



## 5. Critical developments



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### We do not know

- whether the loss of livelihoods on Earth caused by the pollution will continue to progress *gradually*,
- or whether individual systems such as the climate or the Gulf Stream will suddenly and unexpectedly tip over.

A concept generates enormous interest within science, policy, and practice:

### The nine Planetary Boundaries A Safe Operating Space for Humanity



### [The nine planetary boundaries](#)

If we exceed these boundaries, abrupt or irreversible environmental changes could occur.

If we do not exceed them, humanity will be able to evolve and thrive over generations.

According to the most recent data, we have already **shot past 4 of the planetary boundaries**, and **ocean acidification** is nearing the boundary.

1. Stratospheric ozone depletion
2. **Loss of biosphere integrity (biodiversity loss and extinctions)**
3. Chemical pollution and the release of novel entities
4. **Climate Change**
5. **Ocean acidification**
6. Freshwater consumption and the global hydrological cycle
7. **Land system change**
8. **Nitrogen and phosphorus flows to the biosphere and oceans**
9. Atmospheric aerosol loading

### Some examples of critical developments

- **In just 200 years, the world's population has grown from 900 million to nearly 8,000 million people.**

By the year 2100, according to the UNO an estimated 10,000 - 11,000 million people are to live on our Earth.



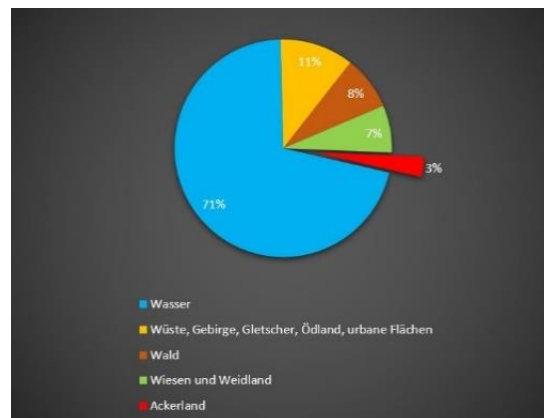
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- **The exploitation of valuable mineral resources and the overfishing of the oceans are progressing without restraint, regardless of the legitimate needs of future generations.**

The extraction of raw materials also causes major environmental pollution.

- **In the past 150 years, almost half of the fertile soil on Earth has disappeared.**

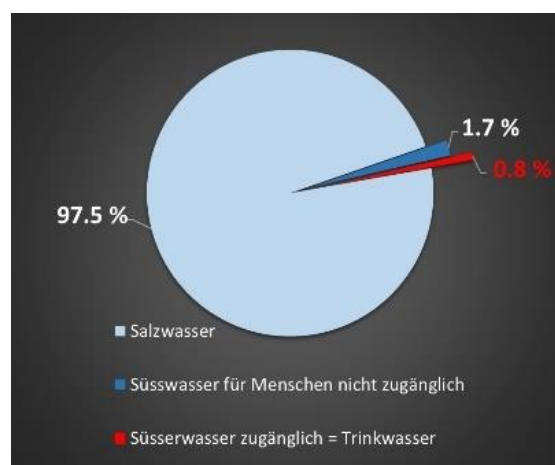
#### Our Earth - Available agricultural land:



Source: UN - World Prospects: The 2015 Revision

- **Every day, about 100 living species die on our planet.**  
FAO [Food and Agriculture Organization of the United Nations] launches the first-ever global report on the state of biodiversity that underpins our food systems.  
*State of the World's Biodiversity for Food and Agriculture. 2019*
- **Waste such as plastic, pharmaceutical products, pesticides, etc. are spreading in nature across the globe and increasingly entering the food chain, even food we humans eat.**  
Thousands of new substances are synthesised annually and many of them are released into the environment, with mostly unknown effects on plants, animals and humans.
- **We pollute drinking water worldwide with serious consequences for millions of people.**  
Around 2,000 million people currently have no access to clean drinking water.

#### Our Earth - Percentage of salt water, fresh water and drinking water:



- **Our protective shield against harmful solar radiation - the ozone layer - has already been weakened.**

- **In the past 200 years, 90 percent of the moors have disappeared.**  
Although they make up only three percent of the land area, they store more CO<sub>2</sub> than all forests together. The current global drainage of the moors produces a CO<sub>2</sub> output that makes up about 5 percent of the CO<sub>2</sub> emissions caused by humans year for year.
- **We are changing the climate, with serious consequences for both us humans and nature.**



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- **Globally, the proportion of livestock has increased to 65% and that of us humans to 32%. The proportion of all wild animals, however, has dropped to 3%.**  
[Percentage of biomass of all vertebrates].  
The production of meat and dairy products already takes up more than 70 per cent of global agricultural land, although it only covers 18 per cent of humanity's calorie needs.  
*Poore et al., Reducing food's environmental impacts through producers and consumers. Science 360, 987-992 (2018)*



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