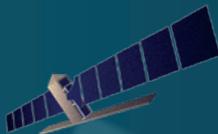# PML | Plymouth Marine Laboratory

CLIMATE CHANGE

MARINE POLLUTION

BIODIVERSITY LOSS

[SCIENCE FOR OCEAN ACTION]

pml.ac.uk

[INTRODUCING]

Plymouth Marine Laboratory (PML) is an independent research charity, globally recognised for pioneering science addressing the interconnected challenges of climate change, biodiversity loss and marine pollution.

We work collaboratively across sectors, with communities, policymakers, NGOs, academia and industry partners to ensure our research informs decision-making and drives practical action.


PML is unique in its capability to link laboratory and field studies, satellite observations, modelling, socio-economics and advanced technologies including marine autonomy and artificial intelligence (AI).

This integrated approach enables us to understand why change is happening, anticipate future scenarios, and translate research into tangible environmental progress.
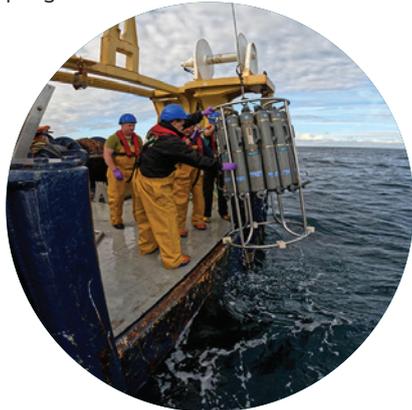
For example, our research on microplastics directly informed a UK ban on microbeads in cosmetics, while our innovative approach to valuing and managing the marine environment influenced more than £50 million in investment and delivered the world's first Marine Natural Capital Plan.

PML Applications, our trading subsidiary (profits reinvested into science), delivers practical solutions for public and private clients, including monitoring, technology development, geospatial analysis, and marine infrastructure management.
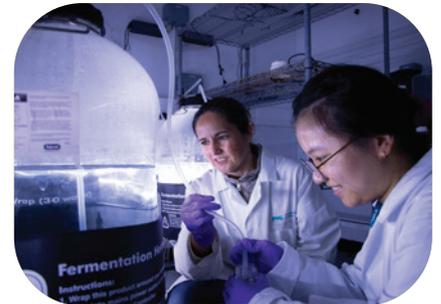
[CLIMATE CHANGE]

Climate-driven shifts in marine species, habitats and ecosystem function are occurring worldwide, disrupting sectors such as fisheries, aquaculture, and coastal industries, while also increasing the complexity of delivering effective environmental management.

PML has been at the forefront of studying climate change and its impacts on marine ecosystems and society for decades and our research informs national and international policy.

We are also focused on developing technologies and novel applications to address the climate crisis.

Areas of focus include:
- Climate-Smart Ocean Management
- Marine Carbon Dioxide Removal (mCDR) & Carbon Capture and Storage (CCS)
- Ocean Acidification
- Blue Carbon & Nature-Based Solutions
- Quantifying Greenhouse Gas Fluxes
- Understanding the Societal Impacts of Climate Change
- Renewable Energy & Offshore Structures
- Long-Term Monitoring for Future Projections (incl. effects of warming)
- Developing Innovative Tools to Combat Climate Change e.g. early warning systems
- Scientific Advice for Climate Policy

'Climate Smart' Ocean Management
PML is leading the development of decision-support tools to support more strategic and sustainable uses of the marine environment, combining ecological, economic and social research on marine space, modelling expertise and evidence-based insight.

Ocean Acidification
PML's work has been pivotal in monitoring and communicating its impacts, raising awareness, leading global initiatives and inspiring action at the highest political levels, since the term was first coined in 2003.

Blue Carbon & Nature-Based Solutions
PML pioneers extensive research on blue carbon - from biogeochemistry through to biodiversity implications and scenario modelling, as well as valuing changes in carbon budgets and societal implications.

We are leading research on the role of macroalgae and how nature-based solutions and blue carbon habitats can be implemented effectively.

Marine Carbon Dioxide Removal
PML provides impartial evidence on the effectiveness, impacts and scalability of marine carbon dioxide removal techniques, ensuring ocean-based solutions are underpinned with robust scientific evidence.

From Observation to Action
Long-term observations provide essential baselines for understanding and forecasting change.

PML leads the Western Channel Observatory – one of the longest-running oceanic time series in the world - integrating pelagic, benthic, and atmospheric timeseries data with satellite observations and computer modelling.

[BIODIVERSITY LOSS]

Human activities are rapidly impacting the planet. Climate change, pollution, exploitation, and habitat destruction and unsustainable use of natural resources are damaging ecosystems on land and in the ocean - driving an unprecedented loss of biodiversity worldwide.

PML employs cutting-edge techniques to study marine biodiversity at all scales, from from microscopic organisms to the largest ecosystem.

This enables us to understand why biodiversity is changing and to forecast future scenarios.

We inform decision-making and have key roles in global biodiversity assessments.

Areas of focus include:
- Biodiversity Monitoring & Tracking
- Advanced Earth Observation & Remote Sensing
- AI & Machine Learning Techniques for Taxonomy
- Environmental DNA (eDNA)
- Invasive Species Monitoring & Detection
- Sustainable Fisheries & Aquaculture
- Habitat Mapping & Informing Management
- Natural Capital & Socio-Economic Assessments

**Transforming Biodiversity Monitoring Using Big Data and AI**
PML is revolutionising biodiversity monitoring shifting from fragmented snapshots to continuous, trusted insights. By harnessing AI, genomics, and satellite technology we track biodiversity and emerging threats across all ocean depths.

Our Automated in situ Plankton Imaging and Classification System (APICS) tracks environmental changes affecting plankton, whilst AI - enabled automated image analysis and eDNA is revolutionising how we monitor marine life.

Ecosystem Assessment
Methods developed at PML inform policy and management approaches and provide evidence for the designation of marine protected areas. Novel statistical approaches from PML are being used to include biodiversity conservation objectives in Marine Spatial Plans such as in Ireland and Vietnam.

PML is also at the forefront of understanding how marine artificial structures like offshore wind turbines interact with marine ecosystems.
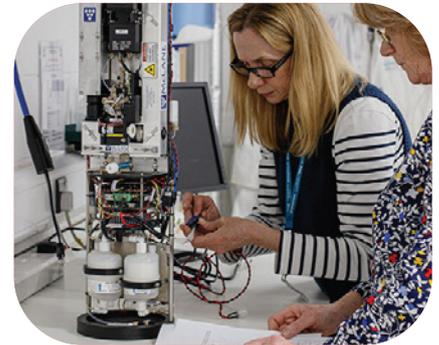
Fisheries & aquaculture
PML develops advanced monitoring and forecasting tools to improve the management of fisheries and aquaculture. We also examine the socio-economic dimensions of seafood production, informing policies and practices.

[MARINE POLLUTION]

PML research identifies pollution pathways and their impacts on marine life, providing the evidence needed to reduce contamination from plastics, chemicals, and other human-derived sources, and to develop effective mitigation strategies.

We understand the diverse needs of stakeholders, from policymakers to industries, and co-design tailored, evidence-based support for sustainable water and environmental management.

Areas of focus include:

- Catchment to Coast Water Quality Assessment & Management
- Marine Plastic Litter, Microplastics & Plastic Alternatives
- Light & Sound Pollution
- Nutrients & Pollutants
- Earth Observation & Forecasting/ Hindsight Tools for Pollution Monitoring (e.g. oil spills)
- Water-Associated Infectious Diseases

'Catchment to Coast' water management

More than half the human population live adjacent to a body of freshwater or the sea and global livelihoods rely on ecosystem services from inland and coastal water bodies.

PML bridges scientific innovation and practical application, enabling more effective policies, improved pollution management, and resilience for water dependent industries and communities.

Combating water-borne diseases

We are improving the predictive power of disease forecasting models and helping to prevent outbreaks in coastal communities.

Pollution Detection and Prevention

PML provides techniques for the identification of pollution from oil, litter and nutrients using satellite data. When integrated with models, we produce actionable intelligence on its source, direction and potential impacts.

Artificial Light at Night (ALAN)

We are pioneering research on the effects of ALAN and sound pollution on coastal and marine wildlife. PML is a founding member of the Global Ocean Artificial Light at Night Network, bringing together the world's leading experts in marine light pollution.

Marine Plastic

PML's award-winning experts have led research into the ecological and societal impacts of marine plastic pollution for nearly two decades.

We also study other human derived particulate pollutants, assess plastic alternatives and evaluate engineered and nature-based solutions to tackle pollution.

[PARTNERSHIPS FOR A SUSTAINABLE OCEAN]

At Plymouth Marine Laboratory (PML), we know that achieving a sustainable ocean is only possible through strong partnerships. Collaboration is at the heart of everything we do, and we work closely with a diverse range of partners around the world. Supported by a broad portfolio of funders, we generate scientific evidence at every scale — from local to global, source to sea, lakes to the open ocean, and from the poles to the tropics.

Contact us to find out more or explore opportunities to work together.

Plymouth Marine Laboratory
Prospect Place
Plymouth
PL1 3DH
United Kingdom

www.pml.ac.uk

+44 (0)1752 633 100 (switchboard)
forinfo@pml.ac.uk (general)
comms@pml.ac.uk (media)

Individual contacts details are available at pml.ac.uk

Find us on:
BlueSky / X / Facebook / LinkedIN / Instagram

Patron: James Cameron
(explorer, environmentalist and filmmaker)