Sustainable Blue-Green Economy
in Sri Lanka and the Indian Ocean

In July 2018, MIND brought together key stakeholders from the research community, government, business and civil society, to further explore ideas on the sustainable blue-green economy in Sri Lanka and the Indian Ocean, and to define pilot projects and develop applied research proposals for major funding, and for subsequent implementation of research results and policy recommendations. This focus on sustainable development of ocean resources is supported by the recent report of the Presidential Expert Committee (PEC) on Sustainable Sri Lanka 2030 Vision – Strategic Path, which envisages Sri Lanka as a prosperous, upper middle income, green and socially harmonious Indian Ocean hub by 2030.

1. Background

1.1. Indian Ocean and South Asia Region

The extensive marine waters of the South Asian region around Sri Lanka contain some of the richest concentrations of biodiversity in the world and support the livelihoods and food security of millions of people. The coastal zones of the five countries (Sri Lanka, as well as Bangladesh, India, Maldives, and Pakistan) also contain about 40% of the economic activities in the region and most of their critical economic infrastructure. Further, economically valuable non-living resources like petroleum, natural gases and minerals are found within the EEZs of the countries and presently only few of these resources are being commercially exploited. While the oceans offer the potential to create considerable socio-economic and cultural benefits, however, they face significant existential ecological risks that can negatively affect the social and economic prospects of all countries, particularly those that are acutely dependent on oceans.

With its cross-cutting nature, the emergence of the Blue-Green Economy concept offers a unique opportunity to address complex and inter-connected challenges, without compromising economic growth. With sustainable growth the new focus of the global policy discourse, many countries have embarked upon the development of more integrated ocean governance frameworks which help avoid, or at least limit, inter-sectoral conflicts at the outset, and to highlight any transboundary implications of coastal/oceans development. Countries seeking to develop their blue economies have, to varying degrees, acknowledged the need for policies that better align future economic growth in their seas with maintaining or even restoring ocean health. Sri Lanka has already made significant progress in terms of the development of national blue-green economy initiatives.

1.2. Sri Lanka

Given Sri Lanka's shared ecological assets, the common threats to these assets from changing global and regional weather patterns, and the need for multi-stakeholder cooperation to effectively deal with these threats and also to leverage these assets for sustainable development, Sri Lanka must develop integrated policy responses to address these issues. The Munasinghe Institute for Development (MIND) has taken the lead in coordinating research initiatives within Sri Lanka on blue-green economy and ocean issues. In this regard, MIND has identified several key drivers and threats to focus on initially: i) reducing ocean pollution; ii) protection and management of marine resources; iii) promoting sustainable fishing

and protecting marine mammals; and (iv) addressing national security concerns. Each threat is further discussed in section 2. Table 1 below summarises the drivers and threats and analytical tools and methods, under each category.

Table 1- Drivers, threats and analytical tools and methods for sustainable blue-green ocean economy research project

Drivers		Pollutants	Sri Lanka Impact (threat) areas				Fishing, Livelihoods & marine mammals	National security
			Marine and near shore Eco-systems					
			Coral Reefs	Mangrove	Sea Grass	Sand and other		
Climate Change and extreme weather events			X	X	X	X	X	X
Mega developments (ports and cities BRI)			Damages and/or complete loss			X Coastal erosion and structure	X Invasion of natural habitats	X
Economic growth	Tourism	✓ Plastics ✓ sewage ✓ Laundry and other chemicals ✓ Other	✓ Damages due to hotel construction ✓ Over visitation	Damages due to hotel construction		Beach erosion due to hotel constructions	✓ Over fishing (local consumption and export) ✓ Over visitation & impact mammals like whales and dolphins	
	Shipping	Oil spills, ship discharges					Damages to mammals eg: whales	
	Agric., Urban, Ind. Activities	Agric., urban & industrial run-off, other pollutants	Damage to coral reefs	Damage to, mangroves	✓	✓ Over consumption of sand ✓ Beach erosion	✓ Over fishing by fishing industry- SL-Southindia fishing-conflict ✓ Explore new livelihoods & activities (eg: marinas)	
	Individual consumption	plastics etc					Over fishing	
Analytical Tools & Methods								
Economic Valuations			X	X		X		
			Total economic valuation of marine and near shore resources					
CC impact analysis			X	X		X	X	X Sea level rise
Ecological Footprint Analysis (EFP)			Bio capacity of SL's marine economic zone					
Carbon mitigation analysis				X	X			
Material Flow Analysis		Physical account of Economy-wide ocean waste flow						
Life Cycle Analysis		X						

Supply/Value Chain Life Cycle Assessment (SVC-LCA)	X					

2. Primary Threat Areas and Preliminary Research ideas for Sri Lanka

2.1 Reducing Ocean Pollution

Sri Lanka has a densely populated coastal area with 14.6 million people residing along the 1600km coastline. This coupled with an ineffective waste management system mean that waste is often dumped into oceans, either from canals, by local councils or frustrated seaside residents with no other facilities. The main source of marine pollution is from plastics. Sri Lanka's dumps about 850,000 tonnes of garbage into the sea every year. This includes plastics, polythene and solid waste arising from tourism, fisheries and others.

Marine ecosystems are also a source of tourist revenue as activities such as scuba diving, snorkelling, and whale and dolphin watching are growing in potential. Biodiversity loss and habitat degradation caused by plastic pollution will affect these ventures which generate revenue and employment - the Bar Reef Marine Protected Area has provided employment for over 15000 people in the neighbouring areas

Any solution to tackle marine debris needs to intervene at different phases, from encouraging people to reduce their usage of single use plastics, to encouraging waste segregation and recycling to even direct and immediate attention through beach clean ups. While solid waste management has been in the spotlight we cannot ignore marine pollution merely because it is sometimes out of sight and thus out of mind. It is vital that we do not pollute our oceans by choking them with plastic that will survive for centuries as our legacy.

Impacts of this pollution on health is quite significant. The plastic enters the food chain, settles on the corals and pollutes beaches. Plastics get entangled in fishing nets and suffocate some sea animals. Whales and other fish eat this polythene and plastic, which gets stuck in their gut, killing them. Micro plastics also have severe toxic effects when ingested through the food chain. The pollutants harm the aesthetic beauty of the marine environment as well.

2.1.1. Research topics and actions

a) Drivers/Causes of Degradation –
  ➢ Sewerage
  ➢ Industrial
  ➢ Agricultural Runoff
  ➢ Marine Oil Spills
  ➢ Waste generated in both land–based activities and sea-based activities
  ➢ The discharge of oil/chemical during transportation of oil and accidents in the sea, offshore oil exploration facilities, disposal of non-degradable litter substances.
  ➢ The use of non-degradable waste.
  ➢ Increasing population
  ➢ Debris generated from numerous human activities including tourism.
  ➢ Fisheries and other related events.

- ➤ Releasing Ballast water
- ➤ Smoke emitted from vessels
- ➤ Faeces released through pipes
- ➤ pollution from tourism, from fisheries and based resources, from shipping and oil and chemical spills from shipping, sea dumping and pollution in offshore areas
- ➤ Consumption behaviours /(un)sustainable industrial production/ circular economy
    - a. Material Flow Analysis (MFA) to describe the nature and quantify the waste flow
        As Sri Lanka's economy focus more on efficient use of materials, our waste generation continues to increase. Outputs of many potentially harmful materials continue to increase. Physical accounts are urgently needed, because our knowledge of resource use and waste outputs is extremely limited.

        MFA creates an inventory of flows, stocks, and treatment processes and hence provides knowledge and understanding about a waste management system. However, an MFA alone cannot actually assess a system in view of certain goals, such as resource conservation, or protection of human health. For such purposes, the MFA has to be combined with further assessment methods such as risk assessment. MFA aids to quantify the resource potential to identify sources and pathways of valuable materials, recycling potentials, reuse options, and reduction of landfill volumes etc.

    - b. Supply/Value Chain Life Cycle Assessment (SVC-LCA) – Focusing on economic activities associated with specific products and services, this methodology estimates the materials and natural resources required for, and the environmental emissions resulting from that activity. This approach can be expanded to include broader sustainability analyses and tailored for ocean impact estimations.

b) Impacts
- Society – livelihoods, cultural impacts
- Economy – tourism, fisheries
- Environment – Erosion, fisheries, biodiversity, oil spills
- Valuation of impacts

2.2 Marine Ecosystems and Ecological Services

Sustainable management of coastal natural resources and their services is key to Blue Economy. The benefits of nature are classed in three broad groups:

1. Provisioning services are those that provide tangible, harvestable goods—fish,   shellfish and seaweed for food, but also mangroves timber, algae, minerals and health products.

2. Regulating services are the benefits ecosystems play in regulating our environment—coastal protection, prevention of erosion, water purification and   carbon storage.

3. Cultural services are the many non-material benefits derived from nature—recreation, beauty, as well as spiritual, intellectual and cultural benefits.

In Sri Lanka, an up-to-date assessment of the value of marine resources and their ecosystem services is lacking. Not only are marine resources poorly measured and understood, they are also rarely valued properly. Measuring the blue economy gives a country a first-order understanding of the economic importance of its oceans.

2.2.1 Research topics and actions

a) Status update of Coral Reefs
Complete status update on coral reefs is 10 years old (ref). Coral reefs are important resources for tourism, biodiversity and for local livelihoods. A comprehensive mapping of the locations and current status of coral reefs paves the way for protection measures. Potential areas could include:
a.1 Current size, status and where (mapping)
existing studies studies atus and where (mapping) year   Their Extent, Condition, and Management Status Arjan Rajasuriya & Alan T. White 1995 and 2008
a.2 Causes of coral reef damages
a.3 Impacts of CC on coral reefs
a.4 Impacts of damages on economy, society and environment

b) Total economic value of ocean and ecosystems
Environmental and resource degradation is already taking place in the ocean due to human interventions. Value placed on natural resources either encourages or prohibits such human induced resource depletion. Valuation of ecosystem services therefore key to sustainable management of marine resources. In Sri Lanka such a valuation is absent.

Similar studies have been carried by-
i) Prof.Prashanthi Gunawardane –"valuation of ecological services from Gal Oya river basin".
ii) Gunawardana & Rowan, 2005. Economic valuation of a mangrove ecosystem threatened by shrimp aquaculture in Sri Lanka https://www.ncbi.nlm.nih.gov/pubmed/16151655

Multiple valuation methods can be used :
b.1) traditional valuation methods
   -   Revealed Preference Methods(Hedonic pricing, Travel Cost etc.,), and
   -   Stated Preference Method (Contingent Valuation, Choice Experiment etc.,)
Examples include;

Economic costs of oil spills – economic cost of ecosystem damage due to oil spills. As Sri Lanka expects to develop further as a maritime port hub, such valuations are important for safeguarding the natural resources

Valuation of marine mammals and coral reefs – currently, over visitation is serious threat to marine habitats (even lives of mammals) and is a huge economic and a political issue. A scientific valuation of carrying capacity of marine habitats and the right cost of visitation are topical research areas.

b.2) Ecological Footprint analysis of Sea - bio-capacity (availability) and footprint (consumption) of marine ecosystem

Ecological Footprint (EF) measures how much of the sea (and Earth) we use for our food, clothing, play, energy, shelter, waste, etc. Ecological Footprints can be calculated for the entire country or region. EF calculations are simply estimates or an inventory of how much of the renewable and non-renewable resources we use. If EF exceeds the amount of renewable resources available (bio capacity) for a country, it is considered unsustainable. EF and available bio capacity can be traced over a period of years together with external changes (eg: prominent policies or social changes) to analyses patterns and causes of resource consumption.

c) Mangroves: Impacts of climate change, adaptation and mitigation potential
(climate change impacts and adaptation also apply to Sections 2.1, 2.3 and 2.4)

In terms of adaptation, a study of impacts of climate change on natural resources and their impacts of socio-economic system is important for long term policy planning.

c.1) Status of Mangroves (focus on cc adaptation)

c.2) Identifying carbon sinks (focus on mitigation) - potential of mangroves and sea grasses and ocean as a carbon sink (IUCN has already done a preliminary study)

c.3) Effects of water currents

d) Sand mining
d.1) The extent and drivers of sand mining
d.2) Impacts of sand mining and not mining (regulations stopping sand mining) on society, economy and environment. Existing studies – Maha oya sand mining and its impacts on coastal erosion – (ref?)

e) New technologies, business models and innovations for promoting or restoring ocean health

f) Capacity building

In order to increase the awareness and technical know-how on managing marine resources, building a platform for capacity building is proposed through introducing a range of post-graduate studies.

2.3. Fishing, Livelihoods & Marine Mammals

Blue economy also covers the study of how money can be made and livelihood opportunities created (aiming towards eliminating poverty), A growing ocean-based economy could thrive in a context where principles of sustainable natural resource management would shape the investment environment.

In the ocean economy new forms of economic activities are emerging. Investments in the ocean have traditionally consisted of living or renewable resources (such as fisheries) as well as businesses that exploit the ocean non-renewable resources (including extractive industries, such as dredging and offshore oil and gas). Large industries such as tourism, coastal development, shipping and port

infrastructure and services are also reliant on the seas and the coasts as a setting for economic activities. Significant opportunities will be available through new technologies to harness the ocean's full potential.

2.3.1 Research topics and actions

To explore the question – as economic growth intensifies (industries grow and new ones emerge), how can the ocean conservation and exploitation of blue economic resources be sustainably managed? Table below identifies a number of ocean industries and their economic drivers.
Specific question can be -

a. Sustainable levels of fishing capacity –
What are the ecological aspects that need to be protected to maintain a healthy, sustainable fish stock? For example, should we ban jellyfish harvesting?

b. Impacts of industry on marine mammals – eg: of shipping, tourism

c. Climate change impacts on fish (stock) and mammals

d. Geo-politics – geopolitical and other external influences on ocean industries

e. Livelihoods - Table 2 below summarises some potential industry areas for Sri Lanka to investigate further.

Table 2. Existing and Potential Ocean industries

Potential Industries	Economic Driver
Sustainable fisheries / Aquaculture	Food security & Demand for protein
Pharmaceuticals	R&D in healthcare and industry
Seabed mining	Demand for minerals
Oil and gas	Demand for fuels
water Desalination	Freshwater shortages
Shipping	Growth in seaborne trade
Port infrastructure and services	Meeting international regulations
Eco Tourism and recreation	Growth of global tourism
Coastal development	Coastal urbanization/ Domestic regulations
Carbon sequestration -Blue carbon (i.e. coastal vegetated habitats)	Growth in coastal and ocean protection and conservation activities
Waste disposal & management	Growth in coastal and ocean protection and conservation activities
Technology and R&D	R&D in ocean technologies

2.4. National Security

The Institute of National Security (INS) of Sri Lanka has identified five areas of study in relation to the overall security of Sri Lanka: Defense, Political Security, Economic Security, Environment Security and Social Security.

2.4.1 Research topics and actions

In relation to the topics identified earlier, INS will be a partner for research on:

1. Chinese Belt and Road Initiative (BRI) - How to ensure economic, social and environmental security whilst benefiting as a partner of the BRI? With Sri Lanka centrally located on the Maritime Silk Route, the country will gain from heavy infrastructure investments related to Ports (Colombo & Hambantota) and increased shipping. It is important to analyse how such heavy investments and infrastructure will impact (positively and negatively) on people, jobs, economy and environment. The increased use of shipping lanes will also have sustainability implications. The maritime investments and flows of goods are also linked to development of Sri Lanka as an Indian Ocean hub for financial, ICT and data services – as highlighted in the Sustainable Sri Lanka 2030 Vision.

Eg., The Hambantota Port is located less than 40 km away from Bundala National Park, the country's first RAMSAR site. The region is known as an important stopover for migratory birds like the Greater Flamingo. Local environmental groups, such as Center for Environmental Justice, have voiced concerns that the Hambantota Port harmed the Karagan Levava Lagoon, an "important refuge" for migratory birds according to Sri Lankan government documents.

MIND and INS would also welcome a Chinese research institution to become a partner in this area.

2. How protection of coastal ecosystems and marine environment, will benefit food security and economic security,

3. Combating environmental pollution/ disaster management - highlighting the importance of environmental protection for national security, and exploring how the military could play a key role in disaster management.

4. Long term impacts of climate change, especially on security-related areas.

3. Workshop Outline

List of participants and organizations –

Names	Institutions
Dr, Risa Morimoto	SOAS, London.
Dr. Terney P.Kumara	MEPA
Ms. P.R.S.A. Abeyraathna	MEPA
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Prof. Ruchira Cumaranatunga	University of Ruhuna
Mr. Rohan Masakorale	Shipping
Mr. Sanith De S Wijeyeratne	CEO, CCC
Mr. Dilisiri Welikala	Kite Surfing Lanka

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Dr..Prashanthi Gunawardane	Univ. of SJP
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Ms. Kushlani Dissanayake	University of Ruhuna
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