Climate Change

VULNERABILITY ASSESSMENT
SCIENTIFIC COMMITTEE

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SC21-EP-WP-01

A G E N D A

- Recap on the TOR
- Literature Review - Overview and highlights
- Draft framework and guidance material
- Pilot assessments
- SC’s proposed role

A quick recap on the TOR

WCPFC21 adopted a TOR for a CMM Climate Change Vulnerability assessment

WCPFC also agreed to a set of CMMs to be reviewed during the assessment:

2025
CMM 2024-07 (Cetaceans)
CMM 2019-05 (Mobulid rays)
CMM 2024-05 (Sharks)
CMM 2017-04 (Marine pollution)
CMM 2024-06 (NP striped marlin)

2026
CMM 2023-01 (Tropical tunas)
CMM 2018-04 (Sea turtles)
CMM 2018-03 (Seabirds)
CMM 2013-04 (Record of Fishing Vessels)

Literature review + Bibliography

Delivered. See NC21-WP-05_suppl. We have also developed a comprehensive library of literature available

WCPFC Framework with vulnerability definition

This framework is in train. We will test this against the 2025 CMMs.

Assessment Report

This assessment report will outline the assessment method, CMM results, limitations and scientific data and information gaps research needs, potential management challenges and suggested recommendations

Information Papers

information papers to NC21 (NC21-WP-05), SC, TCC21, WCPFC 22

Package of documents

SC Paper - SC21-EB-WP-01

The Scientific Committee is invited to:

1. Review and comment on the scientific approach and methodology of the draft framework

2. Provide input on the indicator system and data requirements

3. Identify potential data sources and quality considerations within the SC's expertise

4. Advise on integration with existing scientific processes and assessments

5. Recommend capacity building requirements for successful implementation

6. Support pilot implementation of the framework for 2025 CMM assessments.

Documents included:

WCPFC CMM Climate Change Vulnerability Assessment Report (Annex A to SC Paper)

Literature Review (Att A to Assessment Report)

CMM CCVA Framework-Master Template (excel) (Att B to Assessment Report)

CMM CCVA Framework-Guidance and Information (word) (Att C to Assessment Report)

CMM Pilot Assessment Reports (x 5) (word) (Att D1-D5 to Assessment Report)

CMM Pilot Assessment Results (x 5) (excel) (Att E1-E5 to Assessment Report)

THE LITERATURE REVIEW - IN BRIEF

500+

Documents

Search returned 500+ documents from 2015-2025, in English, that met our search criteria

460

Peer-reviewed

The majority were peer reviewed journal articles from Scopus and Google Scholar. The remainder were eligible grey literature including IPCC reports, World Bank Reports and WCPFC materials

80+

unique definitions of vulnerablity

There was no common definition of climate change vulnerability. Some used IPCC constructions (which also changed) and others used their own, depending on the context of the assessment.

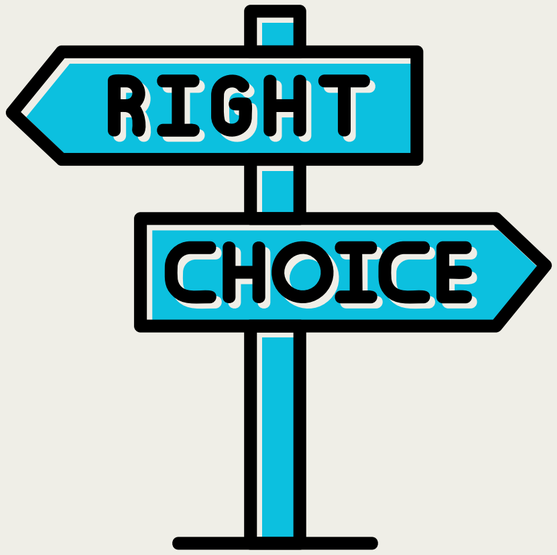
132

operationalised vulnerability assessments

This highlights the huge diversity of approaches used to assess climate change vulnerability, and the wide range of contexts including terrestrial and marine resource management, urban and residential contexts and disaster risk reduction.

LITERATURE REVIEW - WHAT WE TOOK AWAY

The literature review was a helpful exercise because we learned a lot from the examples we read - both what we thought could work for WCPFC, and what would not work for WCPFC. Here's our key learnings:



There's more than one way to do it

The diversity in assessment methodologies and operational frameworks shows us that there are multiple, legitimate ways to do an assessment. Scaleability, flexibility and context-specificity are important

Vulnerability assessments should assist with identifying adaptation options and measures.

Assessments are most valuable when used as a planning tool.

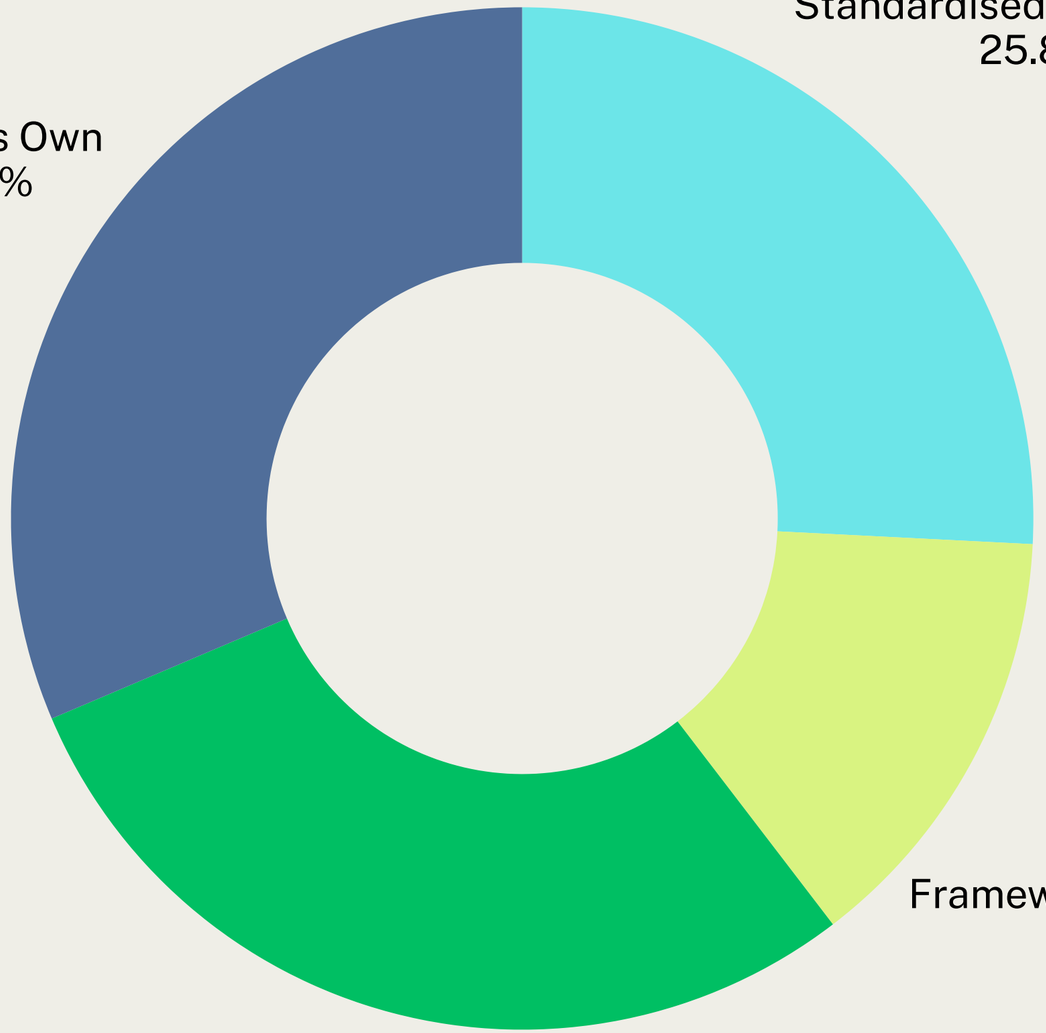
Data gaps are common- work with what you have

No assessment had perfect data. Many assessments use proxies or qualitative data. WCPFC may find it does not YET have the climate data it needs, but it can be updated over time.

This is novel

No one else, anywhere, has conducted a CCVA of a multi-jurisdictional resource
The majority of marine assessments look only at biophysical vulnerability of a specific resource, not the vulnerability of a management framework.

NO ONE, UNIQUE METHOD



Options

This graph demonstrates the diversity of operational frameworks used across the literature reviewed. This represents 132 studies

A DEFINTIION OF ‘VULNERABILITY’

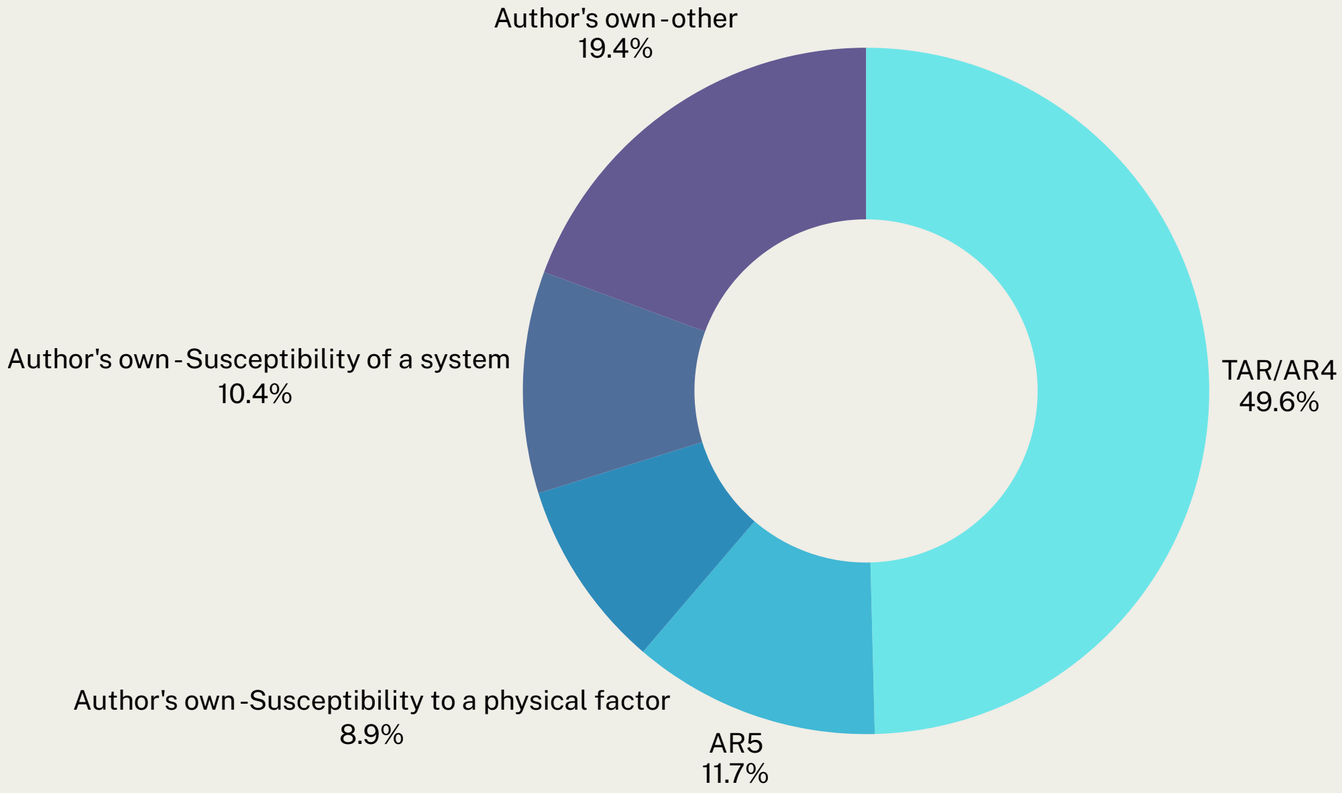
There was no unique definition of climate change vulnerability across the literature.

The IPCC has a definition, which itself has changed over time as its understanding and approach has evolved.

Some studies used IPCC definitions (TAR3/AR4/AR5)

Some used their own

This graph demonstrates the diversity of definitions used across *all* of the literature reviewed, where a definition was provided



SO WHAT SHOULD WCPFC DO?

‘Vulnerability’ is a concept. It is not a term with legal content in the assessments, but a way of conceptualising how to identify impacts attributable to climate change, the extent of it, and what can be done to cope with it.

We propose using the AR6 definition. It is the most contemporary, and most conceptually relevant to assessing the vulnerability of a framework

We understand it like this:

LEARN MORE

To learn more about vulnerability definitions, and particularly how the IPCC definitions have evolved over time, see section 4,2, Figure 3 and Table 2 of the literature review.

LEARN MORE P54

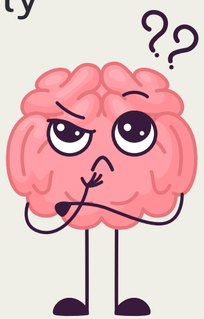
Definition	How we understand it
Climate Risk Hazard × Exposure × Vulnerability	Risk refers to consequences for human or ecological systems Risks can arise from potential impacts of climate change as well as human responses to climate change Adverse consequences can arise from the potential for a response to climate change failing to achieve its intended outcome; or o the intended action creating an adverse outcome elsewhere Example, the term “flood risk” should not be used if it only describes changes in the frequency and intensity of flood events; it would need to be linked explicitly to the consequences of such events for human or ecological systems.
A **hazard** is 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	A hazard is a climate driver of risk A hazard is the climate-related physical event or trend that can cause harm It is specifically about the climate-related physical event or phenomena, not the exposure or vulnerability of systems to them It can include acute events (flood, hurricane) or long-term trends (sea level rise, ocean acidification, temperature increase)
Exposure is the presence of people; livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or economic, social, or cultural assets in places and settings that could be adversely affected	Exposure is about what is at risk, not necessarily what will be harmed, but what is located in areas where climate hazards may occur Exposure does not itself equate to harm. Exposure in combination with hazard and vulnerability determines risk
Vulnerability Is a function of sensitivity and adaptive capacity	We understand vulnerability is a function of adaptive capacity and sensitivity
Sensitivity is the degree to which a system is affected, either adversely or beneficially, by climate variability or change	Sensitivity is a subset of vulnerability rather than treated as a separate variable. It is linked to both biophysical and socioeconomic characteristics of systems Whereas Exposure looks at whether something is in harm's way, sensitivity looks at how much harm it suffers when exposed. We consider what the system, species or group is and what makes it sensitive It depends on biological, physical, economic or social characteristics that help us identify which parts of a system, species or group are most at risk
Adaptive capacity Adaptive capacity is the ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences	It is about the potential to adapt, not whether adaptation is currently occurring Adaptive Capacity is dynamic, context specific and inequitably distributed. Higher adaptive capacity results in lower vulnerability; lower adaptive capacity results in greater susceptibility to harm Adaptive capacity is about more than ecological adaptation, but the capacity of ecosystems, people and institutions to adapt It is influenced by resources, resource management, governance and knowledge It can involve: Reducing vulnerability to climate hazards, • Mitigating potential damage, • Taking advantage of beneficial opportunities • Responding effectively to impacts after they occur

ADAPTING FOR THE WCPFC - SUMMARY

A number of the frameworks we saw were:

- Multi year
- Used a team of researchers (likely to be expensive)
- complex data sets with quantitatively weighted indicators
- Rigid

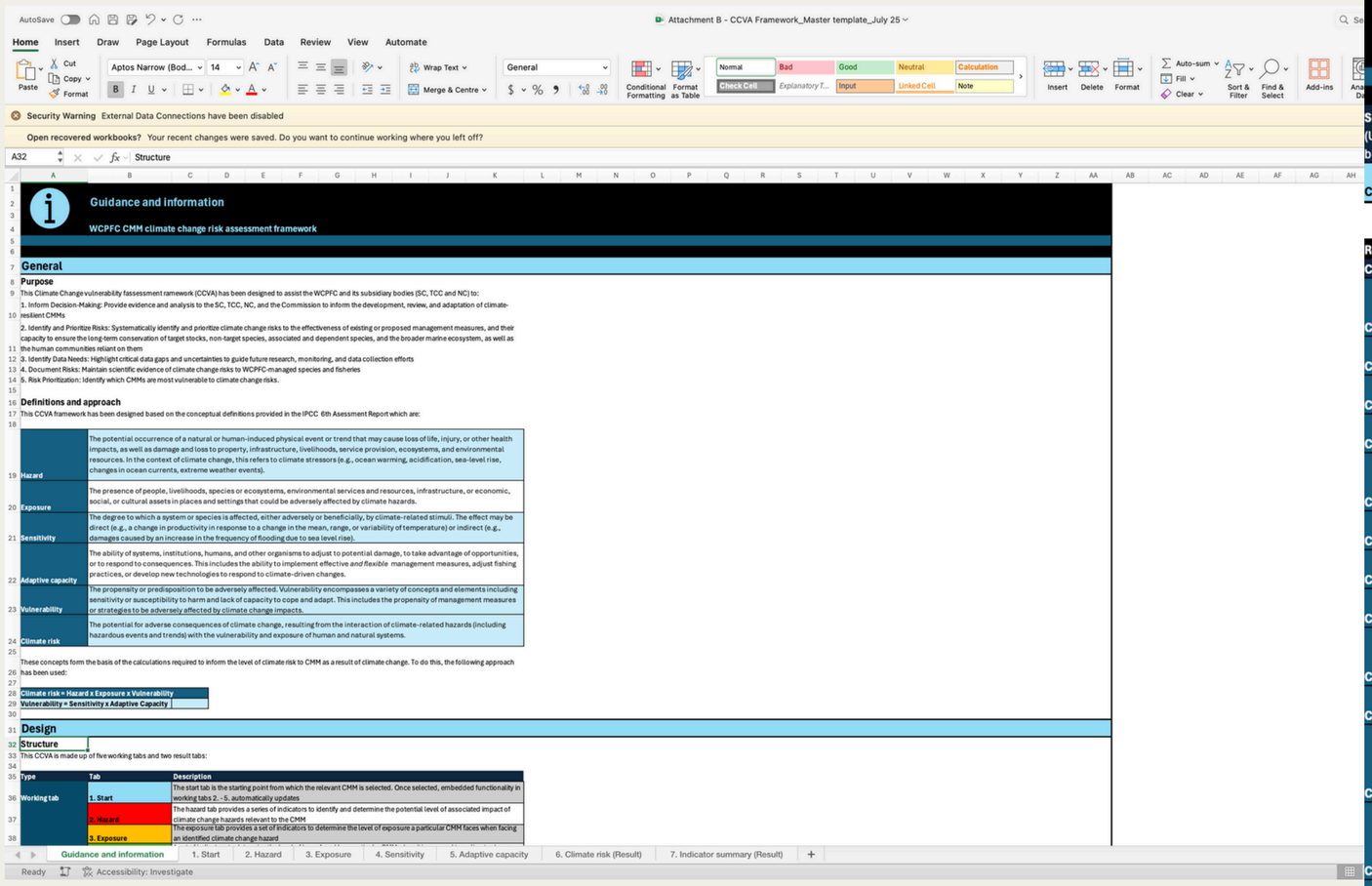
This is very difficult to directly apply to WCPFC.



The Framework we created

- Enable iterative and less resource intensive updated as and when new information becomes available
- consolidate existing knowledge against set criteria
- identifies key climate risks and data gaps
- Flags issues relevant to CMM revisions
- able to be undertaken within the normal annual cycle without relying on outside assistance
- aims to generate information that is meaningful to you for management
- Be a useful tool in the WCPFC toolbox
- Allocates responsiblity across WCPFC bodies

CCVA MASTER TEMPLATE



Start

CMM 2023-04

Select CMM here (Use dropbox below)	Title	Topic	Focus
CMM 2023-04	Conservation and Management Measure the Compliance Monitoring Scheme	Compliance monitoring scheme	MCS

Reference list

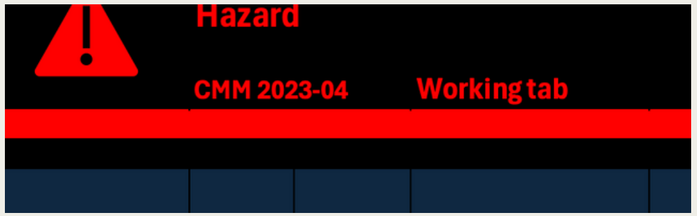
CMM	Title	Topic	Focus
CMM 2024-07	Conservation and Management Measure for Protection of Cetaceans from Purse Seine and Longline Fishing Operations	Cetacean mitigation	Species
CMM 2024-06	Conservation and Management Measure for the North Pacific Striped Marlin	NP Striped marlin	Species
CMM 2024-05	Conservation and Management Measure for Sharks	Sharks	Species
CMM 2024-03	Conservation and Management Measure for the Charter Notification Scheme	Charter notification scheme	MCS
CMM 2024-02	Conservation and Management Measure for the Monitoring, Controlling and Surveillance of Pacific Bluefin Tuna	Pacific bluefin tuna	MCS
CMM 2024-01	Conservation and Management Measure for Pacific Bluefin Tuna	Pacific bluefin tuna	Species
CMM 2023-04	Conservation and Management Measure for the Compliance Monitoring Scheme	Compliance monitoring scheme	MCS
CMM2023-03	Conservation and Management Measure for North Pacific Swordfish	NP Swordfish	Species
CMM 2023-01	Conservation and Management Measure for Bigeye, Yellowfin and Skipjack Tuna in the Western and Central Pacific Ocean	Bigeye tuna, Skipjack tuna and Yellowfin tuna	Species
CMM 2022-06	Conservation and Management Measure on Daily Catch and Effort Reporting	Daily catch and effort reporting	MCS
CMM 2022-05	Standards, specifications and procedures for the Western and Central Pacific Fisheries Commission Record of Fishing Vessels	Record of fishing vessels	MCS
CMM 2022-03	Conservation and Management Measure on Establishing a Harvest Strategy for key fisheries and stocks in the Western and Central Pacific Ocean	Harvest strategies	Procedure
CMM 2022-01	Conservation and Management Measure on a Management Procedure for WCPO Skipjack Tuna	Bigeye tuna, Skipjack tuna and Yellowfin tuna	Procedure
CMM 2019-07	Conservation Management Measure for the Establishment of a List of IUU Vessels for the WCPFC	IUU vessel list	MCS
CMM 2018-05	Conservation and Management Measure on Mobulid Rays caught in association with fisheries in the WCPFC Convention Area	Mobulid Rays mitigation	Species

Excel-based platform - Work through the tabs

Tab 1 - Guidance information

Tab 2 - Select your CMM

CCVA MASTER TEMPLATE



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

Low applicability	Medium applicability	High applicability
Likely to have minimial influence on / low applicability to the focus topic of the CMM	Is likely to have some level of influence or application to the focus topic of the CMM	Likely or very likely to influence or apply to the focus topic of the CMM

Excel-based platform - Work through the tabs
Tab 2 - Hazard by Hazard - is it applicable to the focus CMM?
Tab 3 -Exposure - how exposed is the system or asset?

Question
How frequently does the habitat of the focus species experience the identified hazards?

ow exposure	Medium exposure	High exposure
arely experienced and conditions will likely remain table over the next five years	Occassionally experienced (e.g., marine heatwaves), however conditions will likely remain relatively stable over the next five years	Regularly experienced, and the hazards are directly influencing conditions now / will likely influence conditions over the next five years

CCVA MASTER TEMPLATE

Criteria	Question
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)

Sensitivity

CMM 2023-04 Working tab

Excel-based platform - Work through the tabs
Tab 4 - Sensitivity -How sensitive is the species to the things it is exposed to?
Tab 5 -Adaptive Capacity - Can it adapt or cope?

ow sensitivity	Medium sensitivity	High Sensitivity
emperature tolerance is broad, with the ability to unction normally under a broad range of emperatures	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

Adaptive capacity

CMM 2023-04 Working tab

Prey	What is the likelihood of the focus species being able to change its prey and diet if required in response to environmental changes?

High adaptabilty	Medium adaptability	Low adaptability
The focus species has a high likelihood of being able to change its prey species should environmental changes affect current target prey species populations	It is likely the focus species will be able to change its prey species should environmental changes affect current target prey species populations	The focus species is unlikely/ very unlikely to be able to change its prey species should environmental changes affect current target prey species populations

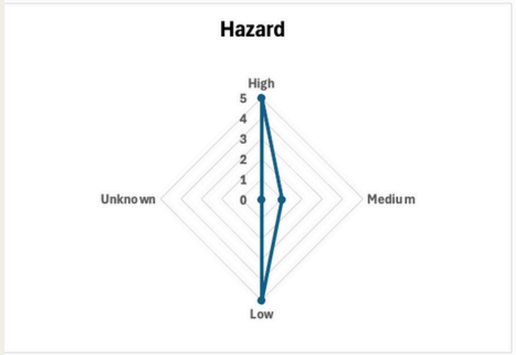
CCVA MASTER TEMPLATE

Climate risk (Result)

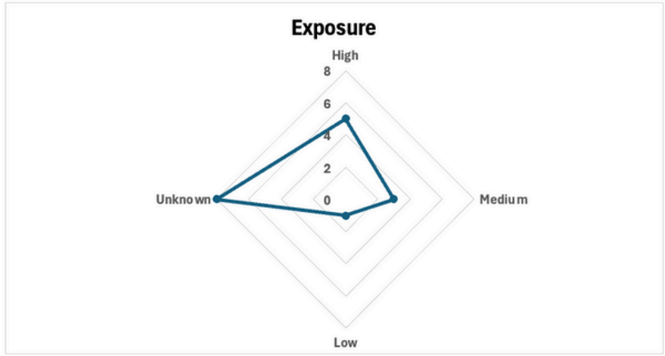
CMM 2024-06 Working tab

Risk score	Low

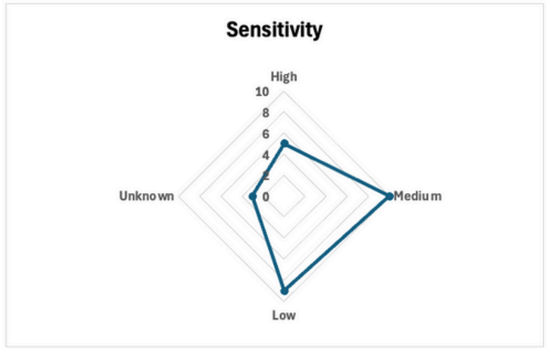
Hazard				
Score	High	Medium	Low	Unknown
Number	5	1	5	0
Ratio	0.454545455	0.090909	0.454545	
Hazard rating	Medium			

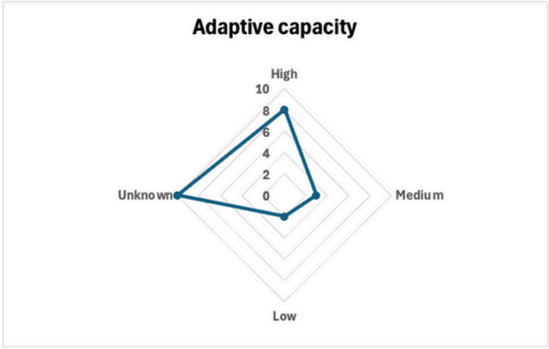


Exposure				
Score	High	Medium	Low	Unknown
Number	5	3	1	8
Ratio	0.555555556	0.333333333	0.111111111	
Exposure rating	High			



Vulnerability									
Sensitivity					Adaptive capacity				
Score	High	Medium	Low	Unknown	Score	High	Medium	Low	Unknown
Number	5	10	9	3	Number	8	3	2	10
Ratio	0.20833333	0.416666667	0.375		Ratio	0.615385	0.230769	0.153846	
Sensitivity rating	Medium				Adaptive capacity rating	High			
Vulnerability rating	Low								





CCVA GUIDANCE DOCUMENT

- Overview of the Excel-based Framework
- How it was developed
- How to use it and how to update it
- Basis of the indicator design
- Scoring methodology and calculations
- Data requirements and quality standards
- Assessment process
- Reporting template

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).	☐ Yes ☐ Partial ☐ No	
Climate model outputs (e.g., IPCC Representative Concentration Pathways - RCPs).	☐ Yes ☐ Partial ☐ No	
Extreme event frequency and intensity projections.	☐ Yes ☐ Partial ☐ No	
Ecological Data		
Species distribution data (historical and current).	☐ Yes ☐ Partial ☐ No	
Life history parameters (e.g., growth rates, reproductive cycles, thermal tolerances).	☐ Yes ☐ Partial ☐ No	
Stock assessment data (biomass, fishing mortality, recruitment).	☐ Yes ☐ Partial ☐ No	
Ecosystem structure and function data (e.g., food web dynamics, habitat mapping, EBSA locations, IMMA locations).	☐ Yes ☐ Partial ☐ No	
Bycatch and associated species data.	☐ Yes ☐ Partial ☐ No	

CCVA PILOT ASSESSMENTS

Undertook 5 Pilot Assessments based on CMMs chosen by WCPFC.

- Cetaceans -HIGH Climate Risk
- Mobulid Rays - HIGH Climate Risk
- Sharks - MEDIUM Climate Risk
- Marine Pollution - MEDIUM Climate Risk
- NP Striped Marlin - LOW Climate Risk

Positives

- Useful for identifying gaps and unknowns to be addressed
- Useful for identifying relationship with (fishing pressure) management challenges
- Useful for identifying sources of risk -though not all are for WCPFC to solve.

Lessons

- Numerous data gaps and data/research not held/verified through WCPFC
- Reports themselves are crucial so nuances and caveats aren’t missed
- While anyone can use the framework, it is only as good as the data that goes in it - requires experts to review information base
- Results should inform but not direct management

CCVA FRAMEWORK - SUMMARY

- User-friendly - in theory anyone could use this and work through the questions
- Guides you through a logically-reasoned throught process to evaluate climate risk
- Aids you in identifying IF there's a risk, how significant it could be, what is causing it and what the options could be to reduce it.

Short on time? We suggest reading prioritising our Assessment Report. This covers what we did and how we did it, along with the limitations we identified.

CCVA ASSESSMENT - CONSIDERATIONS FOR SC

Revisiting the Recs:

The Scientific Committee is invited to:

1. Review and comment on the scientific approach and methodology of the draft framework

2. Provide input on the indicator system and data requirements

3. Identify potential data sources and quality considerations within the SC's expertise

4. Advise on integration with existing scientific processes and assessments

5. Recommend capacity building requirements for successful implementation

6. Support pilot implementation of the framework for 2025 CMM assessments.

SC feedback would be useful:

In the excel-based CCVA Framework

- Are the questions assigned to SC reasonable criteria for identifying climate risk?
- Can the WPCFC support the data required to answer those questions?

In the Guidance Doc

- How could the process be improved for the SC?
- What safeguards should be in place to ensure the data underpinning the assessments is appropriate and able to be validated?
- How does this align with your existing work?

Pilot Assessments

- Were these results meaningful to you? If not, does it signal that there was an issue with the framework, or an issue with the data that went into the assessment?

IMPORTANT!

Feedback is welcome!
Please get in touch anytime

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NEXT STEPS

Consult SC

That’s happening right now!

Revise

Based on your feedback

Consult TCC

Paper to be submitted - focussing on the issues in their remit

Revise

Based on TCC feedback

Submit to Commission

Final delivery of TOR outputs

Thank you!

...AND SEE YOU AT TCC