

# Science for Environment Policy

## Sudden changes in marine ecosystems should be addressed through multi-targeted approach

**The world's marine ecosystems** are at risk of sudden and damaging changes. The authors of a recent study say that co-ordinated management of the many drivers of marine changes, such as overfishing and pollution, is needed across international, national and local scales to help avoid the 'regime shifts' that affect ecosystem services and human wellbeing.

**The world's oceans support a huge range of habitats** and [marine life](#), which are being threatened by human activities. Changes to the marine environment are usually gradual, but can sometimes be sudden, causing a regime shift. This is where a dynamic, but stable, ecosystem undergoes fundamental and rapid changes which alter its structure and the way it functions. This shift affects ecosystem services and human wellbeing, which relies on these services, such as food provision or recreation.

Regime shifts have been observed globally and are typically affected by many drivers. For example, overfishing, eutrophication, alien species, climate and changes in the food web are likely to have driven regime changes seen in the Black Sea over the last 50 years.

In this study, the researchers investigated regime shifts in marine ecosystems across the world by examining available scientific information on an online [regime shifts database](#). Through this, they identified 13 types of marine regime shifts, such as marine eutrophication, fisheries collapse and seagrass collapse, and 54 drivers of change. Drivers included natural forces, such as hurricanes, as well as human activities, such as coastal development or fishing. They also identified 26 ecosystem services that had been affected by regime shifts. These included nutrient cycling and water purification.

The researchers found that over half of marine regime shifts had multiple drivers in common, namely: climate change, fishing, agriculture, demand for food and fibre, deforestation, urbanisation and nutrient input.

All types of regime shift affected [biodiversity](#) and fisheries. Fisheries, biodiversity, aesthetic values, water purification, nutrient cycling, 'primary production' (food production by phytoplankton and algae, for example, which supports ecosystem food webs) and recreation were the group of ecosystem services that were affected together the most often.

The researchers also considered how to manage the drivers at different scales. They found that in nine of the 13 regime shifts, international collaboration would be needed to deal with more than half of the drivers. This is especially the case for regime shifts in polar or sub-polar regions where every driver operates across international borders. Even where international cooperation is not fully achieved, such as in [climate change](#) efforts, reducing drivers (e.g. nutrient input) at the local or regional scale could potentially mitigate disturbances to the marine environment caused by global drivers.

Given that regime shifts are triggered by multiple drivers, some of which (global warming, population growth and demand for food, for example) are going to intensify in the future, the researchers suggest that management strategies across all scales which tackle shared drivers could help reduce the risk of marine regime changes.

Regime shifts are typically difficult to reverse. The researchers believe their work will help environmental managers identify local potential drivers, and, if possible, act to prevent regime shifts from happening, even if monitoring programmes are not in place.



**19 February 2015**  
**Issue 404**

**[Subscribe](#) to free  
weekly News Alert**

**Source:** Rocha, J., Yletyine, J., Biggs, R. *et al.* (2015). Marine regime shifts: drivers and impacts on ecosystems services. *Philosophical Transactions of the Royal Society B* 370: 20130273.  
DOI:10.1098/rstb.2013.0273.

**Contact:**  
[juan.rocha@stockholmresilience.su.se](mailto:juan.rocha@stockholmresilience.su.se)

**Read more about:**  
[Marine ecosystems](#)

The contents and views included in *Science for Environment Policy* are based on independent, peer-reviewed research and do not necessarily reflect the position of the European Commission.

To cite this article/service: "[Science for Environment Policy](#)": European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol.