

Ocean oxygen: the role of the Ocean in the oxygen we breathe and the threat of deoxygenation

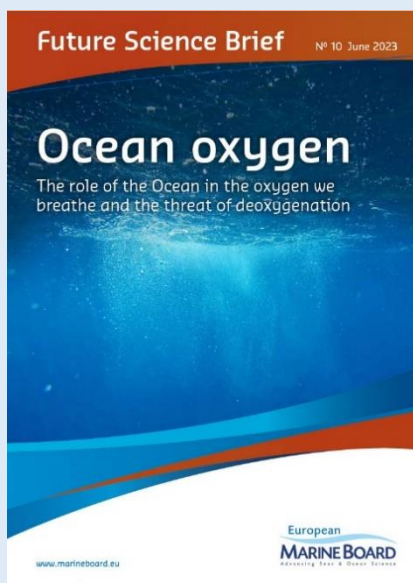
Background

The sentence “every second breath you take comes from the Ocean” is commonly used to highlight the importance of Ocean oxygen. However, despite its widespread use, it is often not phrased correctly. In contrast, there is very little awareness about the threat of global oxygen loss in the Ocean, or deoxygenation, particularly in comparison with other important stressors. Although there are gaps in our knowledge, we know enough to be very concerned about the consequences of deoxygenation: the impacts might even be larger than from Ocean acidification or heat waves. Three out of the five global mass extinctions were linked to Ocean deoxygenation.

This document raises awareness on the most recent science on Ocean oxygen, including causes, impacts and mitigations strategies to tackle Ocean deoxygenation, and whether “every second breath we take comes from the Ocean”. It covers the following overarching topics:

1. History of the oxygen cycle on Earth;
2. The modern oxygen cycle;
3. Current Ocean deoxygenation;
4. Methods to study Ocean oxygen;
5. Addressing Ocean deoxygenation through mitigation and adaptation; and
6. Recommendations for policy and research.

Recommendations



Recommendations for policy and management:

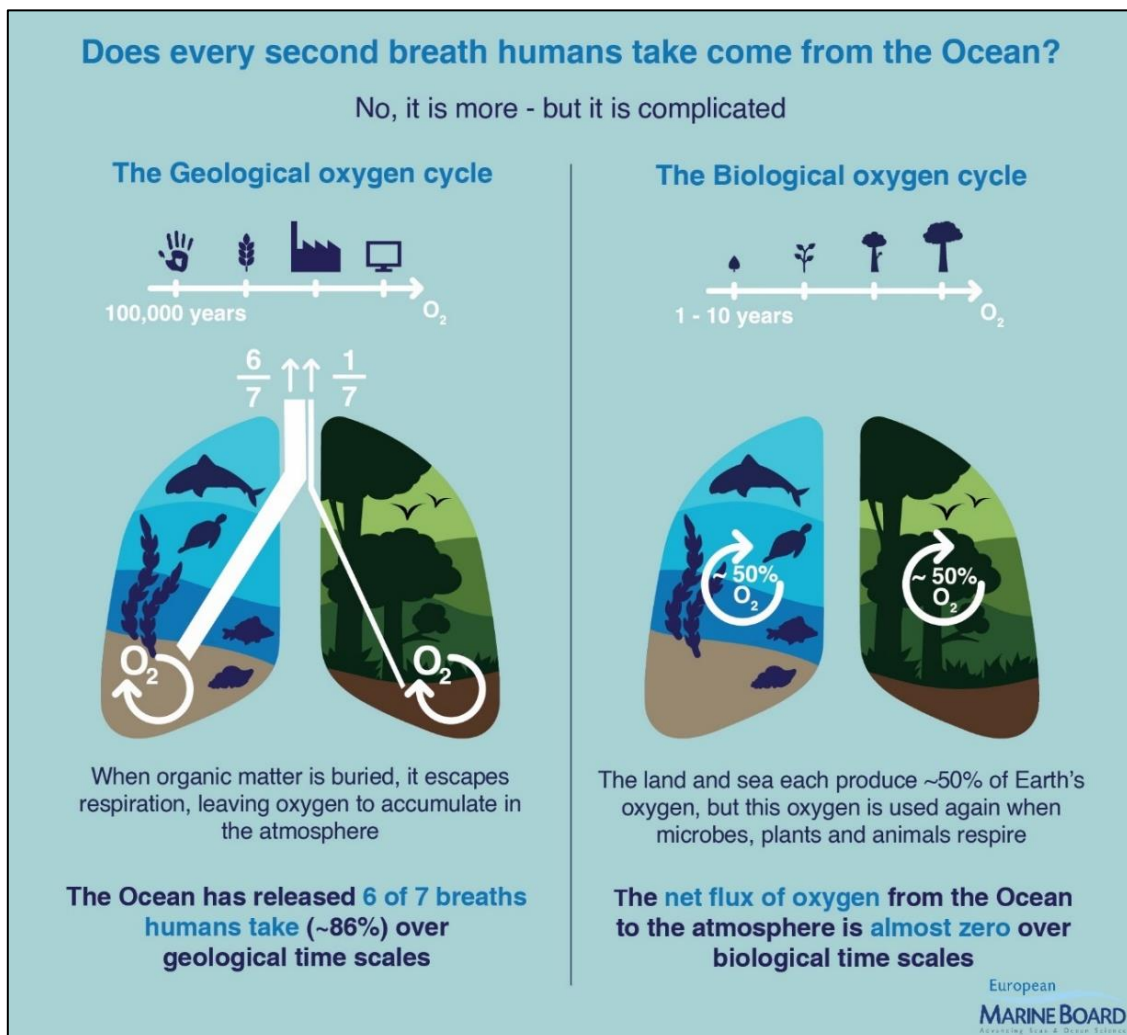
- Recognise Ocean deoxygenation as a major threat to marine ecosystems;
- Reduce and eventually reach net-zero anthropogenic emissions of greenhouse gases to stop upper Ocean deoxygenation;
- Limit run-off of nutrients and organic waste into the Ocean to reduce coastal deoxygenation and hypoxia (low oxygen conditions impacting marine life);
- Reduce stressors and increase protection of marine ecosystems, especially in deep-sea ecosystems, to increase resilience to deoxygenation;
- Include Ocean oxygen in future projections by intergovernmental bodies and in high-level frameworks for planetary health to spur action and societal awareness; and
- Promote the following statements on the role of the Ocean in the oxygen we breathe, to provide the most accurate information:

oxygen we breathe, to provide the most accurate information:

- ✓ The Ocean produces ~50% of Earth’s oxygen;
- ✓ Every second breath taken by all life on Earth comes from the Ocean; and
- ✓ Since the origin of life on Earth, the Ocean has provided most of the oxygen in the atmosphere, and is responsible for 6 of 7 breaths humans take.

Recommendations for funders, research and monitoring:

- Fund and perform coordinated research to better understand historical, current and future Ocean deoxygenation rates;
- Fund and perform targeted research to enhance understanding of the biological, chemical and physical processes controlling oxygen dynamics;
- Fund and increase Ocean oxygen observations and modelling efforts, and ensure that all oxygen data is compiled and shared, feeding into global databases, to accurately document and predict Ocean oxygen changes;
- Develop new low-power and low-cost oxygen sensors;
- Include oxygen in multiple stressor studies of marine environments;
- Fund and perform research to better understand how deoxygenation will impact marine life, from populations to ecosystems; and
- Fund and perform research to better understand the vulnerability of ecosystem services, our society, and our economy to deoxygenation.



More information in the EMB Future Science Brief 10 “Ocean oxygen: the role of the Ocean in the oxygen we breathe and the threat of deoxygenation”, which is free to download at:

<https://marineboard.eu/publications/ocean-oxygen>

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