

# Wadden Sea Board

## WSB 27

13 November 2018  
Copenhagen, Denmark



---

<b>Agenda Item:</b>	<b>5</b>
<b>Subject:</b>	<b>Climate Vulnerability Index (CVI)</b>
<b>Document No.:</b>	WSB 27/5.1/3b
<b>Date:</b>	5 November 18
<b>Submitted by:</b>	<b>CWSS</b>

---

Enclosed is a draft on development of a climate-change vulnerability index as a global assessment tool for World Heritage properties (comparable to document WSB 27/5.1/3). This includes, amongst minor changes, new information on a case study in the Shark Bay World Heritage Area (Western Australia) on page 3.

**Proposal:** The WSB is invited to note the case study in the Shark Bay World Heritage Area (Western Australia).

## **DEVELOPING A CLIMATE-CHANGE VULNERABILITY INDEX**

### **A global assessment tool for World Heritage properties**

#### **Background**

- Climate change (CC) is the fastest growing threat (IUCN, 2017) to World Heritage (WH) properties, many of which – natural, cultural and mixed – are already being impacted. The severity of current climate impacts on individual WH properties varies, as does the range of CC-related drivers causing those impacts (see Table 1), and the rate at which they are occurring. In most cases, the consequence is a decline in the values that collectively comprise the Outstanding Universal Value (OUV) for many WH properties.
- Currently the WH Operational Guidelines (the documentation used for managing all WH properties) has very limited ‘tools’ to deal with impacts on WH values. WH In-Danger (WHID) is the primary tool in the Guidelines, but WHID was developed to deal primarily with local threats that a State Party can resolve given sufficient capacity. Furthermore, many, perhaps most, WH properties could realistically be considered as being potentially in-danger from the impacts of CC, but it would be unrealistic to consider placing all WH properties on the WHID list.
- UNESCO and the WH Committee urgently need better guidance and a more appropriate tool to deal with CC. WHID however should still be regarded as an option when the OUV of properties is in serious decline as a result of CC or is projected in the near future to be in serious decline, or if any WH values are lost.
- CC presents a global threat which no one nation can address alone. It is causing a wide range of worsening impacts on WH properties which need to be assessed through a comprehensive new framework.

#### **The Climate-change Vulnerability Index**

- The Climate-change Vulnerability Index (CVI) is therefore currently being developed which aims to:
  - be a **rapid assessment tool**, that works for, and is **able to be consistently applied** to, all WH properties (natural, cultural and mixed)
  - be **systematic and comprehensive** yet not overly complex (CC itself is a complex issue, so the CVI needs to balance scientific robustness and political credibility with a level of practicality which enables it to be undertaken by managers or non-scientific users at the WH property level);
  - enable CVI assessments to be undertaken at either **an individual property level** or at a **broad thematic level**. Within a broad thematic group, exemplar WH properties may be used to assist other WH properties with similar values to undertake their assessments;
  - rapidly assess the physical and ecological impacts of CC on OUV, but also provide a high-level assessment of the **economic, social and cultural consequences** of CC for a thematic group or individual property;
  - be undertaken **either by experts** at a thematic level .... or by **site managers** at the property level (with expert guidance) and be able to be checked/ confirmed by others)
  - be **transparent and repeatable**, allowing for repeat assessments over time to assess trends, and enabling others to see exactly how the original assessment was arrived at.
  - be **proactive** (not waiting for CC impacts to become manifest, or for long-term trends to be confirmed)
  - put **CC into context** - CC is becoming a dominant threat to many WH values, but CC is only one of many cumulative pressures impacting on WH properties;
  - assist in **better understanding by local and Indigenous communities** and users, of CC and its impacts on WH properties (a key engagement tool)

- be **standardized** enough that it can ultimately become part of WH processes (such as State of Conservation reports, periodic reporting and nominations).
- The CVI methodology (see Figure 1) is based on a risk assessment approach and systematically considers the following:
  - a) the **exposure**<sup>1</sup> to 3-5 key CC drivers determined by experts who know the relevant property or its thematic grouping, and the **sensitivity** of OUV to those drivers to ascertain **potential impact**;
  - b) the **adaptive capacity** at the level of an individual property
  - c) the **economic, social and cultural consequences** of CC on the property
- Once the CVI is assessed for an individual property, the outcome is a relative assessment rather than an absolute ranking. However, the CVI has the added advantage in that it enables WH properties with similar values but less expertise to benefit from assessments undertaken in key exemplar properties.
- The CVI methodology was recently trialed at Shark Bay WHA in Western Australia (see Case Study below) and plans are currently underway for it to be trialed at other Australian WH properties (e.g. the Wet Tropics WHA and Great Barrier Reef WHA).
- Fruitful discussions have occurred with several European WHAs and it is hoped they will conduct trials in the near future (one of these is a serial WH property, which introduces an additional level of scrutiny for the methodology).
- The IUCN Protected Areas Climate Change Specialist Group has taken the CVI on as a project for their current (2018-19) work plan; the ICOMOS Climate Change and Heritage Working Group has also been briefed and is supportive of the CVI.
- Australia's peak scientific agency (CSIRO) were present at the Shark Bay WHA workshop and some of their datasets will be extremely useful when applying the CVI in all Australian WHAs; additional datasets for Qld WHAs at an even finer resolution have recently been located.

**Table 1 – List of key climate drivers causing impacts on WH values**

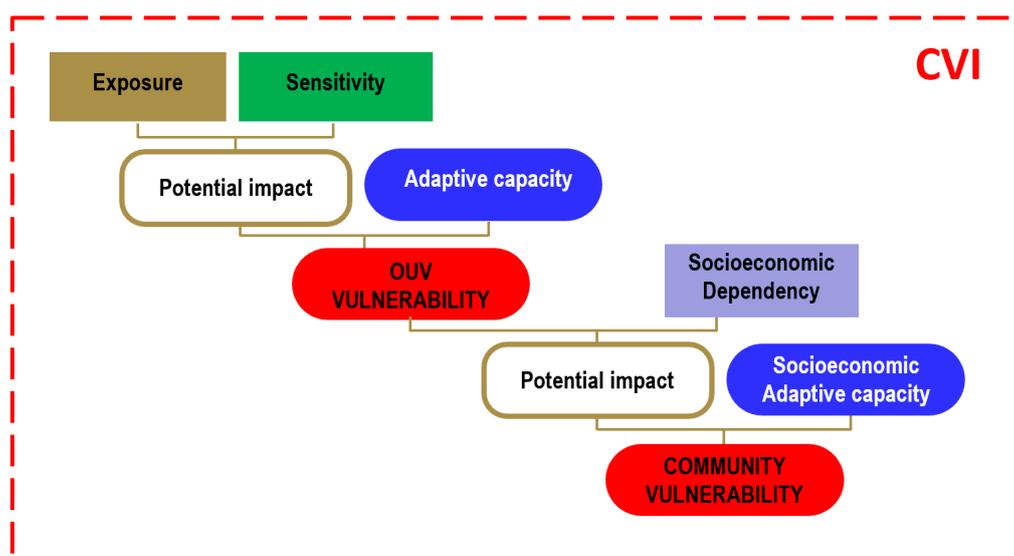
	Driver	Synonyms	Timeframe
Atmospheric	air temperature change	warming; hotter average weather; increased evaporation; desiccation	chronic
	change in wind	gale; gusts; change in wind direction	chronic
	drought frequency and severity	aridity; dehydration; below average rainfall; prolonged water shortage	chronic
	extreme temperature events	heatwaves, bleaching; hot spell; desiccation	acute
	humidity change	evaporation; moisture content; oppressiveness; condensation; clamminess; sweatiness	chronic
	precipitation change	rainfall; rainstorms; showers; drizzle; heavy dew; hailstorms; sleet; snow	chronic
	storm intensity and frequency	cyclone; hurricane; typhoon; blizzard; tornado; storminess; extreme rainfall; lightning strikes	acute
Marine	water temperature change	SST; warming	chronic
	storm surge	storm floods; storm tides; coastal flooding; cyclones; hurricanes	acute
	extreme marine heat events	heatwaves, bleaching; hot spell; desiccation	acute
	sea level change	sea level rise; flooding; subsidence; post-glacial rebound; coastal vulnerability	chronic
	ocean acidification	OA; pH change; acidity; calcification rate; chemical reaction	chronic
	changing ocean currents	ocean circulation; ocean dynamics; ocean conveyor-belt	chronic

<sup>1</sup> **Exposure** describes the nature, magnitude and rate of climatic and associated changes;

**Sensitivity** describes the degree to which OUV is affected, either adversely or beneficially, by climate variability or change;

**Adaptive capacity** describes the potential, capability or ability of a WH property to adjust to CC, to moderate potential damage, to take advantage of opportunities, or respond to the consequences (after Foden *et al.*, 2018)

The final CVI incorporates elements of natural and cultural vulnerability to CC, as well as socio-economic and cultural vulnerabilities:



**Figure 1 – The Climate-Change Vulnerability Index (CVI) methodology**

### Case Study - Shark Bay World Heritage Area (Western Australia)

A first application of the CVI assessment was undertaken during a climate change vulnerability workshop at Shark Bay in September 2018. Twenty-one participants (including managers, practitioners and researchers) began by considering the attributes of OUV and the projected impact on each of 13 specified climate drivers on a time scale prioritized by the attendees (2030s to 2050s). Up to three drivers were selected as the most likely to impact each attribute, from which the three most important climate drivers were identified:

- storm intensity and frequency,
- extreme marine heat events, and
- air temperature change (these three climate drivers influenced more OUV attributes than any other driver and were confirmed by the workshop as intuitively being the most important).

For each of the three identified climate drivers, the likelihood of future exposure and sensitivity of OUV to that driver that would lead to future consequences were assessed. Aspects of temporal frequency and trend, spatial scale of impact, and any compounding factors were considered to determine the risk of potential impact of each climate driver. For Shark Bay, the risk of potential impact from each of storm intensity and frequency, extreme marine heat events, and air temperature change was determined as *Extreme*.

Adaptive capacity describes the potential to adjust to, moderate or respond to climate change impacts. The workshop assessed the adaptive capacity of Shark Bay through the capacity for local management to respond, the level of scientific/technical support for that response, and the effectiveness of any local activities to address each of the three identified climate drivers. The capacity for local management was considered Low for each driver, whilst the technical support was Moderate for each. However, the effectiveness was evaluated as Very Low for extreme marine heat events and air temperature change, and Low for storm intensity and frequency, on a four-point scale (*Very Low, Low, Moderate, High*).

The vulnerability of OUV to each of the three most-important climate drivers was evaluated as *High* (on a scale *Low, Moderate, High*), resulting in an assessment of *High* OUV vulnerability of Shark Bay to climate change.

---

Further information about the CVI is available from:

- **Jon Day** (ARC Centre for Coral Reef Studies, James Cook Uni) [jon.day@my.jcu.edu.au](mailto:jon.day@my.jcu.edu.au)
- **Scott Heron** (NOAA, based in Townsville, Australia) [scott.heron@noaa.gov](mailto:scott.heron@noaa.gov)
- **Imogen Zethoven** (Australian Marine Conservation Society) [imogen.zethoven@amcs.org](mailto:imogen.zethoven@amcs.org)