Thematic STEM Debate 2027 – 8th Edition
Primary Sector – Year 6

How can we best protect Malta's coasts and seas from the effects of microplastics and marine litter?

Theme: Microplastics and marine litter

A. Introduction

Malta, an archipelago at the heart of the Mediterranean, is renowned for its beautiful coastlines and rich marine biodiversity. The Mediterranean Sea itself is one of the world's great natural treasures, supporting an extraordinary variety of life, including dolphins, sea turtles, seabirds, fish and seagrass meadows. It also plays a vital role in the lives of the Maltese people by providing food, jobs, recreation, transport and opportunities for tourism. However, Malta's coasts and the wider Mediterranean face growing threats from marine litter and microplastic pollution.

Every year, millions of pieces of waste enter seas and oceans around the world through beaches, rivers, streets, boats and fishing activities. Since the Mediterranean is almost enclosed by land and has limited water exchange with the Atlantic Ocean, much of this litter remains trapped for long periods, making it one of the seas most affected by plastic pollution.

Plastic is widely used because it is lightweight, strong and inexpensive, but when it is not disposed of properly, it becomes a serious environmental problem. Over time, larger pieces of plastic break down into tiny particles called microplastics, which are smaller than five millimetres and can also originate from synthetic clothing, tyres, fishing equipment and certain personal care products. These tiny particles are difficult to remove and have been found in seawater, on beaches and inside marine animals. Many

species accidentally ingest plastic, mistaking it for food, which can cause injury, disrupt feeding and potentially introduce harmful chemicals into ecosystems. These particles can also enter the food chain through fish and seafood.

A Sea Without Borders

Marine litter does not stay within one country's waters – it moves through the Mediterranean as part of a shared cycle that crosses borders:

- **Currents move litter across borders.** Sea currents can carry plastic hundreds of kilometres from where it entered the water, in or out of Maltese waters.
- **Rivers are the main route into the sea.** Much of the Mediterranean's plastic arrives via rivers in neighbouring countries – Malta itself has no permanent rivers.
- **A sea that does not flush itself out easily.** The Mediterranean exchanges water with the Atlantic only slowly, so pollution tends to recirculate rather than disperse.
- **Malta is both a receiver and a sender.** Malta receives litter from other Mediterranean countries, and Maltese litter reaches other coastlines in turn.

Where Do Microplastics Actually Come From?

Microplastics are not only broken-down litter – scientists group them into two categories:

- **Primary microplastics** – already tiny when they are made or released:
    - Microbeads used in some cosmetics and toothpaste
    - Industrial plastic pellets ("nurdles") spilled during manufacturing or transport
    - *Synthetic clothing fibres* – released when washing polyester, nylon or acrylic fabrics
    - *Tyre wear particles* – worn from road vehicles and washed into drains by rain

- **Secondary microplastics** – broken down from larger items over time:
    - Bottles, bags, fishing gear and other litter breaking down in sunlight, waves and weathering

What Are Malta's Own Sources?

Malta has no permanent rivers, so its own contribution to the sea comes from different sources:

- **Shipping and maritime traffic.** Cargo loss and waste from Malta's busy shipping routes.
- **Fishing activity.** Nets and lines lost or discarded at sea.
- **Tourism and beach use.** Litter increases on beaches during the busy summer season.
- **Direct urban and stormwater discharge.** Waste reaching the sea through drains and storm run-off.

Marine litter such as bottles, bags and discarded fishing gear can also entangle wildlife, damage habitats and spoil the natural beauty of Malta's beaches, affecting both local communities and the tourism industry that depends on clean and attractive coastlines. Scientists, environmental organisations, businesses and governments are all working to tackle this issue through research, education, clean-up initiatives, improved recycling, new technologies and policies to reduce waste. However, important questions remain: Who should take responsibility for protecting our seas? Should individuals change their habits, should businesses reduce plastic use, or should governments introduce stricter regulations, acting alone or in cooperation with other countries?

This debate does not seek a single correct answer. Instead, it provides an opportunity to explore different perspectives, examine evidence and understand how science, society and the environment are interconnected. As you prepare for this debate, consider these questions: What kind of Mediterranean Sea do we want future generations to inherit, and what actions are we willing to take today to protect it? Can a balance be found

between modern lifestyles, economic activities and the need to safeguard Malta's coasts and marine life? And since the sea crosses borders, should the solutions too?

B.Potential debate questions

1. Who should be most responsible for protecting Malta's coasts from marine litter and microplastics?
2. Should Malta introduce stronger measures to protect its coasts and seas from plastic pollution?
3. Are education and awareness enough to reduce marine litter and microplastics in Malta?
4. Can people continue to enjoy and use Malta's coasts while also protecting marine life?
5. What role does science and technology have in addressing the problem of marine litter and microplastics?
6. What role should local communities play in preventing pollution along the coast?
7. Can tourism and environmental protection work together or do they sometimes conflict?
8. Since currents and rivers carry litter across borders, should Mediterranean countries tackle marine litter together, or is it fair for each to focus on its own coastline?

C. Links for further reading and research

- *Pollution* – Find out how pollution from plastic, light, oil, and other trash affects Earth. National Geographic Kids Article. - Read here
- *Plastic Pollution* – You can make a difference by reducing your plastic waste. National Geographic Kids Article. - Read here
- *TED-Ed – What Really Happens to the Plastic You Throw Away?* Emma Bryce traces the life cycles of three different plastic bottles, shedding

- light on the dangers these disposables present to our world. – Watch here
- *How We Can Keep Plastics Out of Our Ocean*. Plastic pollution poses one of the biggest known threats to the ocean, influencing ecosystems. Learn more about how to transition to a system which promotes reuse and repurposing of plastics. National Geographic video. – Watch here
- *The Ocean Literacy Portal* – Transforming ocean knowledge into action. UNESCO Intergovernmental Oceanographic Commission. - Read here
- *Think Like an Explorer: Marine Plastic Pollution*. Plastic pollution negatively impacts marine ecosystems and human health. National Geographic Explorer and sustainability entrepreneur Tati Besada empowers young people to become change-makers fighting marine plastic pollution. National Geographic. – Read here
- *Master level study detects microplastics in the Maltese waters.* This article explains how researchers discovered microplastics throughout the Maltese water column and why these tiny particles are difficult to remove and potentially harmful to marine ecosystems. University of Malta Newspoint. – Read here
- *New research highlights where threatened seabirds are most exposed to marine plastics.* Birdlife International. - Read here
- *THINK – the research magazine of the University of Malta.* UM's quarterly research magazine, including the article *The Great, Big, Floating Landfill* on Malta's marine litter – Read here
- *Nature Trust – FEE Malta: awareness and rescue work.* On their work rescuing sea turtles affected by plastic and running local beach clean-ups. – Read here

D. Links to suggested organisations related to microplastics and marine litter.

Below is a hyperlinked list of suggested related organisations related to microplastics and marine litter, for further research.

- Oceanography Malta Research Group
  The Oceanography Malta (OM) Research Group within the Department of Geosciences of the Faculty of Science aims to promote the field of oceanography through its applied research and teaching activities, making it the quintessential oceanography research group in the Maltese Islands.
- Nature Trust – FEE Malta
  Nature Trust (Malta) is a non-profit non-governmental environmental organization working in the Maltese Islands. It is also a privileged partner of World Wildlife Fund (WWF).
- BirdLife Malta
  Established in 1962, BirdLife Malta is the oldest environmental organisation in Malta, committed to the protection of wild birds and their habitats. A non-governmental organisation (NGO), BirdLife Malta is also part of the BirdLife International network working towards conserving global biodiversity and the sustainability of natural resources.
- Malta Environment and Resources Authority (ERA)
  A national regulator on the environment, maintaining consultation with stakeholders to promote and instil sound environmental management.
- Żibel – Environmental NGO Malta
  A registered Voluntary Organisation and eNGO with the aim of reducing the overall waste generated on our islands and restoring our natural environments to their most natural states.

- Sharklab Malta

  Sharklab-Malta is a non-profit, voluntary organisation based in Malta dedicated to research, education and raising awareness about elasmobranchs (sharks, rays, skates and chimaera) in Mediterranean waters.
- UNEP Mediterranean Action Plan

  The Mediterranean Action Plan (MAP)—Barcelona Convention System works with Contracting Parties and partners to fulfill the vision of a healthy Mediterranean Sea and Coast that underpin sustainable development in the region.
- International Union for Conservation of Nature (IUCN) Mediterranean Programme

  IUCN Centre for Mediterranean Cooperation bridges science, policy, and action to protect biodiversity, restore ecosystems, and support sustainable livelihoods across the Mediterranean.
- Ocean Conservancy

  Ocean Conservancy is an international environmental organisation that works to protect the ocean through science-based solutions, advocacy and global efforts to reduce marine pollution and safeguard marine ecosystems.

This document has been compiled by the Primary Science Team within the STEM & VET Curriculum Hub, Pembroke, Directorate for STEM and VET Programmes, (MES) in collaboration with the University of Malta (Faculty of Science, Department of Geosciences; Faculty of Education, Department of Mathematics and Science Education) and the Malta Chamber of Scientists.