# Managing World Heritage

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World Heritage is the pinnacle of the recognition of the natural, aesthetic, and cultural value of a place on the planet. Since its inception in 1972, over 1100 sites have received World Heritage status. Many of these places are being challenged by the effects of climate change. Urgent action is needed to build the resilience and adaptive capacity of World Heritage sites in the face of climate change threats to come. The Wet Tropics of Queensland World Heritage Area (WTWHA) is one of the most effectively regulated and managed protected Areas in the world. This includes the scientific evidence upon which that regulation and management is based. However, there is growing evidence that climate change impacts are a clear and present threat to the Outstanding Universal Value (OUV) upon which the listing is based. This challenges the very concept of OUV and points to the business-as-usual regulation and management not being sufficient to deal with the threat. It also calls for quantum changes in the approaches to protecting natural and cultural heritage and the OUV in World Heritage Areas.

Keywords: World Heritage ; Wet Tropics ; climate change ; adaptation ; impacts ; cultural values ; Outstanding Universal Values ; OUV ; resilience

## 1. Introduction

World Heritage is the pinnacle of the recognition of the natural, aesthetic, and cultural value of a place on the planet. Since its inception in 1972, 1121 sites have received World Heritage status. Many of these places are being challenged by the effects of climate change. For example, it is predicted that 42 World Heritage sites in the Mediterranean are currently at flood risk or impacted by coastal erosion associated with climate change [1]. The Great Barrier Reef, on the eastern seaboard of Australia, has recently been damaged by cyclones and coral bleaching from sea surface temperate rise, again associated with climate change [2]. Urgent action is needed to build the resilience and adaptive capacity of World Heritage sites in the face of the climate change threats to come.

Here, we use the Wet Tropics of Queensland World Heritage Area (WTWHA) as a case study to show the impacts of climate change on aspects of its OUV and broader global biodiversity and cultural significance. We then move to assess how action is being, and must be, taken to build the reliance and adaptive capacity of the WTWHA. This case study clearly demonstrates the importance that scientific evidence has played in activating climate activism and in the planning processes, community education and engagement, and management of a World Heritage site. We use this case study to discuss the broad needs of the World Heritage Area family to assess and address climate change impacts on OUV, and the potential threat of climate change to the concept of World Heritage as currently defined.

## 2. A Gem of Regulation and Protection

The WTWHA occupies Queensland's north eastern portion of the Great Dividing Range. The Area comprises 8940 $km^2$ [3] of mainly rainforest from Townsville to just south of Cooktown and west to the Atherton Tablelands, with the highest point being Mount Bartle Frere South Peak at just over 1600 m (Figure 1). The Area encompasses the world's oldest continuously surviving tropical rainforest, with evidence of rainforest existing on these mountain ranges for over 130 million years. It is also home to the one of the world's oldest living cultures—Rainforest Aboriginal Peoples have been living in the rainforest environments for at least 5000 years. Before European settlement, the Wet Tropics rainforests were one of the most diversely populated Areas of Australia, and the only place where Australian Aboriginal people permanently inhabited a tropical rainforest environment [4].

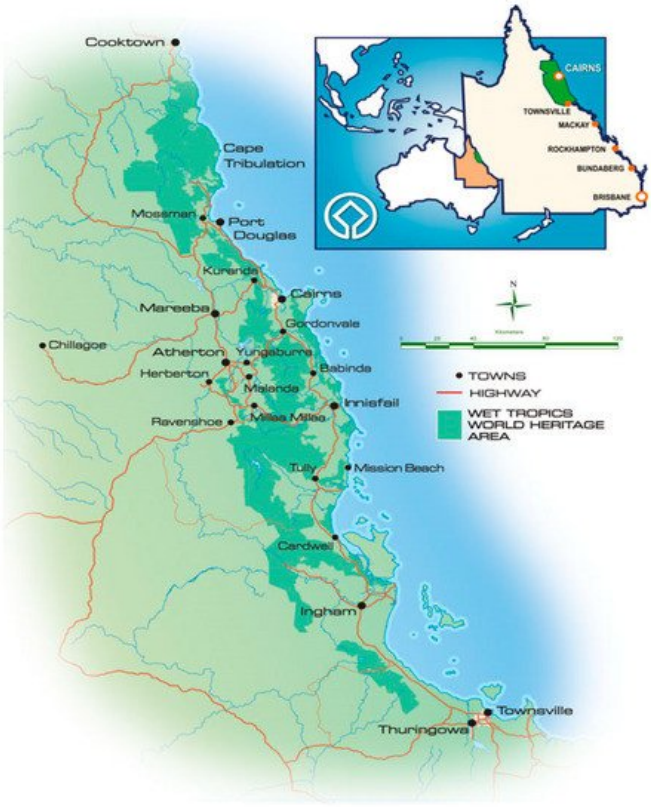


**Figure 1.** The Wet Tropics and the World Heritage Area lie on the north eastern seaboard of Australia, adjacent to the Great Barrier Reef.

Rainforest Aboriginal people developed a specialised and distinctive cultural heritage determined by their dreamtime and creation stories, as well as their traditional food gathering, processing, and land management techniques. Reliance on their traditions helped Rainforest Aboriginal people to live year-round in the rainforests of the WTWHA. The distinctiveness of the traditions and technical innovation and expertise needed to process and prepare toxic plants as food, and the use of fire, has been recognised under national environmental law [5].

The WTWHA rainforests received UNESCO World Heritage listing for all four natural criteria in 1988 and was recognised on the Australian National Heritage list for its cultural values in 2012. It is one of 12 natural World Heritage Areas in Australia. The four natural World Heritage criteria for which the Area is listed are:

- natural phenomena or beauty;
- major stages of Earth's history;
- significant ecological and biological processes;
- significant natural habitat for biodiversity.

The unique biodiversity, and its significance in understanding evolutionary history, makes the WTWHA one of the most important regions in the world. The Area retains the largest expanses of rainforest in Australia, supporting the highest level of biodiversity of any region in Australia. Covering just 0.12% of Australia, the Area is home to an exceptionally high proportion of the nation's biodiversity (Figure 2).

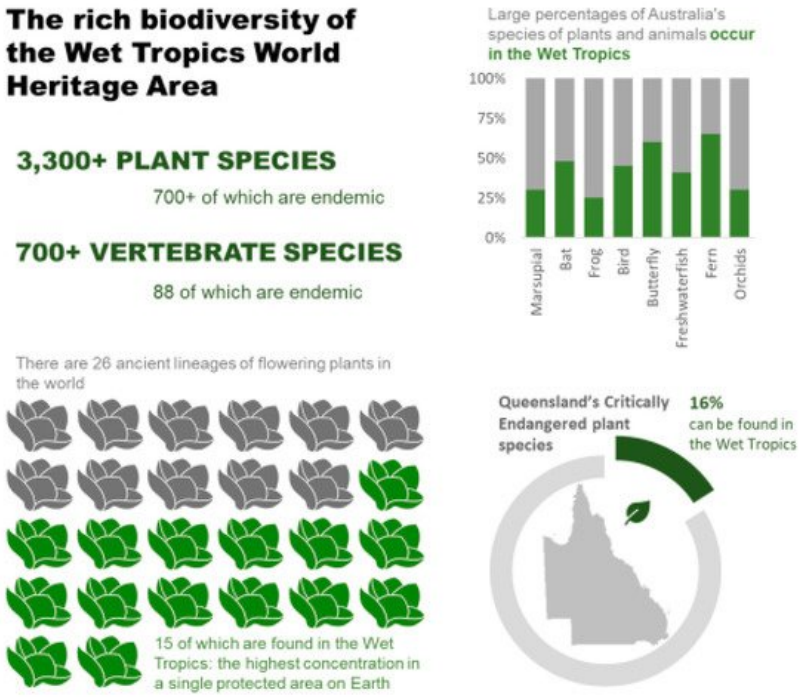


**Figure 2.** The rich biodiversity of the Wet Tropics World Heritage Area.

Assessed as the second most irreplaceable natural World Heritage site on Earth by the International Union for the Conservation of Nature (IUCN), the WTWHA sits in the top 0.1% of the most important protected areas in the world [6].

## 3. The History and Legislation

Following its World Heritage listing, in 1990 the Commonwealth and State governments agreed to jointly fund and coordinate management of the Wet Tropics Management Authority (the Authority) signing an Intergovernmental Agreement that established the WTWHA Management Scheme. This agreement outlined broad structural and funding arrangements, including the establishment of a statutory authority. The Authority has an independent Board comprising six part-time directors nominated by the Commonwealth and State governments, and a full time Executive Director. At least two of the nominees of the Board is to be an Aboriginal person with an interest in the land [7]. The management scheme also establishes a scientific advisory committee to provide advice to the Authority, and a community consultative committee to report to the Authority providing the viewpoint of representative interest groups and the broader community. Both of these committees are chaired by a member of the Board.

## 4. Evidence of Investment in Protection and Management

The Wet Tropics Management Authority was established in 1992, delivering and reporting on the Management Plan and to the World Heritage Committee since that time. IUCN, the international advisory body for World Heritage, produces a three-yearly World Heritage Outlook report [8]. Despite a strong framework of management and protection, the last three reports have consistently cited that the Wet Tropics World Heritage Area remains of “Significant Concern”. This is primarily because of the potential impacts of climate change, invasive weeds, pests, and diseases.

The same report states that the overall protection and management is “Mostly Effective” with the release of the review of the statutory Wet Tropics Management Plan 1998 in September 2020, and the fact that there are policies and procedures in place ensuring the sound management of the Area, cited as contributing to this rating.

## 5. Seeing the Signals and Predicting Their Impacts of Climate Change

The rainforests of the Wet Tropics World Heritage Area were forged in ancient and long-term cycles of change in climate dating back to the time of the supercontinent Gondwana. However, the rate at which the climate is changing due to greenhouse gas emissions is now regarded as the single biggest threat to the future of the Outstanding Universal Value (OUV), and integrity for which the Area was inscribed onto the World Heritage List in 1988.

The climate change threat to biodiversity in the Wet Tropics is well documented (Supplementary Material). The IUCN World Heritage Outlook 3 Report states that “climate change has emerged as a major threat to biodiversity and can

exacerbate impacts of other threatening processes such as fragmentation, pests/weeds and changed water and fire regimes". There is already evidence of changes in the abundance and distribution of fauna.

## 6. Responding to the Signals

### 6.1. Developing the Advocacy

The greenhouse gas emissions that are responsible for human induced climate change is a global issue and citizens and national governments must support immediate action for the reduction of carbon din the atmosphere in alignment with the Paris Agreement. In addition, World Heritage sites are also perfect places to mitigate climate action at the local, regional, and national level. World Heritage site managers should work to limit emissions across their own sites (management, tourism, other economic activities, etc.), and advocate from local to (inter)national levels to mitigate climate change.

In early 2019 a special out of session Board meeting of directors of the Wet Tropics Management Authority called to the national leadership for urgent action and investment following new evidence of escalating climate change impacts on the Wet Tropics of Queensland World Heritage Area. The Board released a statement and 10-point plan [9]. The statement highlighted the serious threat of climate change to the Wet Tropics World Heritage Area and noted that most recent science data indicated 'Extreme heat poses a real and significant threat to the Area's mountain adapted species, like the lemuroid ringtail possum, which are unable to survive even a day of temperatures above 29 °C and called for urgent action and government investment to improve the resilience and protection of the Wet Tropics of Queensland World Heritage Area. The Board stated that it was optimistic that the collaboration and investment on a range of activities and actions now will ensure the Wet Tropics World Heritage Area, the world's oldest living rainforest, is as robust as possible to withstand increasing temperatures.

At the same time, a forum of Rainforest Aboriginal Peoples from across the Wet Tropics sent a strong resolution to a First Nations Climate Summit, held in Brisbane on 4 June 2019 [10]. An excerpt from that statement reads "our lands, seas and waters are under imminent threat from climate change, with escalating decline of the Area's plant and animal species already being observed due to increasing temperatures, changed fire patterns and extreme weather events. The Wet Tropics Management Authority must consider the threats posed by a changing climate to the Area's natural and cultural values and to the spiritual, material, intellectual and emotional features of the landscapes and seascapes. The Authority's ambition is that tribal knowledge systems and western science is brought together to identify ways forward to address those threats and impacts, and influence action to improve the resilience of the Area's lands, seas, and waters. Climate change will, and already is, further disconnecting the Area's people from the lands, seas, and waters and from the Area's ancestral spirits connected to Country. We call on the Australian, Queensland and local governments to take strong action on climate change."

### 6.2. Developing the Climate Adaptation Plan

With all the indicators pointing to the extreme pressures facing the WTWHA because of climate change the Authority had to act. The Authority felt it was necessary to develop a separate climate adaptation and resilience plan, that also aligned with the Strategic Plan 2020–2030. Whilst there was a lot of work already underway to address some of these threats, the magnitude of the challenge meant that "out-of-the--box" and intervention solutions needed to be considered, to help nature 'take its course'.

The Wet Tropics Management Authority's Accept, Act, Adapt: Climate Adaptation Plan for the Wet Tropics 2020–2030 [11] was developed in consultation with the Wet Tropics community, and outlines a strategic framework to guide its vision of "…successful adaptive management of World Heritage in response to climate change." by

- Establishing inclusive regional adaptation planning frameworks.
- Improving landscape resilience.
- Facilitating transition to adaptive communities and industries.

In line with this framework, the following practical steps aim to reduce the impacts of climate change on the region's biodiversity, primarily through adaptive responses. This will be achieved through in-situ conservation of species and ecological communities, facilitating their natural adaptation by rehabilitation, and restoring the Wet Tropics World Heritage Area's overall ecological resilience, and engaging with local, national, and international communities to garner support for actions in support of species and ecological communities.

### 6.3. Establish Inclusive Regional Adaptation Planning Frameworks

The Authority needs to increase the efficiency of planning processes for climate adaptation in the Wet Tropics region, and establish mechanisms that enable cross-sectoral planning. Responding to climate change is unlikely to succeed if it is done in isolation from other land management activities and other agencies involved in land management. Improved regional-scale coordination of adaptation planning will help align adaptation priorities, avoid duplication of effort, promote opportunities to learn from experiences, and avert consultation fatigue among shared stakeholders. For a landscape response to be meaningful, all those affected need to be brought together to deliver integrated approaches to natural resource and land management problems (including the neighbours and adjoining land managers across the Wet Tropics region). This includes government agencies, industries, Rainforest Aboriginal Peoples, scientific institutions, tourists, and regional communities (Table 3). For instance, we propose the action items listed in Table 3.

**Table 3.** How policy and management support can the Wet Tropics World Heritage Area to cope with climate change.

| Establish Inclusive Regional Adaptation Planning Frameworks | Improve Landscape Resilience | Facilitate Transition to Adaptive Communities and Industries |
|---|---|---|
| • Improve the coordination and integration of information across a range of adaptation plans and projects across the Wet Tropics. This will ensure that adaptation is better mainstreamed into all relevant organisations work.<br>• Develop and support decision-making mechanisms that provide realistic opportunities for engagement with existing and new stakeholders.<br>• Support processes that demonstrate innovative adaptive planning and share these learnings. Collaborate with partners to secure the practical support required to deliver these programs.<br>• Incorporate equitable and culturally appropriate processes for including Traditional Ecological Knowledge and tribal science in adaptation decision-making for managing the Wet Tropics.<br>• Increase knowledge about change in Wet Tropics biodiversity and ecosystems to develop appropriate management responses and to reduce the risk of continuing ineffective or maladaptive planning.<br>• Work to ensure that natural systems–including associated ecosystem services and Rainforest Aboriginal Peoples' cultural values-are cross-cutting themes in other sectors' plans to address | • Identify high-risk species and ecosystems to better understand trends and inform management responses and investment decisions.<br>• Secure protection for high priority at-risk habitat in locations that are expected to provide climatic refugia for biodiversity.<br>• Implement strategic management of invasive species and diseases, updated to incorporate knowledge about impacts of climate change on future distributions and emerging issues, together with understanding about key ecological processes.<br>• Identify high priority refugia and conduct on-ground works that increase the diversity, condition and availability of micro-climate refugia, including habitat elements and topographic features that provide shelter during climatic extremes.<br>• All Wet Tropics land managers to implement appropriate fire regimes in response to a variable and changing climate to fire sensitive ecosystems such as rainforests.<br>• Support research and monitoring led by Rainforest Aboriginal Peoples, including approaches based on Traditional Ecological Knowledge and experience of adaptation to historic climate risks. | • Pursue options to increase collaborative research into the current and (uncertain) future states of Wet Tropics natural systems, including manipulative experimentation (The Daintree drought experiment https://www.tern.org.au/The-Daintree-drought-experiment-bgp2911.html). Identify potential socio-ecological links, e.g., indirect impacts of climate change on communities and regional economies through change in ecosystem services.<br>• Explore potential for science-based interventions such as gene banking, assisted gene flow, captive populations, assisted migration, translocation and genetic editing.<br>• Seek and promote opportunities for cultural, social and economic co-benefits of building adaptive capacity in natural systems, including green infrastructure, ecosystem-based emergency management, biodiversity offsets and carbon sequestration programs.<br>• Empower the community through supporting community led initiatives that increases participation in adaptation action across the Wet Tropics.<br>• Implement trials of direct interventions, restoration and management works that facilitate ecosystems transition, for example by allowing novel changes in composition but maintaining ecosystem functions. |

| Establish Inclusive Regional Adaptation Planning Frameworks | Improve Landscape Resilience | Facilitate Transition to Adaptive Communities and Industries |
| --- | --- | --- |
| climate-induced vulnerability.<br>• Develop a comprehensive science and innovation research framework and implement, to support long-term adaptive management. | | |

### 6.4. Improve Landscape Resilience

Many management responses to climate change, such as pest and weed management and creating wildlife corridors, are already being undertaken to improve Wet Tropics integrity. For example, we already know what species of tree to plant in degraded landscapes and the responses of biodiversity to this restoration [12][13]. However, there are still information gaps, such as the long-term impacts of plantings on faunal species and ecosystems services. Such on-ground practical land and conservation activities will become more urgent, and priorities may alter in the light of climate change to ensure additional environmental and socioeconomic co-benefits. The Authority, and its partners' response, needs, therefore, to be placed within an adaptive management framework: plan, act, monitor, review (Table 3).

### 6.5. Innovating to Tackle Climate Change in the Wet Tropics

Wet Tropics researchers have developed a decision framework aimed at guiding managers and policy makers in a way that considers the various adaptation options, ranging from the least expensive and most likely to have benefits to the more costly and risky actions [14].

It is important to stress that many of the common environmental management practices such as control of invasive species, appropriate fire regimes, minimizing fragmentation are all important for maintaining future resilience of the Wet Tropics rainforest.

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