



WCPFC Climate Change Vulnerability Assessment (CCVA) Framework

Guidance and procedural information

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About this document

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Purpose

This document provides a comprehensive overview of the Climate Change Vulnerability Assessment (CCVA) Framework developed for the Western and Central Pacific Fisheries Commission (WCPFC) to assess the level of climate risk associated with Conservation Management Measures (CMMs). In addition to outlining guidance for how to understand, interpret and operate the CCVA Framework, a comprehensive methodology (procedure) is provided to support the establishment, operation and refinement of CMM CCVAs to ensure the CCVA Framework is effectively implemented and maintained, as a standard WCPFC tool to ensure effective and sustainable fisheries management in the Western and Central Pacific Ocean (WCPO).

Structure

This document is presented in three parts:

[Part One – Introduction](#)

[Part Two: Framework design](#)

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Glossary

Acronym	Definition
AIS	Automatic Identification System
CCVA	Climate change vulnerability assessment
CMM	Conservation Management Measure
EBSA	Ecologically and Biologically Significant Areas
GIS	Geographic Information System
IMMA	Important Marine Mammal Areas
IPCC	International Panel on Climate Change
IPCC AR6	IPCC Annual Report 6
LEK	Local ecological knowledge
MCS	Monitoring, Control and Surveillance
NC	WCPFC Northern Committee
PICT	Pacific Island Country or Territory
RCP	Representative concentration pathways
SAR	Search and rescue
SC	WCPFC Scientific Committee
SEAPODYM	Spatial Ecosystem and Population Dynamics Model
SIDS	Small Island Developing States
SST	Sea Surface Temperature
TCC	WCPFC Technical and Compliance Committee
VME	Vulnerable Marine Ecosystem
VMS	Vessel Monitoring System
WCPO	Western and Central Pacific Ocean
WCPFC	Western and Central Pacific Fisheries Commission



Part one: Introduction

1 Context

1.1 Origin of the WCPFC CCVA Framework

The WCPFC Climate Change Vulnerability Assessment (CCVA) Framework has been developed in response to the recognition that climate change poses significant risks to the effectiveness of existing Conservation and Management Measures (CMMs). In line with Resolution 19-01, which calls for enhanced understanding of climate change impacts on highly migratory fish stocks, fisheries, and associated ecosystems, the framework supports efforts to integrate climate considerations into Commission decision-making.

CCVAs are increasingly valuable tools for informing management planning—not only by identifying biological and ecological risks, but also by identifying institutional and governance vulnerabilities, and an institution’s capacity to cope with or adapt to these changes.

CCVA are intended to assist the Commission to anticipate, monitor, prevent and mitigate potential threats, especially when scientific information is uncertain or inadequate. These assessments can highlight where existing management structures, decision-making processes, or technical planning processes could improve to respond to shifting species distributions or increased resource uncertainty.

This CCVA Framework is intended to be a diagnostic tool, and one of the factors the Commission considers, when the Commission adopts new or amended CMMs.

1.2 Benefits of having a CCVA Framework

Climate change is impacting the WCPO, which has direct implications for the WCPFC. Climate-driven changes—such as ocean warming, shifting species distributions, and altered productivity—may pose challenges to the effectiveness of current CMMs. For example:

- Shifting species distributions may impact the assumptions underpinning certain CMMs as well as alter fishing operations and fleet dynamics, impacting enforcement
- Changes in productivity could require adjustments to catch limits and reference points
- Altered seasonality may affect the timing and effectiveness of temporal closures and gear restrictions
- Disrupted food webs could undermine current bycatch mitigation strategies, and
- Economic and environmental instability may increase pressure on compliance and enforcement systems.

The Commission aspires to take a proactive approach by undertaking standardized CCVAs. For the WCPFC, CCVAs support adaptive management by informing strategic adjustments to CMMs and strengthening the governance structures needed to ensure long-term sustainability in a changing climate.

2 Purpose

CCVAs focus specifically on identifying risks arising from climate-related drivers—such as changing ocean temperatures, acidification, and sea-level rise—because these stressors are largely external to the control of fisheries management and may require distinct, long-term adaptation strategies. Separating climate risks from other pressures, such as fishing mortality, enables the Commission to develop targeted, forward-looking policies that complement existing management measures rather than conflate different sources of risk.

The primary purpose of this CCVA is to:

- **Inform Decision-Making:** Provide evidence and analysis to the WCPFC bodies and the Commission to inform the development, review, and adaptation of climate-resilient CMMs
- **Identify and Prioritize Risks:** Systematically identify and prioritize climate change risks to the effectiveness of existing or proposed management measures, and their capacity to ensure the long-term conservation of target stocks, non-target species, associated and dependent species, and the broader marine ecosystem, as well as the human communities that are reliant on them
- **Identify Data Needs:** Highlight critical data gaps and uncertainties to guide future research, monitoring, and data collection efforts
- **Document Risks:** Maintain scientific evidence of climate change risks to WCPFC-managed species and fisheries, and
- **Risk Prioritization:** Identify which CMMs are most vulnerable to climate change risks

3 Role within WCPFC

The CCVA Framework functions as one of several tools within the Commission’s broader fisheries management toolbox. For example, it complements:

- **Stock Assessments** – Evaluate the current status of fish stocks
- **Ecosystem Indicators** – Monitor the health and dynamics of marine ecosystems
- **Compliance Monitoring** – Assess the effectiveness of management measures and ensure compliance, and
- **Technical Implementation** – Considering practical and enforceable management approaches.

Together, these tools support adaptive, science-based decision-making in response to environmental and management challenges.

3.1 Contributions across WCPFC Bodies

The CCVA Framework is intended to draw on expertise and input from various WCPFC bodies to ensure it is robust, relevant, and implementable, including:

- **Scientific Committee (SC):** Provides input on the biological and ecological dimensions of the CCVA, and identifies data needs, technical limitations, and potential methodological approaches

- **Technical and Compliance Committee (TCC):** Offer insights into fleet dynamics and fishing activities relevant to CCVA considerations; advises on the operational feasibility of implementing CCVA-informed measures under changing conditions; and evaluates practical implications of climate-related risks, including potential impacts on MCS.
- **Northern Committee (NC):** Contributes to CCVAs conducted within its specific geographic and species remit
- **Commission:** Makes strategic decisions regarding the evolution of the management framework; determines which CMMs require a CCVA; and reviews CCVA findings and decide on any follow-up actions or policy responses.



Part Two: Framework design

4 Principles

This framework draws on the IPCC AR6³ approach to understanding climate risk, emphasizing the roles of hazards, exposure, sensitivity, and adaptive capacity as key components. In line with IPCC AR6, it also reflects a shift toward holistic assessments, moving beyond purely biophysical vulnerability to consider the broader social and governance context within which WCPFC operates. The WCPFC CCVA Framework is a systematic evaluation tool that examines how climate change may affect the performance and effectiveness of new or existing CMMs.

The CCVA Framework is underpinned by the following principles:

- **Practical:** Designed to be implemented during normal meeting cycles and within existing resource constraints. It can be used by the Commission efficiently and independently, without requiring ongoing reliance on external support or funding.
- **Integrated into Existing Processes:** CCVAs should be conducted using established WCPFC procedures and meetings, and, where appropriate, in line with normal CMM review processes. This ensures the framework is feasible, adequately resourced, and capable of informing evidenced-based, responsive updates to CMMs.
- **Responsive to Management Needs:** The framework is tailored to meet the specific information needs of WCPFC managers and decision-makers, offering clear, actionable insights to support climate-resilient fisheries management.
- **Adaptive and Iterative:** Built to evolve, the framework can be updated as new scientific knowledge, socio-economic data, and insights into climate change impacts become available. This aligns with adaptive management principles, which are essential for managing uncertainty in fisheries.
- **Focused:** While recognizing that other stressors may compound climate risk, the CCVA is specifically focused on identifying and addressing risks directly attributable to climate change, rather than unrelated pressures such as overfishing.
- **User-friendly:** Designed so that it is easy to navigate, operate and understand without necessarily having an in-depth scientific or technical background.

5 Key definitions

To ensure consistency and clarity across all CCVAs, the following concepts, aligned with IPCC AR6 terminology, are used:

- **Climate Risk:** The potential for adverse consequences of climate change, resulting from the interaction of climate-related hazards (including hazardous events and trends) with the vulnerability and exposure of human and natural systems.
- **Hazard:** The potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources. In the context of climate change, this refers to climate stressors (e.g., ocean warming, acidification, sea-level rise, changes in ocean currents, extreme weather events).

³ [Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. AR6. Geneva, Switzerland.](#)

- **Exposure:** The presence of people, livelihoods, species or ecosystems, environmental services and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected by climate hazards.
- **Vulnerability:** The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt. This includes the propensity of *management measures or strategies* to be adversely affected by climate change impacts.
- **Sensitivity:** The degree to which a system or species is affected, either adversely or beneficially, by climate-related stimuli. The effect may be direct (e.g., a change in productivity in response to a change in the mean, range, or variability of temperature) or indirect (e.g., damage caused by an increase in the frequency of storm events).
- **Adaptive Capacity:** The ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences. This includes the ability to implement effective *and flexible* management measures, adjust fishing practices, or develop new technologies to *respond to climate-driven changes*.

6 Conceptual approach

6.1 IPCC IR6

In line with the IPCC AR6 approach, the WCPFC CCVA Framework assesses the level of Climate Risk associated with CMMs. Climate Risk is defined as a function of Hazard, Exposure and Vulnerability, where Vulnerability is determined as a function of Sensitivity and Adaptive Capacity (see **Figure 1** below).

Simply:

Climate Risk = combined output of Hazard, Exposure and Vulnerability

Where:

Vulnerability = combined output of Sensitivity and Adaptive Capacity.

6.2 Rapid assessment

In line with the literature review findings, a pragmatic rapid assessment approach was chosen as the most appropriate for developing the CCVA Framework. The rapid assessment approach:

- enables rapid identification of where attention is required where climate risk is determined 'high' and what elements drive it
- offers a high degree of flexibility with the ability to add or remove indicators
- enables efficient determination of where information gaps exist, and
- can be readily updated or modified on a regular basis without requiring extensive technical expertise and investment.

Risk-Based Framework

Risk is the potential for consequences where something of value is at stake and where the outcome is uncertain, recognising the diversity of values. Risk is often represented as the probability of occurrence of hazardous events or trends multiplied by these impacts if these events or trends occur. Risk results from the interaction of vulnerability, exposure and hazard.

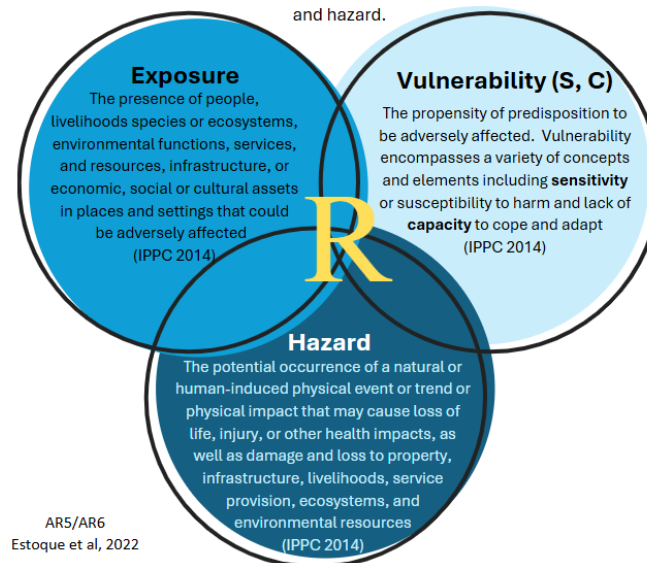


Figure 1. VENN diagram by Estoque et al (2022) of the climate risk-based approach defined in the IPCC AR6.

7 Key design features

7.1 Software platform

Microsoft Excel was chosen as the design platform of the CCVA Framework in recognition that it is a globally accessible and well-known software platform, that can be easily modified and updated over time, and that readily enables automated outputs and long-term reliability without it being dependent on other external software or operating systems.

7.2 Structure

The CCVA is made up of a total of eight tabs. The first tab is a 'guidance and information' tab to aid users in understanding the structure and functionality of the workbook in the case that they do not have access to this document. The remaining tabs are numbered and are split into two category types (working tabs and results tabs), which are described in

Table 1 below.

7.3 Tab design

Each working tab follows the same design to ensure consistency in scoring and understanding while navigating through the scoring process. An exception to this is the '1. Start' tab which provides the starting point from which to identify the CMM that is to be scored. In all cases, a user-friendly design approach was taken to ensure that any delegate or Member can readily access the framework and operate it.

Colour coding was used on the four main working tabs (2.-5.) to ensure users could easily navigate between tabs.

Table 1. Summary overview of the seven working and results tabs that make up the WCPFC CCVA framework

Type	Tab	Description
Working tab	1. Start	The start tab is the starting point from which the relevant CMM is selected. Once selected, embedded functionality in working tabs 2. - 5. automatically updates
	2. Hazard	The hazard tab provides a series of indicators to identify and determine the level of application of individual climate change hazards relevant to the CMM
	3. Exposure	The exposure tab provides a set of indicators to determine the level of exposure a particular CMM faces when facing an identified climate change hazard
	4. Sensitivity	A set of indicators to determine the level of harm faced by a particular CMM when it is exposed to a climate change hazard
	5. Adaptive capacity	A set of indicators to measure the adaptive capacity of a CMM to lower its sensitivity in the face of exposure to a climate change hazard
Result tab	6. Climate risk	An automated results tab that shows the climate risk associated with the CMM via a combination of Hazard, Exposure and Vulnerability (noting vulnerability is a combination of Sensitivity & Adaptive Capacity)
	7. Indicator summary	A summary overview of the different scores for individual indicators under each of the components of climate risk

7.4 Working tabs

Four working tabs are provided to score Hazard, Exposure and Vulnerability (as a function of Sensitivity and Adaptive Capacity). Within each working tab, a set of indicators are provided to generate a score for that component of Climate Risk. To ensure consistency in scoring, each indicator is framed as a question, with indicator reference point information provided to guide the scorer in selecting an appropriate score for the indicator. An example of the design is provided below in **Figure 2**. In addition, several further sections are provided to record the supporting rationale used to justify the determination of the score, to record commentary, and to identify any planned activities / developments / requirements to aid scoring in future.

7.5 Result tabs

The two result tabs (6. and 7.) are fully automated output sheets that are protected to ensure the longevity of the implemented code required to generate the climate risk scores. Tab 6 provides an overview of all the generated scores including individual themes for each component (Tabs 2.-5.), as well as an overall Climate Risk score. Graphics are also automated to help users identify visually how each score has been influenced by individual indicator scores and their respective indicator themes. Tab 7 provides a comprehensive automated list of each indicator by scoring category to aid in the easy identification of indicators requiring immediate or further attention (see **Figure 3**).

7.6 Auto-indicator selection

Several design features are included in each of the working tabs (2.-5.), including drop-down options to ensure consistent scoring and an ability to turn on or off auto-indicator selection based on the type of CMM being scored. The auto-indicator selection only applies to MCS based CMMs in which all biological and ecological indicators are automatically set to N/A.


<div>  <div> Sensitivity CMM 2023-04 Working tab </div> <div> <input type="checkbox"/> Auto indicator selection (On/Off) </div> </div>								
Theme	Ind. Ref #	Committee	Criteria	Question	Indicator reference information			Score
					Low sensitivity	Medium sensitivity	High Sensitivity	
Biological and ecological	S1		Thermal range	What is the temperature tolerance of the focus species? (when unknown the breadth of distribution can be used as a proxy for temperature range)	Temperature tolerance is broad, with the ability to function normally under a broad range of temperatures	Temperature tolerance is considered mid-range, with the focus species able to function normally under medium temperature changes for short durations (e.g., heatwaves)	Temperature tolerance is considered very narrow, with small temperature changes causing significant difficulties for normal functionality	
	S2		Mobility	What is the ability of the focus species to move to a new location if the current location changes and is no longer favourable for growth and / or survival?	The focus species has high mobility, able to travel significant distances to new locations	Mobility of the focus species is considered moderate, with the species able to change locations but not to the level observed under 'low sensitivity'	Mobility of the focus species is low, with limited ability to actively move to change to more favorable conditions	
	S3		Productivity	What is the productivity of the species?	The focus species has high productivity, with an ability of the population to rapidly recover after a negative impact	Moderate productivity, with the population able to recover after a negative impact over a longer period of time	Low productivity, with negative events to the population causing sustained impact over long periods of time	
	S4		Distribution	What is the distributional range of the species?	The focus species has a high distributional range, covering large areas of the ocean and able to adjust to a range of habitats found in coastal and open-ocean environments	Moderate distributional range with the species found across a wide range of areas in the ocean but limited in their ability to adjust and occupy different habits (e.g., restricted to specific coastal environments)	Low distributional range with the species confined to specific / localised areas and habitat requirements	
	S5			What is the level of influence of environmental cues on the distribution of the species?	Environmental cues such as seasonality have minor influences on the distribution of the focus species	Environmental cues have some influence on the distribution of the species	Environmental cues have very high levels of influence on the distribution of the species	
	S6		Reproduction	How dependent is reproductive success on specific or complex environmental conditions / triggers?	The focus species is a broadcast spawner, with environmental conditions having a limited influence on spawning events	The focus species spawns (broadcast / aggregate) when conditions are favourable and with environmental conditions playing a role in these events to a moderate degree	The focus species is an aggregate spawner, with the formation and gathering of aggregations heavily dependent on seasonality and environmental conditions	
	S7			How sensitive is the spawning cycle and duration to changes in seasonal cues and temperature changes?	The focus species is a year-round spawner or spawns over relatively long periods of time when conditions are favourable	The focus species spawns at several different times throughout the year when environmental conditions are favourable	The focus species spawns once annually and for short durations, heavily reliant on seasonal cues and temperature changes	
	S8			What is the age at maturity of the species?	The focus species matures rapidly (<1 year) during its lifecycle	The focus species matures relatively quickly (1-2 years)	The focus species matures over longer time periods (>5 years)	
	S9		Prey	What is the prey specificity of the focus species?	The focus species predated on a relatively wide range of prey species, able to readily adjust and target different prey	The focus species predated on several species of prey, but is more reliant on these particular target prey species	The focus species is relatively restricted to specific prey species that it targets	

Figure 2. Snapshot of indicator scoring system for 'Sensitivity'

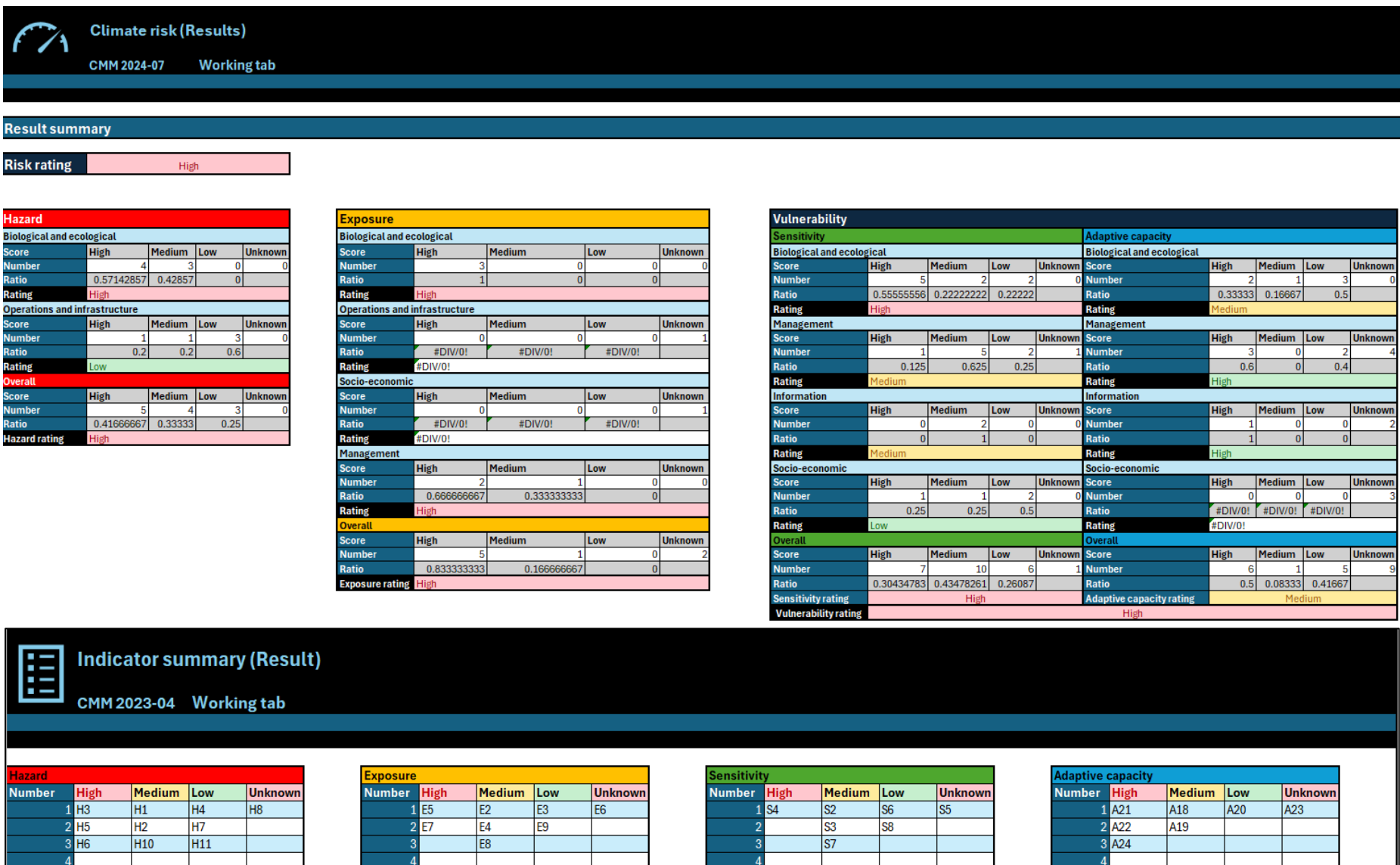


Figure 3. Snapshots of Result tabs 6. and 7.

7.7 Indicators

The specific indicators for each climate risk component were designed based on best judgement and taking into consideration the most commonly identified fisheries specific indicators identified during the literature review. A total of 82 indicators make up the scoring framework. These are split by climate risk component as set out in **Table 2** below.

Table 2. Number of indicators by climate risk component

Climate risk component	Number of indicators
Hazard	12
Exposure	17
Sensitivity	29
Adaptive capacity	24

The indicators per climate risk component are also grouped by theme for easy reference. These include:

- Biological and ecological
- Operations and infrastructure
- Management
- Information
- Socio-economic.

The themes are not consistently applied for each climate risk component noting that in some cases they are not applicable e.g., a climate change hazard does not exist for the theme 'Information'.

A full list of the CCVA Framework indicators per climate risk component is attached as [Annex A](#).

7.7.1 Indicator scoring

Five scoring options are built in as drop-down selection options for each indicator in working tabs (2.-5.). These are set out in table **Table 3**.

Table 3. Scoring options

Score	Description
High	The user determines either a high, medium or low score using the indicator reference information to guide determination ⁴
Medium	
Low	
Unknown	In the case there is no information, or a high uncertainty associated with available information, 'Unknown' can be selected. The 'Unknown' score enables the quick identification of information gaps. It does not influence the overall scoring.
N/A	In the case the indicator does not apply to the CMM, N/A is able to be selected

⁴ Note, for adaptive capacity the reverse colour coding applies e.g., Low adaptive capacity = red background with red text.

The scoring methodology used to generate scores based on the individual indicator responses is discussed in detail in the [Section 8](#) below.

7.8 Responsible WCPFC bodies

To help increase efficiency in scoring, each working tab (2. -5.) also has a 'Committee' column which enables users to select which indicators individual WCPFC bodies are responsible for reviewing or providing the necessary information to generate an indicator score. Available options are provided as a drop-down list, with one, two, or all WCPFC bodies able to be selected as required.

7.9 Future-proofing

The entire workbook has been designed in a manner that allows for the ready addition, deletion or modification of indicators as required over time, without impacting in-built automated functionality. In addition, all automated functionalities have been manually coded into the workbook to avoid the use of macros, to ensure longevity and functionality as software updates occur over time.

7.10 Indicator timeframe

A timeframe of 5-years has been set as the default timeframe for assessing the indicators in working tabs 2. – 5. This timeframe was selected as the most reasonable starting point for CMM review noting that the accuracy of best available scientific information diminishes over longer timeframes, the rate at which systems change and considering the process / operational timeframes at which the Commission operates. The timeframe of the framework can be manually updated to longer time-periods as required by adjusting the relevant questions accompanying individual indicators throughout the framework.

8 Scoring method

8.1 Ratio-based approach

The scoring methodology of Hazard, Exposure, Sensitivity and Adaptive Capacity was purposefully designed to avoid weighting individual indicators. This approach was identified as the most suitable for the CCVA Framework, to avoid consistent review and updates to the weighting arrangement in the event indicators are added or removed or become less or more significant over time.

A counting methodology has been used that automatically sums up the number of times a specific score has been selected for an indicator and then generates a ratio from the total number of indicators that have been scored. This approach also ensures that indicators that are not applicable and are scored accordingly are not used in the development of the overall score for each climate risk component.

Additionally, this approach assists each component resulting in a 'truer' score, because of the ratio-based approach which also helps to remedy differences that could otherwise be caused by having different numbers of indicators per component. These automated counting and ratio functions are 'hidden' as a default within the framework but can be made visible by 'unhiding' the columns found at the end of each scoring table.

8.2 Component results

To generate an overall rating for each climate risk component, including Hazard, Exposure, Sensitivity and Adaptive Capacity, a series of thresholds were identified that would generate either a High, Medium or Low final rating (see **Table 4** below).

Table 4. Thresholds used to determine overall component score

Scenario	High	Moderate	Low	Result
1	>0.5			High
2	>=0.3		<0.3	High
3	>=0.3		>=0.3	Medium
4	<=0.29		<0.3	Medium
5	<0.3		<0.5	Medium
6	<0.3		>=0.5	Low

The thresholds and associated results can be updated by accessing the applicable code for each result cell in Tab 6 and adjusting the thresholds within the code accordingly.

8.2.1.1 Unknown score

As noted earlier in [Section 7.1.1](#), an indicator score of ‘unknown’ identifies specific information gaps but does not affect the overall scoring of each component, noting in some instances there may be very little information available, but that does not necessarily equate to the focus topic being vulnerable.

8.3 Vulnerability

Noting that Vulnerability is a function of Sensitivity and Adaptive Capacity, a Vulnerability final rating was developed by combining the Sensitivity final rating with the Adaptive Capacity final rating. This was done using a matrix of combinations that reflects that when Sensitivity is high and Adaptive capacity is low, Vulnerability is High and vice versa (see Table 5. Below).

Table 5. Vulnerability matrix (Sensitivity and Adaptive capacity)

		Sensitivity		
		High	Medium	Low
Adaptive capacity	High	Medium	Low	Low
	Medium	High	Medium	Low
	Low	High	High	Medium

8.4 Climate risk

The final climate risk score is determined based on the combination of the Hazard, Exposure and Vulnerability final ratings (see

Table 6 above below).

Table 6. Climate risk result based on combinations of final ratings for Hazard, Exposure and Vulnerability

Hazard	Exposure	Vulnerability	Climate risk result
High	High	High	High
High	High	Medium	High
High	High	Low	Medium
High	Medium	High	High
High	Medium	Medium	High
High	Medium	Low	Low
High	Low	High	Medium
High	Low	Medium	Medium
High	Low	Low	Low
Medium	High	High	High
Medium	High	Medium	High
Medium	High	Low	Low
Medium	Medium	High	High
Medium	Medium	Medium	Medium
Medium	Medium	Low	Low
Medium	Low	High	Medium
Medium	Low	Medium	Medium
Medium	Low	Low	Low
Low	High	High	High
Low	High	Medium	Medium
Low	High	Low	Low
Low	Medium	High	High
Low	Medium	Medium	Medium
Low	Medium	Low	Low
Low	Low	High	Medium
Low	Low	Medium	Low
Low	Low	Low	Low



Part Three: Assessment methodology

9 Objective

The key objective for each CCVA is to determine:

- Whether a CMM has a low, medium or high risk to climate change impacts
- How vulnerable the CMM is and what drives that vulnerability (sensitivity vs. adaptive capacity)
- Whether and why current management approaches may become less effective
- Information gaps that need to be filled
- When critical adaptation requirements may be needed
- Whether the WCPFC can cope with the identified level of risk, meaning
 - Institutional capacity: Does WCPFC have the legal authority, technical expertise, and financial resources to implement necessary adaptations?
 - Operational flexibility: Can existing processes be modified quickly enough to respond to climate-driven changes?
 - Management effectiveness: Will current tools and measures remain effective, or do they need fundamental redesign?

10 Scope

The scope for each CCVA must be explicitly defined, including:

- The specific CMM
- The accompanying spatial focus of the CMM:
 - Single Site/Area: e.g., a specific area or a designated fishing area
 - Network of Sites: e.g., a series of areas across the WCPFC Area
 - Range of Sites: e.g., the entire WCPFC Convention Area or specific sub-regions
- Timeframe
 - As a default, the CCVA Framework has a timeframe of five years, however this can be readily updated as required to longer timeframes as required.

11 Scoring

Using the best available information, the CCVA Framework should be worked through systematically from Tabs 1. – 5., scoring individual indicators to generate the climate risk result. Responsible WCPFC bodies should be identified for each indicator to ensure the required level of technical input and expertise required to effectively score each indicator is involved.

For each indicator scored, relevant reference information and supporting rationale for why the score was chosen must be recorded as justification, and to enable effective tracking of how information is changing over time in relation to individual indicators.

Where discussions or different views are expressed in relation to the scoring of an individual indicator, these should be captured in the comments section provided for each indicator. Likewise, if the information does not exist at a particular point in time, this should be clearly recorded to justify a score of “unknown” for the indicator.

Lastly, if future activities or planned actions are known that relate to the indicator are known, these should also be recorded to ensure effective tracking of progress towards strengthening the indicator score over time.

12 Data requirements

12.1 Data Credibility

Because CCVAs rely on available data, their accuracy is only as strong as the information they are based on. Highlighting data gaps is crucial to improving future assessments. All CCVAs must be based on:

- Verified or verifiable data
- Peer-reviewed scientific literature
- Quality-controlled observational data
- Validated model outputs
- Expert knowledge from recognized specialists, and
- Indigenous and local knowledge where appropriate.

Indigenous and local ecological knowledge (LEK) should be viewed as a primary information source together with other knowledge categories, particularly where there is low confidence or limited / no availability of other information types. In these cases, indigenous and LEK will play a fundamental role in ensuring effective overall scoring.

12.2 Core Data Categories

12.2.1 Climate Data

Data that provides the environmental context for assessing how changing ocean conditions may affect fisheries management effectiveness. This could include historical observations of ocean temperature, chemistry, currents, and extreme events, future projections from IPCC-validated climate models and scenarios and key variables such as sea surface temperature, ocean acidification, current patterns, and productivity levels.

12.2.2 Ecological Data

This data provides the biological context for understanding how species and ecosystems may respond to climate-driven environmental changes. This could include species information on distribution patterns (e.g., SEAPODYM outputs), life history parameters, and thermal tolerances and ecosystem structure, including food web dynamics, habitat mapping, and bycatch records.

12.2.3 Fisheries Data

Biological and operational data that provides the information to monitor, manage and assess fishery resources. It could include catch and effort data, biological data on species size, sex, age and reproductive status, and independent observer (human or electronic monitoring) data

12.2.4 Management Performance Data

Management performance data refers to the information used to evaluate the effectiveness, accountability, and outcomes of fisheries management systems. It includes records and

analyses of how CMMs have performed over time, outcomes from monitoring, enforcement, and compliance processes, assessments of whether management objectives (such as stock sustainability, bycatch reduction, or ecosystem protection) have been achieved, performance metrics as well as evaluations of the resources, staffing, infrastructure, and governance systems in place to support implementation and enforcement of management measures.

12.2.5 Socio-economic data

Socio-economic data refers to available information on the importance of specific species or fisheries to fisheries dependent local communities (e.g., employment, income, cultural significant fisheries), market data trends (e.g., the relative importance of the species or fisheries to overall annual economic stability), and governance and institutional capacity information of individual PICTs and WCPFC members.

A tool to effectively track the availability of data sets is attached as [Annex B](#). This should be used to effectively trace available sources of information while undertaking a CCVA.

12.3 Data Sources and Tools

The following data sources and tools should be utilized when acquiring best available information to inform a CCVA:

- WCPFC Data Holdings: Utilize existing WCPFC data catalogue, including those from the SC and compliance monitoring schemes
- Academic Literature and Scientific Reports: Incorporate findings from peer-reviewed publications and relevant scientific assessments
- Databases including the Pacific Data Hub, World Bank, International Monetary Fund, identifying and including relevant socio-economic assessments
- Traditional and LEK: Integrate local and traditional expert knowledge where available and appropriate, as a valuable source of information for understanding ecosystem dynamics and historical changes, and
- Defined Tools and Software: Specify the analytical tools, models, and software platforms to be used for data processing, analysis, and visualization to ensure consistency and reproducibility across CCVAs such as the Compliance Case File System, AIS, GIS, VMS.

13 Roles and responsibilities

Each year at its annual meeting, the Commission will decide which CMMs will undergo climate change vulnerability review in the following year. The selected review will be led by a CCM, or a group of CCMs, which will coordinate the assessment and compile relevant data and analysis.

The review process will follow established pathways for technical input and oversight. Specifically, it will be submitted to the SC for scientific review, the TCC for consideration of implementation and compliance implications, and to the NC where the measure falls within its area of responsibility.

Based on the outcomes of these subsidiary body discussions, the findings and any recommendations will be submitted to the Commission for consideration and decision-making. All CCVAs will utilise the approach outlined in the CCVA Framework and report the findings using the CCVA Report format ([Annex C](#)).

A detailed process breakdown is provided in **Table 7** below.

Table 7. CCVA procedure.

Step	Responsible
Step 1: Establish a CCVA review process <ul style="list-style-type: none"> • Confirm a CCM(s) to undertake the CCVA • Select a CMM(s) to be assessed • Determine why the assessment is required • Determine what will be assessed and at what scale (scope) • Determine what time horizon is to be used (5 years is default) 	Commission
Step 2: Use the CCVA Framework to assess the CMM(s). Determine: <ul style="list-style-type: none"> • Whether a CMM is at a low, medium or high risk to climate change impacts • The components driving the climate risk and individual indicators that require further attention • Whether and why certain management approaches may become less effective • Where adaptation is required to reduce vulnerability • Whether the WCPFC can cope with identified risks in the absence of action, or through strengthening adaptive management, taking into consideration: <ul style="list-style-type: none"> ○ Institutional capacity: Does WCPFC have the legal authority, technical expertise, and financial resources to implement necessary adaptations? ○ Operational flexibility: Can existing processes be modified quickly enough to respond to climate-driven changes? ○ Management effectiveness: Will current tools and measures remain effective, or do they need fundamental redesign? • How results can be used to inform management proposals and decision-making. 	CCM reviewer
Step 3: Consultation and validation of findings with expert input	NC
Step 4: Consultation and validation of findings with expert input	SC
Step 5: Consultation and validation of findings with expert input	TCC
Step 6: Present findings to the Commission using the report template (Annex C)	CCM reviewer
Step 7: Consider CCVA and determine appropriate actions or decisions in accordance with recommendations	WCPFC Commission
Step 8: On approval Commission, the CCVA is uploaded on the WCPFC website and used to inform the development of proposals with required management actions	WCPFC Secretariat CCMs

14 Review and continuous improvement

14.1 Regular Review Cycle

The CCVA Framework and this document should be reviewed on both a regular basis (annually) and comprehensively reviewed on a longer-term basis (5-years).

Annual reviews should focus on updating individual indicators, refining methods in response to new climate and biological information, validating results against observations, and incorporating feedback from CCMs to ensure the framework remains responsive and relevant.

Every five years, a comprehensive review should be conducted to evaluate the overall effectiveness of the framework as a decision-support tool, to compare alternative assessment approaches (including against new IPCC definitions / approaches), assess institutional capacity, and set strategic priorities for the next five-year cycle.

14.2 Adaptive Framework Development

The framework is designed to support continuous improvement. This includes ongoing development of assessment methods, integration of emerging data sources, efforts to reduce uncertainty, and streamlining of processes to improve efficiency. Over time, the framework may also expand to incorporate newly identified approaches to measuring socioeconomic and other ecosystem dimensions, to allow for region-specific application, be adapted as broader multilateral thinking develops, and to align more closely with other ocean sectors to support cross-sectoral climate adaptation planning.

Annexes

Annex A: Indicator list by climate risk component

Hazard indicators

Theme	Indicator reference	Criteria	Description	Question
Biological and ecological	H1	Temperature extremes	Temperature extremes (e.g., marine heatwaves) have the potential to significantly affect species distribution and survival if they have narrow thermal tolerances and limited mobility, adaptability to new habitats / areas	How applicable is the hazard to the focus topic of the CMM?
	H2	Increased sea surface temperature (SST)	Stock displacement, increased mortality, reduced productivity, reduced prey availability a species is dependent on	
	H3	Ocean acidification	Can cause harm to exposed systems in acidifying zones by impairing calcification, disrupting food webs and weakening species resilience	
	H4	Salinity	Salinity fluctuations can severely impact fish biology, affecting both health and homeostasis. Deviations from optimal salinity can cause mortality, reduced growth and impaired immune function	
	H5	Deoxygenation	Tropical pelagic species live near or above oxygen minimum zones. Changes in hypoxic or suboxic zones can affect species physiology, habitat availability and ecosystem function	
	H6	Wind stress	Changes in wind strength or direction can disrupt ecological or physical systems e.g., upwelling, larval dispersal and can contribute to other hazard e.g., intensification of tropical cyclones	

Operations & infrastructure	H7	Current change	Changes in strength, direction, timing or vertical structure can disrupt larval dispersal, nutrient delivery, primary productivity; alter species migration routes; affect heat distribution, oxygen levels and acidification patterns, destabilize or shift climate systems	How applicable is the hazard to the focus topic of the CMM?
	H8	Storms	Wind damage, storm surge, port infrastructure damage, loss of life or injury, damage to vessel infrastructure, loss of fishing days	
	H9	Cyclones	Wind damage, storm surge, port infrastructure damage	
	H10	Precipitation extremes	Flooding, port infrastructure damage, reduction in port access and service	
	H11	Sea level rise	Flooding, port infrastructure damage, reduction in port access and service	
	H12	Wave height	Changes in wave height, frequency or intensity can result in disruption to marine operations, infrastructure damage, wave-driven over wash and saline intrusion and stress to intertidal ecosystems	

Exposure indicators

Theme	Indicator reference	Criteria	Question
Biological and ecological	E1	Habitat	How frequently does the habitat of the focus species experience the identified hazards?
	E2	Food web	How frequently is the food web of the focus species exposed to the identified hazards? (considering predator and prey relationships)
	E3	Species population	How frequently does the focus species population experience the identified hazards?
Operations and infrastructure	E4	Fishing fleet	How exposed are the relevant fleets to the identified hazards?
	E5	At sea operations	How frequently do operations face inadequate weather information for decision-making?

	E6	At sea operators	What percentage of operations cannot financially survive a major weather event?
	E7		How often must operations relocate fishing grounds due to climate-driven species shifts?
	E8		How often are crew and observers exposed to dangerous working conditions or hazardous deck conditions due to weather and identified hazard events
	E9		What is the crew's proximity to SAR services during extreme weather events?
	E10		How often do crew experience dangerous heat stress conditions while working at-sea?
	E11		How frequently do crew face reduced navigating conditions that increase the risk of collision or incidents
	E12	Port infrastructure	How frequently are port facilities affected by the identified hazards (e.g., storm surge/flooding)?
	E13	Economies	What percentage of SIDS/Territory income is affected by the identified hazards?
	E14	Livelihoods	What is the level of exposure to community livelihoods of WCPFC members from the identified hazards?
	E15	Spatial boundaries	Do the identified hazards affect any fixed geographic boundaries used to manage the fisheries or set by the CMM?
	E16	Scientific assumptions	Are the identified hazards factored into the temporal and spatial assumptions used to define management settings?
Management	E17	Information	How often does the WCPFC receive updated scientific information on these hazards?

Sensitivity indicators

Theme	Indicator reference	Criteria	Question
Biological and ecological	S1	Thermal range	What is the temperature tolerance of the focus species? (when unknown the breadth of distribution can be used as a proxy for temperature range)

	S2	Mobility	What is the ability of the focus species to move to a new location if the current location changes and is no longer favourable for growth and / or survival?
	S3	Productivity	What is the productivity of the species?
	S4	Distribution	What is the distributional range of the species?
	S5		What is the level of influence of environmental cues on the distribution of the species?
	S6	Reproduction	How dependent is reproductive success on specific or complex environmental conditions / triggers?
	S7		How sensitive is the spawning cycle and duration to changes in seasonal cues and temperature changes?
	S8		What is the age at maturity of the species?
	S9	Prey	What is the prey specificity of the focus species?
	S10	Competition	What is the level of competition that the focus species has with other species for the same habitat requirements / prey and diet requirements?
	S11	Health status	What is the current health status of the focus species population?
Management	S12		What is the projected health status of the focus species population in 5 years' time based on current environmental conditions?
	S13	Harvest strategy	What is the variability of the focus species' abundance / CPUE indexes?
	S14		Is there a harvest strategy or equivalent best practice management measure implemented for the species?
	S15		How does the harvest strategy account for increased uncertainty due to climate change?
	S16		How quickly can the harvest strategy adjust to new information about stock status or environmental conditions?
	S17	Non-compliance	What is the level of non-compliance across the fishery / fisheries that the focus species is associated?

	S18	IUU	What is the level of serious IUU fishing activity across the fishery / fisheries that the focus species is associated?
	S19	Observer coverage	What is the level of observer coverage (human and / or EM) across the fishery/ies that the focus species is associated with?
	S20	Fishing effort	What is the level of collective fishing effort associated with the focus species?
	S21	Resource and governance	What is the level of resource available to comprehensively assess the health status and distribution of the focus species regularly?
	S22		What is the current capacity of WCPFC members to respond and implement required changes?
	S23		What is the level of confidence to make informed decisions associated with current available information on the focus species?
Information	S24	Information availability	What is the level of availability of climate change information associated with the focus species?
	S25	Awareness	What is the level of climate change knowledge and environmental awareness among WCPFC members reliant on the focus species?
Socio-economic	S26	Economic Dependence	What is the relative economic importance of the focus species to WCPFC membership?
	S27		What is the livelihood reliance of WCPFC members on the focus species?
	S28	Food dependence	What is the relative dependency of PICTs on the focus species for food security?
	S29	Cultural importance	What is the level of cultural / social significance of the focus species to the WCPFC membership?

Adaptive capacity indicators

Theme	Indicator reference	Criteria	Question
Biological and ecological	A1	Thermal range	What is the ability of the focus species to adapt to increased temperatures?
	A2	Productivity	What is the likelihood of the focus species to maintain or improve its productivity in response to increased temperatures and different environmental conditions?

	A3	Distribution	What is the ability for the focus species to change its distributional patterns?
	A4	Reproduction	What is the likelihood of the focus species being able to adapt to successfully spawn under differing environmental conditions and changes in seasonal / temperature cues?
	A5	Prey	What is the likelihood of the focus species being able to change its prey and diet if required in response to environmental changes?
	A6	Competition	What is the ability of the focus species to adapt to reduce its level of competition with other species for habitat requirements / prey and diet requirements?
Management	A7	Health status	Under the current management settings, what is the likelihood of the focus species being able to maintain its current health status or rebuild its health status in response to environmental change (SST, ocean acidification, dissolved oxygen, salinity)
	A8	Species diversification	What is the level of flexibility to change the focus species (if it is a target species) to another target to reduce the impact of fishing?
	A9	Fishing gear	What is the level of flexibility to modify gear requirements or implement gear restrictions for fishing gear identified as creating a higher risk to the focus species compared to others?
	A10	Fishing effort	What is the likelihood of fishing effort associated with the focus species of being significantly affected because of not being able to operate at sea due to increased storm events etc.?
	A11	Observer coverage (human and / or EM)	What is the likelihood of monitoring levels being consistently sufficient for the fisheries associated with the focus species over the next 5 years?
	A12	Research and technology	What is the level of investment (current and planned) in research and technology of direct relevance to the focus species to improve understanding?
	A13	Agile decision making	How easily is the management framework / management settings for the focus topic able to be readily adapted?
	A14	Member capacity	What is the likelihood of WCPFC members having the required capacity to readily respond to required changes over the next 5 years?
	A15		What is the capability of the fleet to change its distribution (fishing grounds)?

	A16	Resource and governance	Is the level of resource currently required (and likely to be required in future) to effectively assess the status of the focus species likely to be sustainable?
	A17		Is there likely to be appropriate resource and capacity for the WCPFC secretariat, SPC, FFA and other notable organizations that contribute support and information to effectively manage the focus species likely to be sustainable?
Information	A18	Information sharing and cooperation	What is the level of certainty / likelihood of improved cooperation and information sharing between members and internationally, to improve efficiencies and understanding associated with the focus species over the next five years?
	A19	Contribution	What is the level of contribution (currently and in future) with social, environmental and fishery organizations on the climate change issues facing the focus species?
	A20	Traditional knowledge	What is the level of engagement (currently and in future) by members with their nationals? (including traditional knowledge holders and local communities) on the climate change issues facing the focus species and to fill information gaps where possible?
Socio-economic	A21	Diversification	What is the relative ability for WCPFC members to diversify their economic interests in response to required changes to reduce risk to the focus species?
	A22		What is the relative ability for WCPFC members to diversify livelihood reliance away from the focus species if required?
	A23	Port resilience	What is the relative ability of the ports of WCPFC members being able to maintain function over the next five years as climate changes become more observed e.g. sea-level rise
	A24	Food security	What is the relative ability for WCPFC members to ensure food security should the focus species require changes to current food supply associated with the fisheries?

Annex B: Data Set Tracker

Category	Does WCPFC have this data?	Source
Climate Data		
Historical and projected oceanographic data (e.g., sea surface temperature, ocean heat content, pH, oxygen levels, current patterns).	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	
Climate model outputs (e.g., IPCC Representative Concentration Pathways - RCPs).	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	
Extreme event frequency and intensity projections.	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	
Ecological Data		
Species distribution data (historical and current).	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	
Life history parameters (e.g., growth rates, reproductive cycles, thermal tolerances).	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	
Stock assessment data (biomass, fishing mortality, recruitment).	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	
Ecosystem structure and function data (e.g., food web dynamics, habitat mapping, EBSA locations, IMMA locations).	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	
Bycatch and associated species data.	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	
Fisheries Data		
Catch and effort data (by species, gear, area, time)	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	WCPFC Data Archives
Vessel monitoring system (VMS) data.	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	WCPFC Data Archives
Observer data (including bycatch and VME encounters).	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	WCPFC Data Archives
Fleet characteristics and fishing capacity.	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	WCPFC Data Archives
Management Effectiveness Data		

Historical CMM performance and compliance rates under varying environmental conditions.	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	WCPFC Data Archives
Responsiveness of management decisions to scientific advice and environmental shifts.	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	WCPFC Data Archives
Implementation rates of management measures	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	WCPFC Data Archives
Fleet information (number/age of vessels, fleet movements)	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	WCPFC Data Archives
Socio-economic Data		
Fisheries-dependent community data (e.g., employment, income, cultural significance of fisheries).	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	
Market data (e.g., prices, trade flows).	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	
Governance and institutional capacity data	<input type="checkbox"/> Yes <input type="checkbox"/> Partial <input type="checkbox"/> No	

Annex C: CCVA Report Format

Executive Summary

- Key findings and management implications
- Vulnerability [rankings]
- Uncertainties and limitations
- Priority actions

Introduction

- Assessment objectives and scope
- CMMs (incl species and regions covered)
- Climate scenarios considered

Methods

- Data sources and quality assessment
- Indicator selection and metrics
- Analysis approaches and tools
- Validation procedures

Results

- Climate risk [Hazard, Exposure and Vulnerability outcomes]
- Spatial and temporal patterns
- Sensitivity analysis results

Discussion

- Interpretation of results
- Comparison with other studies
- Management implications
- Data Gaps, Uncertainties, and Limitations

Conclusions

- Summary of key findings
- Priority actions for management
- Future assessment needs
- Research recommendations
- Management Implications and Recommendations (Specific actions/triggers for CMMs, Harvest Strategies, etc.)

Appendices

- Supporting data, model outputs, and information of the assessment
- References