

CCVA Report For CMM 2017-04 (Marine Pollution)

Executive Summary

The Climate Change Vulnerability Assessment (CCVA) for CMM 2017-04 (Marine pollution arising from fishing vessels) reveals **MEDIUM** overall climate risk rating, driven primarily by a low hazard score, high exposure score, and a medium vulnerability score.

This finding demonstrates that while marine pollution from fishing vessels is primarily driven by operational practices rather than climate factors, extreme weather events significantly increase pollution risk by compromising vessel safety systems and waste management procedures. The assessment indicates that fishing vessels face climate-related operational threats including storms, cyclones, and wind stress that may compromise the effectiveness of current pollution prevention measures.

Few actions to mitigate these risks are within WCPFC's mandate. Actions to mitigate risk from other organisations might include: development of climate-specific waste management protocols for extreme weather conditions, strengthening port waste reception facility resilience, enhanced vessel waste storage systems to withstand operational hazards, and improved crew training on waste management during emergency conditions. However, from the WCPFC perspective, it could be useful to ground truth whether this assessment represents reality for fishers and whether there are any actions within WCPFC's remit it can take.

Introduction

Conservation and Management Measure (CMM) 2017-04 relates to marine pollution arising from fishing vessels, including oil or fuel products, oily residues, garbage (including dumped fishing gear), food waste, domestic waste, incinerator ashes, cooking oil, and sewage discharged into the ocean across the entire Western and Central Pacific Fisheries Commission (WCPFC) Convention Area. The principal aim of this measure is to prevent and reduce pollution from fishing vessel operations that could impact marine ecosystems and sustainability.

Climate change poses multifaceted operational threats to effective pollution prevention through direct impacts such as extreme weather events that compromise vessel operations, as well as indirect effects including damaged port waste reception facilities, equipment failures, and emergency situations that prioritize crew safety over environmental protocols. These climate-driven changes may affect the operational assumptions underlying current pollution prevention measures and potentially compromise their effectiveness in maintaining marine environmental protection.

Method

The climate change vulnerability assessment for CMM 2024-05 (Sharks) was conducted using the WCPFC Climate Change Vulnerability Assessment (CCVA) Framework, an Excel based

assessment tool. The assessment followed the approach and methodology outlined in the CCVA Framework guidance and information document.

Each of the four climate risk components (Hazard, Exposure, Sensitivity, and Adaptive Capacity) was evaluated using specific indicators grouped by theme. Indicators were scored using a five-point scale (High, Medium, Low, Unknown, N/A) based on available evidence.

For each indicator, supporting rationale was documented to justify scoring decisions and to identify information gaps. Where data were insufficient or uncertain, indicators were scored as "Unknown" to highlight areas requiring further research or assessment.

The assessment employed the standard five-year time horizon provided in the framework to evaluate potential climate change impacts and management responses within a policy-relevant timeframe.

Data Sources and Approach

Given the operational nature of marine pollution prevention, the majority of data for this assessment was obtained through logical inferences about the impact of climate hazards on vessel management, particularly waste storage and handling systems, supplemented by literature review. Data sources included:

- Published literature on maritime safety and extreme weather impacts on vessel operations
- Regional climate vulnerability assessments for Pacific Islands ports and infrastructure
- Studies on vessel safety and operational challenges during severe weather

Scope and Limitations

The assessment scope encompasses the entire WCPFC Convention Area and all fishing vessel operations potentially covered under CMM 2017-04. The five-year assessment timeframe focuses on near-term climate change impacts on operational systems and waste management capabilities.

Key limitations include the framework's primary design for biological rather than operational assessments, limited availability of vessel-specific waste management data during extreme weather events, and uncertainty regarding the spatial distribution of port waste reception facilities and their climate resilience across the region.

Results

Climate Risk Assessment

The CCVA yielded a **Medium** overall climate risk rating for CMM 201-07 (Marine Pollution), determined by the combination of:

- **Hazard: Medium** (25% High indicators, 17% Medium, 59% Low)
- **Exposure: High** (50% High indicators, 33% Medium, 17% Low; 6 Unknown)
- **Sensitivity: Low** (100% N/A)
- **Adaptive Capacity: High** (67% Medium, 33% Low, 5 Unknown)
- **Vulnerability: Medium** (combination of Low sensitivity and High adaptive capacity)

Component Analysis

Hazard Assessment: LOW

The hazard assessment reveals a fundamental distinction between biological/ecological hazards and operational hazards in their relevance to marine pollution from fishing vessels.

Biological/Ecological Hazards (All Rated LOW)

Temperature extremes (H1) demonstrated no established causal relationship between temperature extremes and increased pollution discharges. Pollution prevention measures (proper waste storage, discharge protocols, equipment maintenance) operate independently of temperature extremes.

Increased sea surface temperature (H2) showed limited direct causal relationship but potentially some indirect operational impacts such as warmer waters extending fishing seasons leading to longer voyages and more waste accumulation or equipment stress on cooling systems or storage systems.

Ocean acidification (H3) represents a chemical process with no operational connection - it doesn't affect vessel mechanical systems or waste management procedures, garbage handling, or crew behaviour.

Salinity (H4) and deoxygenation (H5) are biological stressors with no direct operational connection to fishing vessels. The pollution sources occur regardless of salinity or seawater oxygen levels.

Current change (H7) shows limited causal relationship as pollution sources are operational decisions not current-driven events. More nuanced than other biological hazards as current change can affect where pollution might go or affect fuel consumption or operational costs.

Operational Hazards (Rated MEDIUM to HIGH):

Wind stress (H6) received a HIGH rating due to direct operational impacts affecting vessel stability, making waste/gear handling difficult. Crew focus shifts to safety over environmental protocols during dangerous wind conditions. These hazards may cause pollution through high winds causing unsecured materials to blow overboard, damage waste storage systems, or increase the risk of gear loss. Garbage and food waste may be easily blown overboard, and hazards may affect deck cleaning procedures.

Storms (H8) received a HIGH rating as they create dangerous conditions and can affect deck operations. These events could lead to gear loss, waste containment failure, emergency discharges, or a higher risk of fuel or oil spill.

Cyclones (H9) received a HIGH rating as they can lead to extreme vessel instability, operational shutdown, equipment damage to waste storage, and emergency response where crew focus will be on safety not waste disposal.

Precipitation extremes (H10) received a MEDIUM rating as they present less immediate safety threat which potentially means less disruption to waste management, but still risk affecting waste management systems, washing accumulated pollutants (oil, debris) off decks, storage system overflow. Flooding can also disrupt port waste management services or limit access for waste disposal.

Wave height (H12) received a MEDIUM rating as it can potentially affect normal waste management procedures, with higher risk of gear or other garbage being lost or swept overboard. High waves make waste handling dangerous and difficult.

Sea level rise (H11) received a LOW rating as there is no direct vessel impact (vessels adapt to different water levels) but could in time lead to flooded or damaged port waste reception facilities. As a gradual infrastructure issue, this rating may be updated to medium over time.

Exposure Assessment: HIGH

The exposure assessment is based on literature review and logical inferences about the impact of identified hazards on vessel management, particularly waste storage and handling systems. The high exposure rating reflects the frequent occurrence of operational hazards in the WCPO, as documented in regional disaster frequency studies, and the widespread nature of fishing operations across areas prone to extreme weather events.

Key exposure factors include the high frequency of tropical cyclones (25-30 annually in the Western Pacific), regular storm events affecting major fishing ports, and the extensive maritime area where fishing vessels operate often far from emergency assistance.

Vulnerability Assessment: Medium (a combination of low sensitivity and low adaptive capacity)

Sensitivity Analysis: No Sensitivity Indicators Relevant to the CMM

A critical finding of this assessment is that no sensitivity indicators within the framework were found to be relevant to CMM 2017-04. This does not necessarily represent a limitation of the framework, but does reflect that operational measures are likely to have less relevance to any given CCVA. The CCVA was primarily designed for species-focused assessments.

The absence of relevant sensitivity indicators highlights the fundamental difference between climate impacts on biological systems versus operational systems. While biological sensitivity relates to species' physiological and ecological responses to environmental change,

operational sensitivity involves equipment functionality, procedural effectiveness, and human behavioural responses under stress conditions.

Adaptive Capacity Analysis: Framework Limitations

The adaptive capacity assessment attempts to examine the ability of the fishing industry and regulatory systems to adjust waste management practices in response to climate-driven operational challenges. However, the framework's biological focus limited the applicability of many indicators to operational pollution prevention measures. Some adaptive capacity indicators were 'unknown' because they relate to the experience and observation of seafarers. Ground-truthing this would possibly alter the overall assessment outcome.

The assessment revealed that marine pollution is interconnected with climate change and can impact climate resilience, but the relationship operates primarily through operational disruption rather than biological pathways.

Discussion

Interpretation of Climate Risk Assessment Results

The Climate Change Vulnerability Assessment (CCVA) for CMM 2017-04 (Marine Pollution) yielded a **MEDIUM** overall climate risk rating, driven by contrasting low hazard ratings for biological factors and high exposure to operational hazards. This finding reflects the unique nature of pollution prevention as primarily an operational rather than ecological challenge.

Operational vs. Biological Risk

The assessment clearly demonstrates that marine pollution from fishing vessels is primarily driven by operational factors rather than biological/ecological climate impacts:

- Operational practices and procedures
- Equipment functionality
- Crew training and compliance
- Port waste reception facility availability
- Economic and human safety incentives/disincentives

Climate change increases pollution risk primarily through extreme weather events that compromise these operational systems rather than through direct environmental changes affecting marine life. The hazard assessment revealed that temperature extremes (marine heatwaves) do not directly influence vessel pollution behaviours, while operational hazards create conditions where normal waste management procedures break down.

This assessment has broader implications beyond marine pollution, potentially extending into other operational aspects such as labour practices and vessel safety protocols. The framework's biological focus means it cannot adequately capture:

- Human behavioural responses under operational stress

- Mental health and physical health impacts that result from working in increasingly difficult weather conditions or spending longer at sea due to weather impacting catch.
- Equipment resilience and failure modes
- Procedural effectiveness during emergency conditions
- Infrastructure vulnerability to climate impacts
- Economic and logistical factors affecting compliance

Labor and Operational Practices: The same climate hazards that compromise waste management also affect crew safety, working conditions, and operational decision-making during extreme weather events.

Infrastructure Resilience: Port waste reception facilities and vessel waste management systems require climate-resilient design to maintain functionality during increasingly frequent extreme weather events.

Emergency Response Coordination: Climate hazards that create pollution emergencies can simultaneously disable communication systems needed for emergency response, creating compounded risks.

Regional Disaster Preparedness: The frequent occurrence of operational hazards (storms, cyclones) documented in regional studies indicates a need for enhanced preparedness specifically addressing waste management during emergencies.

Management Implications - Climate Change as a Risk Multiplier

Although the CCVA framework focuses specifically on climate-related stressors, the assessment reveals that climate change acts as a risk multiplier for marine pollution rather than a direct driver. Unlike direct pollution sources, which are operational decisions, climate impacts create conditions that make proper waste management more difficult or impossible to maintain.

The assessment suggests several areas for enhanced management attention:

Immediate Operational Responses:

- Development of extreme weather waste management protocols
- Enhanced vessel waste storage system resilience
- Improved crew training for emergency waste handling procedures
- Strengthened port waste reception facility climate protection

Medium-term Strategic Adaptations:

- Integration of climate projections into pollution prevention planning
- Development of regional emergency waste management coordination
- Enhanced monitoring of pollution incidents during extreme weather events
- Review of compliance frameworks to account for climate emergency situations

Long-term Framework Development

The assessment highlights the need for operational-specific vulnerability assessment tools that can better capture the unique risks faced by management measures focused on human activities rather than biological conservation.

Strengthening Future Assessments

Future assessments could be significantly strengthened through:

- Development of operational-specific indicators for climate vulnerability assessment
- Integration of maritime safety expertise and emergency response specialists
- Enhanced data collection on vessel waste management performance during extreme weather
- Regional coordination to share best practices for climate-resilient pollution prevention

The assessment demonstrates that while current frameworks may be limited for operational measures, the underlying climate risks are real and require targeted management responses that account for the operational nature of pollution prevention challenges.

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