-SD staff deliver a climate change awareness session in Soso village, Fiji (Photo: Karen McNamara)

4.0 Step 2: Field Observations

It is important to make field observations throughout the entire assessment at each community site. These visual observations of the community site and surrounding areas could include: geology; geomorphology; drainage patterns; vegetation cover; soil type(s); land use types and patterns; population distribution; condition of water sources; income sources; condition and use of resources (terrestrial, marine, freshwater); and signs of land degradation.

This is not an exhaustive list but this step is important, especially to fill any gaps in the information required to be gathered by the assessment team. If possible, try and gather secondary data sources (such as journal articles, reports, previous project documents, census information) to confirm your visual observations at each of the community sites.

Plate 3 provides a series of assorted images to demonstrate the diversity of observations that can be made in communities. For instance, these observations can range from how people make a living, to how they access and manage their resources, to how they secure their household food supplies.

Plate 3: Making charcoal in Tassiriki village, Vanuatu to sell at the Port Vila market (left); a traditional canoe used for fishing and transport of people and goods in Abaiang Island, Kiribati (centre); smoking fish has long been used as a food preservation technique in Soso village, Fiji (Photos: Karen McNamara)

5.0 Step 3: Focus Group Discussion

The focus group discussion is a critical component of this V&A assessment. The discussion is guided by a series of questions, listed in a **focus group guide** in **Appendix 2**. These questions are divided into the following sectors/resource areas: governance and socio-economic resources; disaster risk management; water resources and security; health and sanitation; energy resources and information communication technology; food resources and security; and natural resources. Some of this information may have been ascertained in the rapid assessment process. It is important though to repeat the questions so as to cross-check on the previous responses, thereby validating the information gathered through triangulation.

If there are enough members of the assessment team (i.e. up to three members to each facilitate one group discussion), you may want to split the participants into three groups now. This will save time. If you do split into three groups now, which are outlined below, then each group is to follow the questions for their sections in Appendix 2. The groups should have equal representation of males and females, including youths. If committees of these broad sectors exist in the community, then members of these should be assigned to the appropriate groups. If you don't split into three groups at this stage, then continue on with one large group discussion and proceed to have all the questions answered as listed in Appendix 2. These sectors/resource areas are combined into three groups for ease of gathering data and field observations, apart from their close inter-linkages. For instance, the food resources and security sector is grouped with natural resources as they need to traverse outside the confines of the settlement or village making observations and gathering data on a similar set of bio-physical environments.

Group 1: Governance and Socio-Economic Resources / Disaster Risk Management

Group 2: Water Resources and Security / Health and Sanitation / Energy Resources and Information Communication Technology

Group 3: Food Resources and Security / Natural Resources

6.0 Step 4: Field Assessment

The field assessment follows the focus group discussion. The purpose of this component of the V&A assessment is two-fold:

1. To make observations in these assigned sectors/resource areas; and
2. To verify issues that were raised and discussed in the focus group discussion.

If you haven't split off into three groups as yet, this is the time to do it. Please see Step 3 for the make-up of the three groups. These groups are then tasked to gather information and carry out assessments related to their ascribed sectors/resource areas. A **field assessment tool** is provided in **Appendix 3**, which outlines the tasks and information that needs to be collected by each of the three groups.

Prior to the groups undertaking their field assessments, make sure you take a group photograph. Such group photographs are important for reporting but also for tracking information sources during the later stages of the project for the purposes of monitoring and evaluation. Plate 4 captures two important images from Soso village in Fiji: one from the field assessment on water resources and security; and one on using maps to identify key community resources.

Plate 4: Measuring the holding capacity of a concrete rainwater tank in Soso village, Fiji (left); using maps of the village to ascertain the location of important community resources in Soso village, Fiji (right) (Photos: Karen McNamara)

7.0 Step 5: Group Workshop

The group workshop is divided into two sessions, as outlined below.

7.1 Session 1: Problems, Causes and 'Solutions'

After the field assessment, the three groups should come back together in the same location. Remaining in their nominated groups from the field assessment, each group is to partake in an exercise that lists key problems, root causes and potential solutions for their specific group sectors/resource areas (see Plate 5). Groups are to be encouraged to reflect on the findings gleaned from the focus group and field assessment. This **problems, causes and solutions tool** is provided in **Appendix 4**. Each of the three groups should be given one hour or so to complete the table in Appendix 4 and then report on their findings to the entire group.


Plate 5: Groups list out problems, causes and solutions in Tamakautoga village, Niue (left) and Makefu village, Niue (right) (Photos: Karen McNamara)

7.2 Session 2: Identifying and Prioritising Adaptation Options

Following the presentations from the three groups (see Plate 6), all participating community members should now work together as one group to identify and prioritise adaptation options based on the findings of Session 1.

Plate 6: Sector-based groups present their findings to the entire group in Avatele village, Niue (left) and Makefu village, Niue (right) (Photos: Karen McNamara)
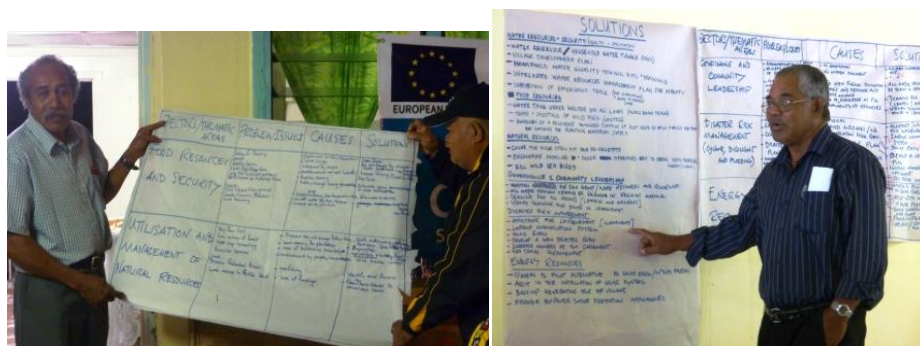
The **adaptation options tool** to undertake this activity is provided in **Appendix 5**. The assessment team should facilitate this discussion and encourage the community to draw on the findings from the focus group, field assessment and the above problems, causes and solutions exercise. The 'solutions' provided from each of the three groups should be listed in the table in Appendix 5 as potential adaptation options. Once they are all listed, the assessment team needs to encourage the community to indicate the most important options for them and then facilitate a discussion whereby the community prioritises these adaptation options according to the PACE-SD Strategic Adaptation Framework. Remember also to reflect on and consider the studies on current climate change effects and impacts, and those projected for the future.

This group workshop should be open, interactive and respectful of any diverse opinions. The views of community representatives and leaders should also be carefully considered as these adaptation options need to be supported by community leaders, as well as the broader community. The goal is to identify a series of prioritised adaptation options that enhance community adaptive capacity. Ultimately, the aim of these participatory V&A assessment tools is to ensure that these adaptation options are: designed and endorsed by the community; technically feasible; cost-effective; culturally acceptable and appropriate; and sustainable. Plate 7 visually illustrates some potential adaptation activities that might target particular sectors or areas of community concern such as coastal erosion and sea level rise, strained food security and poor water quality.

Plate 7: Encroaching sea levels in Walung Village, Federated States of Micronesia (left); threatened taro crop plantations by salination in Abaiang Island, Kiribati (centre); using a local river stream for household water needs in Qeleni village, Fiji (right) (Photos: Karen McNamara)

Once the community has prioritised these adaptation options, the assessment team should accurately price these options and include them in the final V&A report.

8.0 Concluding Remarks

This V&A assessment is comprehensive and involves a number of critical stages to ensure the assessment objectives are achieved. Given that the assessment team must respect the multiple time demands on community members and representatives, this V&A process may have to occur over more than one site visit. It is of paramount importance that at the conclusion of each field visit the assessment team leader makes some concluding remarks about the assessment and shares with the community the next stages of the project. If appropriate, a formal request to leave the community may also be required from the community leaders. Finally, it is important for the assessment team to always remember that this assessment process, and indeed entire project, needs to be grounded in principles of sharing, respect, honesty and open communication.

Appendix 1: Climate Change Knowledge and Attitudes Survey

1. Are you: ⃝ Male   ⃝ Female

2. Please indicate your age group (please select only one):

 ⃝ < 20 years   ⃝ 20-29 years   ⃝ 30-39 years   ⃝ 40-49 years   ⃝ 50-59 years   ⃝ 60+ years

3. What is the main source of income for your household (please select only one):

⃝ No income   ⃝ Wages/salary   ⃝ Own business   ⃝ Sale of products (fish, handicraft, crops, etc)
⃝ Land lease   ⃝ House rent   ⃝ Remittances   ⃝ Other source (please specify) _____

4. What is your highest level of education (please select only one):

⃝ No school completed   ⃝ Primary school   ⃝ Secondary school
⃝ Diploma   ⃝ Degree   ⃝ Masters   ⃝ PhD

5. Please indicate your level of knowledge about climate change (please select only one):

 ⃝ None at all   ⃝ A little   ⃝ Moderate   ⃝ High   ⃝ Very high

6. Thinking about the future, are you concerned about the impacts of climate change?

⃝ No

⃝ Yes ⟶ **How concerned?**   ⃝ Not at all   ⃝ A little   ⃝ Moderately   ⃝ Very   ⃝ Extremely

7. Do you think that climate change is:

 ⃝ A natural occurrence   OR   ⃝ Human-induced

8. Please indicate the level to which you agree with the following statements:

Statements about me and my community…	Do not agree	Agree a little	Moderately agree	Strongly agree	Very strongly agree
I have adequate access to medical facilities when needed	⃝	⃝	⃝	⃝	⃝
I know what to do when there is an impending drought or flood	⃝	⃝	⃝	⃝	⃝
I know what to do if tidal surges or cyclones are approaching	⃝	⃝	⃝	⃝	⃝
We have reliable water resources	⃝	⃝	⃝	⃝	⃝
We have reliable food resources	⃝	⃝	⃝	⃝	⃝
I am continually monitoring local environmental conditions	⃝	⃝	⃝	⃝	⃝
Our village works well together and will meet future challenges	⃝	⃝	⃝	⃝	⃝
We sustainably manage our natural resources (forests, oceans)	⃝	⃝	⃝	⃝	⃝

Many thanks for your time in completing this survey.

Appendix 2: Focus Group Guide

FOCUS GROUP DISCUSSION GUIDE

1. Governance and Socio-Economic Resources

- **Demography**

a. How many people live in the community?

b. How many households are there?

c. What is the age and gender distribution of the population?

- **Governance and Social Systems**

d. What is the community's management / governance structure? (differentiate between traditional and modern structures if they co-exist)

e. How are the various community leaders and representatives chosen?

f. What was the duration of service of the last three village leaders, including the current village leader?

g. What is the community's management system?

h. How many committees are there and what are these?

i. What is the community's communications system and dispute resolution system?

j. What is the status of community cohesion and collaboration in community activities?

k. What types of religion/denominations exist?

- **Human Resources**

l. What types of skilled labourers exist and how many currently reside in the village?

m. What types of skilled trades people exist and how many currently reside in the village?

n. What types of highly skilled professionals exist (e.g. doctors, engineers etc) and how many currently reside in the village?

- **Resources and Economy**

o. What is the total land area owned by the community and how much of this is 'arable' land?

p. How are the resources owned or apportioned to community members?

q. If land is communally owned, what is the distribution of land per tribal groupings and what is the land ownership density (e.g. in x tribe, y number of persons per kilometre square)?

r. What are the main farming system(s) practiced by the community (e.g. subsistence, semi-commercial, entirely commercial)?

s. What are the main fisheries system(s) practiced by the community (e.g. subsistence, semi-commercial, entirely commercial)?

t. What are the main sources of income?

- **Development Plans**

u. Are there any village development plans or community investment/business plans? (if yes, was any training provided or financial assistance received?)

v. Are there any plans relating to the development or management of natural resources? (if yes, was any training provided or financial assistance received?)

w. What projects have been implemented in the last 30 years? (if yes, have these been implemented by the community or through external assistance?)

x. Has a climate change adaptation project been implemented by the community?

y. What in-kind contribution would the community be willing to provide for this project?

z. What cash contribution would the community be willing to provide for this project?

2. Disaster Risk Management (Climate-Induced Disasters)

a. Please describe the last cyclone, drought and/or flooding event in the community (when? what were the impacts? how did the community respond? was this effective?)

b. Is there a disaster management plan? (if yes, how effective is it?)

c. How is the community warned of an impending extreme weather event?

d. Is there a community evacuation centre?
e. Is there a plan to ensure that the community has adequate food and water during a cyclone, drought or flooding event?
f. Are there any traditional knowledge-based practices that the community uses to address climate-induced disasters? (if yes, what are these?)
g. Are any community members trained in first aid? (if yes, how many?)

3. Water Resources and Security
a. List, according to importance, the most prominent source(s) of water (e.g. well, spring, borehole, rainwater, stream etc)
b. What is the water availability throughout the year (e.g. annual rainfall distribution, number of dry months per year, any problems during the dry season or frequency of drought)?
c. What is the water quality of the prominent source(s)?
d. What is the current water distribution system?
e. What are the types and capacities of water storage dedicated for the whole community?
f. What are the types and capacities of water storage at the household level?
g. Thinking about gender, who accesses and manages these resources?

4. Health and Sanitation
a. What is the availability or presence of health services facilities?
b. How far is the nearest health centre?
c. What range of services does the nearest health centre provide?
d. What is the incidence of water borne diseases (e.g. diarrhea, skin diseases, leptospirosis etc)?
e. What is the incidence of vector borne diseases (e.g. dengue, malaria etc)?
f. Are there any other diseases prevalent in the community?
g. What types of toilets are used by households?
h. What is the current waste management system for human waste, kitchen organic waste and inorganic waste?
i. Is there a health committee? (if yes, are there any planned activities?)
j. Does the community use traditional knowledge-based practices to address health and sanitation issues? (if yes, what are these?)

5. Energy Resources and Information Communication Technology
a. List, according to importance, the energy sources for cooking (e.g. fuelwood, kerosene, gas, electricity etc)
b. List, according to importance, the energy sources for lighting (e.g. kerosene, diesel generators, solar, electricity from mini hydro dam, electricity from main grid etc)
c. Have you, or do you, use information communication technology (e.g. mobile phones, Internet, radio, television) or social media (e.g. Facebook, twitter) to learn more about extreme weather events? (if yes, how effective has this been?)
d. Have you, or do you, use information communication technology (e.g. mobile phones, Internet, radio, television) or social media (e.g. Facebook, twitter) to learn more about climate change? (if yes, how effective has this been?)

6. Food Resources and Security
a. List, according to importance, the main root crops, vegetables and tree crops/fruit trees that are used as food sources
b. What are the productivity levels of these crops listed in (a)
c. List, according to importance, any economic crops (if yes, how much money does the community earn weekly?)
d. What is the approximate total size/area of farming land?
e. What are the predominant land use pattern and systems?
f. What is the relative soil fertility of the community farm lands?
g. List, according to importance, the main fish types (non-fin and fin) that are used as food sources

    h. What are the productivity levels of these marine/freshwater products listed in (g)

    i. List, according to importance, any economic marine/freshwater products (if yes, how much money does the community earn weekly?)

    j. What is the estimated area of the fishing ground owned by the community?

    k. Do you farm livestock? (if yes, what type and how many?)

    l. Are there any traditional knowledge-based practices that the community uses to manage food resources and ensure food security? (e.g. food preservation or planting techniques etc)

    m. Thinking about gender, who accesses and manages these resources?

7. Natural Resources (Terrestrial, Marine, Freshwater)

    a. What percentage of the total land area is currently utilised and what percentage is natural vegetation cover?

    b. Are there incidences of burning vegetation? (if yes, what are the impacts?)

    c. Are there incidences of overgrazing? (if yes, what are the impacts?)

    d. Are there incidences of logging? (if yes, what are the impacts?)

    e. Are there occurrences of invasive species (if yes, what are the impacts?)

    f. What is the level of use of natural resources for fuelwood and housing materials etc?

    g. Are there any traditional knowledge-based practices that the community uses to manage terrestrial resources? (if yes, what are these?)

    h. How many fishing boats (and types) are owned by the community?

    i. What are the types of fishing techniques used by the community?

    j. What is the approximate amount of catch/per week? (specify and quantify the species)

    k. What is the approximate amount of catch consumed locally/per week? (specify and quantify the species)

    l. What is the approximate amount of catch sold to market?

    m. What are the trends in catch? (e.g. increasing or decreasing, or a differentiation of the trends at species level?)

    n. Are there any community-based marine/freshwater management practices, policies or laws in place?

    o. Are there any traditional knowledge-based practices that the community uses to manage marine/freshwater resources? (if yes, what are these?)

    p. Thinking about gender, who accesses and manages these resources?

Appendix 3: Field Assessment Tool

Group 1: Governance and Socio-Economic Resources / Disaster Risk Management

a. Governance and Socio-Economic Resources

It is important to continue a discussion within the group that builds on information gathered in the focus group discussion. Questions to pose further to the group revolve around how decisions are made in the community. For instance:
- Which men and which women hold positions of power in the community;
- Who participates in the decision-making process; and
- Are there any socio-cultural factors, or other factors, that restrict or allow men and women to participate in decision-making and leadership roles?

b. Disaster Risk Management (Climate-Induced Disasters)

- *Vulnerability of built structures to the impacts of cyclones*

For this, a categorisation of the types of housing structures in the community should be conducted. The output of this exercise could be a table showing the percentage of the types of buildings in the community (such as cement/brick, wooden, corrugated iron, iron shack or traditional). Also, if the community has an evacuation centre, inspect its status and condition.

- *Vulnerability of the community's agricultural and water supply system to the impacts of droughts*

The two climate-sensitive sectors that would be impacted by drought are water and agriculture. Continue a discussion within the group on how vulnerable the current system of agriculture is to the impacts of drought. Also discuss amongst the group, the capacity of the current water supply during periods of drought, such as flow rates of springs, current volume of storage and any other sources, such as rainwater harvesting, which communities rely on during periods of drought. In addition to this, if communities rely on water being carted from elsewhere, the cost and reliability of this should be documented.

- *Vulnerability of the community and built structures to the impacts of flooding*

Communities located in flood prone areas, such as those located along the coast or near rivers, need to be assessed as to how vulnerable they are from the adverse impacts of inundation and flooding. For this, gather information from the group regarding the impacts of historical events. In addition to this, transect surveys using automatic levels, could be conducted to establish a preliminary risk zoning for the site.

Group 2: Water Resources and Security / Health and Sanitation / Energy Resources and Information Communication Technology

a. Water Resources and Security

The assessment team should inspect all water sources used by the community, including any community rainwater tanks or storage water tanks, and assess the volume of discharge and quality. For the measurement of discharge, the use of a measuring cylinder and a stop watch would be adequate. In terms of water quality, the use of a rapid water quality test kit, such as the hydrogen sulphide test, would be suitable. For this test, take a random sample of household water sources, and also include any community rainwater tanks or storage water tanks. Also, make sure you use a control in your sample, such as bottled water (e.g. Fiji Water). The following table can be used to summarise the results of the hydrogen sulphide test.

Sample No	Location	Date & Time	6 hours	12 hours	18 hours	24 hours
Control						
A						
B						
C etc						

At each of the above time intervals, you should indicate if the water in the test tube is clear, milky/grey or black (see Plate 8). In the case where the hydrogen sulphide test changes from clear to black within 24 hours, particularly for an important source of drinking water for the community, then a sample needs to be collected and taken to the nearest accredited laboratory within 24 hours for further testing, particularly for the presence of e-coli bacteria. The required volume is usually a litre, in a sterilised plastic or glass bottle, and stored in ice at a temperature of below ten degrees centigrade.

Plate 8: Results of the hydrogen sulphide water tests (Photo: Karen McNamara)

b. Health and Sanitation

The health and sanitation assessment should be carried out at both the household and community levels. For the household level, a sample population should be assessed for basic household hygiene, including sanitary condition of the toilets. At the community level, inspection and categorisation of the types of waste disposal, including the types of toilets, should be carried out. The general cleanliness of the village and its surroundings should be described, including the incidence of animal or pest waste or droppings. If possible, try and obtain a health report and health data from the village nurse(s) or health worker(s) but this information needs to be treated with the utmost confidence.

c. Energy Resources and Information Communication Technology

- *Energy resources for cooking*

The assessment team should inspect the cooking facilities of a sample population and assess the fuel used and energy efficiency of the cooking methods used by the community. They should also enquire as to the cost of the cooking fuels and where they have been purchased. For fuelwood, document the accessibility to the source, and the type(s) and volume used to determine the level of sustainability.

- *Energy resources for lighting and other electrical energy needs*

The assessment team should evaluate the type(s), cost, accessibility and sustainability of the types of fuel used for lighting and other electrical needs.

- *Information communication technology*

Build on your questions and discussions about information communication technology from the focus group, including its potential use and relevance for the community.

Group 3: Food Resources and Security / Natural Resources

a. Food Resources and Security

The assessment team should survey a sample of farms to assess the types and volume of food resources available to the communities. This could require an assessment of the soil fertility and productivity or yield of the various cultivated crop. The availability of the basic food crops throughout the year should be assessed by documenting the cropping system. Assessment should also be made of the varieties of root crops, vegetables and fruits crops grown, which may provide a link, though not necessarily, to the health and nutritional status of the community. The area of crop plantations could be measured using a GPS devise. Building on the focus group discussions, an assessment of the marine resources and any livestock should also be included here.

b. Natural Resources (Terrestrial, Marine, Freshwater)

An assessment of the land-based natural resources with respect to the volume and state of the resources should be carried out. This would include the:
- Categorisation and volume of forest;
- Categorisation and volume of wild crop harvest;
- Presence and impacts of invasive species;
- Potential ecosystem services for the community; and
- Potential marketable resources.

The area of forest and wild crop harvest could be measured using a GPS devise. Building on the focus group discussion, also document the availability, accessibility and volume of marine and/or freshwater resources. The results of these assessments could then be used as an indicator of the status of biodiversity in the area.

Appendix 4: Problems, Causes and 'Solutions' Tool

Group 1

Sectors/Resource Areas	Problems/Issues	Causes	'Solutions'
Governance and Socio-Economic Resources	- - - etc	- - - etc	- - - etc
Disaster Risk Management (Climate-Induced Disasters)	- - - etc	- - - etc	- - - etc

Group 2

Sectors/Resource Areas	Problems/Issues	Causes	'Solutions'
Water Resources and Security	- - - etc	- - - etc	- - - etc
Health and Sanitation	- - - etc	- - - etc	- - - etc
Energy Resources and Information Communication Technology	- - - etc	- - - etc	- - - etc

Group 3

Sectors/Resource Areas	Problems/Issues	Causes	'Solutions'
Food Resources and Security	- - - etc	- - - etc	- - - etc
Natural Resources (Terrestrial, Marine, Freshwater)	- - - etc	- - - etc	- - - etc

# Appendix 5: Identifying and Prioritising Adaptation Options Tool

Entire Group

Sectors/Resource Areas	Adaptation options ('solutions')	Priorities (as guided by the PACE-SD Strategic Adaptation Framework)*
A. Governance and Socio-Economic Resources	- - - etc	**Priority (1):** -
B. Livelihood Sectors		
(i) Water Resources and Security	- - - etc	**Priority (1)a:** -
(ii) Health and Sanitation	- - - etc	**Priority (1)b:** -
(iii) Food Resources and Security	- - - etc	**Priority (1)c:** -
(iv) Energy Resources and Information Communication Technology	- - - etc	**Priority (1)d:** -
C. Disaster Risk Management (Climate-Induced Disasters)	- - - etc	**Priority (2):** -
D. Natural Resources (Terrestrial, Marine, Freshwater)	- - - etc	**Priority (3):** -

*Note: Priority 1 is the highest or most important while Priority 3 is the least important. Issues dealing with governance and livelihoods are both equal in priority – highest. For the livelihood sectors, water is accorded higher priority over health and sanitation, and these take precedence over food resources and so forth.

Appendix 6: PACE-SD Strategic Adaptation Framework

As there are scarce resources available for adaptation work in developing countries, it is therefore critical that adaptation plans are strategic. The adaptation framework depicted below is strategic in three ways. Firstly, the assessment and plans are based on a firm understanding of the current socio-economic, cultural and environmental problems currently faced by the community. Secondly, it addresses critical problem(s) that are related to current climatic conditions in the community first, before sequentially addressing other aspects of climate change within the timeframe of short, medium and long term. In the context of climate change, the timeframe neatly corresponds to current climate, climate extremes, climate variability, and projected future climate change. Thirdly, it sets in motion a process that would initiate and catalyse community actions to enable them to develop in a sustainable manner. Furthermore, the framework eliminates the biases in prioritising adaptation options as it elimates subjectivity in the process; a problem frequently encountered at the prioritisation stage during community participatory process.
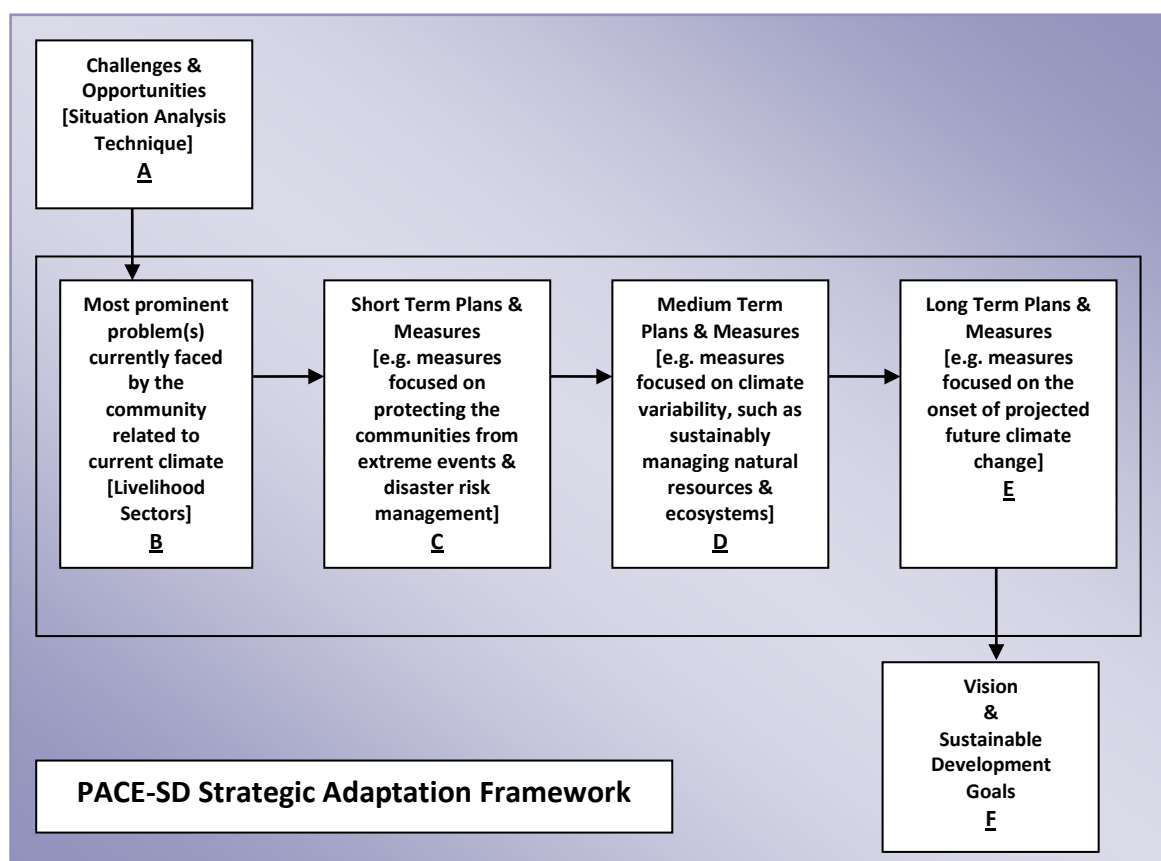
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