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Ecosystem service valuation reinforces world class value of Cape York Peninsula's ecosystems but environment and indigenous people lose out

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ABSTRACT

Cape York Peninsula's iconic status relies on its world-class landscapes and continuity of Indigenous occupation. Contests between economic, environmental, cultural and social interests have not considered valuations of ecosystem services. This first valuation of Cape York's ecosystem services asks the question: who is winning and where?

The total ecosystem services value of Cape York is estimated conservatively to be AUD $130 billion per year. The value for each biome ranges from $0 $ha^{-1}\,y^{-1}$ in 'non-remnant' areas, to $602,000 $ha^{-1}\,y^{-1}$ for coral reefs. Ecosystem services value is comparable to the region's largest industry, bauxite mining. Mining has produced great benefits to the economy, but local communities remain disadvantaged, receiving a fraction of the ecosystem services value, estimated to be worth $120 M. The productivity of grazing lands is $18 $ha^{-1}\,y^{-1}$, compared to the ecosystem services value of at least $3,300 $ha^{-1}\,y^{-1}$.

We argue that the high ecosystem services value of Cape York is because of Indigenous land management over millennia. Since the disenfranchisement of Indigenous people, ecosystems of northern Australia have suffered significant land degradation.

A policy framework is required that acknowledges the value of ecosystem services and also incentivizes the cultural ecosystem services of Cape York.

1. Introduction

The Cape York Peninsula region (Cape York) is a place of extraordinary landscapes distinguished by the continuity of Indigenous occupation. Here, a mosaic of Indigenous, agriculture, pastoralism, government, mining and conservation interests drives a battleground of ideas, values and visions. Complexity and intractability have meant governments have been largely ineffectual in providing sustained leadership in shaping futures attuned to Cape York's complex challenges and potentials (Holmes, 2011a).

This is perhaps no better exemplified than in recent history where a Federal Labor government, supported by the Queensland government, argued for world heritage listing for much of Cape York by 2013 in recognition of its world class natural and cultural values (Mackey et al., 2001). The subsequent overturning of governments at both federal (in 2013) and state levels (in 2012) has, in contrast, renewed interest in the development potential of Cape York, encapsulated in the 2014 Cape York Regional Plan (The State of Queensland, 2014) which has no mention of World Heritage values. Instead, the Plan is focused on the mining, grazing and agricultural industries, on the assumption that these are the basis for long-term economic resilience.

In 1982 the International Union for the Conservation of Nature (IUCN) published the first indicative inventory of the world's most outstanding natural areas. One of these was Cape York (IUCN, 1982). The area contains a remarkable diversity and high level of ecological integrity including wetlands, monsoonal rivers, tropical rainforest, heath lands and dune fields. Cape York includes expansive tropical savannas with an intactness that is rare elsewhere in the world. Its coastlines are largely untransformed and of

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startling beauty. The east coast is bound by the World Heritage Great Barrier Reef and on its south-eastern corner is the northern-most part of the Wet Tropics World Heritage Area. There are 40 endemic vertebrates, and 60% of Australia's butterflies (Mackey et al., 2001). Cape York's mangroves are amongst the world's most species rich, as are its orchids. Two of its rivers contain the richest known freshwater fish fauna in Australia (Mackey et al., 2001). Overall, the area is a mosaic of inter-locking habitats of rare integrity.

This is not to say there are no threatening processes. Feral animals, weeds, inappropriate fire regimes and over-grazing are extensive threats to ecosystems, and Cape York is likely suffering a massive decline in its mammal species, in common with the rest of the northern Australian savanna region (Perry et al., 2015; Ziembicki et al., 2015). These threats to the delivery of ecosystem services require active management, often provided by resident Aboriginal people who contribute these services at catchment, regional and national scales (Altman, 2005), as well as by the non-Indigenous pastoral landholders.

Cape York is sparsely populated, with about two-thirds of its approximately 18,000 people (1 person per 9 km^2) being Indigenous and living in mainly coastal communities. Starting in the 19th century, historical bitter conflict with white settlers forced Aboriginal people off the land (Winer et al., 2012), a process that continued into the 1960 s with the forced removal of people from the community of Mapoon in order to mine bauxite (Comalco, 2001). Today Aboriginal people have regained ownership or control of about 40 per cent of Cape York (the remainder of Cape York is mainly pastoral or mining lease). But due to the bureaucracy imposed on them, and the degraded condition of the land handed back, this control comes with so many caveats and lack of opportunities for traditional owners that the result is the delivery of sub-optimal outcomes for the environment and livelihoods. For example, expansion of protected areas, despite underlying Aboriginal ownership, removes the opportunity for Aboriginal people to privately benefit from areas of high conservation value. Instead, joint management with the State government comes with notoriously inadequate funding for environmental management (Winer et al., 2012).

Pastoralism is also a marginal activity at best, with declining terms of trade the norm across northern Australia (Grice et al., 2013). Against a background of continuing natural resource degradation and biodiversity loss (Bastin and ACRIS Management Committee, 2008) there is limited capacity support for the landscape scale environmental management required to sustainably manage a pastoral enterprise.

Cape York's largely intact environments also mean, perversely, that there is little scope for reforestation and avoided deforestation opportunities which are available elsewhere precisely because the lands are degraded (van Oosterzee and Garnett, 2008).

Most recently, at the national level, the “developing the north” policy has re-emerged. This colonial-aged policy aspires to take advantage of the extensive, sparsely populated landscapes for agricultural development (Australian Government 2015) despite the ample evidence that the potential for agricultural development in northern Australia is severely limited (Russell-Smith et al., 2015).

These on-going contests and trade-offs between economic, environmental, and cultural interests and social advancement have to date not included a valuation of the underlying ecosystem services of the region. In northern Australia, and particularly in Cape York, ecosystem services are central to the on-going environmental and social trade-offs being made toward the goal of developing the north. However, their relative contributions to that goal, unlike built and human capital (the economy), are not often made transparent.

The services provided by the large, intact ecosystems of Cape York include climate regulation, fresh water, waste treatment, erosion prevention and moderation of extreme events (by a large barrier reef), lifecycle maintenance services for a large variety of species, wild foods and grazing lands, and opportunities for recreation (tourism, including fishing). In contrast to non-renewable mineral resources, ecosystem services are renewable and can produce benefits perpetually; though they can still be degraded, depleted, and importantly improved or enhanced by land management practices (Comberti et al., 2015).

Here we provide a preliminary valuation of the ecosystem services of Cape York as a fundamental component of its wealth, well-being and sustainability. These estimates are of aggregate accounting value for ecosystem services in monetary units, analogous to the approach taken in deriving GDP (Costanza et al., 2014). Most people understand value in monetary units and this valuation provides a convenient way of expressing the relative contributions of ecosystems, which can be factored alongside other accounting methods as part of the economy.

These first ecosystem services values for Cape York can, at the least, begin to raise awareness (Costanza et al., 2014) of the trade-offs being made in crafting a path toward a multifunctional future. We discuss the relevance of our findings in terms of raising awareness, and in answering the question, ‘who is winning, where?’ in relation to land management practices in Cape York. We then discuss how these findings might influence planning and policy for natural resource management.

2. Methods

2.1. Study area

The Cape York Peninsula region lies in the monsoon tropical zone of Australia, extending from 10° 30′ S to 16° 30′ S, and from 141°E to 145° 30′ E, and covers 16.6 million hectares, including coastal areas and coral reefs. Around 60% of Cape York has an average rainfall of less than 1100 mm per year, mostly falling in the wet season from December to March. Less than 1% of the region is considered to be wet tropics with an average rainfall of more than 2100 mm per year falling year-round. Mean maximum summer temperatures vary from 32 °C in the north and east and 37 °C in the south-west. Mean winter maximums vary from 24 °C in the north to 32 °C in the south-west. Highest temperatures occur in the late dry season in November or later (Environment Science and Services, 1995). Soils are generally deficient in plant nutrients and many are prone to erosion when cleared (Environment Science and Services, 1995).

2.2. Monetary valuation of Cape York's ecosystem services

We used recent global meta-analyses of studies quantifying ecosystem service monetary units (de Groot et al., 2012; Wratten et al., 2013; Costanza et al., 2014) based on 10 biomes. We produced an approximation of these 10 biomes from Queensland vegetation, land use and topographic spatial data and used a benefit transfer approach to generate first-cut, order-of-magnitude ecosystem services value estimates.

2.2.1. Mapping the Cape York biomes

We built a spatial layer of the biomes on Cape York using the descriptions provided by de Groot et al. (2012) in their supplementary information. We used the Cape York boundary to limit the extent of the area. The Cape York boundary is defined by Cape York Natural Resource Management Ltd., which follows the *Cape York Heritage Act 2007* boundary to the west and east, and the