Global Initiative for Protected Areas and Climate Adaptation
COLOMBIA • PHILIPPINES • MADAGASCAR

Basic Vulnerability Assessment Methodology for Coastal and Marine Protected Areas

B A V A P A

Grant No. EuropeAid/DCI-ENV/2010/248-197

Guidance Note on
"Basic Vulnerability Assessment Methodology for Coastal and Marine Protected Areas – BAVAPA"

1. INTRODUCTION

BAVAPA - ***'BAsic methodology for Vulnerability Assessment of Protected Areas'*** - has been developed as a rapid vulnerability assessment tool to be included in the *Manual for Climate Change Vulnerability Assessments for Marine Protected Areas*, which is being prepared as part of the EU-funded project 'Natural Solutions: Global Initiative for Protected Areas and Climate Adaptation'.

BAVAPA was developed in response to the identified need to make available a simple, rapid, 'first-cut' methodology for vulnerability assessments that could be implemented in data or resource poor environments. It is by no means exhaustive as a methodology to assess vulnerability but it has been used successfully in testing to screen targets for further detailed investigation and to provide broad guidance on relative vulnerability and drivers of vulnerability. It is based on the widely accepted definition of vulnerability:

VULNERABILITY = CLIMATE IMPACT (a function of exposure and sensitivity) minus ADAPTIVE CAPACITY / RESILIENCE

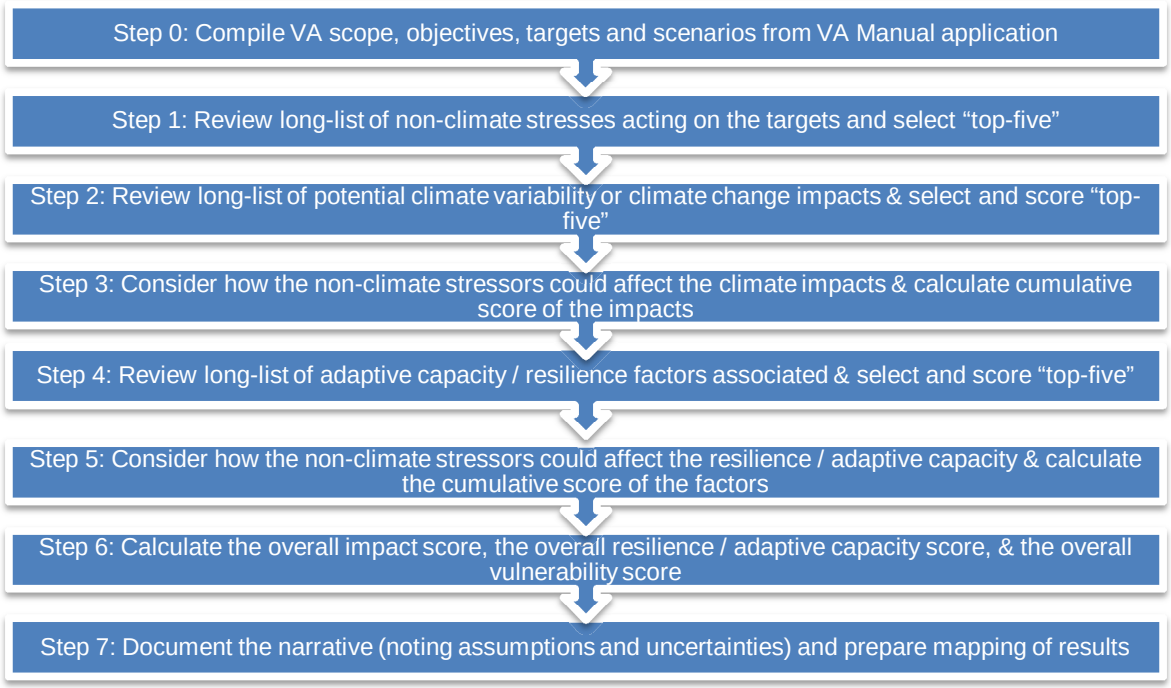
It aims to provide broad guidance on the relative and qualitative vulnerability of targets. The scores developed by BAVAPA have no quantitative meaning in themselves but provide: (i) an understanding of the relative vulnerability of a series of targets; and (ii) an understanding of the relative contribution of climate impact and adaptive capacity/resilience to that vulnerability. The methodology aims to also include consideration of non-climate stressors acting on the targets by carrying out a qualitative analysis of how such stressors could affect climate impacts and adaptive capacity/resilience. It is important to bear in mind that the methodology is intended to provide a rapid-first pass assessment and therefore involves higher degrees of uncertainty than other more comprehensive methodologies. It is however considered to be a useful tool to prioritize targets for further detailed analysis, or to allow rapid assessments when resources do not allow for more detailed assessments.

BAVAPA is based around a series of checklists and an accompanying series of Excel worksheets that guide the user through an identification of likely climate change impacts and the existing adaptive capacity of social and ecological systems to climate change to allow calculation of overall vulnerability. It has been designed as an integral component of the Natural Solutions VA Manual and thus relies on teams to implement the initial steps in that Manual to define VA scope, objectives and targets before commencing application of BAVAPA. Information on definitions, concepts and other relevant information are also found in the Manual and are not repeated here.

Due to the nature of the methodology and the subject that it addresses, BAVAPA should be considered to be a work-in-progress. As with the other outputs of the Natural Solutions project, the methodology will be subject to ongoing testing and refinement both in the three pilot countries and more broadly by partners. Your experience in using BAVAPA will be extremely helpful in helping us to improve the tool and we would greatly appreciate your feedback and suggestions for improvement. Comments can be sent to:

WWF International
Attention: Alexander Belokurov
abelokurov@wwfint.org

2. Overview of Steps in the BAVAPA Methodology



3. Detailed Guidance and Checklists

Methodology Participants & Setting

The BAVAPA methodology is designed to be applied in a participative manner in a workshop or group setting. The participants in methodology application could include as representatives from the following groups: PA managers; experts with knowledge of social, ecological and ecosystem service targets; local community; local authorities; climate specialists; civil society; and private sector interests.

Typically the methodology can be applied in a one-day workshop, however if resources are available a longer workshop could be organized that included a more detailed briefing session for participants on key concepts. It is recommended that participants are provided with background information in advance of the workshop so that they can come prepared with useful data and information on-hand.

Step 0: Compile VA scope, objectives, targets and scenarios from VA Manual application

Application of activities 1.1, 1.2 and 1.3 of the VA Manual will guide teams through the process of defining the VA scope (geographical and temporal), objectives, and targets and aid them in the development of the baseline, climate and non-climate scenarios. All this information will be required in the application of the BAVAPA methodology so teams should compile this before commencing application of the methodology and ensure that all stakeholders that will participate in the methodology application are familiar with this information.

Step 1: Review long-list of non-climate stresses acting on the targets and select "top-five"

For each of the VA targets, the teams should work through the Checklist A: Non-Climate Stressors and, in Worksheet A, list the top five to ten stresses that currently act on each target or that are likely to act on targets in the future. Information for this step can be drawn from the baseline and future non-climate scenarios developed in Activity 1.3 as well as the knowledge of workshop participants. While it is recognized that more than ten stresses may act on any one target, it is necessary to prioritize the influences to carry forward into future stages of the methodology. It may be useful to form small groups for this step to allow different groups to work on different targets. Note that the checklist is simply a guide for this step and teams should feel free to add, delete or change the items in the checklist as relevant to their circumstances. The narrative section of Worksheet A should be used to

provide a short description of each non-climate stressor that can be understood by those not involved in the methodology application.

STEP 2: REVIEW LONG-LIST OF POTENTIAL CLIMATE VARIABILITY OR CLIMATE CHANGE IMPACTS & SCORE "TOP-FIVE" POTENTIAL IMPACTS

Climate variability impacts or climate change impacts are defined as the physical effects on targets resulting from short-term climate variability or longer-term climate change. Such impacts are the result of the interaction of a target's exposure to climate and its sensitivity to climate. The choice of whether the team looks at the impacts of climate variability and/or climate change will depend on the agreed scope of the VA. For each of the VA targets, the teams should work through the Checklist B: Climate Impacts and, in Worksheet B, list the top five to ten impacts that could act on each target. Information for this step can be drawn from the climate scenarios developed in Activity 1.3 as well as knowledge of workshop participants on how targets have reacted to climate stresses in the past or are currently reacting to climate conditions and events. Note that the checklist is simply a guide for this step and teams should feel free to add, delete or change the items in the checklist as relevant to their circumstances. The narrative section of Worksheet B should be used to provide a short description of each impact that can be understood by those not involved in the methodology application.

Once the top five to ten impacts have been identified, the teams should assign them a score between -2 and +2 using the grid below as a guide. The scores should be entered into Worksheet B. The assumptions and uncertainties associated with the application of this step need to be recorded in the narrative section of Worksheet B along with other relevant comments or observations.

CLIMATE IMPACT SCORE	INTERPRETATION
-2	The climate impact in question will be highly beneficial to the target
-1	The climate impact in question will be beneficial to the target
0	The climate impact in question will be insignificant or neutral for the target
+1	The climate impact in question, after consideration of the cumulative effects of all the non-climate stressors will be negative for the target
+2	The climate impact in question, after consideration of the cumulative effects of all the non-climate stressors will be highly negative for the target

This part of the methodology calls for the group to make subjective judgments based on experienced, local knowledge and expert opinion. The broader the group of stakeholders involved in this process, the stronger the resulting informed opinion.

STEP 3: CONSIDER HOW THE NON-CLIMATE STRESSORS COULD AFFECT THE CLIMATE IMPACTS & CALCULATE CUMULATIVE SCORES FOR EACH OF THE IMPACTS

The scale and magnitude of climate impacts can be influenced positively or negatively by interactions with the range of non-climate stressors acting on the target. For example, an identified climate impact of coastal erosion may be negatively influenced, that is increased, by a non-climate stressor of deforestation of mangroves for charcoal production. The aim of this step of the methodology is to discuss and reach consensus on the way that the identified non-climate stressors may affect climate impacts. This step will not provide definitive right or wrong answers, but by carrying it out in a workshop setting with a view of participants it will represent the a solid and informed opinion in relation to this issue.

To implement this step, consider each of the climate impacts listed in Worksheet B in the context of the non-climate stressors listed in Worksheet A and discuss whether one or more of the non-climate stressors could act to have: (i) a negative effect – i.e. increase the adverse elements of the impact; (ii) have a positive impact – i.e. decrease the adverse elements of the impact; or (iii) a neutral impact – i.e. no effect on the adverse elements of the impact. The aim is to arrive at an overall picture of how each climate impact could be influenced by the full range of climate stressors that are acting on it. A relative score from -2 to +2 for each impact should be entered into Worksheet B using the guide below. The Worksheet will then automatically calculate an overall cumulative impact score that takes into account the climate impact score, and the cumulative effect of the non-climate impacts. The assumptions and uncertainties associated with the application of this step need to be recorded in the narrative section of Worksheet B along with other relevant comments or observations.

SCORING OF EFFECT ON NON-CLIMATE IMPACTS	INTERPRETATION
-2	The cumulative effects of all the non-climate stressors will have a highly beneficial influence on the climate impact (i.e. significantly enhance the positive elements of the impact)
-1	The cumulative effects of all the non-climate stressors will have a beneficial influence on the climate impact (i.e. enhance the positive elements of the impact)
0	The cumulative effects of all the non-climate stressors will be insignificant or neutral for the climate impact
+1	The cumulative effects of all the non-climate stressors will have a negative influence on the climate impact (i.e. enhance the negative elements of the impact)
+2	The cumulative effects of all the non-climate stressors will have a highly negative influence on the climate impact (i.e. significantly enhance the negative elements of the impact)

Again this part of the methodology calls for the group to make subjective judgments based on experienced, local knowledge and expert opinion. The broader the group of stakeholders involved in this process, the stronger the resulting informed opinion.

STEP 4: REVIEW LONG-LIST OF ADAPTIVE CAPACITY / RESILIENCE FACTORS ASSOCIATED & SCORE "TOP-FIVE" FACTORS

Adaptive capacity, defined as the ability to change in anticipation of, or in reaction to disturbance or stress, or resilience factors, defined as those factors that increase or reduce the ability of a target to resist or recover from climate impacts. While there is some ongoing academic debate about the differences between resilience and adaptive capacity, for the purposes of this methodology a broad definition has been used that encompasses the two terms. For each of the VA targets, the teams should work through the Checklist C: Adaptive Capacity / Resilience Factors and, in Worksheet C, list the top five to ten factors associated with each target. Information for this step can be drawn from the knowledge of workshop participants on the inherent characteristics of the targets as well as the surrounding environment as described in the baseline and future non-climate scenarios developed in Activity 1.3 of the VA Manual. Note that the checklist is simply a guide for this step and teams should feel free to add, delete or change the items in the checklist as relevant to their circumstances. Once the top five to ten factors have been identified, the teams should assign them a score between -2 and +2 using the grid below as a guide. The scores should be entered into Worksheet C. The narrative section of Worksheet C should be used to provide a short description of each factor that can be understood by those not involved in the methodology application.

ADAPTIVE CAPACITY / RESILIENCE SCORE	INTERPRETATION
-2	The adaptive capacity/resilience factor in question will be highly negative for the target (i.e. it will act to strongly decrease overall adaptive capacity/resilience)
-1	The adaptive capacity/resilience factor in question will be negative for the target (i.e. it will act to decrease overall adaptive capacity/resilience)
0	The adaptive capacity/resilience factor in question will be neutral for the target (i.e. it will act to will not change overall adaptive capacity/resilience)
+1	The adaptive capacity/resilience factor in question will be beneficial for the target (i.e. it will act to increase overall adaptive capacity/resilience)
+2	The adaptive capacity/resilience factor in question will be highly beneficial for the target (i.e. it will act to strongly increase overall adaptive capacity/resilience)

Once more, the broader the group of stakeholders involved in this process, the stronger the resulting informed opinion.

STEP 5: CONSIDER HOW THE NON-CLIMATE STRESSORS COULD AFFECT THE RESILIENCE / ADAPTIVE CAPACITY FACTORS & CALCULATE CUMULATIVE SCORES FOR EACH FACTOR

Just as the scale and magnitude of climate impacts can be influenced positively or negatively by interactions with the range of non-climate stressors acting on the target, the characteristics of the targets that give it its resilience / adaptive capacity can also be affected by non-climate stressors. For example, an identified resilience / adaptive capacity factor of strong genetic diversity between populations could be negatively affected by a non-climate stressor related to habitat loss that isolates populations and hinders breeding between populations. The aim of this step of the methodology is to discuss and reach consensus on the way that the identified non-climate stressors may affect resilience / adaptive capacity factors of targets. This step will not provide definitive right or wrong answers, but by carrying it out in a workshop setting with a view of participants it will represent the a solid and informed opinion in relation to this issue.

To implement this step, consider each of the adaptive capacity / resilience factors listed in Worksheet C in the context of the non-climate stressors listed in Worksheet A and discuss whether one or more of the non-climate stressors could act to have: (i) a negative effect – i.e. decrease the degree of adaptive capacity / resilience; (ii) have a positive impact – i.e. increase the degree of adaptive capacity / resilience; or (iii) a neutral impact – i.e. no effect the degree of adaptive capacity / resilience. The aim is to arrive at an overall picture of how each adaptive capacity / resilience factor could be influenced by the full range of climate stressors that are acting on it. Once this is completed, a score from -2 to 2 should be identified for each factor using the below scale and entered in Worksheet C. The assumptions and uncertainties associated with the application of this step need to be recorded in the narrative section of Worksheet C along with other relevant comments or observations.

ADAPTIVE CAPACITY / RESILIENCE SCORE	INTERPRETATION
-2	The cumulative effects of all the non-climate stressors will have a highly negative influence on the factor (i.e. significantly enhance the negative elements of the factor)
-1	The cumulative effects of all the non-climate stressors will have a negative influence on the factor (i.e. enhance the negative elements of the factor)
0	The cumulative effects of all the non-climate stressors will be insignificant or neutral for the factor
+1	The cumulative effects of all the non-climate stressors will have a positive influence on the factor (i.e. enhance the positive elements of the factor)
+2	The cumulative effects of all the non-climate stressors will have a highly positive influence on the factor (i.e. significantly enhance the positive elements of the factor)

STEP 6: CALCULATE THE OVERALL IMPACT SCORE, THE OVERALL RESILIENCE / ADAPTIVE CAPACITY SCORE, & THE OVERALL VULNERABILITY SCORE

A calculation of the degree of vulnerability of a target is often thought of as the desired end-point of a vulnerability assessment. However, most often vulnerability assessments are the first phase of climate change adaptation planning and in this case, understanding the drivers and components of vulnerability is arguably more important than only identifying an absolute or relative degree of vulnerability. The aim of this step is therefore to determine the overall climate impact score, the overall adaptive capacity / resilience score and the overall vulnerability score for each target. The first two scores will be particularly important in the latter stages of adaptation planning. All scores are calculated automatically in Worksheet D and the analyses used explained below.

The overall impact score and the overall adaptive capacity / resilience score are calculated by identifying the median of the range of impact and adaptive capacity / resilience scores respectively for each target. The median is the preferred statistical tool to use in this case as it represents the middle score for a set of data that has been arranged in order of magnitude.

The overall vulnerability score is calculated by the application of the following formula:

VULNERABILITY = CLIMATE IMPACT (a function of exposure and sensitivity) minus ADAPTIVE CAPACITY / RESILIENCE

This formula is founded in the widely accepted logic that the adaptive capacity / resilience offsets the climate impact.

For each of the scores calculated, the following grill can be used to convert them to a descriptive, qualitative view of vulnerability as the resulting numbers have no real quantitative meaning once they have been used as tools to allow calculation of the scores. The first table provides an interpretation of overall impact scores and overall AC / R scores, and the second provides an interpretation of overall vulnerability scores.

Interpretation of Overall Impact and AC / R Scores

RESULTING OVERALL IMPACT OR AC / R SCORE	INTERPRETATION FOR OVERALL IMPACT SCORE	INTERPRETATION FOR OVERALL AC / R SCORE
-4 or -3	The target is expected to experience a highly positive climate impact.	The target has very low adaptive capacity / resilience.
-2 or -1	The target is expected to experience a positive climate impact.	The target has low adaptive capacity / resilience.
0	The target is expected to experience a neutral or negligible climate impact.	The target has medium level adaptive capacity / resilience.
+1 or +2	The target is expected to experience negative climate impact.	The target has high adaptive capacity / resilience.
+3 or +4	The target is expected to experience a highly negative climate impact.	The target has very high adaptive capacity / resilience.

Interpretation of Overall Vulnerability Scores

SCORE	INTERPRETATION FOR OVERALL VULNERABILITY SCORE
-8 to -6	The target has very low relative vulnerability.
-5 to -3	The target has low relative vulnerability.
-2 to +2	The target has medium level relative vulnerability.
+3 to +5	The target has high relative vulnerability.
+6 to +8	The target has very high relative vulnerability.

It is also important to note that the scores and the descriptive results are relative. That is, they can be used to compare relative vulnerability across targets that have been analyzed using the BAVAPA method in the same workshop / evaluation process. They are not absolute values and thus can not be directly compared to the results of VAs carried out obtained from the application of different methodologies, or even the BAVAPA methodology used in different locations or with different groups.

STEP 7: DOCUMENT THE NARRATIVE (NOTING ASSUMPTIONS AND UNCERTAINTIES) AND PREPARE MAPPING OF RESULTS

The BAVAPA methodology is applied as part of Activity 2.2 of the VA Manual. The VA Manual's templates to document the narrative, including the assumptions and uncertainties identified in the VA process, and mapping of the VA results are reproduced below and should be used to summarize the outcomes of the BAVAPA methodology. This step can be carried out by the VA project team following the workshop but ideally would be sent to workshop participants for comments and revisions prior to finalization.

Template 1. Narrative of BAVAPA Methodology	
Relevant Target(s):	
Key Data Inputs:	
Key Activities / Steps Carried Out:	1. 2. 3. 4. …..
Strengths / Advantages of Methodology:	
Weaknesses / Disadvantages of Methodology:	
Other Comments:	

Template 2. Narrative of Results using BAVAPA Methodology	
Relevant Target(s):	
Zones / targets exhibiting high vulnerability:	
Drivers of high vulnerability for relevant zones/targets (i.e. exposure, sensitivity, resilience drivers):	
Zones / targets exhibiting medium vulnerability:	
Drivers of medium vulnerability for relevant zones/targets (i.e. exposure, sensitivity, resilience drivers):	
Zones / targets exhibiting low vulnerability:	
Drivers of low vulnerability for relevant zones/targets (i.e. exposure, sensitivity, resilience drivers):	

Template 2. Narrative of Results using BAVAPA Methodology	
Overall vision of vulnerability and drivers for relevant targets (< 100 words):	

Template 3. Mapping of Results using BAVAPA Methodology	
Relevant Target(s):	
Map Name	***Suggested Elements***
Baseline map	PA boundaries Geographical scope of VA Villages and human settlements Major drainage, topographical and physical features Administrative boundaries Nearby PAs All ecological targets and limits - note that for species this could include distribution / range / resource use zones as appropriate All social targets and limits Legend, north-point etc.
Areas of high vulnerability	Baseline map Geographical limits of targets with high vulnerability – note that for species this could include distribution / range / resource use zones as appropriate
Areas of medium vulnerability	Baseline map Geographical limits of targets with medium vulnerability – note that for species this could include distribution / range / resource use zones as appropriate
Areas of low vulnerability	Baseline map Geographical limits of targets with low vulnerability – note that for species this could include distribution / range / resource use zones as appropriate
Overall vulnerability	Baseline map Areas of high vulnerability Areas of medium vulnerability Areas of low vulnerability

Template 4. List of Assumptions using BAVAPA Methodology			
Relevant Target(s):			
Assumption	***Stage of methodology at which assumption was made***	***Justification for assumption***	***Possible influence on VA outcomes or process***

Template 5. List of Uncertainties / Data Gaps using BAVAPA Methodology			
Relevant Target(s):			
Uncertainty / Data Gap	***Stage of methodology at which uncertainty / data gap arose***	***Explanation of how uncertainty / data gap was treated***	***Possible influence on VA outcomes or process***

Checklist A: Suggested Non-Climate Stressors

Species Targets[1]	Habitat / Ecosystem Targets	Ecosystem Service Targets	Social Targets[2]
1 Residential & commercial development *(1.1 Housing & urban areas; 1.2 Commercial & industrial areas; 1.3 Tourism & recreation areas)*			Rapid population growth
2 Agriculture & aquaculture development *(2.1 Annual & perennial non-timber crops; 2.2 Wood & pulp plantations; 2.3 Livestock farming & ranching; 2.4 Marine & freshwater aquaculture)*			Low population growth
3 Energy production & mining activities *(3.1 Oil & gas drilling; 3.2 Mining & quarrying; 3.3 Renewable energy)*			Uneven age distribution
4 Transportation & service corridors *(4.1 Roads & railroads; 4.2 Utility & service lines; 4.3 Shipping lanes; 4.4 Flight paths)*			Income inequality
5 Biological resource use *(5.1 Hunting & collecting terrestrial animals (intentional or unintentional use); 5.2 Gathering terrestrial plants (intentional or unintentional use); 5.3 Logging & wood harvesting; 5.4 Fishing & harvesting aquatic resources (intentional or unintentional use))*			Limited access to natural resources
6 Human intrusions & disturbance *(6.1 Recreational activities; 6.2 War, civil unrest & military exercises; 6.3 Work & other activities)*			High dependency on natural resources
7 Natural system modifications *(7.1 Fire & fire suppression; 7.2 Dams & water management/use; 7.3 Other ecosystem modifications)*			High levels of immigration / outward migration
8 Invasive & other problematic species, genes & diseases *(8.1 Invasive non-native/alien species/diseases; 8.2 Problematic native species/diseases; 8.3 Introduced genetic material; 8.4 Problematic species/diseases of unknown origin; 8.5 Viral/prion-induced diseases; 8.6 Diseases of unknown cause)*			High level of debt
9 Pollution *(9.1 Domestic & urban waste water; 9.2 Industrial & military effluents; 9.3 Agricultural & forestry effluents; 9.4 Garbage & solid waste; 9.5 Air-borne pollutants; 9.6 Excess energy)*			Lack of land use titles / landlessness
10 Geological events *(10.1 Volcanoes; 10.2 Earthquakes/tsunamis; 10.3 Avalanches/landslides)*			Lack of access to housing, health, education or other basic social services
Other…			High degree of poverty / low household income
Other…			Female headed household
Other…			Chronic or seasonal food insecurity
Other…			Poor health
Other…			Other…
Other…			Other…

[1] Adapted from IUCN Threat Classification Scheme http://www.iucnredlist.org/technical-documents/classification-schemes/threats-classification-scheme

[2] Adopted from Marshall et al, 2010

Checklist B: Suggested Climate Impacts

Species Targets	Habitat / Ecosystem Targets	Ecosystem Service Targets	Social Targets
Climate driven migration	Coastal erosion or accretion		Coastal erosion or accretion
Loss of suitable habitat through inundation	Climate driven expansion of habitat		Change in availability of natural resources (accessibility, abundance, over-exploitation etc.)
Loss of suitable habitat due to habitat retreat	Climate driven retreat of habitat		Pressure or conflicts from presence of climate migrants
Inundation from sea level rise or storm surge	Inundation from sea level rise or storm surge		Inundation from sea level rise or storm surge
Coral bleaching	Coral bleaching		Cyclone or storm damage to infrastructure, crops or livelihood assets
Cyclone or storm damage	Cyclone or storm damage		Inundation from changed precipitation
Inundation from changed precipitation	Inundation from changed precipitation		Drought
Drought	Drought		Bushfires
Bushfires	Bushfires		Heatwave
Heatwave	Heatwave		Inadequate surface water
Inadequate surface water	Inadequate surface water		Inadequate groundwater
Inadequate groundwater	Inadequate groundwater		Pathogen / disease spread
Invasive species / pathogen spread	Invasive species / pathogen spread		Forced climate migration
Other…	Other…		Other…
Other…	Other…		Other…

Checklist C: Suggested Adaptive Capacity / Resilience Factors

Species Targets[3]	Habitat / Ecosystem Targets[4]	Ecosystem Service Targets	Social Targets[5]
No or low specialized habitat and/or microhabitat requirements	Not located near geographical extent of habitat range		Ability to cope with past climate events
Wide environmental tolerances or thresholds	Wide environmental tolerances or thresholds		Formal and informal support networks
No or limited dependence on specific environmental triggers or cues that are likely to be affected by climate change	High physical diversity (topography, slope, soils, geology, elevations, hydrology etc.)		Ability to cope with change
No or limited dependence on interspecific interactions that are likely to be disrupted by climate change	Rapid regeneration times (inc. keystone species)		Local environmental and climate knowledge and information
Ability to disperse or to colonize a new or more suitable range (genetic / physical)	High biodiversity		Employability / diverse skills / flexibility to change occupation
High reproductive rate	Low fragmentation		Land security
Large population size	Resilient keystone species		Livelihood diversity (current and perceived)
No or limited fluctuations in population size	Physical and genetic ability to disperse		Access to markets, education services / training, health services, clean water & sanitation
Short generation times	Large extent of habitat type		Access to credit
High genetic diversity	Low level of habitat fragmentation		Level of education of household head
Other…	Other…		Food / seed reserves
Other…	Other…		Financial reserves
Other…	Other…		Physical isolation
Other…	Other…		Access to new technologies
Other…	Other…		Low degree of physical isolation
Other…	Other…		Sales points for agricultural products / fishing supplies
Other…	Other…		Governance arrangements for equitable access to resources
Other…	Other…		Other…

[3] Adapted from Foden et al, 2008
[4] Adapted from US-EPA, 2010
[5] Adopted from Marshall et al, 2010