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VALUING MANGROVES AS AN ECONOMIC PART OF COASTAL INFRASTRUCTURE

BY LUCY EMERTON, NAOYA FURUTA, TSUYOSHI INOUE & RYO OYAMA

A general lack of evidence about environmental costs and benefits means that it is often difficult to make a strong business case for investing in green infrastructure. In an effort to overcome these information gaps, one of Japan's largest insurance companies has been piloting an innovative system of corporate ecosystem valuation. The aim is to account for and report to the company's customers, shareholders and other stakeholders on the economic impacts of its investments in mangrove restoration and rehabilitation.

Why ecosystem undervaluation is a problem
Even though the concept of 'green infrastructure' has gained currency over recent years, it still tends to be accorded a low priority as compared to more conventional 'grey' measures. One important reason is the lack of demonstrable evidence as to how and why ecosystems offer an economically worthwhile investment choice. For the most part, calculations of the relative returns to different land, resource and investment choices simply do not factor in ecosystem costs and benefits. Given these informational and methodological gaps, it is perhaps hardly surprising that both public and private sector planners often remain unconvinced — or even unaware — about the potential to harness the natural environment to deliver key infrastructure and development services.

Intensifying competition over scarce public and private investment funds, coupled with increasing demands from shareholders and taxpayers for information about how their money has been spent, means that the need to demonstrate cost effectiveness and value for money is becoming an ever-more pressing concern. Yet, while figures are readily available on the benefits of hard engineering options, and are routinely used to measure assets, inform investment planning and report on financial performance, much less information is on hand about the gains and economic opportunities from investing in nature-based solutions.

Ecosystem valuation can provide a powerful tool for placing green infrastructure on the agenda of investors, planners and policy-makers^[1]. Yet, although it has increasingly started to enter the lexicon of public sector decision-makers, as yet there remain far fewer examples of ecosystem



A community mangrove nursery in Tar Ton Son village, Thailand



Mangrove planting site in Bedono Village, Indonesia. The sign reads "one mangrove = saves 5 lives in the coastal area"

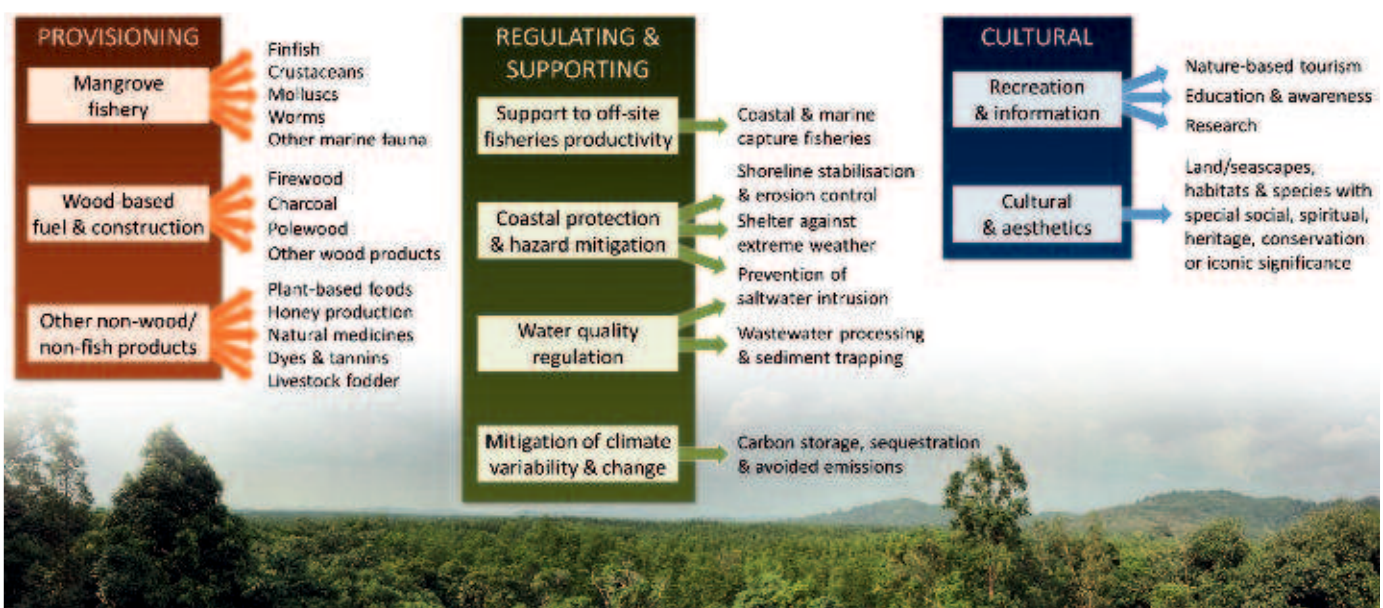


Figure 1. Mangroves provide a wide range of economically-valuable ecosystem services

valuation being used in a corporate context. It is against this backdrop that Tokio Marine & Nichido Fire Insurance Co., Ltd.(TMNF), one of Japan’s largest insurance companies, initiated an innovative study to look at the economic value of mangrove ecosystem services – one of the most productive, and valuable, components of the ‘natural’ infrastructure base in coastal zones.

The Mangrove Planting Project

As part of its commitment to a safe, secure and sustainable future, TMNF has a long-standing corporate environmental and social responsibility programme. One of the core components is a Mangrove Planting Project. Between 1999 and March 2019, TMNF has worked with a network of non-governmental organisations and local partners to plant 10,930 hectares of mangroves in nine countries in the Asia-Pacific region: Bangladesh, Fiji, India, Indonesia, Malaysia, Myanmar, Philippines, Thailand and Viet Nam.

As well as contributing to corporate responsibility and reputational goals, the Mangrove Planting Project helps to secure important ecosystem services – ‘the benefits people obtain from ecosystems’^[2]. The intention is to support local community development, strengthen climate change mitigation and adaptation, assist in disaster risk reduction, and contribute towards biodiversity preservation. Yet many people – both within and outside the company – remain unaware of the wide-ranging benefits that the company’s investments in mangrove planting have had on local livelihoods, national development, and even the

global economy. This poses a real risk of undermining the support and funding that is required to sustain TMNF’s mangrove planting activities into the future.

With a view to overcoming these information gaps, in 2015 TMNF commissioned an initial study to value the ecosystem services generated by its Mangrove Planting Project^[3]. The intention was to account for and report to the company’s customers, shareholders and other stakeholders on the economic returns from mangrove restoration and rehabilitation. Four years later, just after the project had come to the end of its fourth phase and twentieth year, the study was repeated and updated^[4].

Valuing mangrove ecosystem services

The question of how to ascribe values to ecosystem services has long posed something of a challenge to economists. The easiest and most straightforward way, and the method used conventionally, is to look at their market price: what they cost to buy or are worth to sell. However, as ecosystem services very often have no market price (or are subject to prices which are highly distorted), these techniques obviously only have very limited application. However, over the last two decades or so, a suite of methods has emerged with which to value goods and services that cannot be calculated accurately via the use of market prices^[5,6,7]. These have now come into wide acceptance and common usage among environmental economists.

The TMNF study drew on this ‘toolbox’ of market and non-market ecosystem valuation

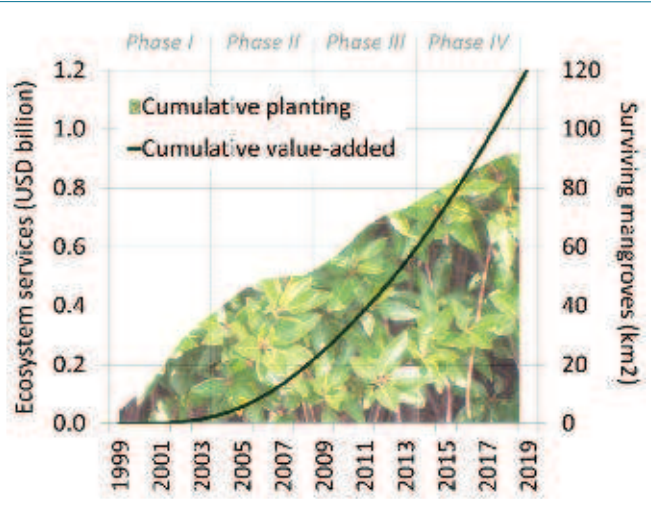
techniques. It followed three interrelated steps: first identifying mangrove ecosystem services and their stakeholders at the project sites, going on to assess baseline economic values, and then modelling the changes in ecosystem service benefits resulting from mangrove restoration and rehabilitation. As well as conducting a macro-level analysis of the economic impacts of mangrove planting across all nine countries, micro-level case studies of specific mangrove ecosystem service values and beneficiary groups were carried out at three planting sites: Bedono Village in Indonesia, Dông Rui Commune in Viet Nam and Mueang Ranong District in Thailand.

The returns to investing in mangrove restoration and rehabilitation

The study found that the vast majority of the coastal population in the project planting sites depend in some way on mangroves for their livelihoods and economic wellbeing. Nine ecosystem services were found to be of particular socio-economic importance (Figure 1): mangrove fishery, wood-based fuel and construction, other non-wood/non-fish mangrove products, support to off-site fisheries productivity, coastal protection and hazard mitigation, water quality regulation, mitigation of climate variability and change, recreation and information, and cultural and aesthetics.

It follows that a large number of local communities have benefited directly from the Mangrove Planting Project. These include more than 1.4 million people or almost 350,000 families, many of whom face high rates of poverty, live in extremely precarious economic

Figure 1. Mangroves provide a wide range of economically-valuable ecosystem services



Ecosystem services	Total value (USD million)	Average annual value (USD/ha)	Benefits per unit of investment (USD)
Mangrove fishery & other product harvests	144.97	752	11
Support to off-site fisheries productivity	360.95	1,872	26
Shoreline stabilisation & erosion control	258.13	1,924	19
Shelter against extreme weather	128.20	956	9
Wastewater treatment & sediment trap	168.17	872	12
Prevention of saline intrusion	134.06	695	10
Carbon sequestration	11.55	60	1
TOTAL	1,206.0	6,256	87

Table 1. The economic value and return on investment from mangrove planting 1999-2019

conditions, and are subject to recurrent shocks, stresses and pressures. In addition, many towns and industries further afield depend on the disaster risk reduction services provided by mangroves, and even global stakeholders benefit from the climate change mitigation offered by the 1.25 million tCO₂e stored in mangrove forests and soils in the project planting sites.

The economic impact is substantial. The study calculated that mangrove ecosystem services worth USD 125 million* are being generated in the year 2019 alone. This figure will continue to increase into the future – in another 20 years, by 2038, the annual value of mangroves planted is projected to reach almost USD 150 million. In total, the project is estimated to have added ecosystem services with a value of USD 1.2 billion over its first 20 years of operation – an average of USD 6,256/ha/year (Figure 2, Table 1). It is worth noting that a large proportion of this value – more than half – is accounted for by disaster risk reduction and other coastal protection services.

By the end of 2018, TMNF had invested around JPY 1.23 billion in the Mangrove Planting Project (equivalent to almost USD 14 million at current price levels). Comparing this figure with the value of ecosystem services added over the course of the first four phases of the project suggests that, to date, each USD (or JPY) of TMNF's investment has generated 87 Dollars (or Yen) of economic benefits for coastal communities, surrounding areas and the global community. This figure has risen steadily over time, in line with the growth in planted area, and as mangroves have increased in maturity and thus in the level of ecosystem service benefits they are able to generate. The return on investment is impressive: over its first four phases, the Mangrove Planting Project displays an economic internal rate of return (EIRR) of 157%.

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* All values in the study were expressed at constant 2019 price levels, in international USD. This accounts for the effects of inflation, and also adjusts for differences in real prices and values between the countries in which the Mangrove Planting Project was carried out. It thus allows for costs and benefits generated in different years and places to be directly compared, combined and aggregated.