

## Down the river and into the sea – plastic pollution and its consequences

For years, plastic pollution of our global ocean, rivers and coastlines has been on the increase. Today, plastic is found on the shorelines of every continent, above all close to popular tourist destinations and densely populated areas. This has complex and costly impacts on export revenues, employment, food security, and the health of marine ecosystems and biodiversity. Our authors call for a source-to-sea approach to tackle the problem.

By Lynn Sorrentino, Janaka Da Silva and João Sousa

Plastic is ubiquitous. The synthetic organic polymer made from petroleum has properties which make it ideally suited for a wide variety of applications, including in packaging, building and construction, household and sports equipment, vehicles, electronics and agriculture. Thanks to this wide range of applications, plastic provides many benefits to society. But this is only one side of the coin. Given their low degradation, coupled with unsustainable production, use and disposal, plastics and microplastics have become a severe transboundary threat, affecting livelihoods and economics, human and ecosystem health, ecosystem services and clean water supplies worldwide. The exportation of plastic waste to nations with little infrastructure to handle the transfer effectively and the overall mismanagement of plastic waste is affecting every ecosystem on the planet.

As a survey from 2017 shows, to date, 8,300 million tonnes of virgin plastics has been produced world-wide. What is above all worrying

about this is that out of these 8,300 million tonnes, 6,300 million is now waste with only 9 per cent recycled and 12 per cent incinerated. At 79 per cent, the majority of plastic waste is accumulated in landfills or the natural environment. And each year, another 300 million tonnes of plastic is newly produced, half of which is used for single-use items such as shopping bags, cups and straws. The sheer magnitude is staggering and is choking our ecosystems.

### How does plastic waste become plastic pollution?

Plastics are released into the environment at different stages of their life cycle. Transport sources include urban and stormwater runoff, sewer overflows, littering, inadequate waste disposal and management, industrial activities, tyre abrasion and wind. Plastic pollution in the ocean originates largely from the fishing industry, nautical activities and aquaculture. Un-

der the influence of solar ultraviolet radiation, wind and other natural factors, plastic breaks down into small particles called microplastics (particles smaller than 5 mm) or nanoplastics (particles smaller than 100 nm). Plastics produce greenhouse gas (GHG) emissions from their production, transportation and incineration – even emitting GHG while in landfills. When plastic waste is incinerated, it releases carbon dioxide and many other chemicals into the atmosphere, thereby increasing carbon emissions and air pollution overall. Open burning of plastic waste can pose significant risks for human health, owing to the release of noxious chemical substances such as dioxin and particulate matter.

The term plastic leakage refers to the potential amount of macro- and microplastics that are not kept in a circular loop or properly managed at their end-of-life, and thus leak into the environment. Data from the International Union for Conservation of Nature (IUCN) shows that at least 14 million tonnes of plastic ends



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Photo: NOAA

up in the ocean every year. Thus, plastic debris is currently the most abundant type of litter in the ocean, making up 88 per cent of all marine debris found from surface waters to deep-sea sediments. Improperly discarded plastics leak into the ocean through several pathways, but the primary transport mechanisms are rivers. In some places, like North Africa, most plastic leakage comes from open landfills and the wind effect. New research estimates that more than 1,000 rivers account for 80 per cent of global annual leakage of plastic to the ocean. Therefore, a source-to-sea approach is needed to deal with plastic pollution – preventing plastics from entering rivers is the key by ensuring proper waste management on land.

### How coastal regions and the global ocean are affected

Coastal countries that rely on healthy marine ecosystems and fisheries for food and income face immense challenges if their waste management systems are not capable of handling plastic waste well enough to avoid it leaking into the environment. For example, a 2011 study demonstrates that the costs of clean up, loss of fishing gear and damage to vessels and equipment from marine litter costs the Asia-Pacific Economic Cooperation fisheries sector approximately 1.26 billion US dollars (USD) per year (2009 prices).

The economic losses for marine fisheries include aspects such as the lost value of dumped catch, the costs to repair fishing gear and nets, the overall costs of plastic nets causing fouling incidents and lost earnings as a result of reduced fishing time due to clearing litter from nets. By directly impacting fishing and fish stocks, plastic pollution in the coastal and marine environment has a negative effect on the livelihoods and food security of the people of coastal countries. The potential average annual cost of plastic pollution on marine fisheries in Mozambique, for example, is estimated at 347 million meticals (5.4 million USD), or 0.05 per cent of GDP, based on 2017 values. However, costs and revenue losses could potentially be higher due to an underestimation of the value of fisheries, but also due to aspects not included, such as the costs resulting from the impact of ghost fishing. Extrapolating research models such as those produced by the IUCN to other coastal nations with similar plastic pollution issues would likely show similar detrimental effects.

Marine biodiversity is also massively threatened by plastic pollution. Solid plastic particles



44 per cent of seabird species are affected by ingestion of marine debris.

Photo: NOAA

found in the ocean are ingested by marine fauna. Certain marine animal populations, especially those that feed exclusively at sea, such as seabirds and sea turtles, present plastic debris in their stomachs.

Entanglement in plastic debris is another manner in which animals are impacted. Abandoned, lost or otherwise discarded fishing gear poses special risks for large, air-breathing marine animals, such as whales, dolphins, seals, sea lions, manatees and dugongs, as they can become entangled in the nets and drown. According to a 2016 report of the Convention on Biological Diversity (CBD), the total number of species known to be affected globally by marine debris (mainly plastics) is around 800. These impacts can occur through different routes, primarily through the above-mentioned ingestion and entanglement, but also through the toxic effects of chemical additives. For example, 40 per cent and 44 per cent, respectively, of cetacean and seabird species are affected by ingestion of marine debris.

Moreover, marine plastics can affect marine biodiversity and ecosystems by facilitating the introduction of alien species. Free-floating marine plastics can disperse aggressive invasive species. The introduction of new species could endanger sensitive or at-risk coastal environments.

And last but not least, marine and coastal plastic pollution are threatening the income opportunities of communities which rely on beach tourism. The major economic cost of this plastic debris is the reduced aesthetic appeal of

coastal areas. Plastic debris is commonly found on many beaches around the globe. This adversely affects the tourism industry, leading to a loss of output, revenue and employment.

### Addressing plastic pollution needs a holistic approach

Given the complexity of the problem, tackling plastic pollution requires a holistic, inclusive approach with participation across all stakeholders. Here, implementing circular economy (CE) practices represents one of the most important approaches. Whilst CE certainly requires strategies to improve business circularity, the participation and engagement of local citizens may play an equal role in other stages of the plastic cycle. In fact, communities certainly are amongst the first affected by marine plastic pollution. Directly impacted by the waste landing on their beaches, coastal citizens have a real incentive to act. Engaging them in circular economy projects with an inclusive approach not only provides them a source of livelihood, it will also increase their awareness and knowledge of plastic pollution in the long term, whilst contributing to improved local waste management practices (see lower Box).

Aside from implementing circular economy practices, there are many best practices to consider to eliminate plastic pollution from the municipal and national level. For example, alternative value chains could be developed, such as reusable containers designed to avoid single-use plastics and bottle-to-bottle recycling – these include advanced recovery systems involving consumers, retailers, bottling companies, manufacturers and others. The economic evidence is clear that deposit refund schemes (DRS) are also a good practice to implement, especially in combination with activities such as beach clean-ups. A recent IUCN analysis of the costs and benefits of current beach clean-ups in Cape Town, South Africa shows that adopting a DRS approach in conjunction with beach clean-ups could reduce the cost of beach cleaning by an estimated 14 per cent. Both the number of plastic bottles on beaches and the cost of a DRS will continue decreasing as bottle-return rates increase; in other words, the DRS will become more efficient. Although it is a local, specific example, there are implications for coastal tourism globally.

The improved management of plastic waste and the reduction of plastics flowing into the environment should be an integral part of any strategy that attempts to strengthen the economic sectors which depend on the marine

environment, when reviewing support to the blue economy, or addressing the Sustainable Development Goals (SDGs).

It is clear that reducing mismanaged plastic waste is a priority for most nations, as was indicated by tremendous support for the UNEA-5.2 draft Resolution “End plastic pollution: Towards an international legally binding instrument”. These nations will work over the next two years on a harmonised legal framework to eliminate plastic pollution. The framework is to come into force in 2024 and will establish a global plastic pollution management treaty, with national and regional solutions identified, funded and implemented. IUCN welcomes the move for an international legally binding instrument on plastic pollution. World leaders have recognised that high and rapidly increasing levels of plastic pollution represent a serious environmental problem at global scale, negatively impacting the environmental, social and economic dimensions of sustainable development.

The draft agreement is to lead to alternatives addressing the full lifecycle of plastics and the design of reusable and recyclable products and materials. Access to technology, capacity building, and scientific and technical cooperation will be increased. National governments and regional bodies should consider how their existing legislative frameworks will fit the new treaty, and focus also on sustainable plastic production and consumption and extended producer responsibility (EPR) where appropriate. In the case of plastic, there is a strong connection between the private sector (the main supplier of plastic to the market) and the public sector (generally responsible for the infrastructure to handle plastic waste) and as such, EPR schemes have emerged as a tool to better connect these two dimensions of the plastics value chain. The reality, however, is that many governments of developing nations are not likely to be able to implement EPR schemes effectively without careful assessment of the feasibility in their specific context; they will require additional support for implementation.

Policy-makers and national institutions should consider creating linkages to emerging initiatives that encourage a circular economy for plastic. One example of this is the Ellen MacArthur Foundation’s Plastics Pact Network. It brings together national and regional initiatives – plastics pacts – that emphasise how knowledge sharing among stakeholders and coordination of actions can be tailored for success.

### Plastic pollution and the SDGs

The nature of plastic pollution impacts the entire environment, our society and the economy. As the issue is cross-cutting, the plastic pollution crisis affects the successful implementation of several Sustainable Development Goals (SDGs). A least twelve of the Goals – 1 (No poverty), 2 (Zero hunger), 3 (Good health and well-being), 6 (Clean water and sanitation), 7 (Affordable and clean energy), 9 (Industry, innovation and infrastructure), 10 (Reduced inequalities), 11 (Sustainable cities and communities), 12 (Responsible consumption and production), 13 (Climate action), 14 (Life below water) and 15 (Life on land) – have links to plastics. But there is only one indicator related to plastic pollution (14.1.1b), and it specifies micro-plastics.

### Engaging communities to address plastic pollution

From 2019 to 2021, the IUCN supported nine small scale circular-economy initiatives in coastal communities in Eastern and Southern Africa and Southeast Asia, which created jobs and long-term economic opportunities. These innovative projects reduce pressure on coastal and marine resources, which are critical for the resilience of the local communities. In Kenya, Mozambique, South Africa, Thailand, and Viet Nam, the Marine Plastics and Coastal Communities initiatives for circular economy prevented over 240,000 kg of plastic from entering the ocean in a year of operation. But more importantly, these projects empowered coastal communities to clean their environments and created hundreds of sustainable livelihoods in five coastal communities. For the first two years, the total number of people engaged was 1,875, including waste-pickers, youth, recycling entrepreneurs and other community members. In the case of Thailand, 72 per cent of workers in the recycling centre were women.

In 2021, the Circular Plastic Economy Innovation Lab (CPEIL) was set up in Kenya, Mozambique, South Africa and Tanzania. At regional, national and sub-national levels, this programme accelerated the transition at scale towards a circular plastic economy as a driver of development of a sustainable, inclusive and resilient blue economy. Through the CPEIL, with mentorship and training, the IUCN identified and supported four small enterprises, one in each country, at regional, national and sub-national levels – over 20 entrepreneurs and community members benefited from the Lab to expand their existing recycling businesses for cleaner environments and circular economies in their countries.

The creation of blueprints to guide interventions, instruments, tools and capacity-building courses in the fight against plastic pollution is a final best practice to share. These blueprints demonstrate effective, quantifiable solutions to address plastic leakage. Key stakeholders from governments, private sector and civil society, united in a vibrant learning and leadership network, can co-generate and demonstrate demand-responsive solutions to plastic waste incorporating policy, business operations, and consumer behavioural changes. Evidence and lessons are packaged into a scalable blueprint for use and sharing.

### A final note

Unsustainable global plastic production and consumption patterns and mismanagement and littering of waste have created the plastic problem and continue to exacerbate it. Existing linear take-make-dispose economic models are broken, and when combined with limited or non-existing infrastructure for waste management such as sanitary landfills and inciner-

ation facilities – which is the case of many developing nations – plastics end up in our land, rivers and ocean. The legal and illegal global trade of plastic waste may also damage ecosystems where waste management systems in the receiving country are not effective enough to contain the imported plastic waste.

Prevention of plastics from entering the environment is the key. It is no longer simply a matter of “reduce, reuse, recycle”, it must also include refuse (to buy plastics, plastic wrapped items, etc.), repair of times (avoid waste) and redesign for a circular economy.

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