NORTHERN COMMITTEE
Twenty-First Regular Session

14 – 15 July 2025
Toyama, Japan (Hybrid)

WCPFC CMM CLIMATE CHANGE VULNERABILITY ASSESSMENT FRAMEWORK

WCPFC-NC21-2025/WP-05

Kerrie Robertson[1] and **Matthew Baird**[2]

[1] Adira Consulting
[2] EnviroSea Consulting

WCPFC Northern Committee

WCPFC CMM Climate change vulnerability assessment framework

Progress update

Prepared by

Kerrie Robertson[1] and Matthew Baird[2]

[1] Adira Consulting
[2] EnviroSea Consulting

Purpose

To provide a progress update to the WCPFC Northern Committee (WCPFC-NC) on the 'WCPFC CMM Climate change vulnerability assessment' consultancy commissioned by the WCPFC following WCPFC21 (see Attachment 14 (Terms of Reference)), and to seek early feedback on design considerations from the WCPFC-NC on the vulnerability assessment framework.

Context

In recognition of the serious threats posed by climate change to highly migratory species and wider ecosystems, including (but not limited to) influencing species distribution patterns, lifecycles, and foodwebs (e.g., trophic cascades), the WCPFC adopted Resolution 2019-01 on Climate Change as it Relates to the WCPFC during the 16th Regular Session of the Commission (WCPFC16).

In 2023, WCPFC20 reaffirmed the resolution by agreeing to develop a dedicated workplan and support an assessment of the susceptibility of WCPFC CMMs to the impacts of climate change (WCPFC20 Outcomes).

In 2024, WCPFC21 adopted the WCPFC Climate Change Workplan 2024-2027 (see Attachment 13), which outlines the specific activities and tasks to be taken by the Commission and its three subsidiary bodies to address climate change impacts on WCPFC fisheries.

In addition to the Workplan, WCPFC21 also adopted the Terms of Reference (TOR) for a CMM Climate Change Vulnerability Assessment, which includes a defined Scope, set of Objectives, Rationale, Methodology, Timing and Resources of the Assessment. Accompanying the TOR, WCPFC21 also agreed on a set of CMMs to be reviewed during the Assessment, broken down by year. The table below shows the most up to date CMMs to be reviewed as a part of the assessment.

2025	2026
CMM 2024-07 (Cetaceans)	CMM 2023-01 (Tropical tunas)
CMM 2019-05 (Mobulid rays)	CMM 2018-04 (Sea turtles)
CMM 2024-05 (Sharks)	CMM 2018-03 (Seabirds)
CMM 2017-04 (Marine pollution)	CMM 2013-04 (Record of Fishing Vessels)
CMM 2024-06 (NP striped marlin)	

Key project deliverables

As a part of the project, the following key deliverables are required:

1. A bibliography and targeted literature review complete with a complied list of identified and available information sources
2. A WCPFC-framework to assess CMM provisions using the best available information and that also provides a 'vulnerability' definition
3. An assessment report outlining the assessment method, CMM results, limitations and scientific data and information gaps, research needs, potential management challenges, and suggested recommendations to further enhance and strengthen CMM vulnerability assessment
4. Information papers for NC21 (**this paper**), SC21, TCC21 and WCPFC 22.

Progress update

In late March 2025, Adira Consulting (Kerrie Robertson) and Matthew Baird (EnviroSea Consulting) were commissioned by the WCPFC Secretariat to undertake the CMM Climate change vulnerability assessment (WCPFC VA) project.

The following provides a summary overview of the current status of the required project deliverables:

1. Targeted literature review complete with a compiled list of references (***completed***)
2. Clear definition of 'climate change vulnerability' in the context of WCPFC required to determine the developmental approach of the WCPFC VA framework (***completed***)
3. Development of the WCPFC VA framework (in development)
4. Assessment report (in development)
5. NC21 information paper (***completed – this paper***).

Figure 1 below provides a quick snapshot of progress made to date against the project deliverables.

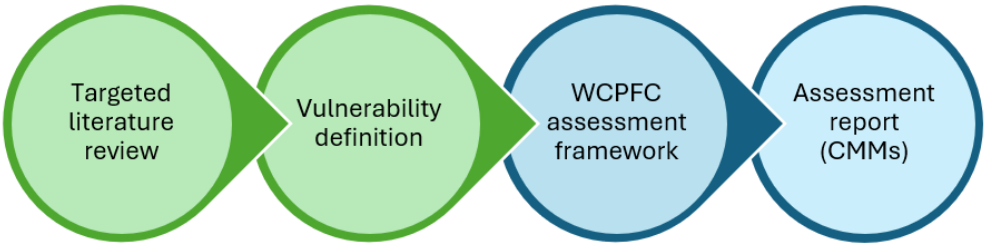

Figure 1. Progress of project deliverables (green = completed; blue= in development)

Targeted literature review

An extensive literature review was undertaken between April and June 2025 on climate change vulnerability assessments across different contexts, to help inform the development of an appropriately framed and readily applicable WCPFC VA framework.

The review explored 500+ studies from across the globe, including over 100 operational vulnerability frameworks, to develop practical and theoretical understanding of best practice, and to explore options that could work in a WCPFC context.

Importantly, the review also led to a definition of 'vulnerability' from which the assessment framework is being designed against.

Key findings

Vulnerability definition

There was an immense range of conceptual and operational approaches and methodologies used across the literature to define climate change vulnerability. The Intergovernmental Panel on Climate Change (IPCC) definitions of vulnerability are some of the most widely used and referenced. However, they are inconsistently applied with either older versions continuing to be applied, or specific concepts and elements being piece-mealed to create bespoke vulnerability definitions.

On balance and recognising that IPCC vulnerability definitions are for the most part globally recognised best practice, we consider AR6 (the most recent IPCC framework definition) provides the most up to date and holistic approach to determining vulnerability in the recognition that vulnerability is multi-faceted – influenced by governance, justice, social and cultural systems in addition to classic physical based hazards (see Figure 2 below for the AR6 definition of climate change vulnerability as an element of climate risk).

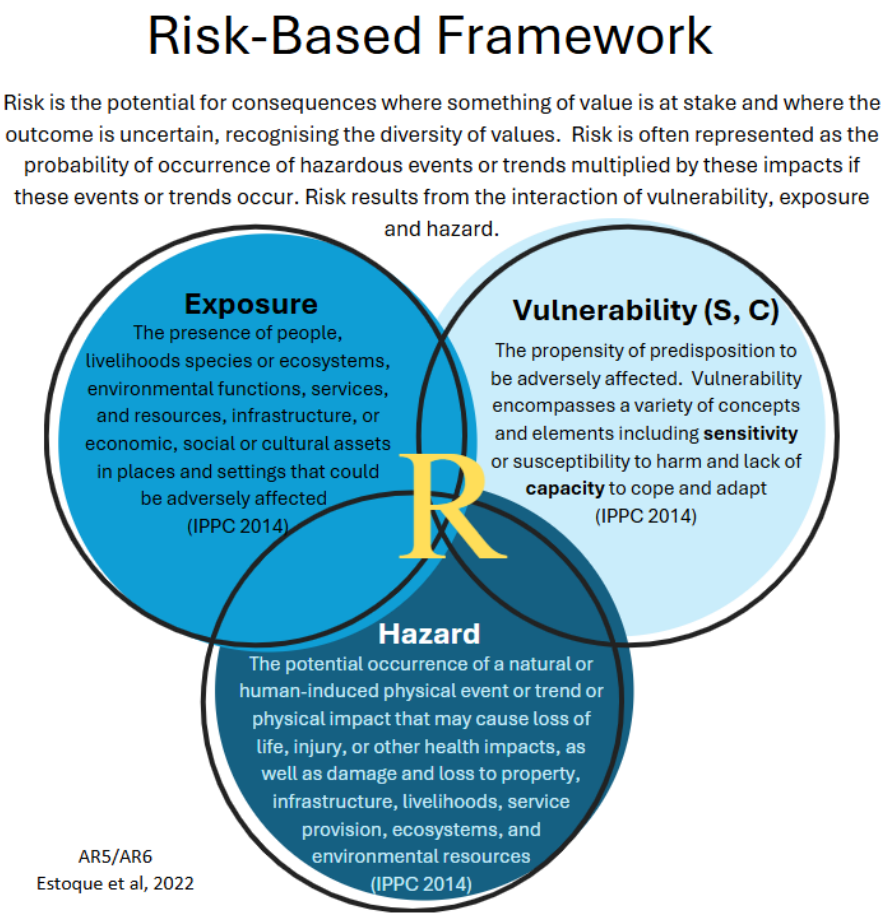

Figure 2. VENN diagram of the IPCC AR6 approach to defining climate risk as a function of Exposure, Vulnerability and Hazard

As a result of its comprehensive nature, the AR6 definition has been selected as the basis to develop the WCPFC VA framework (see Annex 1 for the full definition being used).

Assessment framework insights

In addition to the range of vulnerability definitions, there is a significant range of assessment frameworks across literature. They can very broadly be defined into two categories: 1) resource (and expertise) intensive quantitative assessments; and 2) high-level rapid assessments.

Given the purpose of the WCPFC VA framework is to determine the vulnerability of CMMs, we consider that a high level rapid assessment is required, that is less resource intensive to update or apply on a regular basis, is flexible and adaptable over time, readily consolidates existing knowledge, identifies the major climate risks associated with individual CMMs, while flagging issues (such as data and information gaps) that require attention.

A core element of every framework are the designated indicator sets. The literature provided a good sense of indicators that are frequently used to assess hazards, exposure, sensitivity and adaptive capacity (n.b. vulnerability = sensitivity x adaptive capacity). Further, across fisheries specific studies, the most commonly used indicators were identified and incorporated as the starting basis from which to develop the WCPFC VA framework. A snapshot of the indicators is attached as Annex 2, with the full set of common indicators available in the literature review report[3].

Other key insights found that a well-informed and enduring VA framework that provides meaningful input into management must include:

- A transparent and standardized methodology that is easily replicable to enable confidence in results and effective tracking over time
- A multi-faceted approach with well-defined indicators, and
- The ability to incorporate all information sources (quantitative and qualitative), noting in some cases only qualitative information is available (e.g., traditional knowledge sources).

Collectively, the insights and key learnings from the literature review have been used as the basis to inform the development of the WCPFC VA framework.

WCPFC VA framework

In unison with and following the delivery of the literature review, work has commenced to develop the WCPFC VA framework.

Approach

As outlined above, the latest IPCC AR6 definition of climate change vulnerability has been used to inform the development of the VA framework. This includes designing specific indicators to readily measure climate change risk, as a function of 'Hazard x Exposure x Vulnerability', where 'Vulnerability' is a measure of 'Sensitivity x Adaptive Capacity'. The common indicators identified above (refer Assessment framework insights) are being used to form the basis of this work.

The selected software being used as the development platform is Microsoft Excel. Microsoft Excel has been chosen in recognition that it is a globally used and readily accessible software, that is able to be easily modified and adjusted to remain relevant as climate knowledge and systems change over time.

Overall, our approach to the development of the framework is to make it as accessible and user-friendly as possible, by providing clear guidance and information on its use and functionality, incorporating automation wherever possible (particularly in the generation of climate risk assessment outputs), and ensuring that it provides meaningful insights to inform management of potential CMM requirements for consideration.

Design features

Some of the key design features being built into the WCPFC VA framework include:

[3] Available on request.

- bespoke tabs aligned with the AR6 category definitions, complete with clearly identified indicator inputs
- clear information requirements associated with each indicator to ensure the rapid identification of information to be sourced and used
- designated indicator areas of responsibility for each Commission body (NC, TCC & SC) to guide the input of necessary expertise provided by each body
- automated climate risk outputs (including risk-based graphics) generated in response to indicator inputs
- hard coding as opposed to the use of Macro's to ensure reliability of the framework over time as software updates occur, and
- clear identification of information gaps requiring attention.

Next steps

The WCPFC VA framework and the required CMM assessments will be completed and ready in time to be explored and worked through at WCPFC-SC and WCPFC-TCC, ensuring these Commission bodies have the required opportunity to test and provide feedback to further strengthen the WCPFC VA framework design ahead of its presentation for consideration at WCPFC 22.

We welcome any interested CCMs to get in touch with us directly if you have any specific insights or queries that you would like to raise with us.

Annex 1: WCPFC Climate risk definition

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
Hazard *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 *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	Sensitivity is a subset of vulnerability rather than treated as a separate variable. It is

Sensitivity is the degree to which a system is affected, either adversely or beneficially, by climate variability or change	linked to both biophysical and socio-economic 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 (e.g., longer growing seasons in some areas), • Responding effectively to impacts after they occur

Annex 2 – Snapshot of common fisheries VA indicators

Criteria	Sub-criteria
Hazard	
Atmospheric	Temperature extreme
	Storms / Cyclones
	Precipitation extreme
Marine	Sea level rise
	Sea surface temperature
	Ocean acidification
Sensitivity	
Physiology	Reliance on environmental cues or triggers
	Temperature sensitivity
	Spawning season
Stock status	Assessed status
	Catch volume/rate
Mobility	Adult Mobility
	Seasonal migration
Economic Dependence	Fisheries export value as a proportion of export value
Food dependence	Dependence on fishery as protein and nutrition
	Food sufficiency
Compliance	Performance of MCS
	Level of IUU
Demographics	Number of vessels
	Number of processors
	Number of fishers
Livelihood dependence	Livelihood diversity and alternatives
	Gear dependence on habitats
Awareness of perception	Access to information and resources on climate change
	Local ecological knowledge
Social and cultural dependence	Cultural importance of fishing
Infrastructure	Fisheries Infrastructure
Adaptive capacity	
Biological adaptative capacity	Mobility
	Stock status
	Range
	Spawning
Ecological adaptive capacity	Habitat health, extent and diversity
	Presence of adjacent habitats
	Reliance on environment cues for reproduction, hibernation and migration
	Diet/Abundance of food sources
Governance & Management	Effectiveness of management framework
	Use of technology
	Knowledge creation and research input