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## Natural ecosystems as coastal development infrastructure



which most development planning in coastal areas is carried out ('sustainable development' and 'integrated coastal zone management') is founded on such principles.

Economic measures and indicators strongly influence how trade-offs in coastal development are conceptualised and decisions are made, and are important for choices in allocating funds, resources and lands. However, the economic calculations that underpin these decisions remain fundamentally incomplete, because they omit an important set of costs and benefits: the values associated

More than 40% of South and Southeast Asia's population (about 864 million people) live within 100km of the coast, along a combined coastline length of some 200,000km. This population occupies some of the richest and most extensive tropical coastal and marine ecosystems in the world, and benefits from the valuable services they provide.

The region's coastal zones have long been the focus of intense development but since the Indian Ocean tsunami of 2004, there has been a steep increase in the time, effort and funds invested in rebuilding and expanding infrastructure in coastal areas. Yet, this mandate to develop and the rush to rebuild have come at a significant cost — the widescale loss of coastal ecosystems, and attendant reduction in the economically valuable goods and services that they provide.

An inherent tension exists between economic development and natural resource conservation. This tension is related fundamentally to making choices about how to produce, consume and invest. Actors in both conservation and development sectors are well-aware of these trade-offs, and a host of policies and laws exist which attempt to balance the competing demands on coastal lands and resources. The rhetoric under

with ecosystem goods and services. Coastal ecosystems should be treated and counted as other elements of development infrastructure: as a stock of facilities, services and equipment which society and the economy need to function properly.

The role of natural ecosystems in economic development is, at best, under-valued persistently, and at worst, ignored completely in decision-making. This is leading to ecosystem degradation and loss. Ecosystem undervaluation may, therefore, ultimately undermine many of today's efforts at sustainable, equitable, and integrated coastal development and economic growth.

This newsletter describes why investment in coastal ecosystems as infrastructure is important. It also emphasises that a paradigm shift in calculating development and conservation trade-offs — moving from approaches which do not factor in ecosystem costs and benefits, to those which recognise, count and invest in natural ecosystems as an economic part of coastal infrastructure - is critical.

*Photograph: Banda Aceh © Nishan Perera. Thumbnails top & middle © Nishan Perera; bottom © Sriyanie Miththapala*

# Articulating the link between ecosystems and human well-being

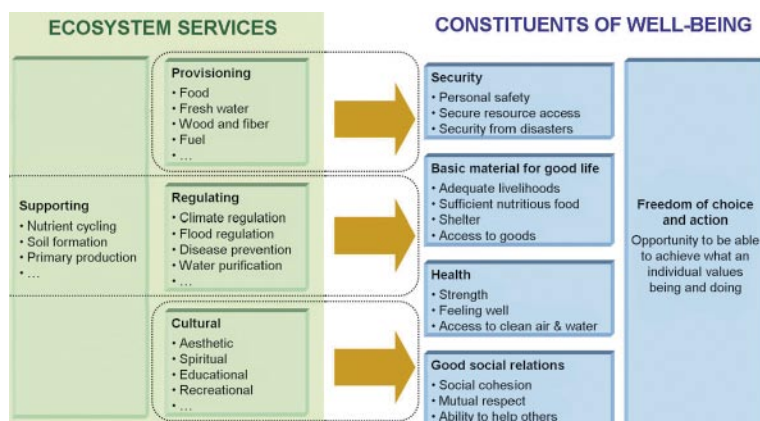
Infrastructure is defined as 'the stock of facilities, services and equipment that is needed for the economy and society to function properly'. Few people would deny that roads, ports, bridges, water supplies and buildings provide the foundations for coastal development. It is therefore hardly surprising that 'development' investments have always had such a heavy focus on ensuring that sufficient funds are ploughed into this vital capital.

However, conventional definitions of infrastructure (and the bulk of investments in it) have ignored one of the most important (and productive) components of coastal infrastructure — natural ecosystems such as wetlands, forests, coral reefs, mangroves, sandy beaches and other habitats. While recognising and focusing on the urgent needs to provide good living conditions, safe settlements, adequate water supplies, sanitation facilities, power and so on, coastal development planning rarely considers the role that ecosystems play in providing for these essential goods and services. In most instances 'built' infrastructure cannot deliver adequately without a well-functioning natural environment, and in many cases ecosystems themselves provide a cost-effective and efficient mechanism for assuring that essential goods and services are available to coastal populations.

Like other components of infrastructure, ecosystems provide the basic life support services and facilities that support economic production and consumption, and are required for society to function and grow. Wetlands, for example, play an appreciable role in wastewater purification and treatment. Coral reefs and mangroves provide a critical set of defences against floods, storms and tidal surges. Forests generate important services which protect and assure water quality and supplies for both domestic and industrial uses. Natural ecosystems also provide services that contribute enormously towards upholding economic productivity, and generate goods which are key to household livelihoods and commercial industries. In short, ecosystem well-being is connected intimately to human well-being.

The Millennium Ecosystem Assessment offers a useful framework for understanding the linkages between ecosystem services and human well-being. It shows how 'ecosystem infrastructure' generates a series of services which in turn underpin social and economic functioning in coastal areas.

Source: Emerton, 2006; Millennium Ecosystem Assessment, 2005; [www.un.org/millenniumgoals/](http://www.un.org/millenniumgoals/)



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Coral reef, Koh Bon Island, Thailand  
© Nishan Perera



# Coastal Ecosystems

## Counting coastal ecosystems as development assets

While vast amounts of money have been sunk into bricks, mortar and pipes, valuable natural capital has remained largely absent from the investment equation. At the worst, there has actually been a 'negative investment' process whereby coastal ecosystems have been destroyed, degraded and converted in the course of expanding the built environment, or in rebuilding after the tsunami.

A review of past patterns of coastal development in the region reinforces the observation that decision makers perceive that there are few economic benefits associated with the conservation of natural ecosystems, and few economic costs attached to their degradation and loss. The expansion of agriculture, aquaculture, urban and tourist infrastructure has involved the widespread conversion and reclamation of natural habitats. Intensive harvesting of natural resources has been promoted as a means of generating income, employment and foreign exchange earnings, and has placed high and often unsustainable demands on the natural resource base. At the macro-level, undervaluation of ecosystems in economic policy formulation has often hastened processes of coastal environmental degradation and species loss — for example through subsidies to fisheries, tax breaks and fiscal inducements to 'reclaim' natural habitats, and low or non-existent environmental penalties and fines.

Ecosystem under-valuation remains a persistent problem in coastal development planning. When projects and developments are planned, balance sheets rarely tally up the economic benefits that ecosystem goods and services provide, or recognise that there is a tangible return to investing in their conservation. At the same time the economic costs, losses and opportunities foregone that are incurred when ecosystems are degraded are simply not factored in when investment, land and resource use alternatives are weighed against each other. For the most part, the calculations that underpin coastal development decisions therefore remain fundamentally incomplete, because they (at best) under-estimate or (at worst) ignore altogether ecosystem values.

Marine and coastal tourism is the largest industry in the Maldives, for instance, directly accounting for 20% of GDP and 40% of employment. Its wider effects produce 74% of national income, 60% of foreign exchange earnings, and 90% of government revenues. National economic indicators and development statistics rarely reflect these broader values.

Ecosystem goods and services also in many cases provide the basic infrastructure which underpins household production and consumption — a particularly critical set of values given that efforts to strengthen livelihoods and alleviate poverty form the major focus and primary policy goal in today's development agenda. In parts of Indonesia, for example, the traditional use of mangrove products has been valued at over 3,000 USD/ha/year, contributing up to a half of the income of the poorest households. In Southern Thailand, mangroves contribute more than a quarter of per capita GDP.

Ecosystem services typically have an enormous value in upholding economic productivity, safeguarding settlements and reducing vulnerability. On the Baluchistan coast of Pakistan, mangroves directly contribute around 1,300 USD/ha/year to on-shore fisheries (about 95% of local income), and are responsible for providing the nursery and breeding habitat upon which up to a half of off-shore commercial fish stocks depend (a value of some 900 USD/ha). The value of coral reefs, including coastline protection, is gauged to be hundreds of thousands of dollars per square kilometre in Indonesia, and close to a million dollars in the Philippines. In Sri Lanka, coastal wetlands provide critical flood protection and water treatment services to surrounding urban settlements, to an economic value of 2,500 USD per hectare.

These values tell an important story, and belie the wisdom of omitting ecosystem costs and benefits from coastal decision-making and investments. Ecosystems should, in fact, be considered as inseparable from other parts of development infrastructure, and their value in underpinning economic production and consumption needs to be factored into decision-making. Their maintenance and upkeep requires an equal – or greater – priority when coastal development is being planned, and investments are being made.



Fishermen in Muthurajawela marsh, Sri Lanka © Sriyanie Miththapala

# The need to invest in ecosystems as coastal infrastructure

Just as is the case for any type of infrastructure, there is a strong economic rationale and high pay-off to investing in coastal ecosystems. In contrast, failing to count and invest in ecosystems as assets, either in post-tsunami reconstruction or within the context of longer-term coastal development processes, is not only short-sighted in economic terms, but the costs, losses and foregone values that result may ultimately undermine many of the goals that so much time, effort and funds are being channelled into — cost-effective, equitable and sustainable development for all in coastal areas.

Despite their high economic value, there is massive under-investment in natural ecosystems. Both public and private investment in ecosystem conservation remains low, across the region - despite a strong emphasis on the importance of building coastal infrastructure. The belief that infrastructure development lies at the heart of economic growth and poverty reduction in South and Southeast Asia is frequently reiterated by government decision-makers and representatives of development banks and donors. Yet natural ecosystems are rarely, if ever, seen as part of these investment needs, or as a source of development and economic returns. Budgets to conservation remain low, and continue to be positioned as pure 'conservation' funding rather than investments in vital development infrastructure.

A burning question is, therefore, how to move forward the paradigm which drives planning in coastal areas, and to find ways of stimulating investment in natural ecosystems as a core component of infrastructure. A shift in the way in which development and conservation trade-offs are calculated is required — moving from approaches which fail to factor in environmental costs and benefits, to those which recognise natural ecosystems as an economic part of coastal infrastructure. A proper valuation of the development benefits and returns to conserving ecosystems, and the costs of their degradation and loss as expressed through the erosion of basic goods and services, is clearly one important change that needs to take place. Until the economic calculations that underpin land, resource and investment decisions start to take these costs and benefits into account, they will remain incomplete, misleading, and in many cases sub-optimal in development terms.

At the same time it is necessary to go beyond merely valuing ecosystem costs and benefits, and start also to reflect them in the calculations that are used to inform decision-making. However high the value of coastal ecosystems is demonstrated to be in theory, this has little meaning unless it actually translates into changes in real-world policy and practice. Yet a better understanding, and more accurate quantification, of the economic benefits of ecosystem conservation (and economic costs of ecosystem degradation and loss) is still reflected weakly in the policies, markets and prices which determine the trade-offs and decisions faced by public policy-makers, private landholders and resource users whose actions have the potential to influence coastal ecosystem status. There remain few incentives or requirements to take account of ecosystem values when calculating land, resource or investment trade-offs, or to conserve coastal ecosystems in the course of planning and carrying out economic activities.

Until such benefits and returns are not just expressed, but also reflected in conservation and development planning, policies and management practice, there is a real risk that coastal ecosystems will continue to be degraded and lost, however great their value has been demonstrated to be on paper. In contrast, if ecosystems are recognised as assets which yield a flow of services that are required for the economy and society to function properly, the human, social and financial capital that is required to sustain them (and which they, in turn, sustain) also needs to be allocated to their upkeep. In order to ensure their productivity and continued support to human development, ecosystems need to be maintained and improved to meet both today's needs as well as intensifying demands and pressures in the future — just like any other component of infrastructure.



*Pulau Baleh, Indonesia © Nishan Perera*



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