



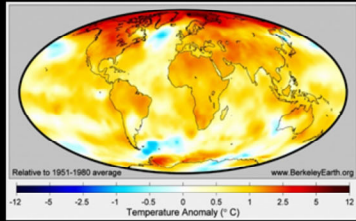
- This is the image taken in 1968, famously known as “Earthrise.”
- It was the first ever photographic image of Earth hanging in the blackness of space.
- This was the first time that it really sunk in to people that the Earth is our temporal home and that we are not leaving it anytime soon.
- This is what we have to work with.
- And we hear of extensive changes to the environment of the globe.
- But what do we mean by “global” environmental change?



- A number of definitions could be used, but one based on the physical character of the change is useful.
- There are two types of such change – the globally systemic and the globally cumulative

# Globally Systemic Change

## Atmosphere:



### Global Average Temperature

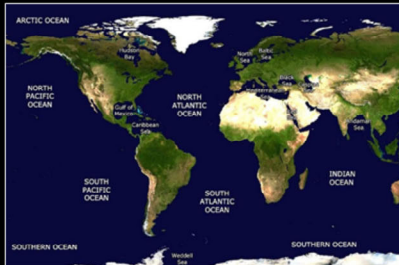
<https://berkeleyearth.org/archive/global-warming-2016/>



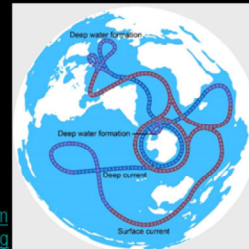
### Stratospheric Ozone Layer

<https://pre-sustainability.com/articles/obscure-impacts-demystified-stratospheric-ozone-depletion/>

## Ocean:



<http://www.general9ledge.com/geography/top-five-largest-oceans-of-the-world/>

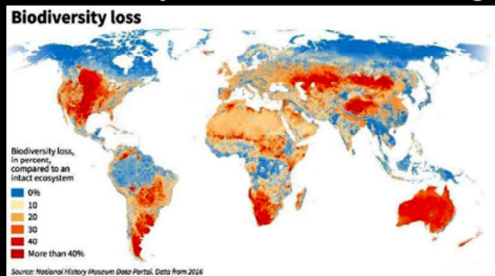


[https://en.wikipedia.org/wiki/Ocean#/media/File:Thermohaline\\_circulation.svg](https://en.wikipedia.org/wiki/Ocean#/media/File:Thermohaline_circulation.svg)

Meyer W. B. and B. L. Turner II. 1995. The Earth Transformed: Trends, Trajectories, and Patterns. In R. J. Johnston, P. J. Taylor, and M. J. Watts (eds), *Geographies of Global Change: Remapping the World in the Late Twentieth Century*. Oxford: Blackwell, 302-315.

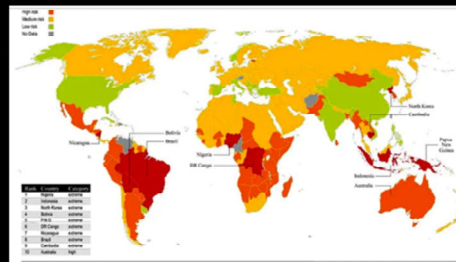
- Globally Systemic Change refers to change that occurs in a system that is truly worldwide.
- There are two systems that operate in this way – the atmosphere and the ocean.
- It's important to note that even though the entire system changes, the effects will likely vary in different places.
- In the atmosphere, there are two global systems: (1) global average temperature is increasing around the world, in some places more than other places, and this causes climates to change; (2) stratospheric ozone is a layer that reduces the amount of UV radiation that reaches Earth, and the layer has grown thinner allowing harmful radiation to reach the surface.
- Although we label the oceans of the world with different names, there is really one world ocean. They are all connected which allows residues such as radioactivity and DDT to spread around the world.
- The small image shows circulation around the world through the ocean.

## Globally Cumulative Change



### Biodiversity Loss

<https://phys.org/news/2019-04-biodiversity-conference-groundwork-nature.html>



### Deforestation

<https://www.businessinsider.com/map-of-the-day-deforestation-2011-12>

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- Globally Cumulative Change refers to something that is happening in so many places around the world that it substantially reduces the total amount of some particular resource.
- Examples of this include biodiversity loss (plants and animals) and deforestation, which are shown here.
- But there are other examples of globally cumulative change such as reductions in soil fertility, loss of wetlands, and more.
- These maps show what is happening on land, but changes are occurring in the ocean as well.



- So, those are the two types of “global” change that have a physical basis.
- And remember, there are major changes happening in our world.