

## ENVIRONMENTAL AND SUSTAINABILITY FORUM

### Plastics and pollution in the sea

**O**n June 26th 2024, a joint event organised by CILT's Environment and Sustainability Forum and CILT's Merseyside & Warrington Group was held at Liverpool John Moores University (LJMU). It involved a series of presentations followed by discussion about this major international problem.

#### Plastics in the sea, how big a problem is it?

Geoff Clarke, Chair of the Environment & Sustainability Forum introduced the topic of plastic waste in the sea and shared a number of shocking statistics.

The ocean is said to be Earth's life support, with 97% of the world's water held by the ocean. We rely on it to regulate our climate, absorb CO<sub>2</sub> and it is the number one source for protein for over a billion people whose diet largely relies on fish.

However, at the rate we are polluting the ocean with around 12 million tonnes of plastic a year, the damage we are doing to marine life and our ecosystem is becoming irreparable. Our actions over the next 10 years will determine the state of the ocean for the next 10,000 years.

- There are 5.25 trillion pieces of plastic debris in the ocean and this is expected to triple by 2040. Of that 269,000 tonnes float on the surface
- 1 million seabirds and 100,000 marine animals die from plastic pollution every year
- India, China and Indonesia top the list as the worst offenders for ocean plastic dumping in 2021, according to the IUCN
- The Pacific ocean is the most polluted, with 2 trillion pieces of plastic (most of this found in the North Pacific Gyre). The Caribbean sea, however, is one of the most concentrated areas for anthropogenic waste (made by humans)
- 88% of the sea's surface is polluted by plastic waste
- The equivalent of one garbage truck of plastic is discarded into our oceans every minute
- Over 2 million tonnes of plastic packaging are used in the UK each year
- Britain contributes an estimated 1.7 million tonnes of plastic annually
- 1 in 3 fish caught for human consumption contains plastic
- The US discards 2 billion razors and 1 billion plastic toothbrushes a year

- More than 1 million plastic bags end up in the trash every minute
- A plastic bag is used on average for 15 minutes
- 500 billion plastic bottles are used every year – Meaning there are 66 times as many bottles as there are humans on the planet
- Estimates suggest there are 150 plastic bottles littering every mile of the UK coastline
- 705,000 tonnes of discarded fishing nets drown mammals including seals – this is known as 'ghost fishing'
- If coral encounters plastic the likelihood of it becoming diseased increases from 4% to 89%; a disastrous effect as coral is home to more than 25% of marine life
- 10 river systems contribute to 90% of the plastic that flows into the sea. Eight of these are in Asia, the Yangtze, Yellow, Indus, Hai He, Ganges, Mekong, Amur, and Pearl and the other two are in Africa, the Nile and the Niger
- Excessive marine pollution has helped create 500 dead zones (the size of the United Kingdom's surface (245,000 km<sup>2</sup>) in the ocean – this number will double every decade
- The lack of oxygen in dead zones causes marine life to migrate to new areas – disrupting the balance of marine life in other parts of the ocean
- 70% of Earth's oxygen is produced by marine plants
- 30% of our CO<sub>2</sub> emissions are absorbed by the oceans

#### How long has the problem of pollution existed and what is being done?

Just over 50 years ago on 2 November 1973 the MARPOL Convention was adopted. This was led by the IMO (International Maritime Organisation) which covers all aspects of international shipping – including ship design, construction, equipment, manning, operation and disposal. The International Convention for the Prevention of Pollution from Ships (MARPOL) covers prevention of pollution of the marine environment by ships from operational or accidental causes. The Convention includes regulations aimed at preventing and minimizing pollution from ships and currently includes six technical Annexes of which two are most relevant to this article.

- Annex V Prevention of Pollution by Garbage from Ships (31 Dec. 1988). Imposes the complete ban on the disposal of all forms of plastics into the sea from shipping sector
- Annex VI covers a reduction in air pollution (19 May 2005)

In 2021, IMO adopted the IMO Strategy to Address Marine Plastic Litter from Ships, with a vision to 'strengthen the international framework and compliance with the relevant IMO instruments, endeavouring to achieve zero plastic waste discharges to sea from ships by 2025'. This followed the adoption, in 2018, of an Action Plan to address marine plastic litter from ships. This plan aims to enhance existing regulations and introduce new supporting measures to reduce marine plastic litter from ships. Shipping companies are taking this matter very seriously as shown by this case study.

#### Case Study – Condor Ferries

This company based in Poole and Guernsey has a fleet consisting of 5 ships that connects the UK, the Channel Islands and France.

Condor's Head of Sales Marketing, reflected on the company's commitment:

*"As a ferry operator, our connection to the sea is intrinsic. We're actively pursuing waste reduction on our vessels and implementing measures to protect the marine environment."*

There are several measures, relating to energy efficiency and concern about plastic pollution, that have been or will be implemented including:

- Use of specialist hull coating on their vessels to reduce CO<sub>2</sub> emissions
- Replacement of traditional bulbs with LEDs
- Installation of anti-glare solar film to reduce air conditioning loads
- Monitoring fuel usage and emissions using a specialist online platform tracking vessels by individual journeys and the fleet as a whole, thus assisting with the scheduling of the vessels
- Researched plastic pollution and covered issue on their website
- Sponsored an underwater/beach clean in Jersey

## Type of plastics, where they come from and how harmful are they?

Fredrik Hjelset, Principal Consultant, Waste & Resources, Carbon & ESG Practice at AECOM gave an overview of the type of plastics, where they come from to enter the sea, and how harmful they are. Then he discussed legislation and alternatives to plastics.

There are several types of plastic including PET, PP, HDPE, LDPE, PVC and fibres for clothing. The type of product is chosen depending on the application. PET (polyethylene terephthalate) is a type of resin and a form of polyester and often used for plastic bottles, polythene is the most common plastic; PP (polypropylene) is the second most extensively used plastic and used in many applications; PVC Polyvinyl chloride is the world's third-most widely produced synthetic polymer of plastic typically used for windows and doors; High Density Polyethylene (HDPE) is a thermoplastic polymer, sometimes called polythene and used for pipes and packaging; Low Density Polyethylene (LDPE) is flexible and often used for plastic bags.

The scale of plastic production has been growing year on year and between 1950 and 2019 it is estimated that 9.2 billion tonnes of plastic had been produced and 5.2 billion of that had been discarded. Recycling statistics are slowly improving but of the 9.2 billion tonnes produced just 700 million tonnes has been recycled.

Where does the plastic in the sea come from? There are three main sources of plastic; discarded from boats; discarded fishing gear; and Rivers washing into the sea. IMO has been working to reduce waste from vessels for 50 years. The discarding of old plastic fishing nets is still a major problem and tends to vary on the level of understanding of the issue in the countries where the vessels are based. The volume of waste entering the sea has grown significantly reflecting the increase in use of chemicals and plastics. Although there is some realisation of the serious nature of the problem in some countries, the worst pollution is centred on 10 rivers mainly in Asia.

How harmful are plastics? They range from larger pieces of plastic which can get tangled up with wildlife causing discomfort and even death, to microplastics which are small pieces which can be ingested by birds and marine creatures. The latter can end up in the human food chain.

What is being done about it? Legislation in larger jurisdictions is happening eg. in EU, China, Indonesia, USA led by initiatives such as from the IMO, environmental and wildlife



charities but there is much more to do. Cleanup projects have been initiated in several countries and including for example barriers in rivers, beach cleanups, monitoring use of ocean nets) and use of special waste collection vessels, see later.

There are some alternatives to the use of plastic, such as the use of Bioplastics which are made from more natural ingredients that may break down in seawater, move back to more use of paper and card packaging, and most significantly the transition to a Circular Economy with reduce, reuse and recycle options.

Ms Stamatia Galata, a marine environmental scientist at LJMU talked about sea pollution caused by microplastics which are bits of plastic less than 5mm in size. They've been found everywhere from beaches to the deepest parts of the ocean. It is estimated that 12 million tonnes of plastic enter the ocean every year. Nearly a million tonnes of this goes into the sea as 'primary microplastics', meaning they're already less than 5mm in size. These microplastics may be from products we use every day such as cosmetics, fibres from fishing gear and the clothes we wear, and even from our car tyres.

It's estimated that 35% of primary microplastics come from domestic and industrial washing cycles. Industry is working on reducing microfibrils entering the oceans from washing machines. Launched in 2021, Grundig produced the world's first domestic washing machine with a factory fitted filter.

Road run-off acts as a major pathway to the ocean for two thirds (66%) of microplastics. This is due to plastics found in paint on our roads as well as in our tyres, which generate microplastics as they wear down over time. When it rains, run-off takes them via waterways and wastewater networks into the sea. It is estimated that around 28% of microplastics that end up in the environment are caused by tyre wear. This is expected to rise in the UK, with the increased weight of electric vehicles resulting in greater tyre wear and microplastic emissions.

## Is there now a reason for optimism?

The initiatives of the IMO and various governments are positive but there needs to be multiple action including education, the production of alternatives and widespread clean-up of the pollution already caused. Although the majority of the plastic sinks to the bottom of the sea there is some that floats on the surface. The fourth speaker spoke about what his company is doing to clean up floating plastic. Tom Caddick, a former graduate of LJMU, works in the Liverpool-based family business Water Witch. This company has been in the maritime sector for several generations and now specialise in building vessels designed to collect waste especially from river basins and port infrastructure. They have vessels working widely across the UK, in use with the Canal and Rivers Trust, Cardiff Bay and various ports. 500 tonnes is collected annually just from Cardiff Bay. Water Witch have exported vessels to over 30 countries and these operate in different locations to clean up plastics.

As much of the problem is in the developing world where affordability is an issue the company has designed a simpler light-weight version of the vessel that can be exported in a standard shipping container. This enables easier access to the most important areas of need. The latest version is an all electric powered vessel which can be charged at the mooring and is much more sustainable and cheaper to operate with fewer moving parts. They are also looking at a solar powered unit which will be more self-sufficient.

Other methods of clean-up include the use of barriers but there needs to be waste collection units.

We are all challenged to do more in rethinking our use of plastic and helping to reduce the problem of waste in the sea. ■

**Geoff Clarke FCILT**  
Chair, Environmental and Sustainability Forum, CILT(UK).