Great Barrier Reef and Climate Change: Laws, Institutions and Resilience

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Abstract— **The Great Barrier Reef (GBR) is an international and national ecological icon. It attracts millions of visitors to Australia every year. Although GBR is recognised as one of the best-managed coral reef systems in the world, climate-related events have already caused significant damage to it. To minimise the extent of damage to the Great Barrier Reef due to climate change, international, federal (Commonwealth) and state (Queensland) laws and institutions provide different tools and control mechanisms to increase the resilience of GBR. This paper evaluates the effectiveness of the existing laws, regulations, plans and institutions for the maintenance and conservation of GBR. The paper concludes with some legal and institutional guidelines to improve resilience from the impacts of climate change in GBR.**

I. Introduction

The Great Barrier Reef (GBR) is internationally prominent as a place of ecological significance. It is protected as a Marine Park and a World Heritage Area since 1981. It is the largest coral reef system in the world, composed of over 2,900 individual reefs and 900 islands stretching for over 3,000 kilometres over an area of approximately 344,400 square kilometres [1, 2, 3].

Although GBR is recognised as one of the best-managed coral reef systems in the world, climate-related events have already caused significant damage to it. Coral bleaching affected over 50% of reefs in both 1998 and 2002 [4]. These are just the first of many anticipated impacts of climate change on GBR. Even if global warming is constrained to 2-2.5˚C, coral reefs are likely to experience widespread and serious damage. To minimise the extent of damage to GBR international, federal (Commonwealth) and state (Queensland) laws provide different tools and control mechanisms to increase the ecological resilience. The main purpose of this paper is to evaluate the effectiveness of the existing laws and institutions as developed at the international, federal and state levels, and to provide some legal and institutional guidelines to improve GBR's resilience.

II. Climate Change and Great Barrier Reef

Corals provide the ecological foundations of biodiversity and productivity in GBR. It also provides food and income to millions of people throughout the tropical world [5]. However, climate change poses serious threats to the long-term health of coral reefs and thereby on the livelihoods of millions of peoples. For illustrations, in many places around the world such as the Maldives, Seychelles and Palau, coral bleaching has already destroyed over 50% of reefs. This loss of corals, triggered by unusually high sea temperatures, has far-reaching implications for reef ecosystems. GBR is also not untouchable from this threat [6].

Clive and Wilkinson (2004, p.304) make clear that "*… there is rising concern about the increasing threats from land runoff from the wet tropical areas, climate change and over-fishing on the GBR*" [6]. Average sea surface temperatures of the GBR for the most recent 30 years (1976 to 2005) are 0.4°C warmer than the earliest instrumental 30 years (1871 to 1900) [7]. The Australia State of the Environment 2001 Report also states that: "*Rising sea surface temperatures in the tropics are considered responsible for widespread bleaching of corals, including on the Great Barrier. …This is a matter of major concern in the context of climate variability*" [8].

Using IPCC data, Hoegh-Guldberg projected coral cover would decline to near zero in all sectors of the GBR by 2030-2040 [9]. IPCC also projected that a significant loss of biodiversity will occur by 2020 in GBR due to climate change [10].

CO_2 levels in the atmosphere have arisen from an average of 280 parts per million (ppm) over the last millennium to 370 ppm at present and continue to rise by 1.5 ppm a year and once the atmosphere reaches 500 ppm, suggests that coral dominated reefs will be rare or non-existent in the near future [11]. Stabilising atmospheric greenhouse gases and aerosols at 450-550 ppm carbon dioxide equivalents will lead to a rise in mean global temperature of 2-3^{0}C. Stabilisation at these levels appear to constitute dangerous climate change and hence not suitable to protect GBR from inexorable damage. Therefore to stabilise mean global temperature rises no higher than 1^{0}C by stabilising atmospheric greenhouse gases and aerosols at 350 ppm is appears to be more appropriate to protect GBR [12]. In this context Garnaut (2008) identified that Queensland is the Australia's most affected state by unmitigated climate

change and he further said that "… *at 450 ppm, the Great Barrier Reef will be exposed to massive coral bleaching and at 550 ppm, it could disappear and be replaced by seaweed and soft corals…* " [13]. He stressed that by 2100 the impacts of unmitigated climate change on Australia could include catastrophic destruction of GBR.

The future of GBR in the context of climate change is questioned by Veron (2008) [14]: "*We are now facing the inescapable conclusion that the GBR, along with all the other coral reefs in the world, will be diminished beyond anything we have ever considered "normal" as a direct result of human-induced climate change and this will happen during the present century*". A number of climate change impacts on GBR over the next decades likely to affect the marine and human life and livelihoods [15]. What is less certain is the capacity of the existing legal framework and institutions to provide GBR as an entity with the adaptive resilience that it requires.

III. Laws and Institutions for Maintenance of GBR

The laws and institutions for the maintenance of GBR include international, Commonwealth and Queensland State laws, regulations and institutions. These are discussed and evaluated below in terms of their effectiveness to offer protection to the GBR from the expected consequences of climate change.

A. International Laws and Position of Australia to protect GBR:

1) Convention concerning the *Protection of the World Cultural and Natural Heritage, 1972*: The GBR was inscribed on the World Heritage List in October 1981 as a natural property under this convention (hereinafter referred as World Heritage Convention-WHC). As a party to the convention and under the customary principles of international law, Australia is required to perform the obligations imposed by the convention in relation to the Great Barrier Reef World Heritage Area (GBRWHA) in good faith. As per article 4 of the WHC, each State Party is committed to: "…*recognize that the duty of ensuring the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage…situated on its territory, belongs primarily to that State*". It further obliges to the convention- "*It(state party) will do all it can to this end, to the utmost of its own resources and, where appropriate, with any international assistance and co-operation, in particular, financial, artistic, scientific and technical, which it may be able to obtain* ".

Article 5 of WHC provides that: "*To ensure that effective and active measures are taken for the protection, conservation and presentation of the cultural and natural heritage situated on its territory, each State Party to this Convention shall endeavour, in so far as possible, and as appropriate for each country*: … and *to take the appropriate legal, scientific, technical, administrative and financial measures necessary for the identification, protection, conservation, presentation and rehabilitation of this heritage …*".

Considering the above provisions of WHC, in the Tasmanian Dam Case (a case relating to conservation of World Heritage Site) [16], a majority of the High Court of Australia held the convention (WHC) was not a mere expression of aspiration, but imposed legally binding obligations. By joining the convention, the Australian Government has assumed the duty of ensuring the identification, protection, conservation, presentation and transmission to future generations of the GBRWHA and other World Heritage properties. So this can be interpreted as the Australian Government is under obligation to protect GBR by "doing all it can to this end". In fact the move of former Australian federal and Queensland state Governments not to ratify the Kyoto protocol was seen as a violation of WHC obligations and intent to protect GBR.

2) *United Nations Framework Convention on Climate Change (UNFCCC)* [17], *1992 and Kyoto Protocol* [18]: The UNFCC and Kyoto Protocol offer the only international legal framework for achieving specified reductions in global greenhouse gas emissions. Article 2 of UNFCCC provides "*The ultimate objective … is to achieve … stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system…".*

In fact Australian greenhouse gas emission per capita is the highest of any industrial country and more than double the average for industrial countries [19]. Although Australia is a party to UNFCCC and secured an extremely favourable deal at Conference of Parties (COP) in December 1997, the then Howard Government refused to ratify the Kyoto Protocol and, thereby, refused to accept a binding target of a 108% increase in its greenhouse gas emissions over 1990 levels during 2008-2012. Thus former Australian and Queensland governments failed to set binding targets to avoid climate change that is expected to damage the GBR. It was argued by former Australian Government and Queensland Government [20] that Kyoto Protocol target will be harmful for Australian Industries; therefore they looked for alternatives and relied on technological breakthroughs. Such an alternative approach is harmful for the greater protection of World Heritage Area like GBR and it is not acceptable as per the Australian obligation under International Law particularly under WHC, UNFCCC and Kyoto Protocol. In this respect one can consider the following observation of the Tasmanian Dame Case:

"*The obligation under Article 4 of the Convention (WHC) leaves no discretion in a party as to whether it will abstain from taking steps in discharge of the "duty" referred to in that Article. Each party is bound to "do all it can . . . to the utmost of its own resources*".

Determining the level of reductions in greenhouse gases required to meet Article 4 of the WHC is a complex and difficult legal question. Australia's decision not to commit

to any reduction in greenhouse gases below its 1990 baseline constitutes a clear failure to comply if it is within the resources of the Australian Government to pursue more substantial cuts. Therefore, it is necessary that Australian Government should justify publicly why it is not within Australia's resources to commit to a policy of deep cuts, if it believes that this is the case.

After extensive setback and disagreement both at the domestic and international level, Australia ratified the Kyoto Protocol following the election of a new federal government in November 2007. Under the Protocol Australia has a target of limiting its greenhouse gas emissions to 108% of its 1990 levels during 2008-2012. On May 14, 2009, the federal Government of Australia introduced a Carbon Pollution Reduction Scheme (CPRS) in the parliament and in April, 2009 the Government announced new measures for the CPRS, including:

"A commitment to reduce carbon pollution by 25 per cent of 2000 levels by 2020 if the world agrees to an ambitious global deal to stabilise levels of CO2 equivalent in the atmosphere at 450 parts per million".

The bill is now under debate process in the federal parliament of Australia and still seems unacceptable to the main opposition party despite its having minimum target of emission. In this regard, it would be better to examine the Garnaut's review and its criticism regarding what target would be suitable for Australia to meet its obligation under the WHC and Kyoto protocol and how far that would be appropriate to protect the GBR.

In fact, his report analysed two targets of 550 ppm and 450 ppm carbon reduction, both of which may not be effective to protect GBR.

That is why, to set a target at 350 ppm to minimise catastrophic effects on the GBR is supported by McGrath (2008) as follows-

"We do not know whether we can stabilise atmospheric greenhouse gases at 350, 450 or 550ppm, but think of it this way: If we wanted to build a bridge across a 1km- wide river, we would not ask our engineers and scientists to build us a bridge that was 500m long. We should apply the same logic to climate-change policy and set targets that produce the results we want to achieve".

It is worth noting that a 350 ppm CO2-eq stabilisation level is also supported by leading climatologists to minimise the catastrophic outcomes due to climate change and to avoid saddling future generations with extreme economic and environmental hardships [21].

Nevertheless, even if all parties to the Kyoto Protocol achieved their emissions targets, the Protocol would reduce global emissions of greenhouse gases by only a small fraction due to some inherent defects in the protocol. For example the Protocol sets binding targets only for developed countries thereby excluding developing countries with large emissions such as India and China and it sets binding targets only for a short period (2008-2012) [22].

B. National Laws to protect GBR (Commonwealth and Queensland): Until now, there is no Australian Commonwealth or Queensland state law designed specifically to protect the GBR from the predicted effects of climate change [23]. In fact, most laws, which were used to deal with the issues of climate-change in particular and environmental issues in general, were drafted long before the climate change was a political reality. Therefore, they do not recognise climate change as a major threat to Australian environment in general and GBR in particular. However, a number of existing environmental laws and other laws deal with the GBR will be discussed below to identify their applicability and effectiveness in the conservation and protection of GBR from the impacts of climate change.

1) Laws and regulations:

Great Barrier Reef Marine Park Act 1975 ('GBRMP Act') is the principal legislation to regulate activities within the GBR. The Act and regulations created under it provide a framework for planning and management of the Marine Park incorporating Zoning Plans and Plans of Management. Under this law mining is prohibited in the GBR Marine Park unless approved for research. The regulations also provide an important measure for reducing the risk of oil pollution through imposing a system for compulsory pilot age for certain ships in prescribed areas of the GBR.

Pre-dating the GBR's world heritage listing, the GBRMP Act contains express reference to world heritage and provides that it has effect subject to the obligations of Australia under international law, including international agreements, such as the WHC. Therefore the obligation to protect the GBRWHA is also reconnected under the national law and prime duty of maintenance is entrusted to Great Barrier Reef Marine Park Authority (the GBRMPA).

Although Queensland is the only state among the Australian states that supported the former Howard Government's policy of not to ratify the Kyoto protocol, it has adopted Greenhouse Strategy, 2004 and Climate Smart 2050 Strategy and Climate Smart Adaptation Plan 2007-2012 to deal with the issues of climate change. The Climate Smart Adaptation Plan 2007-2012 has some actions focused on GBR, including under Action 43 (by mid 2009) to review available options and mechanisms to manage the impacts of climate change on Queensland's at-risk ecosystems, and Action 47 (by end 2012) to work with the GBRMPA to implement joint initiatives that address climate change in the Reef region [24].

Although these action plans are very crucial for the protection of the GBR, none of these action plans have any direct legislative force or mandated accountability. Therefore, due to a lack of legislative force the plans are not binding, and hence not as effective to reduce green house gas emissions as direct legislative measures.

There are some significant measures in place to regulate land-use and development of the GBR catchment. Of particular importance to the planning and management of land clearing, coastal development and land-sourced marine pollution impacting on the GBR are: the Environment Protection and Biodiversity Conservation Act 1999

(Federal) ("EPBC Act"), and Environmental Protection Act 1994 (Qld) ("EP Act").

In reality the above mentioned laws are not able to regulate land-sourced marine pollution adequately due to the impacts of existing uses in the GBR catchments' on the GBRWHA, which are virtually provided complete protection as existing lawful uses under the Chapter 1, Part 4, sections 1.4.1-1.4.8 of Integrated Planning Act(IPA). But for the greater protection of the GBR that existing lawful uses (exempted/exceptions under the existing laws) must not be allowed to contribute to the bulk of land-sourced marine pollution under the veil of virtually unregulated existing uses.

Environment Protection and Biodiversity Conservation Act 1999 (Federal) ('EPBC Act') [25] provides for assessment and approval of developments that may have a significant impact on the values of the Great Barrier Reef World Heritage Area. But this Act does not explicitly address climate change. However, it requires the Minister to consider "all adverse impacts" of an activity when deciding whether EPBC Act approval is required - so it would seem conceivable to argue that climate change impacts should also be considered including any kinds of climate change threats to the GBR.

The above argument was unsuccessful in the Wildlife Preservation Society of Queensland Proserpine/Whitsunday Branch Inc v Minister for the Environment & Heritage & Ors [2006] FCA 736 (popularly known as "Bowen Coal case") in the Federal Court of Australia . In that case Environmental Defender's Office of Northern Queensland while representing Wildlife Whitsunday argued that the government had failed to consider the climate change impact of the mining, transport and use (burning) of coal from two large coal mines in Central Queensland (in the process of considering whether federal assessment of the mines was required because of any likely significant impact on matters of national environmental significance) . On the other hand, the government found the mines were not likely to have that impact, and the statement of reasons for those decisions made no mention of the consideration of greenhouse gas emissions.

The Court held that since there was no specific link between the emissions from the mines and any discernible impact on a protected matter, the mines did not require federal approval. This case triggered the assumption that without specific provision in the EPBC Act and other related legislations to oblige decision makers to consider the climate change impacts of large mining projects and other emitting activities that may have severe negative effects on the GBR may not be effective .

The Environmental Protection Act, 1994(Qld) regulates activities that cause pollution or environmental harm in Queensland. Mines are also dealt with under this Act and administered by the Environmental Protection Agency (EPA) and the Department of Mines respectively. In assessing mining applications, the Mines Minister has to consider (amongst other things) whether there will be any adverse environmental impact and whether the public right and interest will be prejudiced. The EPA must consider (amongst other things) the principles of ecologically sustainable development.

In the Queensland Conservation Council Vs. Xstrata Coal Queensland P/L & Others[2007] QCA 338 (popularly known as Xstrata Case) it is argued that greenhouse gas emissions should be a consideration when deciding whether to licence new coal mines under The Environmental Protection Act, 1994 (Qld) . In this case, applicant Queensland Conservation Council (QCC) sought that conditions should be imposed to require the mine to avoid, reduce or offset the emission from the mining, transport and use of the coal. But the Tribunal President (Land and Resources Tribunal) doubted the science of climate change (even critiqued the findings of IPCC regarding global warming and the global risks of climate change) and therefore not accepted the link between the mine's green house gas emissions and serious environmental degradation like climate change.

2) Institutions and plans:

Great Barrier Reef Marine Park Authority (GBRMPA): The Great Barrier Reef Marine Park Authority is constituted as an Australian Government statutory authority in 1976 under the Great Barrier Reef Marine Park Act 1975. It is the principal adviser to the Australian Government on the concern and fortification of the Great Barrier Reef Marine Park and GBR World Heritage Area.

The key objective of the GBRMPA is: to provide for the protection, wise use, understanding and enjoyment of the Great Barrier Reef in perpetuity through the care and development of the Great Barrier Reef Marine Park.

Although GBRMPA has strong constitutional root, organisational efficiency is not out of question. For example, one argues that the Office holders of the GBRMPA failed to fulfil their responsibility to disseminate information of a factual nature, and thereby failed to make impartial decisions and also raised questions of biasness.

GBRMPA is unable and not fully equipped and empowered to directly address global climate change [26]. Despite this limitation, it is working to ensure that coral reef resilience is not degraded by human activities. Therefore, it would be better to give clear mandate to GBRMPA to deal with the issues of climate change as well.

It is worth noting that a Climate Change Response Program has been implemented to monitoring coral bleaching in every summer as part of a global protocol for assessing and monitoring coral bleaching [27]. It is expected that the GBR Coral Bleaching Response Plan is to be useful to understand the effects of climate change on the GBR and will be useful to take future directions to prevent the negative impacts of climate change.

Great Barrier Reef Marine Park Zoning Plan 2003 (Federal): It defined the range of activities that can occur in

which areas, both to separate potentially conflicting activities and to protect the marine environment.

Following detailed scientific and socio-economic analysis and extensive public consultation including analysis of some 31,500 public submissions through the GBRMPA's Representative Areas Program, the Great Barrier Reef Marine Park Zoning Plan 2003 substantially expanded the area of no-take "green zones" to over 33% of the GBRMP [28]. Given the verification of serious ecological impacts caused by certain fishing practices, pursuing rigorous compliance and enforcement of the new zoning regime is a must to ensure the protection of GBR from the environmental dangers in general and climate change in particular.

Australia's Productivity Commission report [29] on the economic value and employment characteristics of industries within the GBR catchments' clearly demonstrated that tourism far exceeds, in terms of both economic value and employment, any other single industry using the GBR catchments'. That is why, in terms of economic and employment value and possible ecological impacts on the GBR tourism is far preferable than fishing and other activities.

The Reef Water Quality Protection Plan (Reef Plan) 2003:

In order to address the decline in water quality entering the Reef, the Australian and Queensland Governments worked in partnership with a wide range of industry and community groups to develop the Reef Water Quality Protection Plan (Reef Plan). The goal of the Reef Plan is to halt and reverse the decline in water quality entering the Reef within 10 years.

Unfortunately Reef Plan failed to regulate the vast bulk of development that damages the GBR through pollution of coastal waters. As the reef plan to some extent relied on voluntary cooperation and partnership approach, it may not be effective without proper monitoring and enforcement mechanisms.

IV. Findings and Analysis

A. Climate Change and Coral Bleaching in GBR-Coral bleaching in GBR is continuing despite so many protective and preventive measures. In fact to keep it in a minimum level or to minimise the negative consequences, there must be deep cut of green house gas emissions to prevent climate change which is the prime cause of coral bleaching.

B. Inadequate Control of Green House Gas Emission-The present target of minimising green house gas emissions is not adequate to prevent negative consequences of climate change in general and catastrophic effects in GBR in particular.

C. Lack of Clear Mandate on Climate Change in National Law-Neither the Federal Laws of Australia nor Queensland state laws contain any specific mandate to consider climate change issues while permitting and/or evaluating any activities like mining, fisheries etc. Due to absence of clear mandate sometimes climate change issues that may have adverse impacts on GBR are ignored.

D. Lack of Mandatory Global Understanding on Climate Change-Present obligations to minimise green house gas emissions will expire in 2012 and it has no binding target for developing countries like China, India and Brazil, which are also responsible for great amount of green house gas emissions. Therefore lack of mandatory global understanding compelling all for the control of green house gas emissions may jeopardise the achievement of present stage and in the long run may not be beneficial to protect coral systems around the world including GBR.

E. Lack of monitoring of existing uses

Existing uses are not monitored, which are to some extent harmful for the protection of the GBR.

V. In lieu of Conclusion: Great Barrier Reef-Let's keep it Great

The GBR is a vital ecological and economic asset; therefore it is to be protected not just considering its contribution to Australian economy but also considering its ecological significance. Australia is under obligation as per the provisions of the WHC, UNFCCC and its Kyoto protocol to protect GBR as world heritage site. International law places particularly onerous obligations on Australia, including to 'do all it can, to the utmost of its own resources', and to ensure '… protection, conservation, presentation and transmission to future generations of the cultural and natural heritage … '.

However, to date Australia has failed to take adequate measures, internationally and in relation to its own excessive greenhouse gas emissions, to discharge its WHC and Kyoto obligations. It is expected that after signing the Kyoto protocol and ongoing debate in the federal parliament of Australia for the establishment of Carbon Reduction Scheme, it will proceed to make a leadership role to protect its world heritage sites including GBR from the potential effects of climate change. To meet this end, Australia should ensure within its domestic jurisdiction that the legislation frameworks for climate change mitigation are in place and understood as well as supported by Australian institution in a collaborative way. The creation of a mechanism to reduce the carbon emission at the 350 ppm level and internationally to negotiate to achieve the same goal and create a post 2012 mechanism applicable for developing countries, including great emitters like India and China will assist the Great Barrier Reef to be 'Great' for future generations.

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