

# Using The Ocean To Solve Land Problems

Problem	Possible Solution	Prototype
Energy-inefficient lighting	Bioluminescence-inspired lighting	"Glowing Jar Lamp" using glow-in-the-dark paint and LEDs
Inefficient wind energy harvesting	Whale-inspired wind turbines	"Bumpy vs. Smooth Pinwheel" comparing spin rates
Bacterial growth on surfaces	Shark skin-based antibacterial surfaces	"Textured vs. Smooth Petri Dish" experiment
Fragile materials	Sea cucumber-inspired self-healing materials	"Self-Healing Slime" using borax and glue
Weak adhesives in wet conditions	Mussel-inspired adhesives	"Underwater Glue Test" comparing various adhesives
Inefficient water filtration	Sponge-inspired water filtration	"Layered Water Filter" using household materials
Excess atmospheric CO2	Coral-inspired CO2 sequestration	"CO2 Absorbing Chalk" with pH indicator
Need for strong, lightweight materials	Hagfish slime-based super-fibers	"Super-Strong Slime Strings" from non-Newtonian fluid
Inefficient waste treatment and bioremediation	Deep-sea extremophile-inspired biotechnology	"Extremophile Composting Box" comparing decomposition rates
Limited color perception in optical sensors	Mantis shrimp-inspired optical sensors	"Multi-Spectrum Viewer" with layered color films

# Ocean Problems

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Plastic pollution in oceans	Biodegradable plastics and improved recycling	"Ocean Plastic Decomposition Test" comparing regular and biodegradable plastics in saltwater
Coral reef bleaching	Coral restoration techniques	"Mini Coral Nursery" using artificial corals and different water temperatures
Overfishing	Sustainable fishing practices and marine protected areas	"Fishing Game" demonstrating population dynamics with colored beads
Ocean acidification	Reducing CO2 emissions and potential alkalinity enhancement	"Ocean Acidification Simulator" using vinegar and pH indicators
Oil spills	Improved cleanup technologies and prevention measures	"Oil Spill Cleanup Challenge" testing different materials to absorb oil from water
Rising sea levels	Coastal protection and managed retreat strategies	"Rising Seas Model" demonstrating impacts on a model coastline
Marine habitat destruction	Creation of artificial reefs and habitat restoration	"Mini Artificial Reef" using safe materials in an aquarium
Underwater noise pollution	Regulations on marine noise and quieter ship designs	"Sound Wave Visualizer" showing how noise travels underwater
Harmful algal blooms	Nutrient management and early warning systems	"Algae Growth Experiment" testing effects of different nutrient levels
Deep-sea ecosystem damage from mining	Sustainable deep-sea mining practices and protected areas	"Seafloor Mining Simulator" demonstrating impacts on a model seabed

Other	Problem	Possible Solution	Prototype
Biological/Ecological	Invasive marine species	Prevention, early detection, and control measures	"Invasive Species Spread Simulator" using colored water in connected containers
	Loss of marine biodiversity	Marine protected areas and species conservation efforts	"Biodiversity Board Game" demonstrating ecosystem interactions
	Disruption of marine food webs	Ecosystem-based management approaches	"Marine Food Web Mobile" with removable species cards
Chemical/Pollution	Microplastic pollution	Improved waste management and plastic alternatives	"Microplastic Filtration Device" using different mesh sizes
	Heavy metal contamination	Industrial regulation and bioremediation techniques	"Heavy Metal Absorption Test" using activated charcoal or plants
	Eutrophication	Nutrient management in agriculture and wastewater treatment	"Algae Bloom in a Bottle" experiment with varying nutrient levels
Physical/Geological	Coastal erosion	Coastal protection structures and beach nourishment	"Coastal Erosion Model" with sand, water, and different barriers
	Submarine landslides	Improved mapping and monitoring of underwater slopes	"Underwater Landslide Simulator" using sand and water in a clear container
	Changes in ocean currents	Climate change mitigation and adaptation strategies	"Ocean Current Conveyor Belt Model" using water of different temperatures and colors

Climate-related	Ocean deoxygenation	Reducing nutrient runoff and climate change mitigation	"Oxygen Depletion Chamber" demonstrating effects on aquatic life
	Changes in marine species distribution	Creating wildlife corridors and assisted migration	"Species Migration Map" with temperature-sensitive stickers
	Melting sea ice	Global efforts to reduce greenhouse gas emissions	"Melting Sea Ice Model" demonstrating impacts on sea level and reflectivity
Human-use related	Destructive fishing practices	Sustainable fishing methods and gear modifications	"Seafloor Protection Trawl Net" design challenge
	Impacts of aquaculture	Sustainable aquaculture practices and regulations	"Sustainable Fish Farm Design" project
	Marine litter from shipping	Improved waste management on ships and in ports	"Ship Waste Sorter" design challenge
Technological/Emerging	Impacts of desalination plants	Improved brine disposal methods and plant designs	"Mini Desalination Plant" with impacts visualization
	Effects of offshore wind farms	Careful siting and design to minimize impacts	"Wind Farm Impact Assessment Game"
	Ocean geoengineering impacts	Thorough research and international governance	"Geoengineering Consequences Simulator" board game

Governance/Management	Lack of effective international ocean governance	Strengthening international agreements and cooperation	"International Waters Management Role-play Game"
	Challenges in monitoring marine protected areas	Use of satellite technology and community involvement	"MPA Patrol Strategy Game" using a gridded board
	Conflicts over marine resources	Equitable resource sharing agreements and arbitration	"Marine Resource Allocation Negotiation Game"



**Next Level  
Teacher**