Human influence on environment

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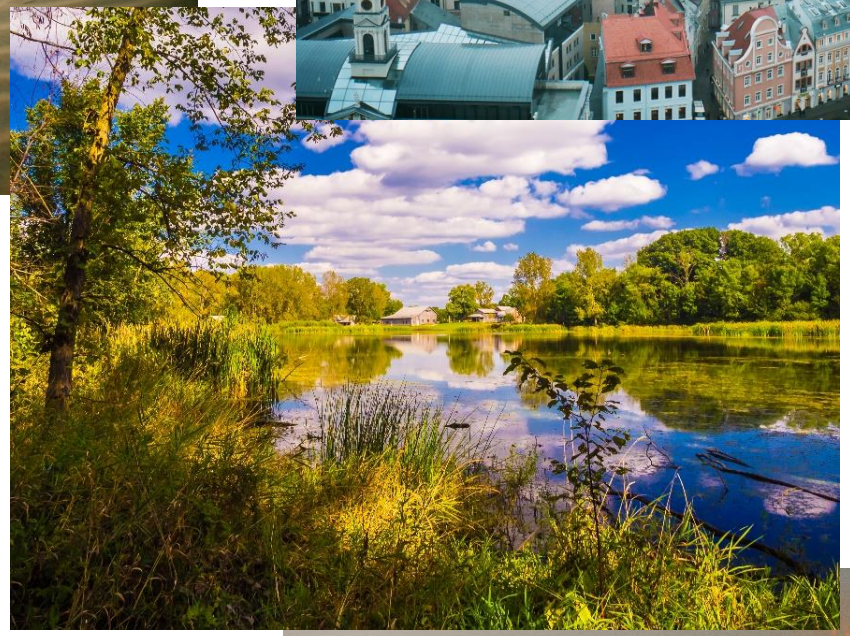
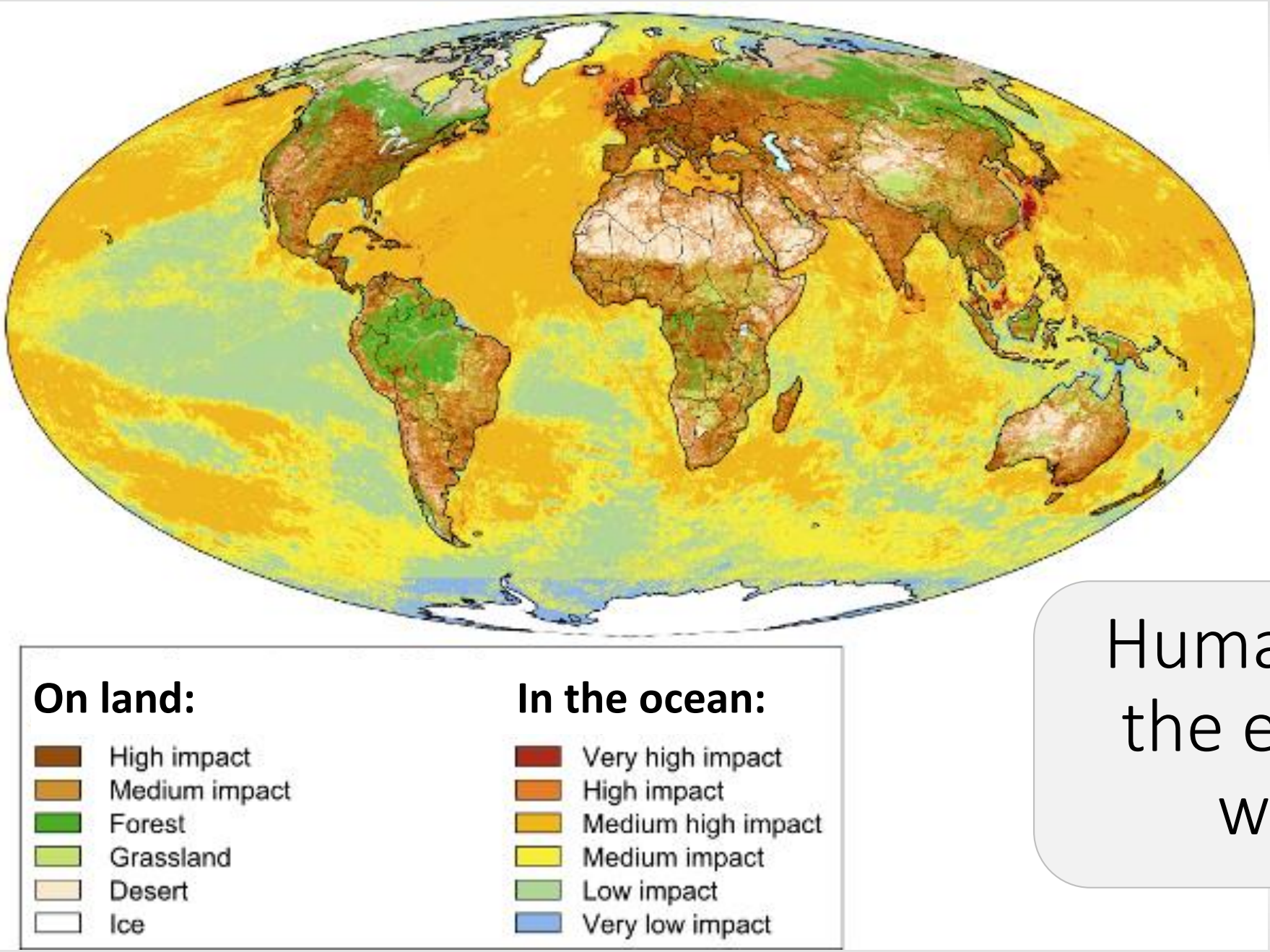
How do we understand the environment?



The environment involves all the conditions and factors that may affect living organisms during their lifetime

- **Natural environment**
- **Human internal (mental) environment**
- **Environment transferred by humans**
- **Social environment**

Nature affects us – but how can we influence the nature and environment?

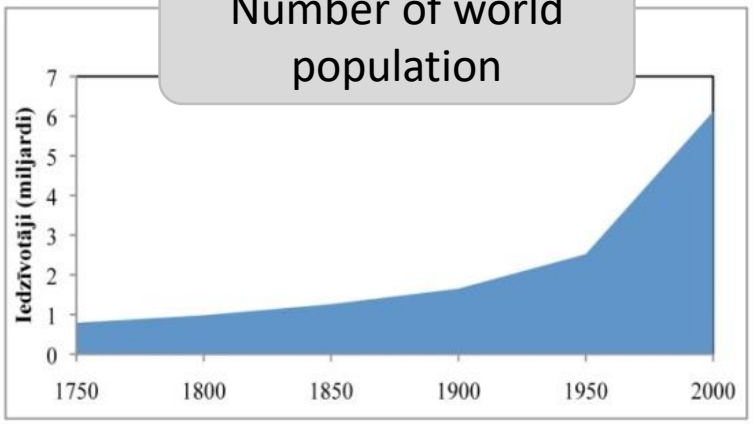


Human impact on the environment worldwide

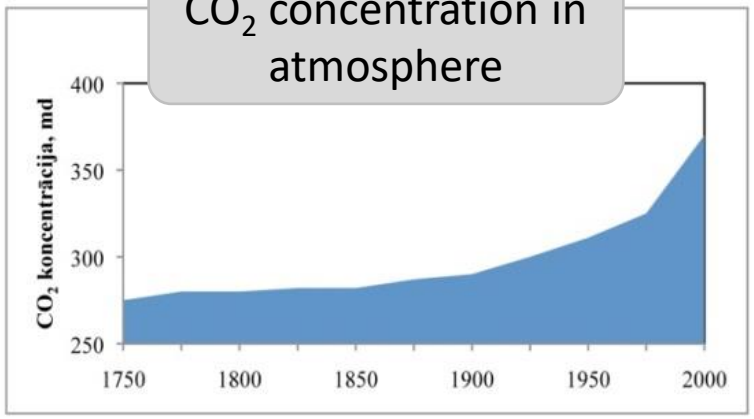
Spheres of human impact

- Production growth
- Consumption growth
- Globalization of processes

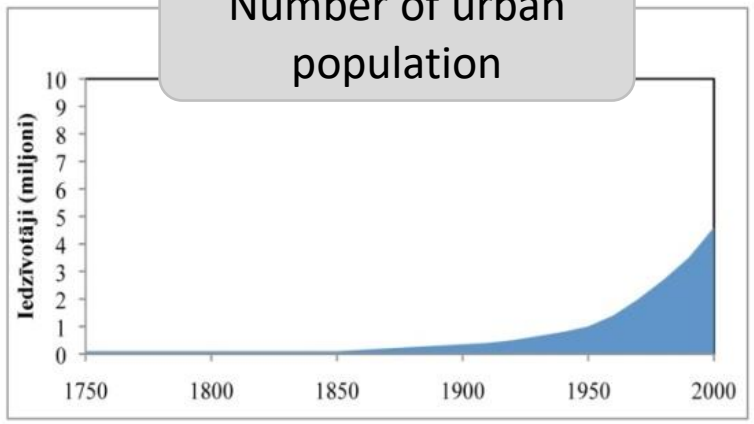
Number of world population



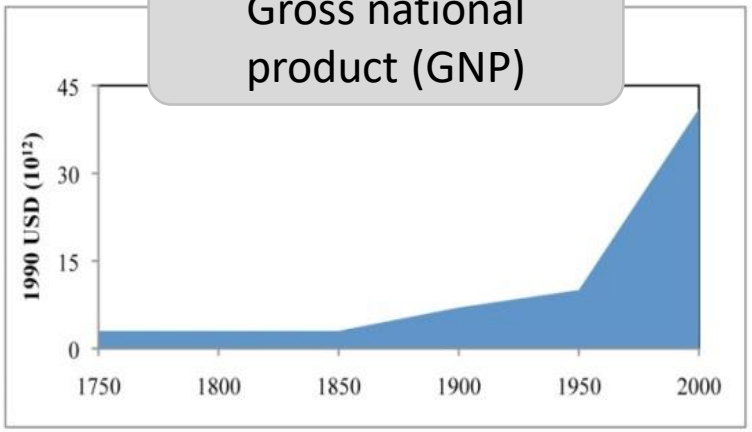
CO_2 concentration in atmosphere



Number of urban population



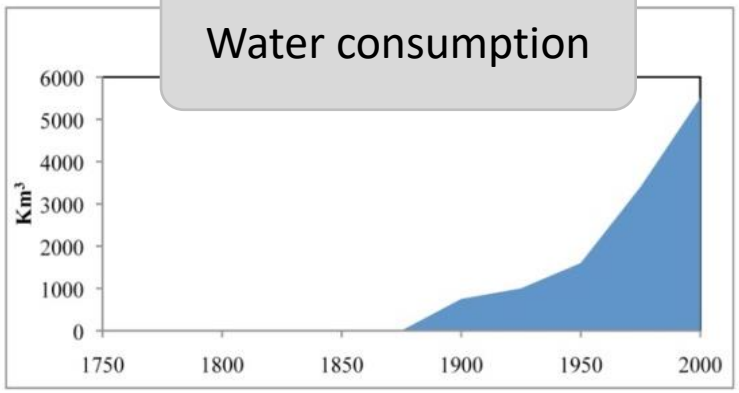
Gross national product (GNP)



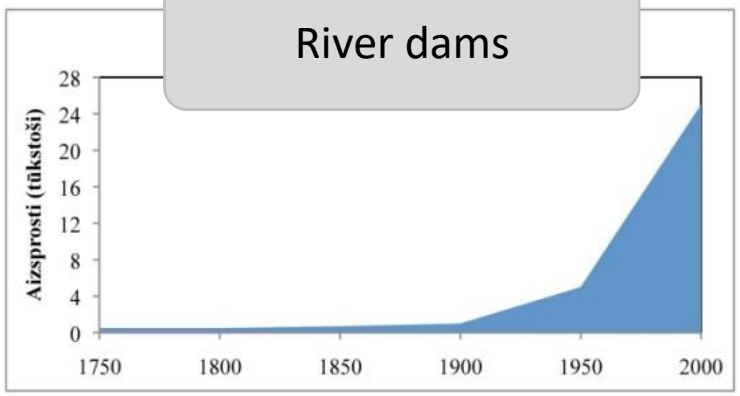
Variation of characteristic parameters of human development during the last century

Speed of changes is different, but the overall trend – **exponential growth** – is continuing

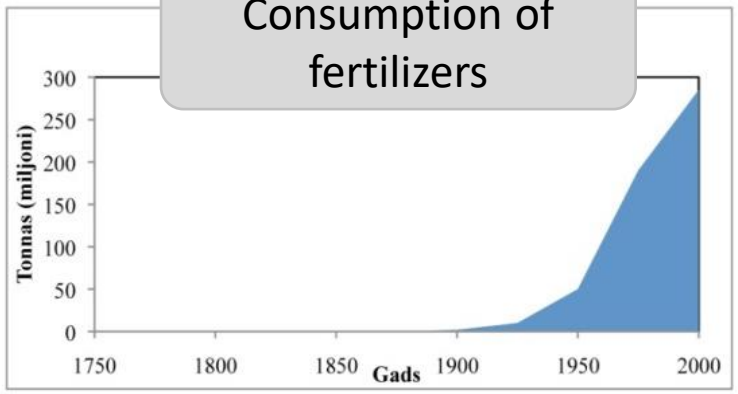
Water consumption



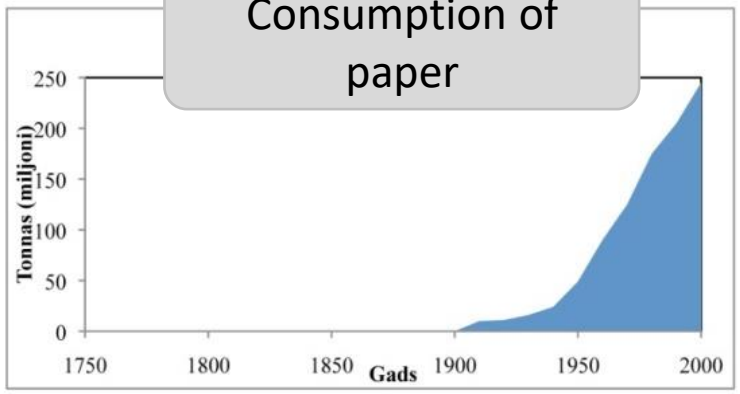
River dams



Consumption of fertilizers



Consumption of paper



Nowadays every person utilizes **4 times** more resources than in the beginning of 20th century

- **World population has increased more than 4 times (from 1.5 to 6.9 billion)**
- **World economics turnower has increased 14-fold**
- **Production amount has increased 40-fold**
- **Energy consumption has increased 16-fold**
- **Carbon dioxide emissions have increased 17-fold**
- **Sulphur dioxide emissions have increased 13-fold**
- **Ocean catch has increased more than 35 times**
- **Number of domestic pigs has increased 9 times**

Exponential growth is the driving force of the public economy approaching physical borders of the planet

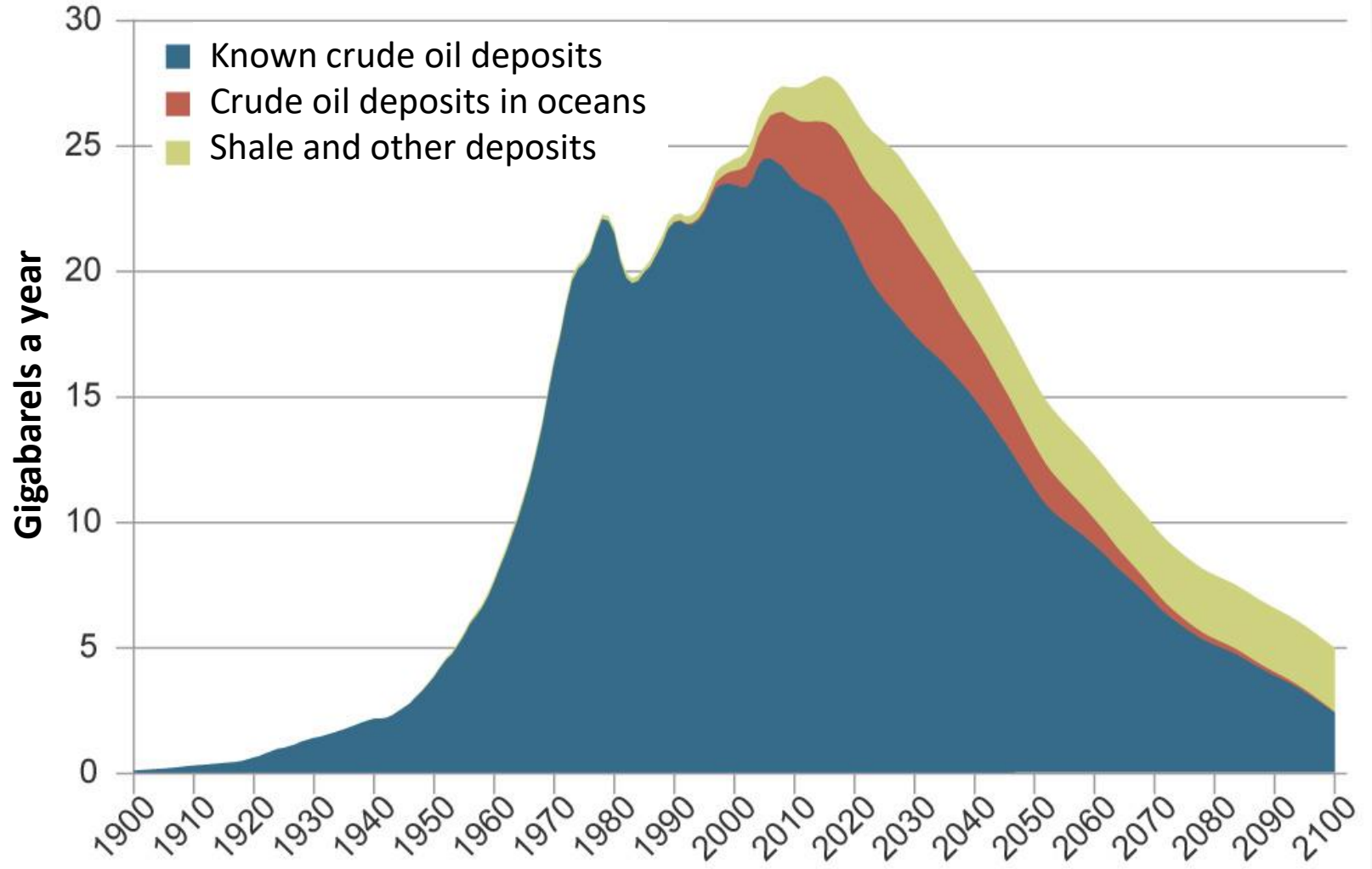
Growth of humanity can not continue endlessly – **growth has its limitations** which are determined by our planet

LIMITATION OF RESOURCES

Use of non-renewable resources

Belchatow lignite-fired power station in Poland – the largest environmental pollutant in the EU

TEC-1 of Riga uses natural gas as a fuel, consuming about 230 m^3 of gas a year and diesel is used as a reserve fuel



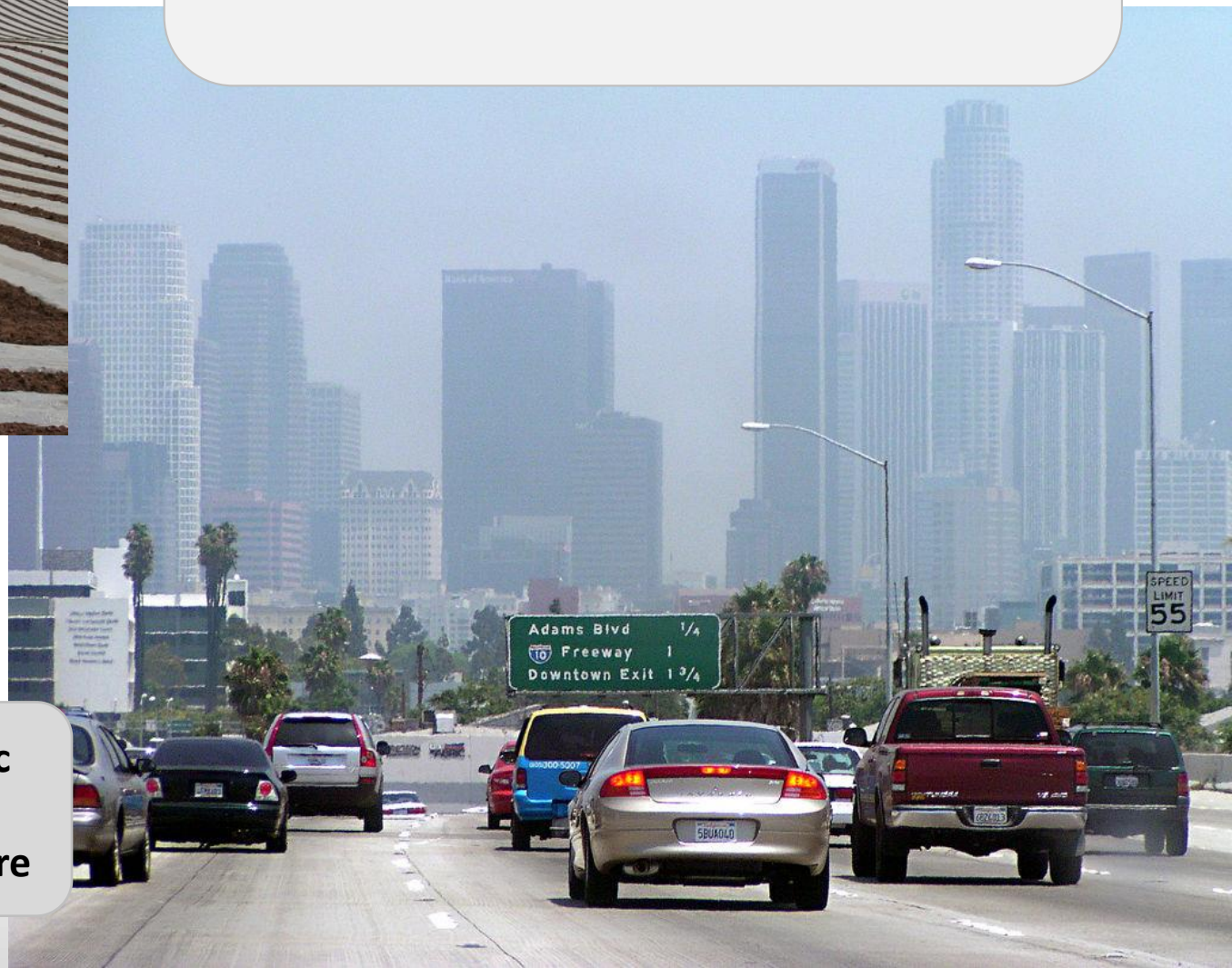
Future assessment of crude oil and petroleum hydrocarbon production volumes and resources

Existence of humanity is dependent on resources which are coming from the Earth

Growth is limited not only by depletion of resources, but also due to increased pollution and **limited capacity of the planet** to absorb waste and pollution

Examples of excessive use of resources

Overwhelming monocultural cropping in agriculture where biodiversity is endangered and environment is polluted by chemicals



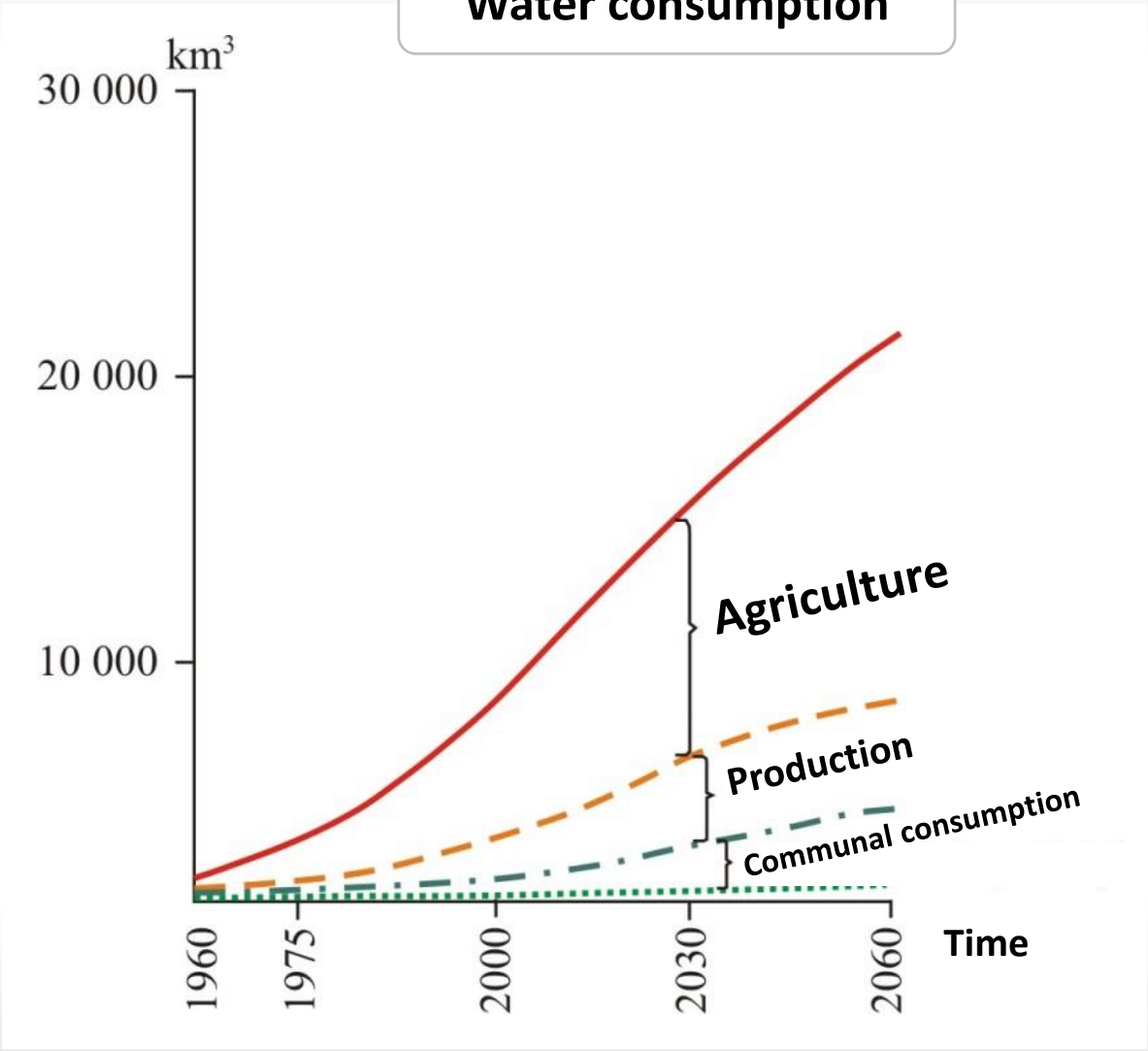
Urban environment with unstopable traffic flows that are consuming non-renewable resources and releasing waste to atmosphere

Water is one of the most consumed substances by people – used in households, as well as in production

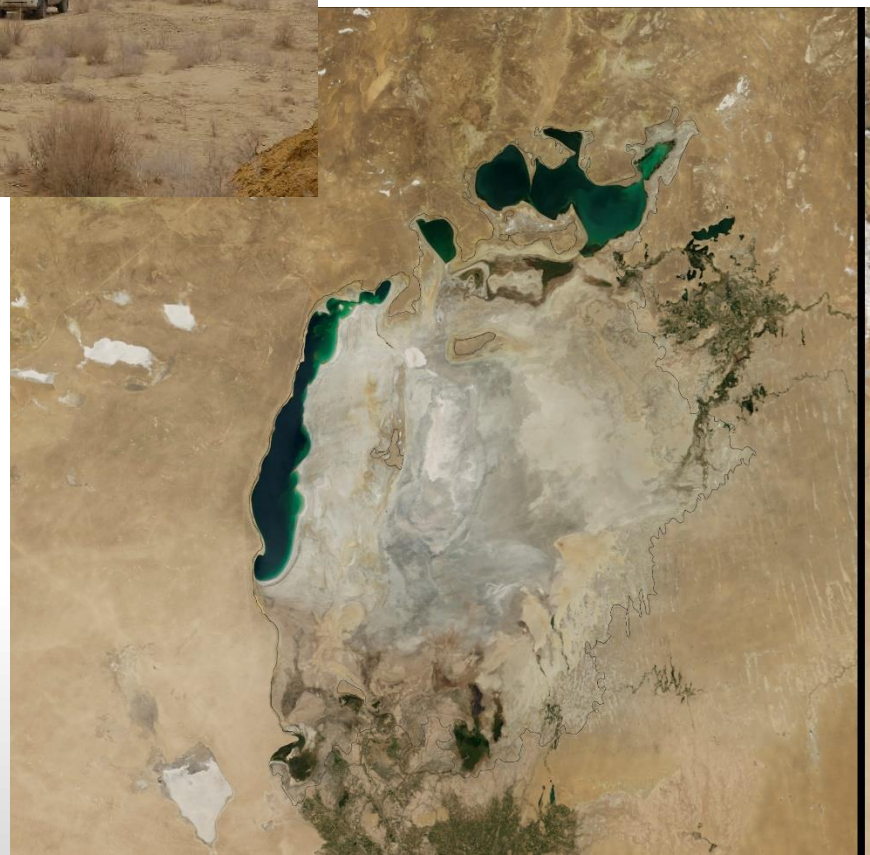
Worldwide water consumption:

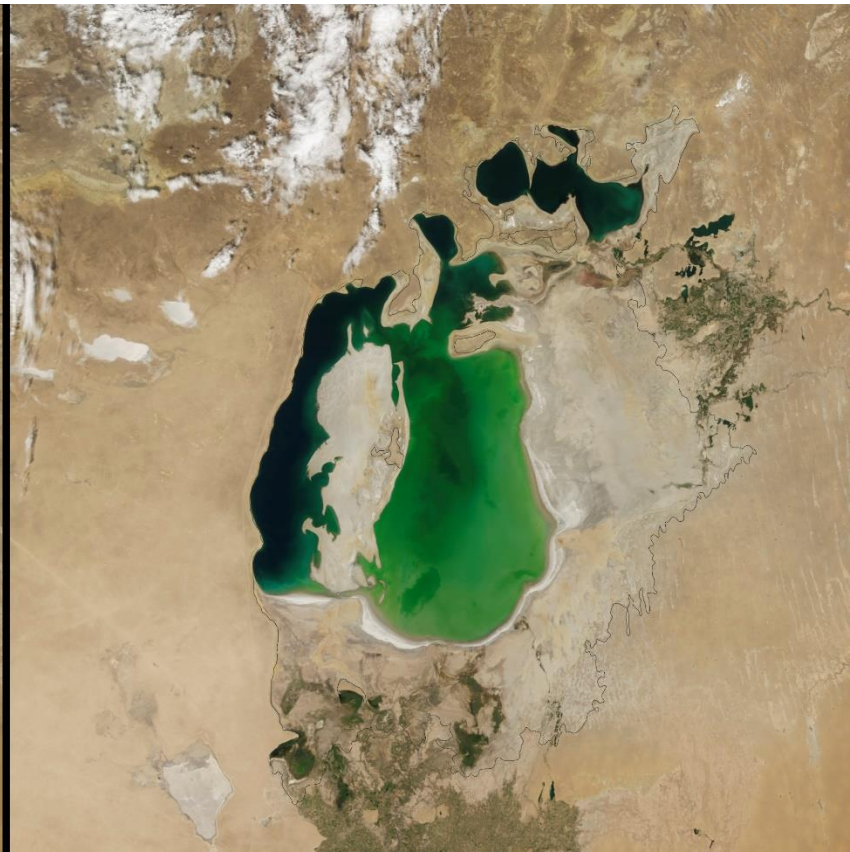
- **Agriculture (69%)**
- **Industry (23%)**
- **Households and services (about 8%)**

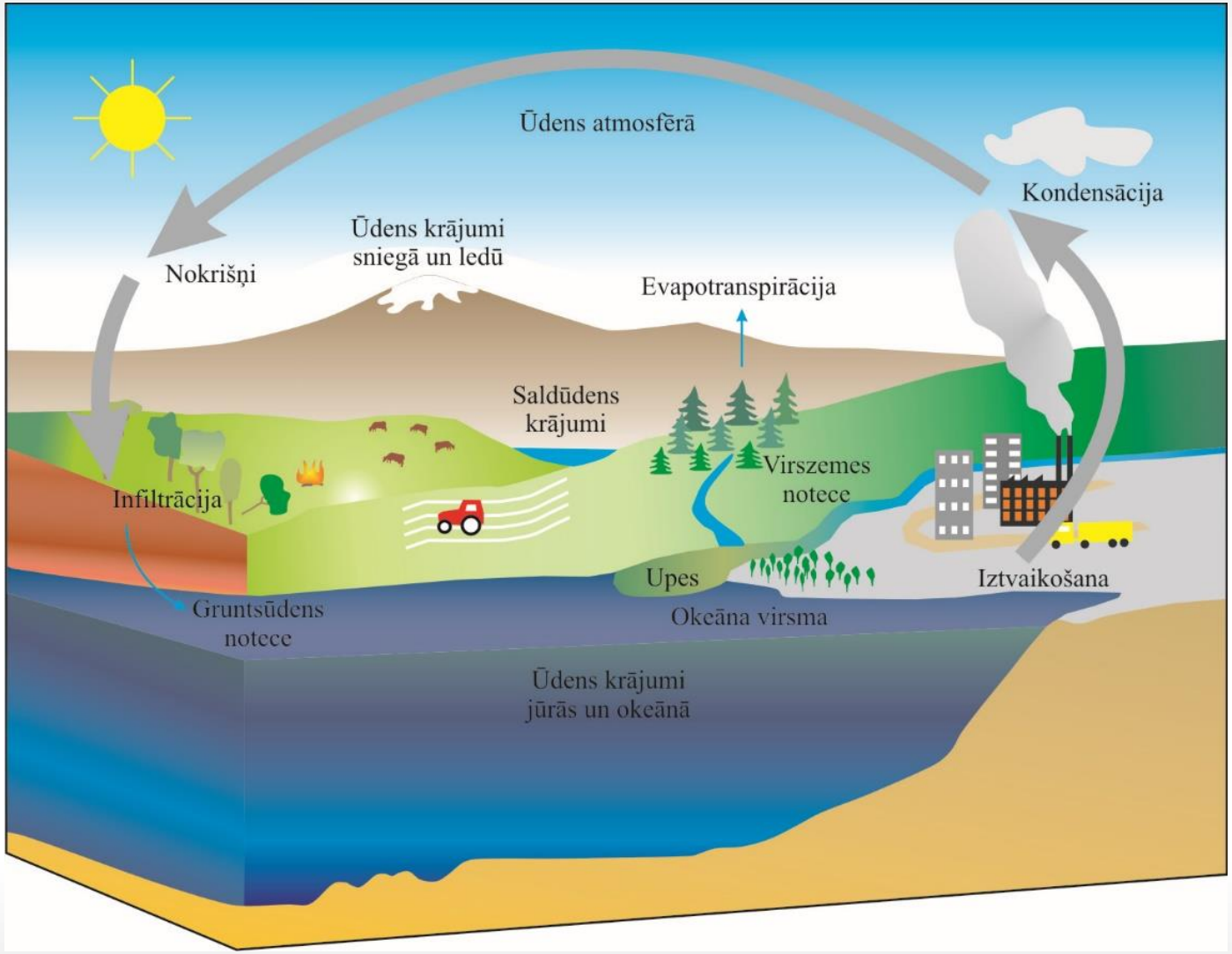
Water consumption



Negative human impact on water circulation processes can be ilustrated by depletion of the Aral sea







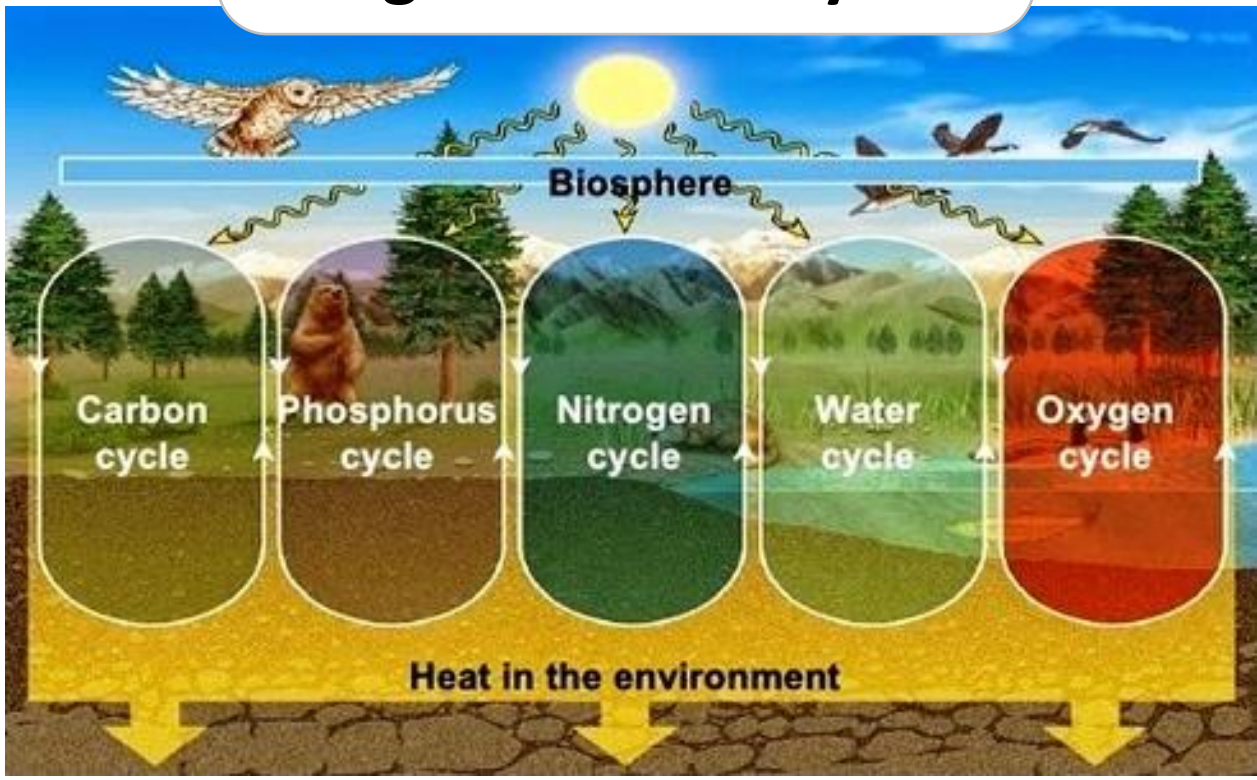
Human activities can affect flows of substances in environment, for example, **hydrological cycle**

- **Hydrological cycle reveals connection among the main water sources**
- **It reflects the role of evaporation and atmospheric precipitation in water balance**
- **The main energy source which provides water turnover in global circulation cycle is the Sun**

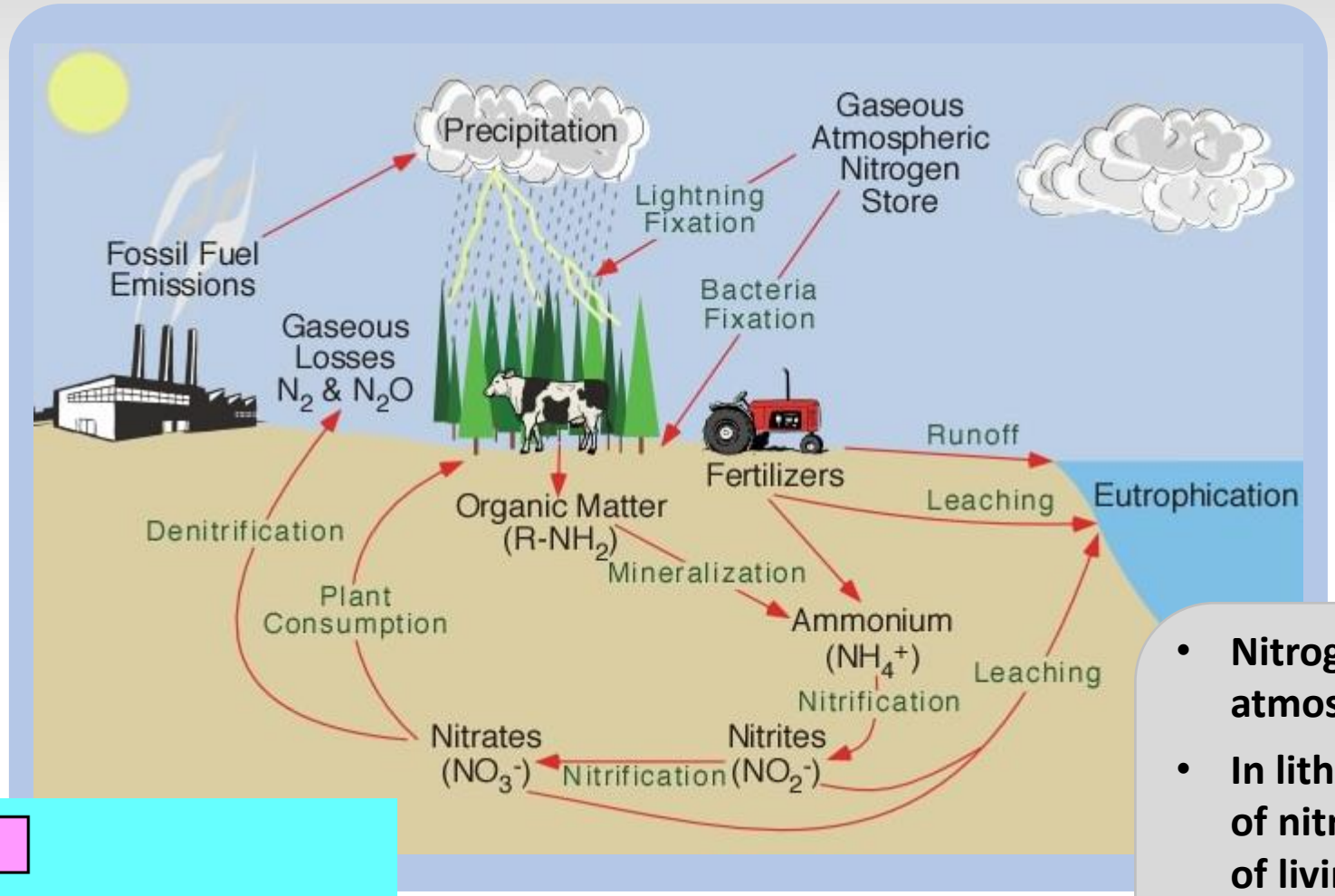
Circulation of elements, substances and energy continues endlessly on the Earth – it is described by **circulation cycles**

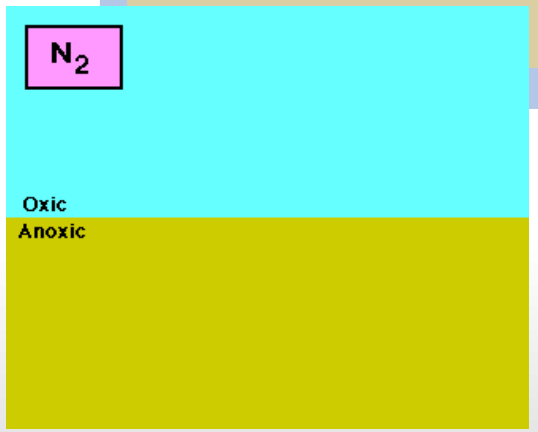
Circulation cycles usually are named as **biogeochemical cycles** because they incorporate many chemical transformations, geological processes carried out involving living organisms – **biota**

Biogeochemical cycles



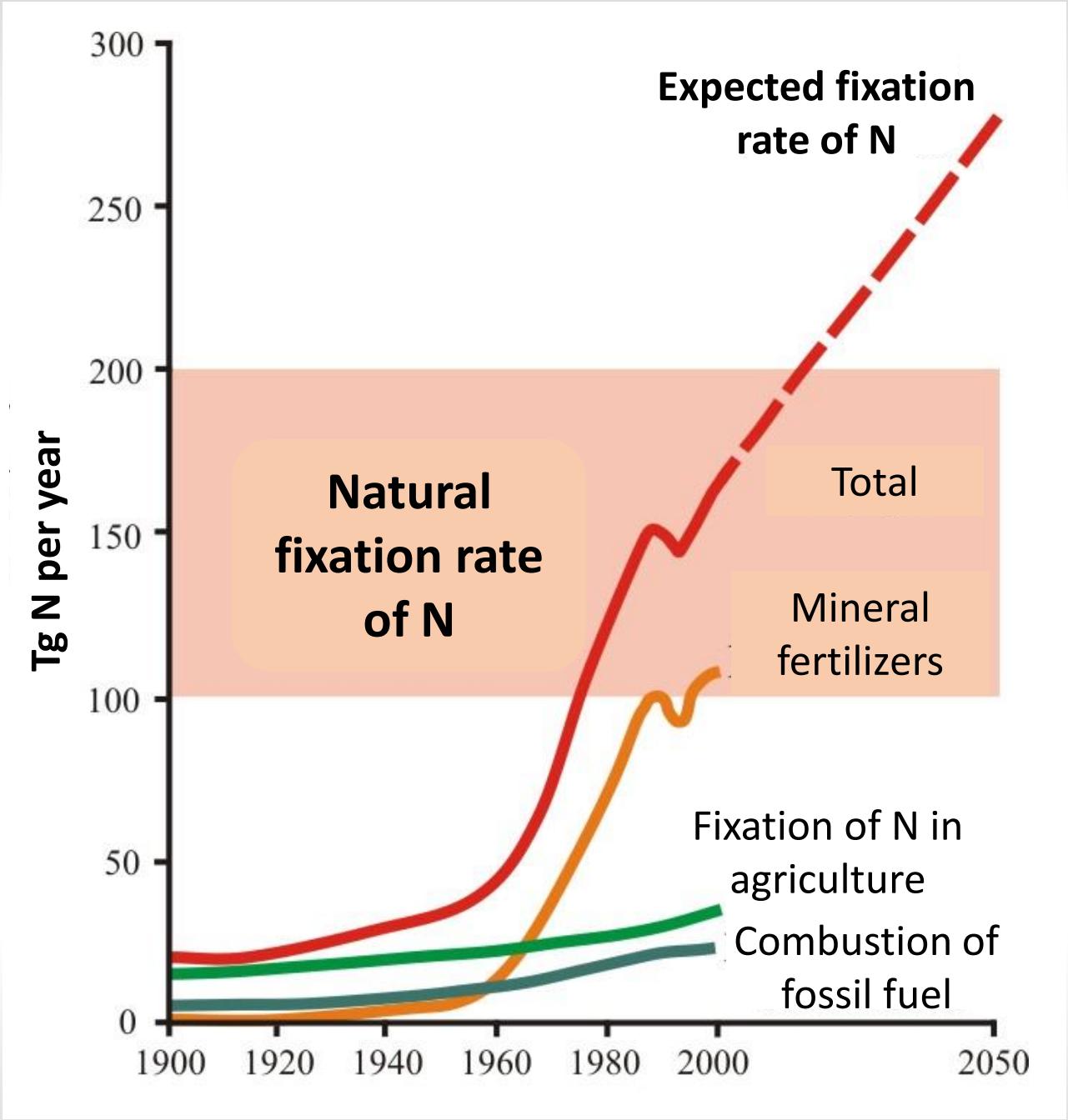
Biogeochemical cycle of nitrogen



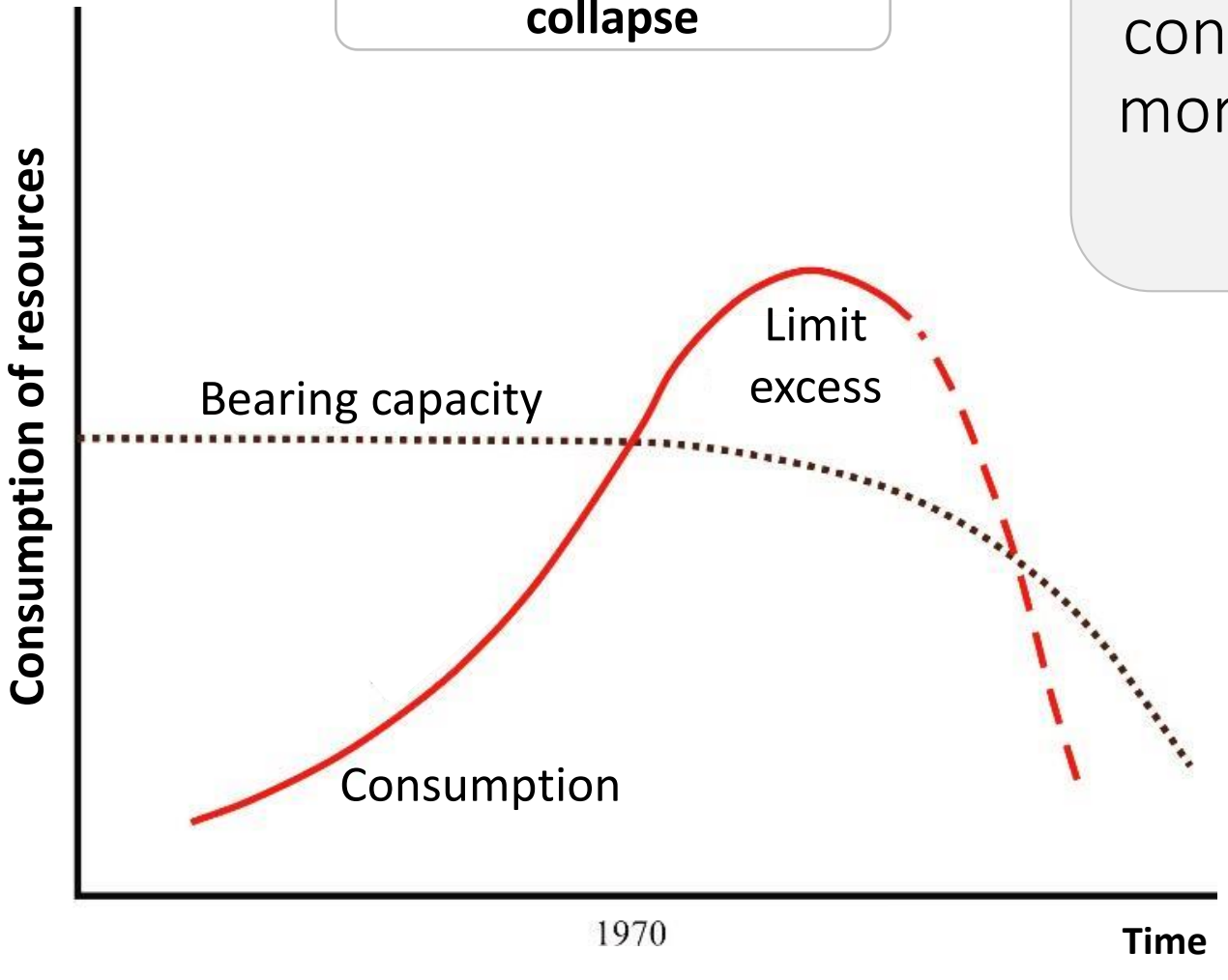


- **Nitrogen is the main component of atmosphere (76%)**
- **In lithosphere and hydrosphere concentration of nitrogen compounds is low and the majority of living organisms are unable to use nitrogen directly**
- **Nitrogen cycle involves a variety of processes that ensure the transfer of atmospheric nitrogen compounds to forms available for living organisms**

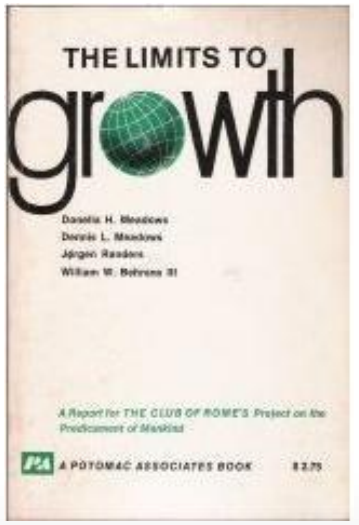
Nitrogen fixation rate during natural processes and human activities on a global scale

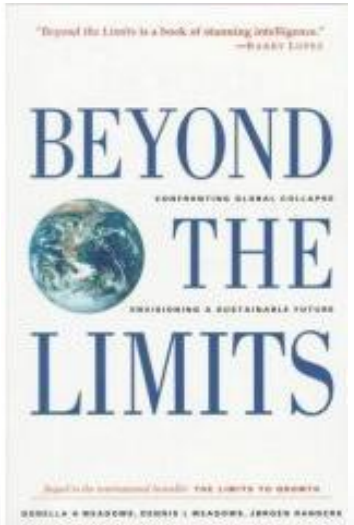


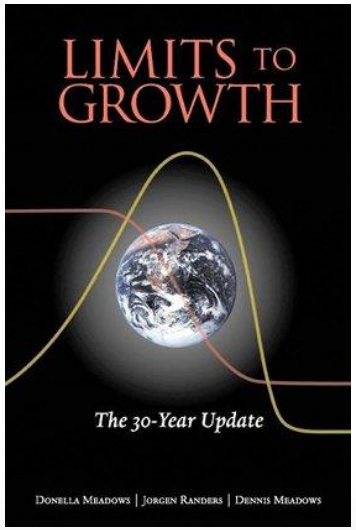
Consumption and collapse



If growth in as system is continuing continuously, it will unavoidably consume more resources than it can produce – and at some point may collapse





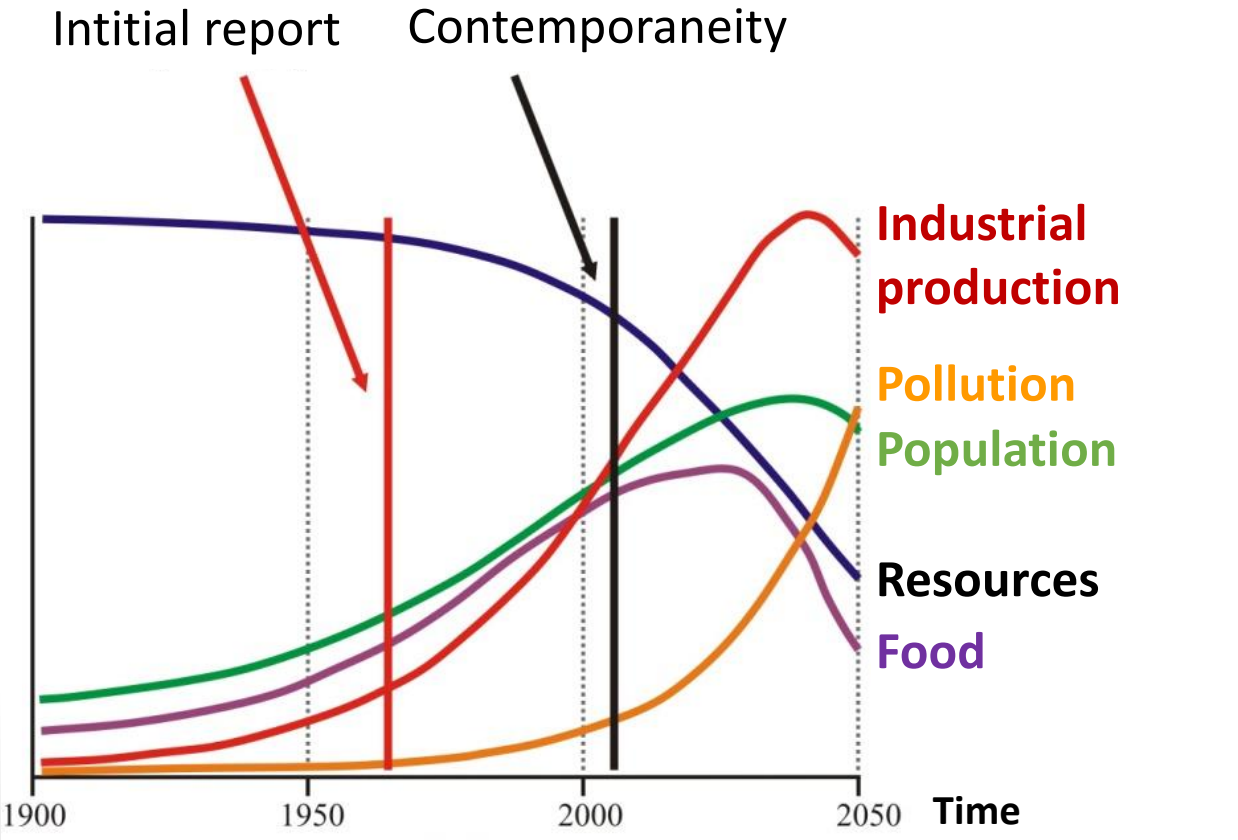


MODELLING OF THE LIMITS TO GROWTH

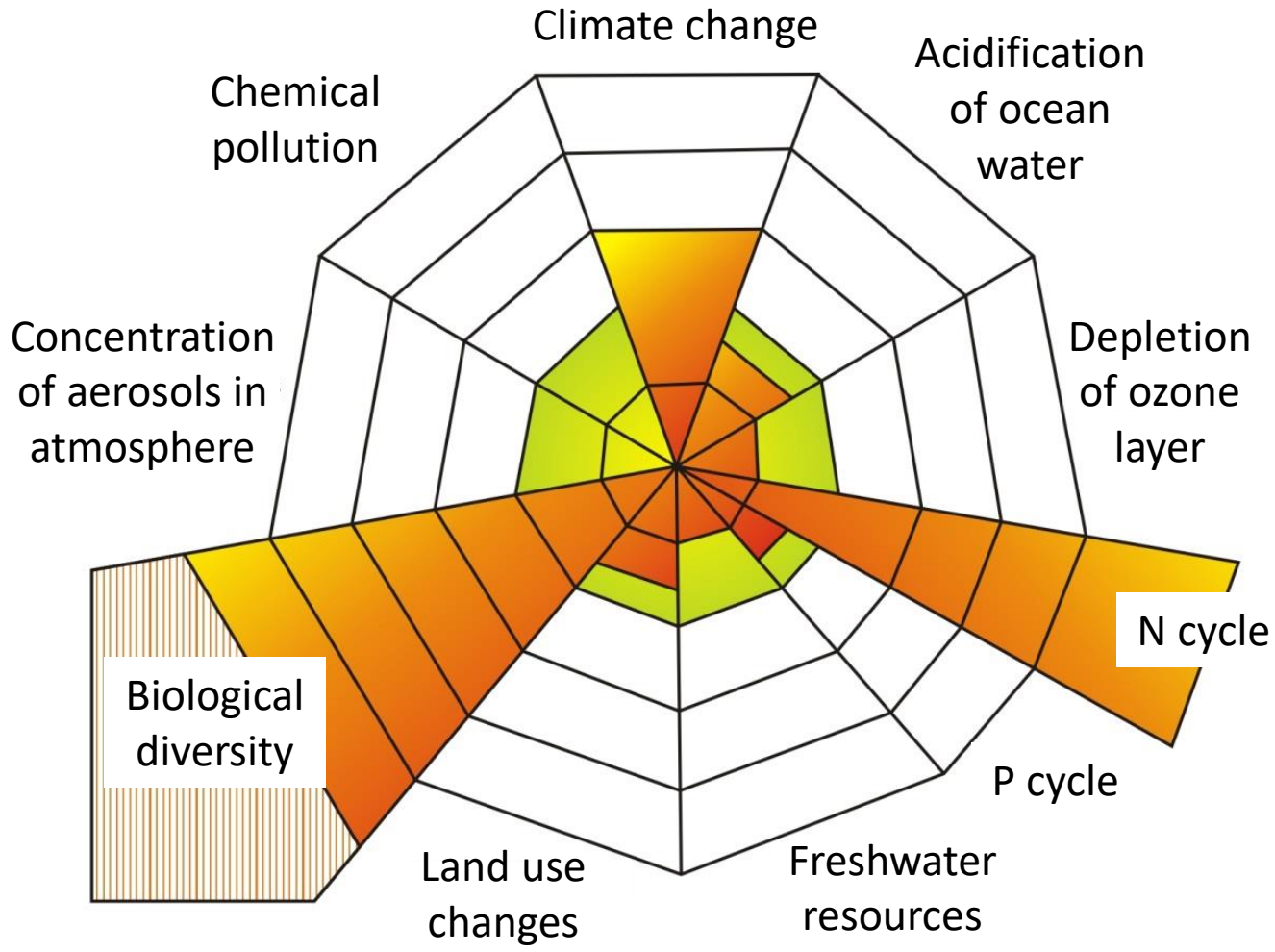
It is believed that the situation can be changed using technologies, however also they can not prevent the expiry of growth or deterioration of the situation

In order to achieve a better outcome, the changes in society are necessary

Potential variability of human development indicators



Concept of the planet's limits



The planet's limits are evaluated for nine different processes and resources - **limits of three of them already are exceeded:**

- **Concentration of GHGs in atmosphere**
- **Speed at which loss of biodiversity is going on**
- **Content of N and P in biosphere**

BIODIVERSITY LOSS

Existence of the only species of dolphins – harbor porpoise – in the Baltic Sea is endangered

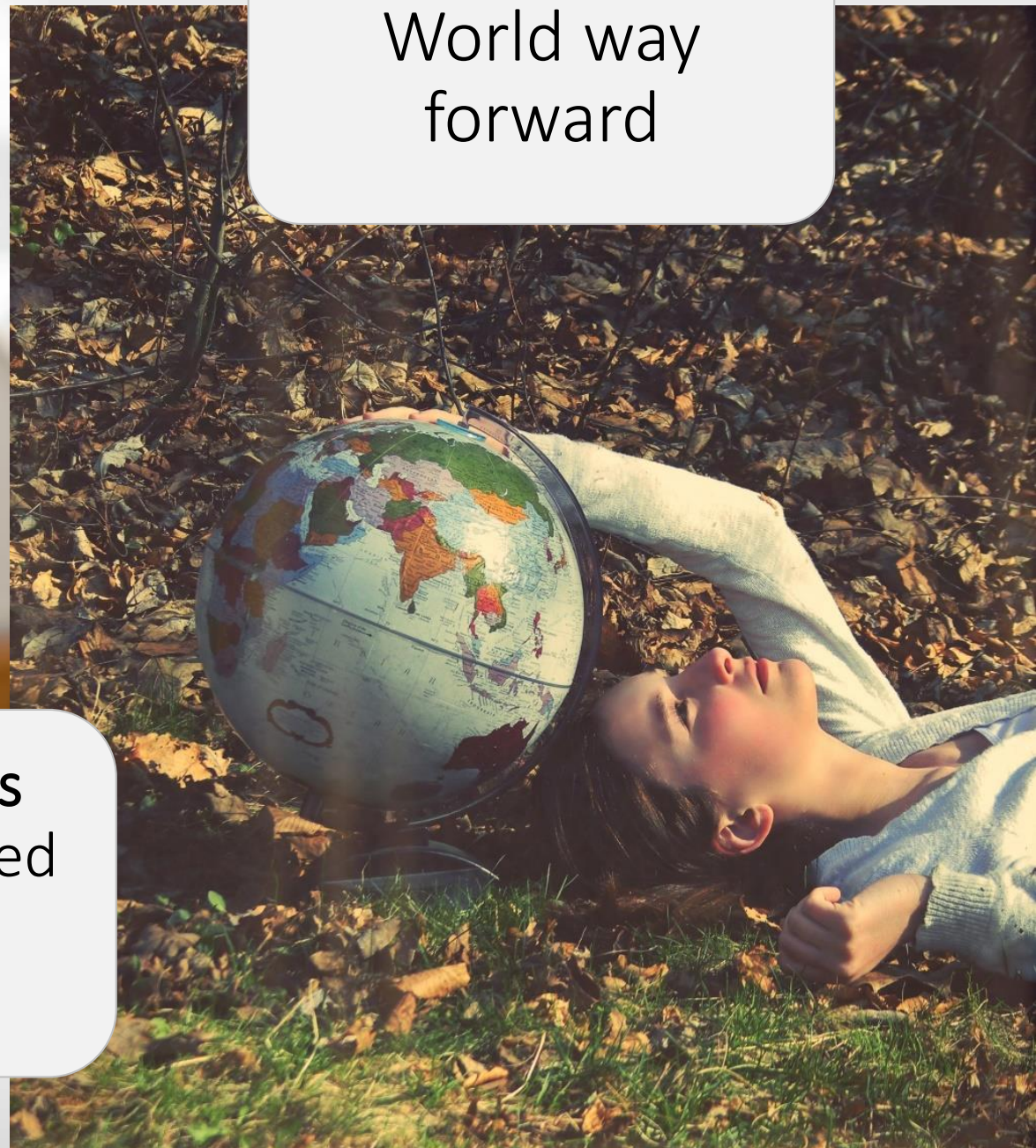
Wolverine – species that was habitating in Latvia, but the last two wild wolverines were hunted in 1875-1876

According to the predictions of scientists, in the 21st century extinction rate of species may reach up to 100 species a day

The human impact on the natural environment is comparable to influences of the power of nature

Evaluation of the Earth has moved in a new stage of development: **anthropocene**, which is characterized by an active impact on all the ongoing processes on the Earth

World way forward



It is necessary to create **«a single planet's society»**, i.e., a society which does not need more resources than those which are provide by the Earth

Thank you for the attention!