

## Framing the flow

Innovative Approaches to Understand, Protect and Value Ecosystem Services Across Linked Habitats



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Innovative Approaches to Understand, Protect and Value Ecosystem Services Across Linked Habitats

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#### Preface



Marine, coastal and freshwater ecosystems are complex and characterised by an array of ecological functions and processes essential to the regulation and continued provision of ecosystem services of direct or indirect benefit to human welfare and society. Ecosystem services flow from their source to sink across both land- and seascapes, and call for the integrated management of connected ecosystems to optimise the flow of these services and benefits.

This publication highlights the interconnectivity and linkages between coastal ecosystems (mangroves, coral reefs, seagrasses, estuaries, and lagoons) across environmental, economic, social, and management contexts. It presents innovative approaches to better understand, protect and value ecosystems services across linked habitats, informing the trade-off of different land-use management decisions and the effects on healthy systems from drawing on ecosystem services from linked habitats.

Worrying findings are presented on the impacts of rapid natural and human induced change on the health of coastal ecosystems, the implications of these disruptions for ecosystem functioning and the delivery of ecosystem services. At least 35% of mangroves and 29% of seagrasses have been lost in the last two decades, while coral reefs are estimated to have lost up to 19% of their original area on a global scale. A further 15% of coral reefs are seriously threatened with loss within the next 10-20 years, and 20% are under threat of loss in 20-40 years, with potentially negative impacts on fisheries and food security for vulnerable coastal populations.

Understanding the benefits of maintaining and indeed restoring the flow of ecosystem services across the complete supply chain can result in reducing risk and securing the continued supply of those services.

Finally, information on ecosystems services flows can allow planners to make the case for truly integrated management approaches, especially those bridging the divide between terrestrial watershed management, coastal zone management and marine ecosystems-based management, by stressing how an integrated approach can deliver multiple benefits to society and the environment.

This report presents further evidence of the need to develop appropriate economic and governance frameworks that best protect the essential services from natural ecosystems that human populations will need for the future.

> Achim Steiner UNEP Executive Director United Nations Under-Secretary General



#### **Executive Summary**

This publication presents a framework for an understanding of the connectivity between tropical coastal ecosystems (including mangroves, seagrasses and coral reefs) across environmental, economic, social, and management contexts. It presents innovative approaches to better understand, protect and value ecosystem services across linked habitats, and to allow informed trade-offs between different land-use management decisions and consequent changes in different ecosystem services.

Coral reefs, mangroves, seagrasses and nearshore terrestrial ecosystems are highly interconnected by their physical and biological dependence on each other. The importance of this interdependence to ecosystem function and service provision is becoming increasingly recognised, particularly in the context of the disruptive impacts of human drivers of change.

Tropical terrestrial and coastal marine ecosystems provide a wide range of benefits and services and can be assigned substantial economic value. The 'flow' of these services can be traced over space and time, linking producing and consuming systems and human communities. Quantification of these flows is essential in order to define the ultimate beneficiaries of services, a process which can be achieved through a combination of biophysical and socio-economic analysis and modelling. One example of this approach would be the valuation of the flow of ecosystems services that can be supported by a 'with or without' scenario, using a 'what if' approach, i.e. what may happen if we stop the flow and modify the links between ecosystems?

In converting ecosystem functions (regulation, habitat, production, and information) to a quantitative value, among many aspects to be considered are: the evidence for non-linearity in ecosystem services; the spatial extent of the entire linked ecosystem responsible for service delivery; the future use of the resources; and variation in value according to the scale considered. Spatial mapping, combined with a definition of benefits and beneficiaries, can be a useful tool to support the valuation process and identify regions more likely to provide higher or lower levels of value.

Recognising the dynamic links between terrestrial, coastal and marine ecosystems, and how ecosystem services flow across these systems can help businesses improve their environmental performance, reduce risks and costs, and gain public support. Adopting the concept of flows of ecosystem services as part of business planning involves acknowledging the spatial and temporal coupling between areas where ecosystem services are generated and areas where the services are being used. It also involves understanding the mechanisms through which ecosystem services flow from source to points of usage. Each of these three components of ecosystem service – flows, source and use – are crucial for maintaining a healthy supply of critical ecosystem services, and therefore information about them is necessary to inform business decision-making.

Businesses have many additional reasons for ensuring that sources of ecosystem services are maintained over time. Maintaining access to these resources and guaranteeing their sustainable use enables businesses to operate at a desirable level of productivity, keeping costs of inputs low, avoiding scarcity, and reducing risks to the supply chain.

The awareness of the linkages between coastal ecosystems and the integration of the flow concept in management processes could lead to a more comprehensive approach which includes recognition of the need to protect the natural capital that generates services, together with the underlying ecological connections that regulate the flow of these benefits across systems. Not taking into account the interconnections between ecosystems and the flow of ecosystem services among them carries the significant risk of individual ecosystems deteriorating despite management efforts, with the consequence of loss in services and the potential to cause some ecosystems to approach their ecological tipping points. Information on flows allows planners to make the case for truly integrated management approaches, especially those bridging the divide between watershed management, coastal zone management and marine ecosystem-based management, by exhibiting how this improves the efficiency of overall management.

The transboundary nature of ecosystem service flows holds inherent challenges for the policy makers as new, holistic and cross-sectoral approaches must be developed to address the needs of complex groups of stakeholders and agencies. In these novel governance structures, the availability of simple, accessible and comprehensive information will be critical to support informed decisionmaking. Policy and decision makers will need to incorporate appropriate tools for resolving conflicts and trade-offs. The ability of policy makers to address the key challenge of reducing poverty worldwide is dependent on building the capacity to appropriately manage and preserve ecosystems and the services they provide. There remains a general lack of integration of knowledge of ecosystem services into development policy and the concept of ecosystem flows may help to fill this gap.



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