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Research article

# Valuing visitor access to forested areas and exploring willingness to pay for forest conservation and restoration finance: The case of small island developing state of Mauritius

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ABSTRACT

Small island developing states share as common constraints their small size, geographical dispersion, greater vulnerability to rapid and drastic environmental change, and limited administrative and technical resources. Within these, they have to cater for urban and agricultural areas, as well as enough natural landscape for ecosystem services. Funding for conservation of forest ecosystems on these islands has received relatively less attention and national park systems are chronically underfunded. We used Mauritius as a case study to investigate the willingness to pay for conservation of state and privately owned forests. It is part of a biodiversity hotspot with highly threatened forest ecosystems, but has known some conservation successes. We designed and administered survey based contingent valuation approach to estimate the willingness to pay entry fees to visit forest areas across the island. Study results suggest international and domestic tourists have a mean willingness to pay of USD 7.73 and USD 3.74 respectively, for conservation. These values represent amounts visitors are willing to pay every time they visit a public or private forested site. Results show that mid-level supervisory roles positively influence willingness to pay values. Results also show that people aged 50 and above, not having any supervisory role, married with one child or less, tend to have lower willingness to pay for conservation.

## 1. Introduction

Forests on island states make up less than one percent of the global forest coverage (Wilkie et al., 2002) – which stands at 1.5 billion hectares (Achard et al., 2014) - but provide invaluable goods and services to about 66 million islanders (House, 2013). Plant endemism richness on islands is 9.5 times than mainland regions (Kier et al., 2009), showing the importance of conserving terrestrial ecosystems on islands. Between 3% and 32% of coastal areas on islands in Southeast Asia and Pacific could be affected by inundation and erosion because of 1 m–6 m sea level rise (Wetzel et al., 2012). The small size of islands intensifies impacts on critical ecosystems that their economies and supply of freshwater, amongst other things, depend upon. Invasive alien species (IAS) (Vitousek et al., 1997), habitat destruction and fragmentation (Brooks et al., 2002), dense human populations (McKee et al., 2004) are amongst the many factors that particularly threaten native island biota. Conservation and restoration of terrestrial ecosystems requires funding from international aid and grants, private donations, or government funds. Protected areas suffer from limited financial provisions for conservation improvement (Lal et al., 2017), and the financial situation is worse for non-protected forests. Small island developing states (SIDS) received around 2.4% of the 1.2 billion USD allocated globally to conservation for the period 2001–2008 (Miller et al., 2013; Waldron et al., 2013). With unmet conservation priorities and most SIDS focusing on socio-economic development, the ability to leverage funds from tourists and residents to improve native biota, can ensure greater success for conservation programs. Funds can come from entry fees, taxes and levies on tourism activities or targeted donation campaigns, but a full review of mechanisms in place across SIDS is missing from literature. Studies that explore the potential and acceptable range of entry fees from visitors to forest areas on SIDS are also limited; a gap we have sought to address.

This study explores individual willingness to pay for conservation of native biota in mainland Mauritius, in the form of entry fees to forest areas. Unfortunately, strategies like payments for ecosystem services, government land retirement, conservation subsidy programs, conservation easements and tax incentives, are still in infancy (National Biodiversity Strategy and Action Plan [NBSAP], 2017; United Nations Development Program-Global Environment Facility [UNDP-GEF], 2009). Hence, for Mauritius, using entry fees as a source of revenue for

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environmental conservation can act as a viable first-step towards improving services and increasing the quality of the experience that is valued by visitors to natural areas. The study findings can be used as a model for other SIDS given commonalities in size, population growth, development needs, pressures on natural resources and ecosystems (United Nations Conference on Trade and Development [UNCTAD], 2004).

### 1.1. Study area

Mainland Mauritius covers an area of 1865 $km^2$ and is located in the Indian Ocean with a population of around 1.27 million (Statistics Mauritius, 2017), making it the fourth most densely populated SIDS with a population density of 678 per $km^2$, following Guinea-Bissau, Singapore and Maldives (Central Intelligence Agency, 2014). As part of the Mascarenes archipelago, it is one of most bio-diverse hotspots of the world (Myers et al., 2000). The island bears 691 species of native flowering plants of which 273 are endemic to Mauritius alone, and about 150 species are endemic to the Mascarenes (Baider et al., 2010). Over time, and with development and lifestyle changes, Mauritius has seen a rapid decline in forest cover with the percentage of good quality native forest (more than 50% native canopy) drastically reduced from 85% of the island's surface area in the 1700s (Vaughan and Wiehe, 1937) to under 2% in late 1990s (Page and D'Argent, 1997). Combining these conditions with ecological impacts like loss of natural dispersers and pollinators, as well as increased distance from source populations, the likelihood of extinction of species left within fragments increases (Cordeiro and Howe, 2001). Despite these same pressures in Mauritius, native forests retain the highest tree diversity of the Mascarene region (Florens et al., 2012) and are home to 12 native forest birds, 9 of which are endemic (NBSAP, 2006). Land-use changes (Hammond et al., 2015), but more importantly, impacts and interactions of invasive alien species act as the greatest biological threats to Mauritian forests (Baider and Florens, 2011; Florens et al., 2017), and their control and eradication have shown the highest success for forest restoration and conservation in the island (Florens and Baider, 2013). Mauritius has shown it has the capacity and ability to restore its native forests (Mauremootoo, 2003; Florens et al., 2012). The challenge is therefore in terms of guaranteed financing (as opposed to one-off donations or grants) and providing consistent technical support to forestland owners.

Natural forest stands on the island are either under state or private ownership. Public forests are managed by the Forestry Service (FS) and the National Parks and Conservation Service (NPCS), both of which operate under the Ministry of Agro-Industries. Private forests are managed by individual land owners, where the forest land may be part of a deer *chassé* (grazing and hunting ground), or managed for nature-tourism, or fenced off and left untouched. The island has twelve formal state protected areas on the mainland comprising of two National Parks, seven Nature Reserves, one Forest Reserve, one Bird Sanctuary, one Ramsar site, in addition to nine offshore islet protected areas, covering a total area of 8027 ha (UNDP-GEF, 2009; Government Information Service [GIS], 2011). One of the key conservation mechanisms used by state agencies on the island is the creation of Conservation Management Areas (CMA), where patches of good quality forest are fenced off against deer and feral pigs, and cleared of all invasive alien plants within them. Since the setting up of the first CMA in 1987 covering 1.2 ha (Baider and Florens, 2011), today CMAs cover 73ha (NPCS, 2018a), but are disproportionately located in the South West of the island (Florens et al., 2010; NPCS, 2018b). Conservation costs associated to setting up CMAs on state forest lands range from USD 10,000 (Dulloo et al., 2002) to USD 13,000 per ha per year (UNDP-GEF, 2009; Florens et al., 2010); adjusted to USD 16,064 and USD 20,883 respectively to reflect 2017 inflation and exchange rates (Mauremootoo, 2017). Mauremootoo (2017) highlights that CMA costs (excluding fencing) go to paying salaries of laborers and supervisors; overhead costs associated to utilities and administrative salaries; rental of storage facilities for pesticides; transport costs of fuel and vehicle purchases; costs of tools and equipment used for weeding and data collection and lastly, costs of consumables like masks, gloves and herbicides. Baider and Florens (2011) found that fencing was not actually significant in deterring introduced animals. Florens (2013) showed that investing in forest restoration by removing invasive alien plants alone can bring about strong positive effects on both native plants (Baider and Florens, 2006, 2011; Monty et al., 2013) and animals (Florens and Baider, 2007; Florens et al., 2010; Hugel, 2012), and this at lower costs. In addition, contracting labor from local communities and using improved weeding techniques can reduce restoration costs to USD 1000- USD 3000 per ha (Florens et al., 2010; Florens and Baider, 2013). These costs were adjusted to fit 2017 inflation and exchange rates at USD 2400 and USD 3100 (Mauremootoo, 2017) per ha respectively.

With regards to private lands, about 6553 ha under forests are classified as mountain or river reserve under the Forest and Reserves Act of 1983 but enforcement of regulations or conservation activities in those reserves are limited. Many environmentally sensitive areas (landscape features that are critical to the provision of ecosystem services) span across both state and private owned lands, interspersed with urban landscapes. What adds to the complexity is the fact that private landowners lack technical and financial incentives to invest towards setting up CMAs or other consistent conservation programs on their lands (Seewoobaduth et al., 2005). If cost-saving measures are employed, the area of restored forest can be significantly increased. Alternatively, smaller amounts can be leveraged for effective restoration work with lower risk. This has the potential of encouraging more private forestland owners to engage in forest conservation.

The Wildlife and National Parks Act (1993), now replaced by the Native Terrestrial Biodiversity and National Parks Act (2015), catered for the creation of the National Parks and Conservation Fund, money for which comes from a USD 75/head tax on the export of F1-generation *Macaca fascicularis* for vivisection (Greenwood, 2008). This funding is used for all expenses incurred by the NPCS, and any additional annual funding is secured through Government budget. A report to the Convention on Biological Diversity (CBD) dated 2014 highlights Government budget allocations of USD 38 million for the NPCS and USD 97 million for the FS but there is no disclosed information on the minimum amount that goes specifically to forest restoration work on an annual basis, as opposed to salaries, office maintenance or other expenses. Additional local sources of funding come from export and import permits under the Convention against Illegal Trade in Endangered Species (CITES), sales of nursery-grown native plants and the National Environment Fund created under the Environment Protection Act (1991) (Convention on Biological Diversity, 2003). In terms of donor funds, Mauritius has received so far a total of some USD 30.6 million from the GEF, out of which USD 4.4 million have been broadly allocated to biodiversity projects (GEF, 2018). However, Mauritius is poised to rise to a high-income economy (Rapoza, 2014) suggesting that the flow of aid will eventually decline in favor of lower income countries (Paupiah, 2004). In 2009 the Ministry of Finance gave corporate bodies the option to direct two percent of their annual book profits towards projects that would bring social and environmental benefit to local communities (PriceWaterhouseCoopers, 2010), but there is no information on how much has specifically gone to forest conservation. Thus, most conservation activities are financially supported by the Government and various legislative funds, but funding is still limited. Investigating means to complement current funding sources is of importance, especially as concern for protecting forest areas increases, both for nature-tourism opportunities and in response to social pressures on mitigating impacts of climate change.

Mauritians nowadays bear little to no direct link to, or reliance upon, native forests for survival. However plantation forests and some areas of the National Parks are highly favored by residents as picnic and hiking spots, as well as for collection of *Psidium cattleianum* and *Rubus rosifolius* berries. State lands that are under the purview of the FS and