

# Centre for Sustainable Oceans (CSO)

**From Ocean Health to Oxidative Stress**

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Acting Chair: Dr Conrad Sparks (April 2023 – present)

### Vision

*The positioning of the Centre for Sustainable Oceans over a five-year period as a Centre of Excellence in international, regional, and national Ocean Governance arenas and a thought **leader in ocean sustainability** and ocean conflict and equity challenges in the Southern African region*

### Mission

*The advancement of **knowledge and information** bases, **skills**, and **technologies** for informed management and governance of multi-sectoral **ocean resource-uses** and **ocean health** across the Southern African Ocean Economies*

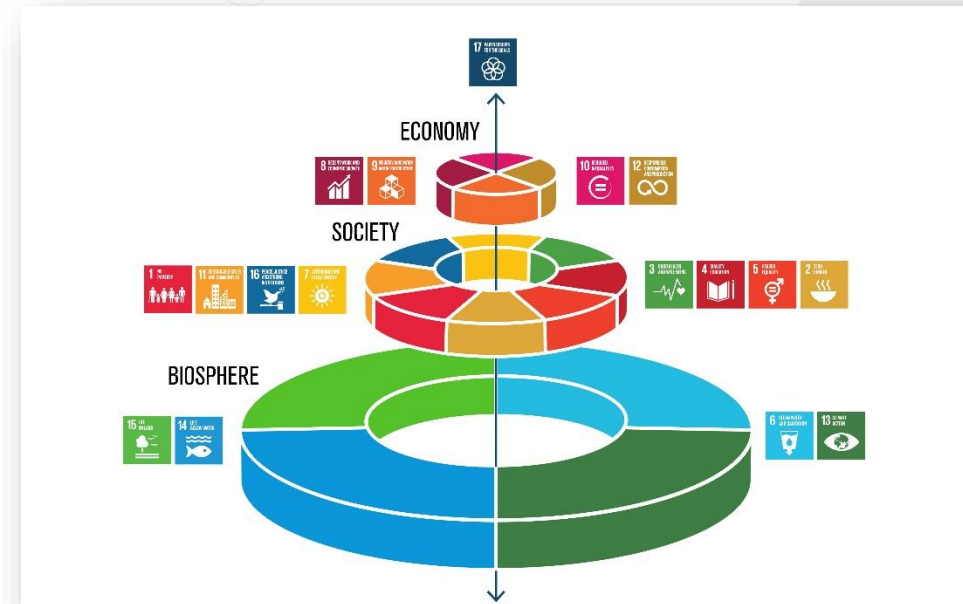
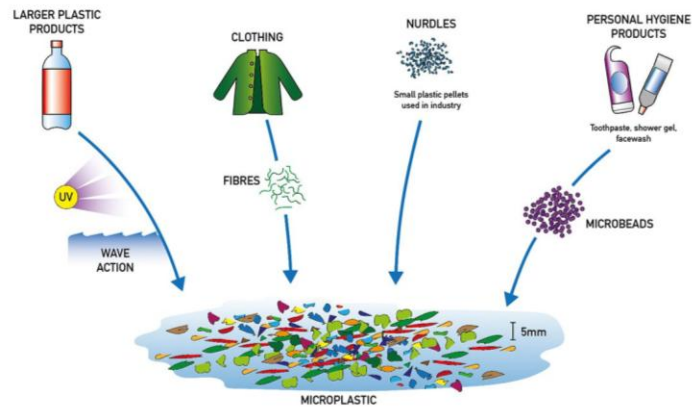
**Focusing on coastal microplastics (MPs) and plastic**

# Why plastics?

## Triple Planetary Crisis:

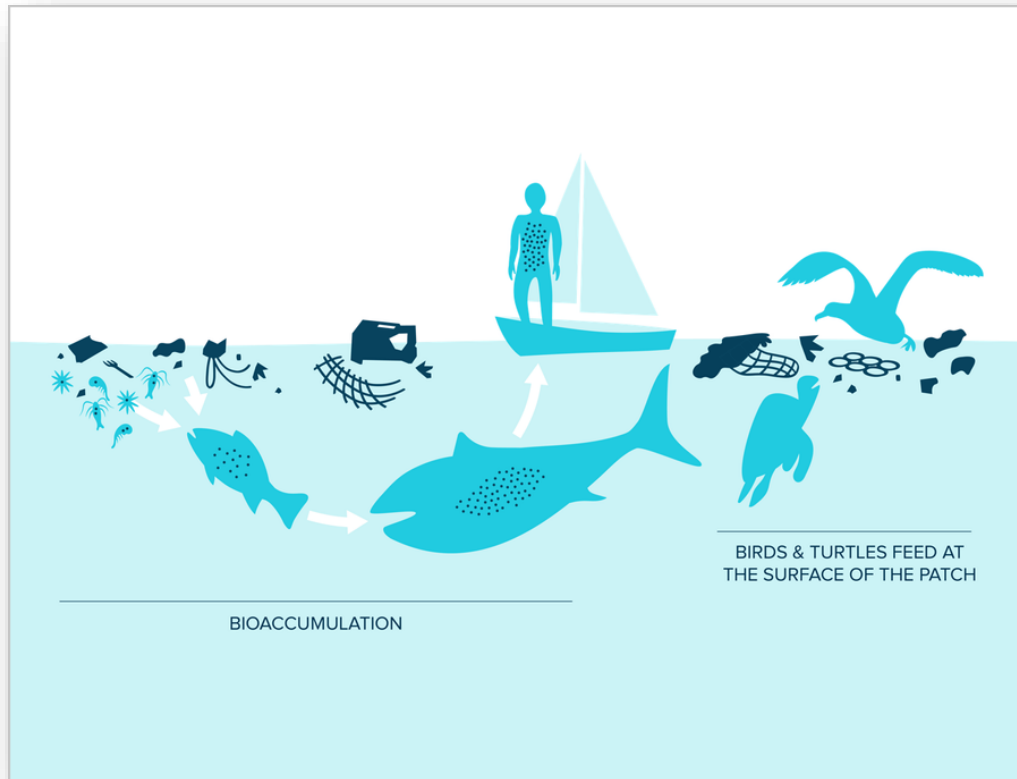
- Climate change
- Loss of biosphere integrity
- Pollution

**Plastics are an integral part of the problem!**



Source: Azote Images for Stockholm Resilience Centre, Stockholm University

# Why coastal?



Source: The Ocean Cleanup



-  **Marine Life Threats**  
Impact on marine life due to ingestion
-  **Bioaccumulation**  
Microplastics entering and accumulating in the food chain
-  **Ecosystem Disruption**  
Changes to the physical environment of ecosystems due to microplastic waste
-  **Public Health Concerns**  
Release of toxic chemicals from plastics into water or food supplies
-  **Economic Impact**  
Effects on industries like fishing, tourism, and other marine-related activities

Source: DOI 10.3390/su151713252

## Marine Plastic Impact Research

- Bioplastics & Marine Microbiome Interactions
- Experimental Microplastic (MP) Ecotoxicology

# Bioplastics & Marine Microbiome Interactions

- Effects of bioplastics on sediments, mussels, seawater & seaweed
- Metagenomic and metabarcoding analyses
- Oxidative stress and biochemical responses
- Plastic-associated microbial community shifts

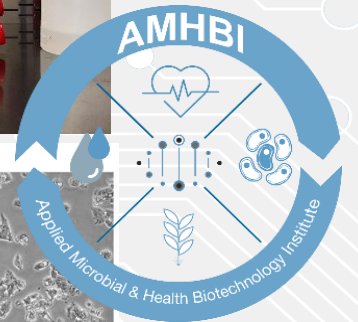
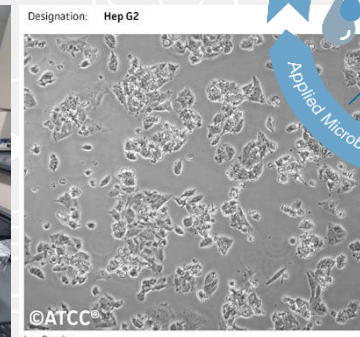
Projects: assessing effects of bioplastics on microbiomes of marine sediments, mussels, seawater, and brown algae



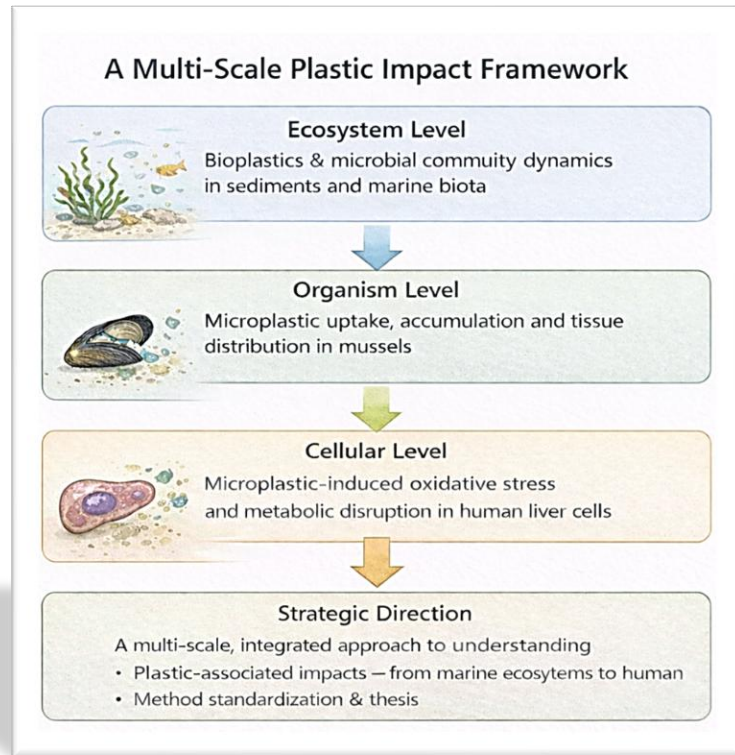
# Ecotoxicology: Bridging Marine and Human Health

- Controlled exposure trials in marine organisms
- Size- and concentration-dependent uptake studies
- Acute toxicity and tissue-specific distribution
- Method development and protocol standardisation in experimental ecotoxicology of MPs

Projects: microplastic uptake in marine bivalves as well as bridging metabolic research with microplastic toxicology



# Integrated Research Vision



## **Strategic Positioning**

- Integrated ecological-molecular toxicology
- Plastic impact research across biological scales
- Method standardisation & reproducibility
- Bridging marine systems and human health

## **Research Direction**

Positioning CSO and AMHBI as a regional leader in:

- Experimental microplastic ecotoxicology
- Plastic-microbiome interactions
- Translational environmental health research

# Research connections

## Department of Conservation and Marine Sciences

- Most CSO students
- Research fellows / collaborators (Prof Snyman, Dr Johnson)
- Co-hosting the 2025 South African Marine Science Symposium

**Chemistry:** sample analyses

**Horticulture:** co-supervising a student

**Environmental and Occupational Studies:** PGDip student

**Functional Foods and Research Unit (FFRU):**  
Farmed mussels in Saldanha Bay (Prof Opperman)

## Applied Microbial and Health Biotechnology Institute (AMHBI)

- Space for new MP Ecotoxicology lab
- Ecotoxicology of MPs and associated contaminants
- Effect of MPs on human health (new)
- Post doc (shared)
- LDIR machine

## Engineering & the Built Environment

- Clothing and Textile Technology: reducing MP fibers in laundry systems (Prof Patnaik)
- French South African Institute of Technology (F'SATI): monitoring plastics using satellites (Prof Davison); Oceans Plastics Group

## Coastal plastics offer both a warning & an entry point:

- revealing systemic weaknesses
- providing measurable indicators

## Opportunity for:

- harmonised monitoring frameworks
- additional collaborative ecotoxicology research
- postgraduate mobility
- shared data platforms that strengthen regional responses to marine pollution and ocean governance challenges.



The ocean does not recognise national borders- and neither should our research.

**Thank you**