

# Why We Need The Oceans

Effective management of oceans is clearly needed if society is to benefit from the ocean's ecosystem services in the long term and meet the goal of sustainable development.

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01

The oceans cover 71 percent of Earth's surface and descend to depths sufficient to fully submerge the highest mountain. This vast liquid environment remains dynamic with water constantly moved by vertical and horizontal currents influenced by the planet's rotation, gravitational forces of the sun and moon, and atmospheric conditions. The fluid property makes the environment an open and interconnected one where tides and currents persistently carry waste across geopolitical boundaries.

At least half of Earth's oxygen comes from the oceans, generated by tiny drifting phytoplankton. At the same time, it absorbs and removes carbon from the atmosphere. The movement of water across all oceans is known as the great ocean conveyor belt system. There are also density currents where warm surface layers shift water from the tropics to the polar region, cooling, sinking, and gradually moving along the bottom of the ocean back to the tropics. Both systems are aided by the remarkable properties of water, to exist as a liquid, gas or solid, distribute and regulate heat in the atmosphere, and drive weather patterns.

The oceans hold an enormous volume of water because of its depth, which results

in diverse environmental conditions from the surface to the ocean floor. Upon descending into the ocean, decreasing light, primary productivity, temperature, dissolved oxygen, current strength, and environmental fluctuation, contrast with increasing nutrients and pressure. This vertical gradient results in zones with different properties, each favoring specific biological communities that have evolved and are best suited to it. The oceans therefore accommodate a massive variety of species that have adapted to these varying conditions.

Deep ocean species appear bizarre with large mouths, small bodies, and large or no eyes. They give an indication of an environment that is cold and totally devoid of light. Yet, it is not just a few species that have evolved to live in such conditions, but entire biological communities. It is surprising that new habitats such as deep-sea vents were only discovered in the 1970s and cold-water reefs in the 1990s. Scientists were puzzled by how rich the benthic community was around hydrothermal vents. Worms, clams, mussels, shrimps, crabs, and fishes, all new to science thrived without sunlight energy needed to drive photosynthesis. They were instead driven



02

by chemosynthetic bacteria on which other organisms fed or formed a symbiotic association with.

## Ocean Resources

The oceans have provided people with both living and non-living resources since the dawn of civilisation. Minerals such as salt, magnesium, iron, cobalt, copper, nickel, sand, and gravel have been mined or extracted, and active drilling for crude oil is widespread. The marine environment supports an incredible diversity of species ranging from microbes to Earth's largest living creature, the blue whale. It has 35 animal phyla compared to 11 on land. So far, only 250,000 of the estimated more than 1 million species have been described and named, and this excludes 10 to 100 million microbial types. What is known is that marine biodiversity is greater than terrestrial biodiversity. More familiar are the specialised habitats of coral reefs, seagrass, and mangroves found mainly in the tropics. They support specific biological communities and their high primary productivity makes them a valuable exploitable resource.

Much more is known about marine biodiversity in the upper layers of oceans

and shallow seas, which show a general distribution pattern of high species richness in the tropics compared to the temperate region. At the same time, species richness varies increasing from east to west along the equatorial Pacific and Atlantic Oceans and is greater along their western than eastern rims. Biodiversity surveys have been restricted to shallow coastal seas and continental shelves, which make up only 5 percent of the ocean environment.

## Killing The Oceans

The vastness of the oceans anesthetise people with the perception that it can provide an inexhaustible supply of food and materials and that it is also a massive absorber of waste and pollutants. This is further exacerbated by the 'out of sight, out of mind' mentality where a deforested area in plain view attracts wide attention but a dead reef does not because of visual obscurity. Waste dumped into the sea usually stays hidden, either sinking or carried to parts of the ocean out of view. While there is much about marine biodiversity that we don't know about, humans have already driven about twenty species including the Steller's sea cow and the Caribbean monk

seal to global extinction, mainly by hunting.

Seas and oceans are a downstream environment. Waste and pollutants generated on land will wash into the sea. Or if they are airborne, will also settle over the ocean surface. Using the sea as a convenient waste dumping ground resulted in habitat degradation and the weakening of ecological integrity, which in turn depresses biological productivity and the abundance and quality of seafood. Further unmanaged exploitation and destructive fishing methods will only lead to collapse of the ecological carrying capacity of marine systems.

A published study by Diaz and Rosenberg in 2008 showed that nutrient enrichment from agricultural run-off and sewage discharge have led to increasing marine dead zones devoid of dissolved oxygen where life cannot be sustained. The annual release of nitrogen from land into the rest of the environment more than doubled since 1950 based on the Millennium Ecosystem Assessment in 2005. Other harmful pollutants include heavy metals, pesticides, and persistent organic pollutants that disrupt endocrine functions or cause cancer in marine species as well as humans.

Decades of litter, mostly plastic dumped into the sea resulted in the Great Pacific Garbage Patch, discovered only in 1997. It extends an astounding 1.6 million square kilometres. Floating marine litter is estimated to kill more than 1 million birds and 100,000 marine mammals and turtles a year from ingestion or entanglement. Lost and abandoned fishing gear continue to trap fish and other sea creatures, killing them needlessly. The litter also helps to transport invasive species between seas and oceans. The impact of plastic litter to marine life has been known for a long time but the potential impact on humans was only recently established and is now receiving widespread attention. Plastic litter does not decompose, but breaks into tiny fragments known microplastics, small enough to be ingested by zooplankton and filter-feeders and accumulating through the food chain to end up in the seafood we consume.

There is consistently no good news. The extent of coastal habitats such as mangroves, seagrass beds, salt marshes, intertidal flats, continue to decline, while

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03

tropical reefs suffered significant biodiversity decline globally since the 1970s according to the third Global Biodiversity Outlook published in 2010 by the Secretariat of the Convention on Biological Diversity. About 70 percent of the developing world's untreated industrial waste are dumped into rivers, lakes, and oceans, and 70 percent of the world's fisheries have been overfished beyond recovery for most. A 2003 study by researchers Myers and Worm concluded that many commercial fisheries such as the once abundant Atlantic cod have collapsed within the last four decades.

### East Asia

The world's average coastal population (within 100km of coastline) is 40 percent but in East Asia, it is disproportionately high at 77 percent. This pressure exposes the marine environment to unsustainable resource exploitation and environmental degradation that are further intensified by threats from climate change and natural hazards.

The "State of the Marine Environment Report for the East Asian Seas 2009" concluded that there is a steady decline in the quality of East Asia's marine and coastal waters from oil spills, contaminants from shipping, sewage, domestic wastes, industrial effluents, and urban and agricultural runoff. Sewage is a major source of organic pollution. Many of the coastal megacities in the regions lack adequate sewage treatment facilities and the high volume of untreated or partially treated waste discharged into

the sea places great pressure on the seas in terms of dissolved oxygen depletion and bacterial contamination. Inadequate sewage treatment and disposal has caused massive fish kills, aquaculture harvest failures, and human health risks in many populated coastal areas of Indonesia based on an assessment by coastal management researcher Dahuri in 1999. Unmanaged growth of popular coastal tourism sites without sufficient sewage treatment capacity has resulted in unacceptable seawater quality forcing drastic action, such as closure of the area until proper treatment facilities could be installed. This is a clear case of the area's environmental carrying capacity being exceeded by overcrowding, unmanaged development, and lack of waste treatment infrastructure. The recent case example of this is Boracay in 2018. However, this is not a new problem but reminiscent of earlier similar instances such as Pattaya in the 1980s.

Suspended solids in Asia's rivers quadrupled since the late 1970s, while two-thirds of the world's total sediment transport to oceans occur in Southeast Asia. From the 2000 report "Transboundary Diagnostic Analysis for the South China Sea" published by UNEP Regional Coordinating Unit / East Asian Seas, it is estimated that the rivers of Cambodia, China, Malaysia,

Thailand, and Vietnam discharged 636,840 tonnes of nitrogen to the coastal waters overlying the Sunda Shelf. Most serious is the rising level of nutrients from land-based sources leading to increased risk of harmful algal blooms. With increasing population and economic growth and the current low level of sewage treatment, eutrophication with its threat to public health will increase and potentially take on transboundary proportions. Industrial and domestic wastes are identified as the major sources of marine pollution in the region. A 2017 UNEP report on waste management in ASEAN countries indicated that municipal solid waste is increasing in the region and while much is buried in landfills, a significant amount is transported to the sea by rivers. A great proportion of this waste is plastic material. An assessment published in 2017 by a team of researchers led by Lebreton demonstrated that the main input of plastics to oceans is from land-based sources with the top twenty polluting rivers, all in Asia, contributing 67 percent of the world's total.

Southeast Asia is recognised as the global marine biodiversity center. It has one quarter of the world's coral reefs and one-third of the world's mangroves. These habitats maintain species richness higher than elsewhere in the world. Marine



04

ecosystems in Southeast Asia are also among the most productive in the world and of vast social and economic importance. For example, reef fish contribute 70 percent of fish catch and people depend on the ocean's resources for livelihood. Fisheries production of East Asian countries amounted to 40 percent of the world's catch, while aquaculture production is 87 percent of the world's total. However, while the region's natural coastal and marine resources are the richest in the world, they are subject to tremendous pressure from the expanding coastal population and rapid pace of coastal development. More than 90 percent of Southeast Asia's coral reefs are at high risk and mangrove habitat loss remains of concern. An estimated 3 million hectares of mangrove were lost to aquaculture.

Marine management priorities in Southeast Asia include improved regulation of the fisheries industry particularly the rapid growth of aquaculture and its associated environmental challenges such as excess nutrients, exotic species escape and use of disease-control chemicals. There is also an urgent need to address emerging problems such as marine litter (especially plastic) and invasive species. Various strategies have been adopted to manage the marine environment so that its resources can be harvested more

sustainably and without seriously affecting its ecosystem services, and its environmental quality kept intact. The Integrated Coastal Management (ICM) approach has been demonstrated to be an effective governance framework in East Asia as it integrates economic and environmental concerns, encourages stakeholder participation and community ownership, facilitates data collection, management and dissemination, and enhances the country's capacity to adhere to international conventions more closely. Regional experience with ICM implementation were compiled in the 2018 book "Local Contributions to Global Development Agenda: Case Studies in Integrated Coastal Management in the East Asian Seas Region" published by the Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) and Coastal Management Center (CMC).

### SDG 14 – Life Below Water

One of the global goals established by the United Nations General Assembly in 2015 to transform the world for sustainable development by 2030 focuses on the marine environment. Sustainable Development Goal 14 (SDG 14) calls for the conservation and sustainable use of the oceans, seas, and marine resources for sustainable

development. A review of the goal's progress in 2018 revealed the need for effective strategies and management to address overfishing, coastal eutrophication, and increasing ocean acidity. More protected areas for marine biodiversity are required together with increased research capacity and ocean science funding to help preserve marine resources.

Here, I wish to add that marine biodiversity protection is relevant to urbanised coasts and perhaps more so. East Asia's urbanisation rate is among the highest in the world with the majority of population concentrated in the coastal area. While coastal development has an impact on the marine environment, conservation measures including protection and habitat restoration can contribute to the preservation of marine habitats such as corals reefs and marine biodiversity in urbanised coasts. Urban coastal cities will continue to grow and they will have a role in accommodating marine biodiversity.

Can the oceans provide for human needs? Yes, but not at the rate resources are exploited and the degree of damage to the environment. The oceans sustain people but people in turn need to sustain the ocean. We need to switch gears and move into a management mode of sustaining ocean sustainability. 🌊

# ENVISION

THE ROAD TO ZERO:  
HOW CITIES CAN TACKLE WASTE AND GO CIRCULAR



## THIS ISSUE

Combating plastic and industrial waste. New Alliance to End Plastic Waste formed by the World Business Council for Sustainable Development.

Discover why we need the oceans, and what we can do to protect them. ALSO: Singapore and France join hands to fight e-waste.

Singapore builds state-of-the-art Integrated Waste Management Facility to treat multiple waste streams and synergise solid waste management with used water treatment.

# DOWA launches the new Modern Asia Environmental Holdings



Merged company centralises waste management and recycling operations in Singapore hub

DOWA, the leading Japanese waste management and recycling solutions provider, announced today the formation of the new Modern Asia Environmental Holdings (MAEH) in Singapore to strengthen its innovative offerings locally and regionally. The merged entity spearheads DOWA's strategic expansion across Southeast Asia by test-bedding cutting-edge solutions in Singapore and building a network of effective waste management and recycling capabilities across Southeast Asia.

The new MAEH brings together combined capabilities of Technochem Environmental Complex Pte Ltd (Technochem) and Dowa Eco-System Singapore Pte Ltd (ESG) under one umbrella to offer incineration, recycling and precious metal recovery capabilities as well as an end-to-end approach to help countries in the region address their growing environmental waste management and recycling needs.

Technochem specialises in the collection of chemical and water treatment, industrial cleaning services, incineration of waste and the sale of solvents and chemicals. It runs DOWA's first vertical combustion incinerator outside Japan and the first of its kind in Singapore and Southeast Asia at Tuas Industrial Estate.

"Singapore provides us with an excellent environment to test-bed some of our state-of-the-art waste management and recycling solutions. It is our hub for Southeast Asia and also our spring-board to the region. We are grateful for the support that we have received from the Singapore government and for its technological foresight and appetite for innovation," added Mr. Kobayashi.

DOWA currently has overseas operations in Singapore, Indonesia, Myanmar and Thailand, with a staff strength of almost 1,500 across this region.

## About the DOWA Group

DOWA consists of five different business groups that has accumulated technologies across the entire lifecycle of waste management: incineration, landfill, ash smelting, precious metal smelting, soil remediation, and electric equipment recycling. DOWA hires more than 6,200 employees across 5 different business groups:

1. Environmental Management & Recycling
2. Non-ferrous metal
3. Electronics Materials
4. Metal Processing
5. Heat treatment for automobile parts



# Contents

## Global Briefing

**018** Science-Based Approaches to Eliminating Plastic Waste  
*The World Business Council for Sustainable Development (WBCSD) is the strategic founding partner for the new Alliance to End Plastic Waste (AEPW) - a landmark effort to collectively address the problem of plastic waste in the environment.*

**026** Advancing Towards Zero Waste  
*The transition towards a regenerative and circular economy in cities.*

**032** Why We Need The Oceans  
*Effective management of oceans is clearly needed if society is to benefit from the ocean's ecosystem services in the long term and meet the goal of sustainable development.*

**038** Climate Resilience Yields Returns  
*To maintain target returns and ensure the most sustainable and resilient projects are financed, investors and lenders must consider climate resiliency in their decisions.*

## Policy

**044** A Recipe Against Food Waste  
*How data and business play a vital role in the fight against Food Loss and Waste (FLW).*

**052** Food Waste Reduction for the Environment  
*The World Wide Fund for Nature (WWF) creates innovative policies to tackle the global problem of food waste. What can this mean for the handling of our planet's future resources?*

**058** Recovering SCARCE Resources From e-waste  
*France and Singapore join hands to find breakthroughs in e-waste treatment.*

**062** Circular Economy for Singapore Food Security  
*Singapore might face uncertainties over her food security in an ever-changing landscape. Professor William Chen of the Nanyang Technological University in Singapore looks at some of the solutions to these contemporary issues.*

**068** Addressing Asia's Plastics Waste Problem  
*Innovative solutions to plastic pollution have emerged across Asia to cope with the growing piles of waste on land and in water. But are they truly effective?*

## Industry Spotlight

**074** Synergising Solid Waste Management With Used Water Treatment  
*Singapore builds state-of-the-art Integrated Waste Management Facility to treat multiple waste streams and synergise solid waste management with used water treatment.*

