

**M U N I**  
**S C I**

# **12 Milestones of environmental history**

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# Content

1. Milestones of natural origin
2. Milestones of anthropogenic origin
3. Milestones of combined origin

# Milestones of environmental history

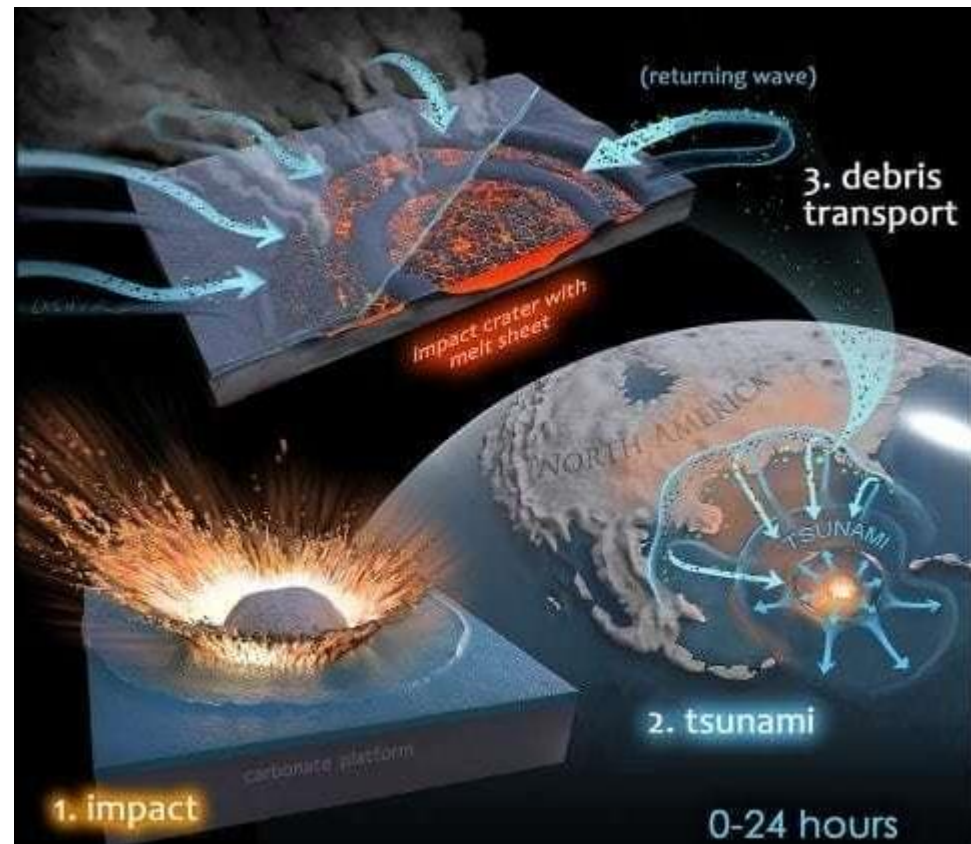
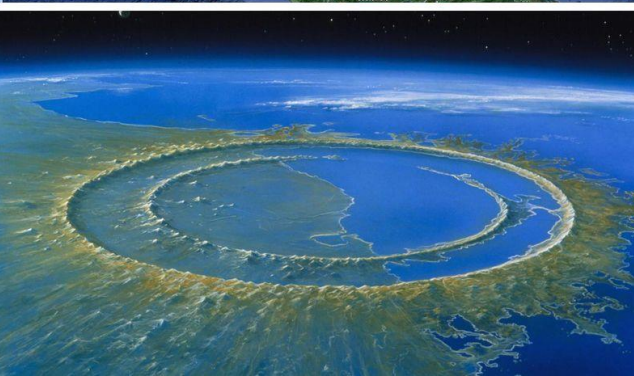
- **Milestone**
  - an event of **natural** or **anthropogenic** origin that has significantly affected humanity or the natural environment in the past
- **Milestones of natural origin**
  - climate change, volcanic eruption, pandemic, megatsunami, etc.
- **Milestones of anthropogenic origin**
  - revolutions, industrial accidents, nuclear explosions, conferences, etc.
- **Milestones of combined origin**
  - French revolution, dust bowl, great smog, etc.

# **Milestones of natural origin**

# Chicxulub meteorite impact (66 Ma ago)

- The impact of a meteorite about 10 km in size on the **Yucatán Peninsula**
- **Extinction** of non-bird dinosaurs
- Global **ecological disaster** and mass extinction
- Megatunamis, earthquake ( $11^{\circ}$  RS), temporary increase in air temperature to 100–260°C, subsequent decrease in global average air temperature by 2–8°C, increase in volcanic activity
- **Beginning of the mammal boom on Earth**

# Chicxulub meteorite impact (66 Ma ago)

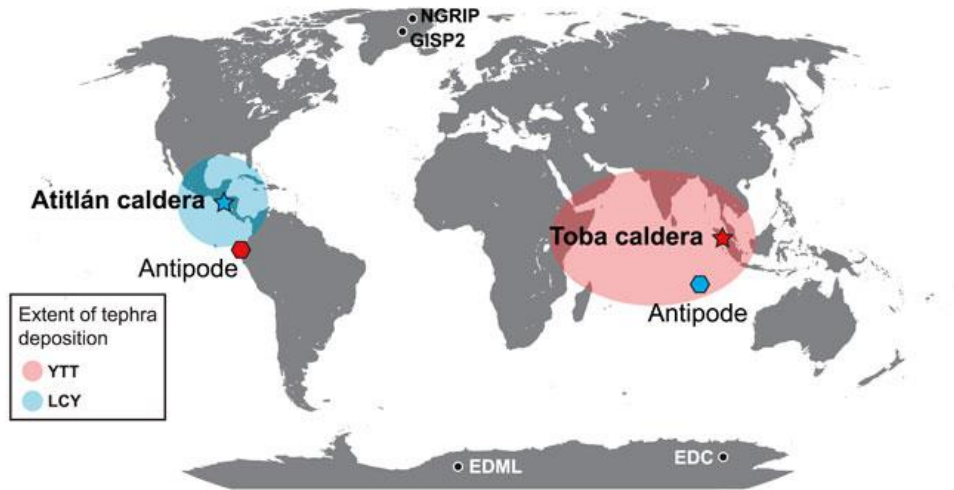


# Eruption of the Toba supervolcano (72 000 BC)

- Supervolcano eruption on **Sumatra Island**
- **The strongest eruption in the last 27 Ma**
- Temporary global air **temperature decrease of 1–5°C**
- **Extinction** of most species in **SE Asia** (last recorded major global extinction), increase in glaciers (cooling)
- The **decline** of the then **global human population** from 50–100 000 to 3–10 000 individuals (genetic bottleneck)

# Eruption of the Toba supervolcano (72 000 BC)

A





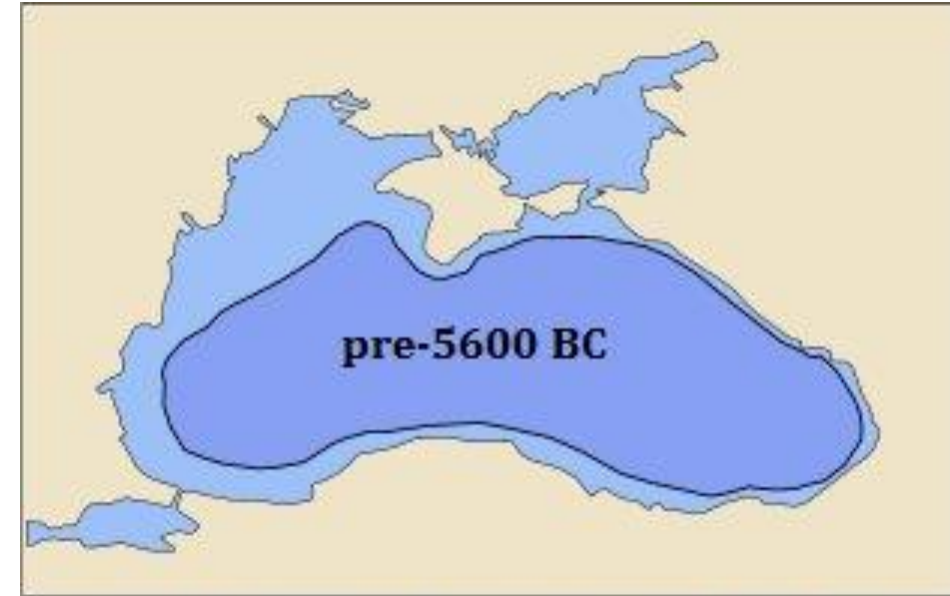
# Formation of the Black Sea (7 600 BP)

- **Ice age:** the Black Sea by a lake separated from the Mediterranean
  - lake level 120 m lower than at present
- **7 600 BC:**
  - breaking of the **Bosporus strait**
  - 12–15 cm/day rise = 1 km/day progress (flood period 35 years)
  - **destruction of advanced civilisation** on the shores of the lake
  - **ecological disaster:** saltwater intrusion into the freshwater lake

# Formation of the Black Sea (7 600 BP)



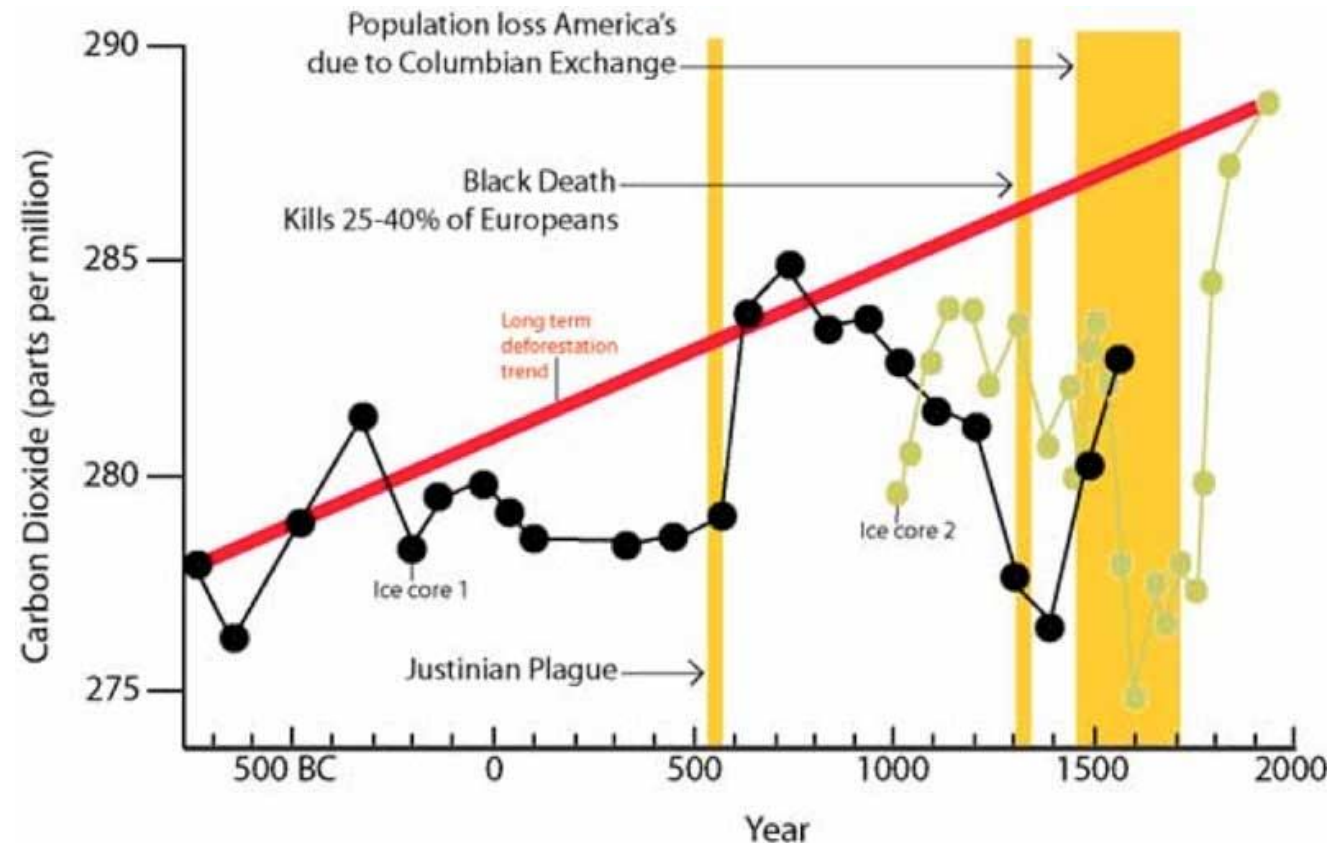
*Bosphorus strait*



**~5600 BC: Bosphorus bursts, forming Black Sea**

# Rediscovery of America (1492)

- Beginning of **crop** and **disease exchange** between west and east hemisphere
- Massive **decline** of the **indigenous population** of the Americas: killings, smallpox and measles



Graph showing intervals of low CO<sub>2</sub> concentrations in Antarctic ice cores correlating with major epidemics that decimated populations. After: Ruddiman, William F., *Plows, Plagues and Petroleum: How Humans took Control of Climate*, p. 133

# Rediscovery of America (1492)

- The geographical position of Europe in the sixteenth century and its access to New World silver, furs, forests, and agricultural land
  - **stimulation** of new and expansive strategies for capital accumulation over the next five centuries through **long-distance trade, colonialism, slavery, and industrialization**

# Lisbon earthquake and tsunami (1755)

- One of the **most devastating** and **deadly earthquakes** with subsequent tsunami in **Europe**
- Earthquake magnitude ca. **7.7 on the Richter scale**
- Ca. **60 000 deaths** due to tsunami and fires
- Interest of enlightenment philosophers – **first scientifically studied disaster** of its kind (origins of seismology)

# Lisbon earthquake and tsunami (1755)



*earthquake in Lisbon in 1755*

# Spanish Flu (1918–1919)

- Origin in China, **global pandemic**
- **50–100** million victims
- **Causes of spread:**
  - hostility between warring states
  - trivialisation (USA)
  - censorship of information (Europe)
- Analogy with covid-19?

*"The mysterious epidemic is nothing but hay fever."*

Lidové noviny, 1. 6. 1918

# Spanish Flu (1918–1919)

*American military base (Spanish flu outbreak)*


**EPIDEMIC  
INFLUENZA  
(SPANISH)**

**This Disease is Highly Communicable.  
It May Develop Into a Severe Pneumonia.**

There is no medicine which will prevent it.  
Keep away from public meetings, theatres and other places where crowds are assembled.  
Keep the mouth and nose covered while coughing or sneezing.  
When a member of the household becomes ill, place him in a room by himself.  
The room should be warm, but well ventilated.  
The attendant should put on a mask before entering the room of those ill of the disease.

**TO MAKE A MASK**

Take a piece of ordinary cheesecloth 8 x 16 inches, fold it to make it 8 x 8 inches. Next fold this to make it 8 x 8 inches. Tie cords about 10 inches long at each corner. Appl. over mouth and nose as shown in the picture.



**ISSUED BY THE PROVINCIAL BOARD OF HEALTH**





# Spanish Flu (1918–1919)



*American soldiers serving in the First World War, Seattle*

# Spanish Flu (1918–1919)

*Emergency hospital near Fort  
Riley, Kansas, USA*

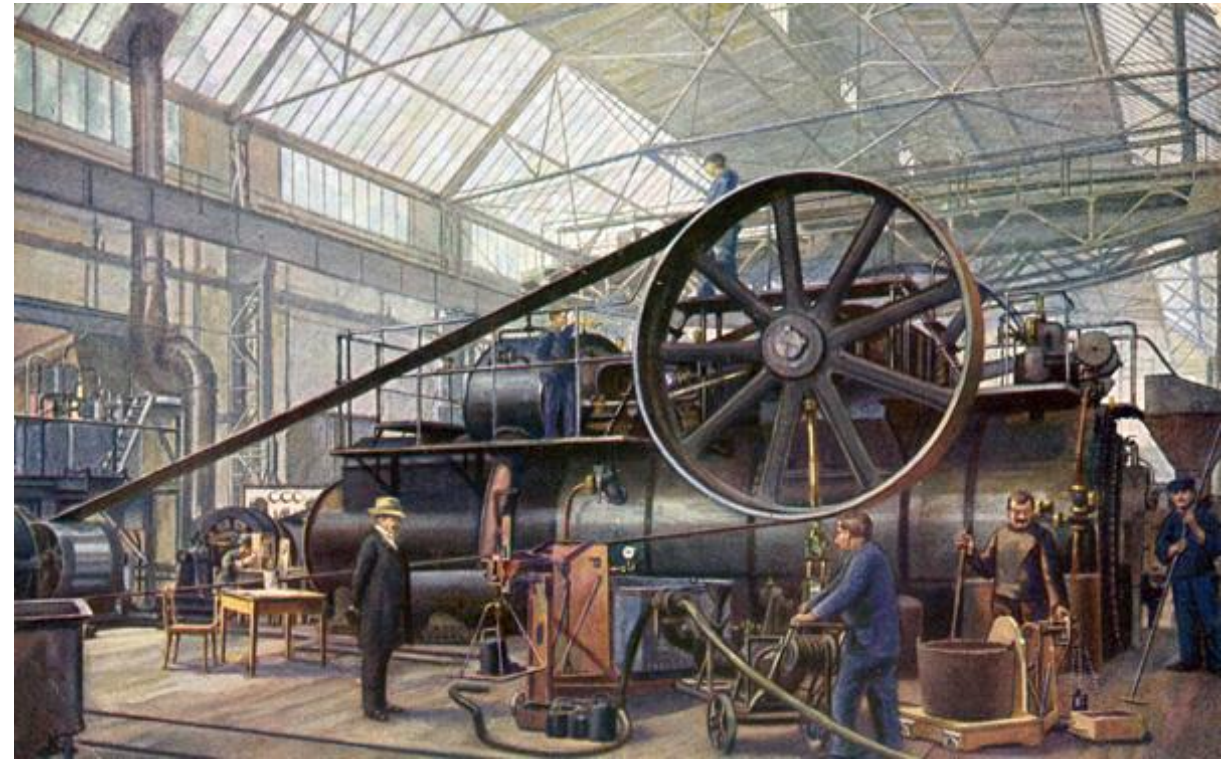
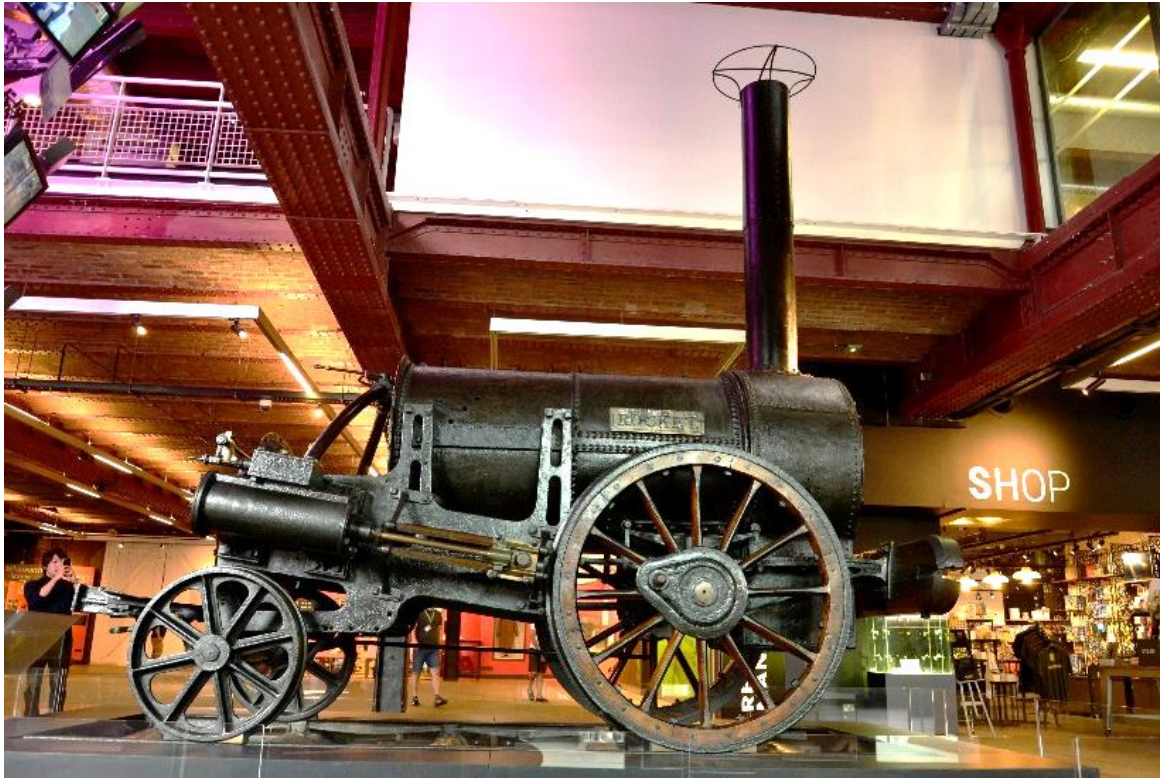


# **Milestones of anthropogenic origin**

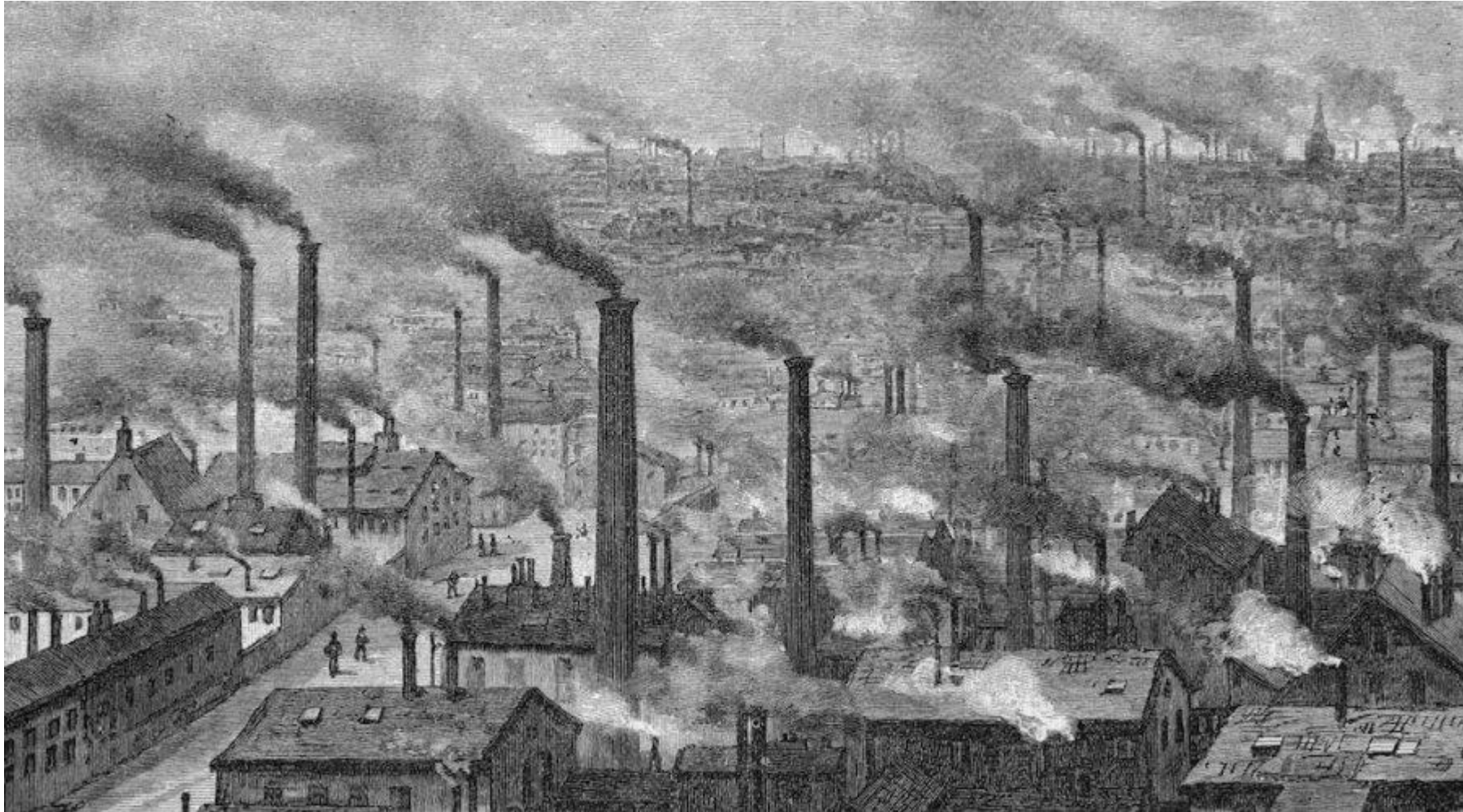
# Industrial Revolution (1750s–19<sup>th</sup> century)

- Landscape shaped by industrial development
- Expansion of the **steam engine** and the **railway** (fragmentation of the landscape)
- Increasing **extraction** and **burning of fossil fuels**
- **Agricultural revolution** (unification of the landscape, increase in erosion, new crops and pests)
- **Demographic revolution** (population growth and its migration)
- **Urbanisation** (increasing pressure on the urban landscape)

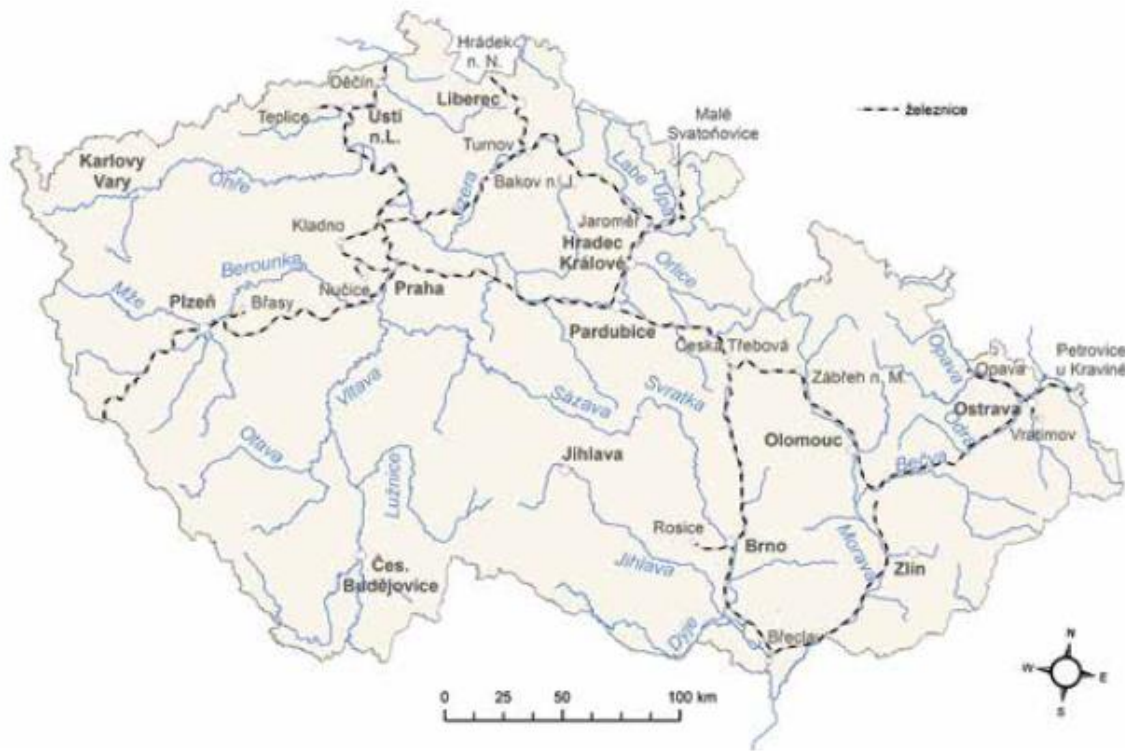
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*Development of the steam railway in the Czech Lands between 1867 (left) and 1874 (right)*

## The ploughing of the world's grasslands (1750s–20<sup>th</sup> century)

- One of **the largest global transformations** of the **Earth's surface** since the 2<sup>nd</sup> half of the 18<sup>th</sup> century: ploughing the steppes of southern Russia and Ukraine into fields
- **19<sup>th</sup>–20<sup>th</sup> centuries**: Great Plains (NA), pampas (SA), N and S Africa, N India, Australia...
- **Loss of about 20% of pastureland** now (increase in CO<sub>2</sub> emissions from soil)



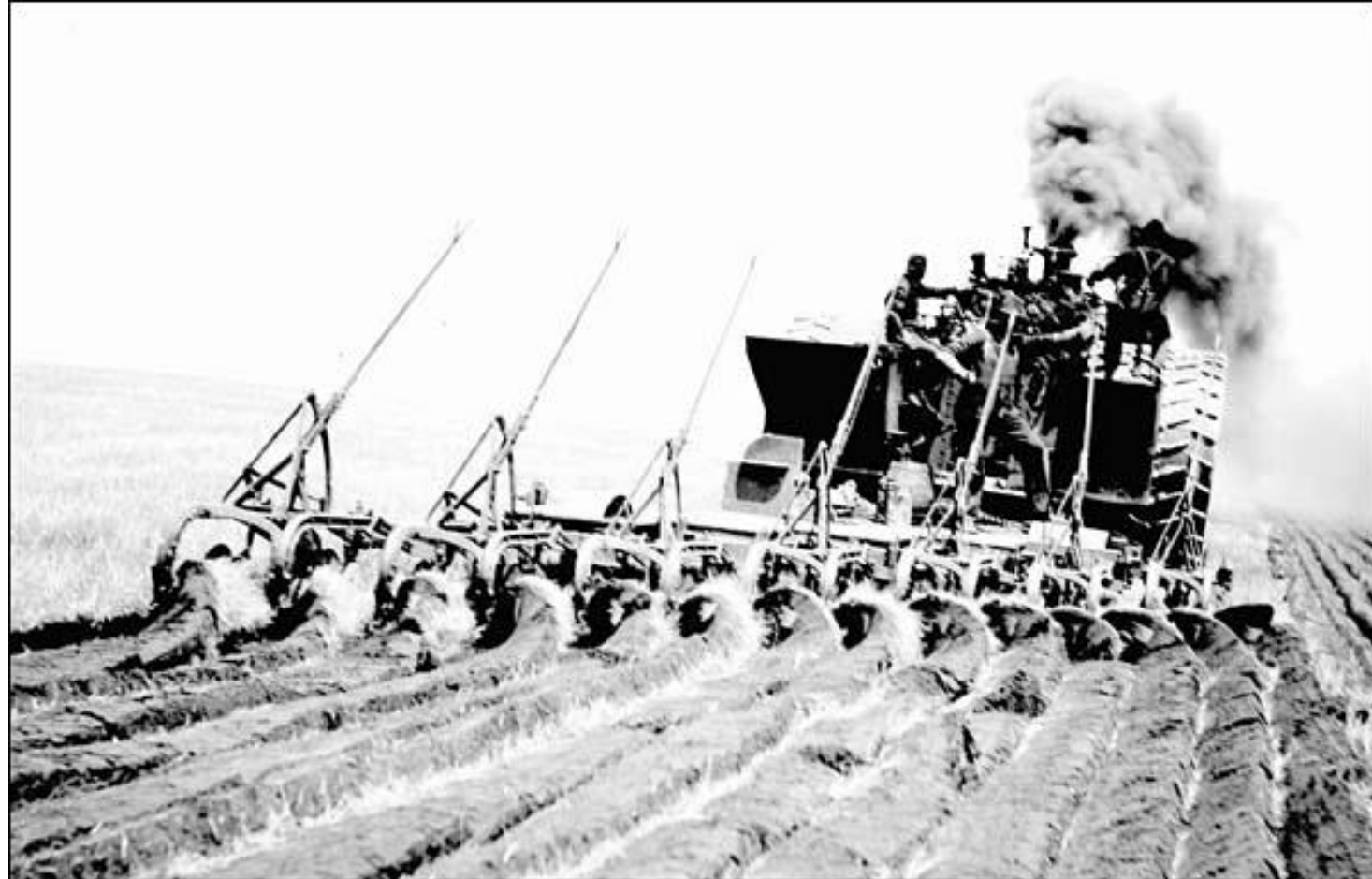
# The ploughing of the world's grasslands (1750s–20<sup>th</sup> century)

- Expansion due to **transport revolution** and demand for grain



# The ploughing of the world's grasslands (1750s–20<sup>th</sup> century)

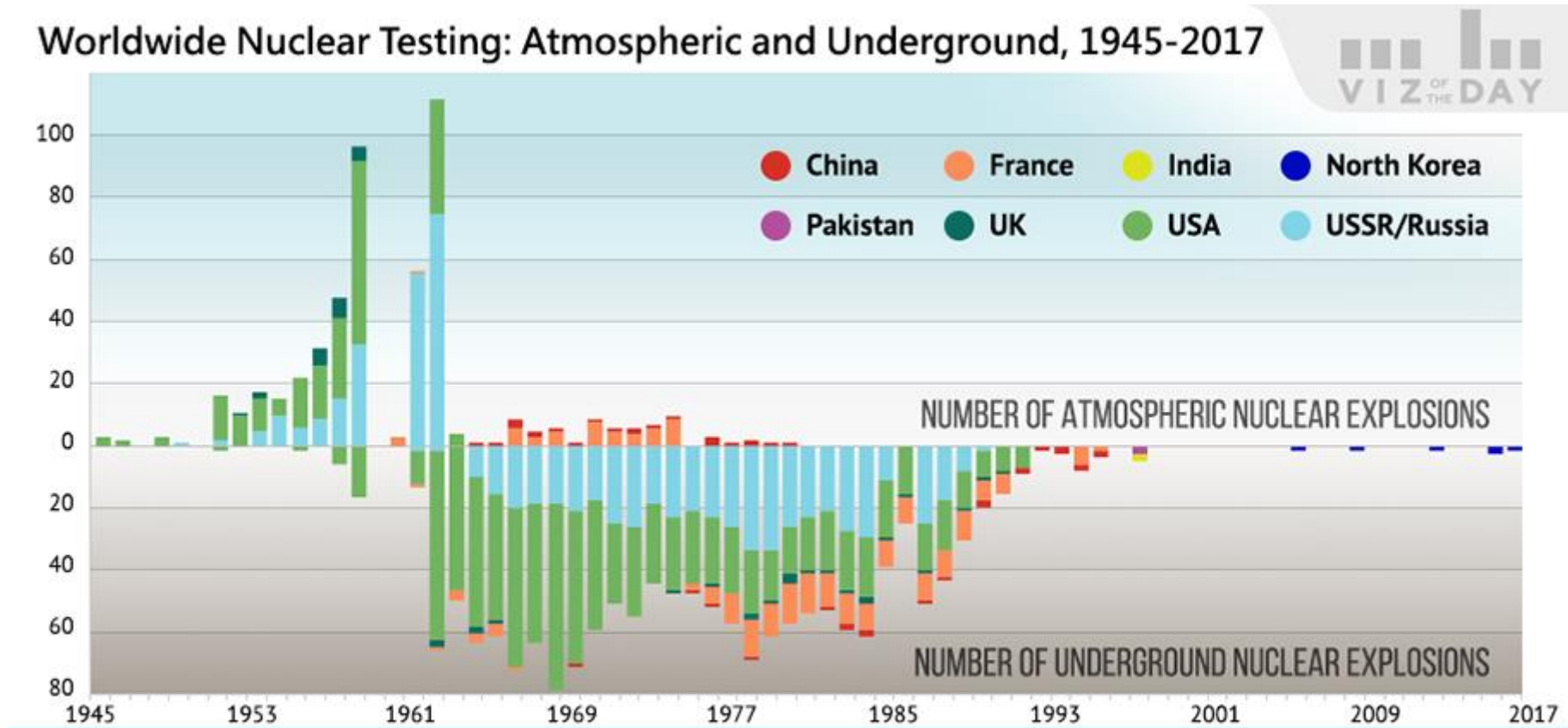
- **Consequences:** loss of biodiversity, loss of livelihoods and places to live, dust storms, oil boom, nitrogen crisis



# Nuclear explosions (1945–1963)

- **Hiroshima and Nagasaki (1945)**
  - US pressure on Japan to accept surrender in WWII
  - 150 000–244 000 casualties, other negative consequence
- **Nuclear tests (1945–1963)**
  - > 2 000 nuclear tests mostly in the US and USSR
  - > 1 million deaths from cancer
- since **1963** ban on atmospheric, underwater and space testing
- **2017**: last documented nuclear test (North Korea)

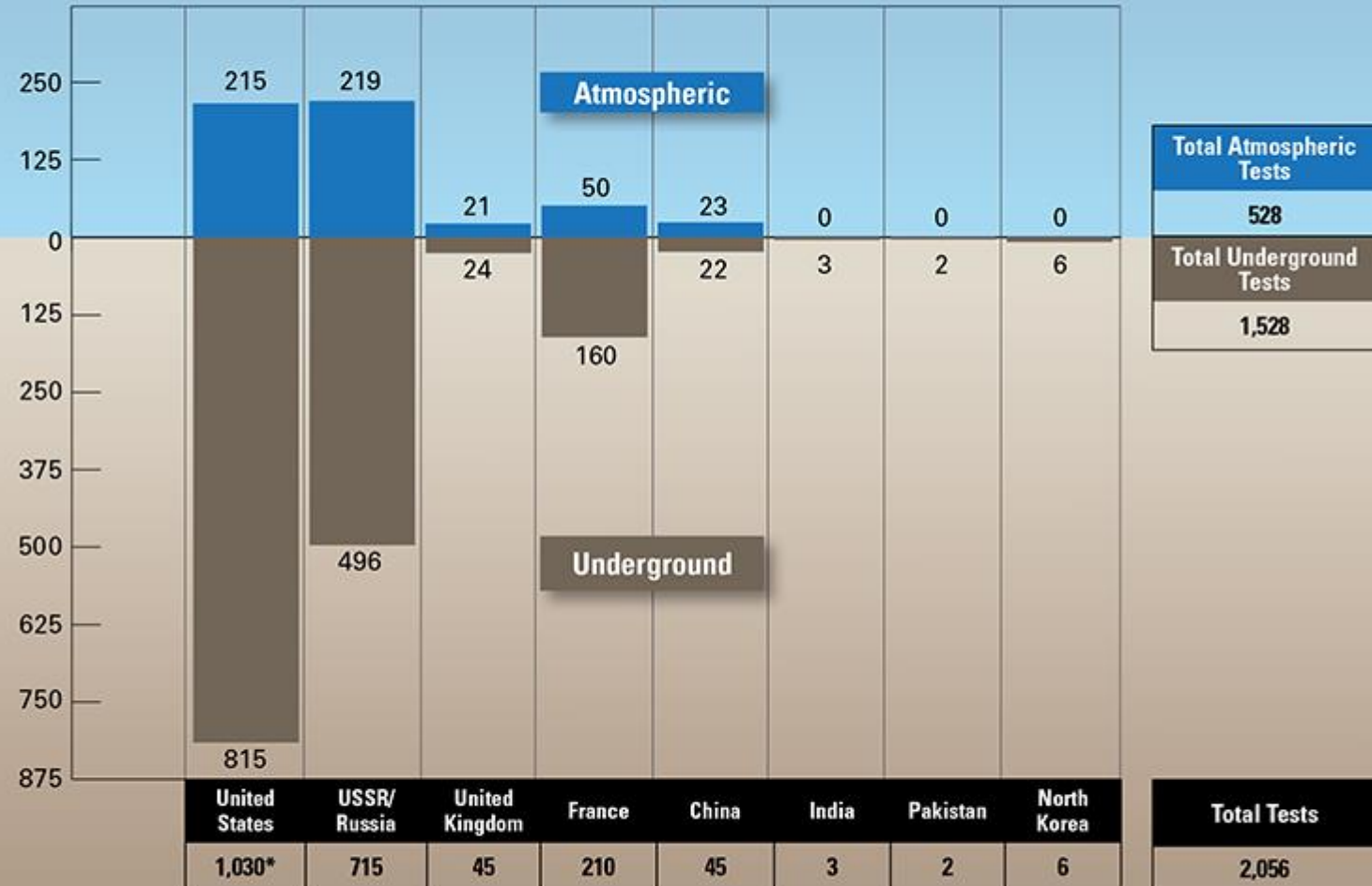
# Nuclear explosions (1945–1963)



# Nuclear explosions (1945–1963)

## Nuclear Testing Tally 1945–2017

Arms Control Association



\*The United States total does not include the atomic bombings of Hiroshima and Nagasaki.

# Nuclear accidents (1979–2011)

- **Three Mile Island (1979)**
  - the worst nuclear accident in the USA (partial meltdown of a nuclear reactor)
- **Chernobyl (1986, approx. 4 000 victims)**
  - worldwide debate on the safety of nuclear power plants
  - delay of nuclear renaissance until early 21st century
- **Fukushima I (2011, approx. 1 000 victims)**
  - worst accident since 1986 caused by tsunami inundation

# **Milestones of combined origin**

# The Suez Canal and the Lesseps Migration (1869)

- **Suez Canal:** 193 km long canal connecting the Mediterranean and the Red Sea built by **Ferdinand de Lesseps**
- **Lesseps migration:** migration of marine organisms mainly **from the Red Sea** to the **Mediterranean Sea** through the Suez Canal
- **Cause of predominantly one-way migration:** tropical habitat of the Mediterranean, but organisms typical of the Atlantic habitat - more suitable living conditions for organisms from the Red Sea





# The Suez Canal and the Lesseps Migration (1869)

- **Examples of migratory species:** mercenary warbler, striped platypus



# Dust bowl (1930s)

- Period of **drought** and **dust storms** of the **Great Plains** (USA – Texas, New Mexico, Kansas, Oklahoma, Nevada...) and **Canada** in the **1930s**
- **Causes:**
  - long **drought** (1931, 1934, 1936, 1939–40, 1942)
  - **deep plowing** (displacing deep-rooted grasses – retention of soil and moisture)

# Dust bowl (1930s) – consequences

- **Ecological disaster**
- **Erosion** over > 400 000 km<sup>2</sup>
- USA newly grain importer



# Dust bowl (1930s) – consequences

- **Emigration** of people to cities (0.5 million of homeless)
- **Bankruptcies**
- **Worsening Great depression**



# Dust bowl (1930s)

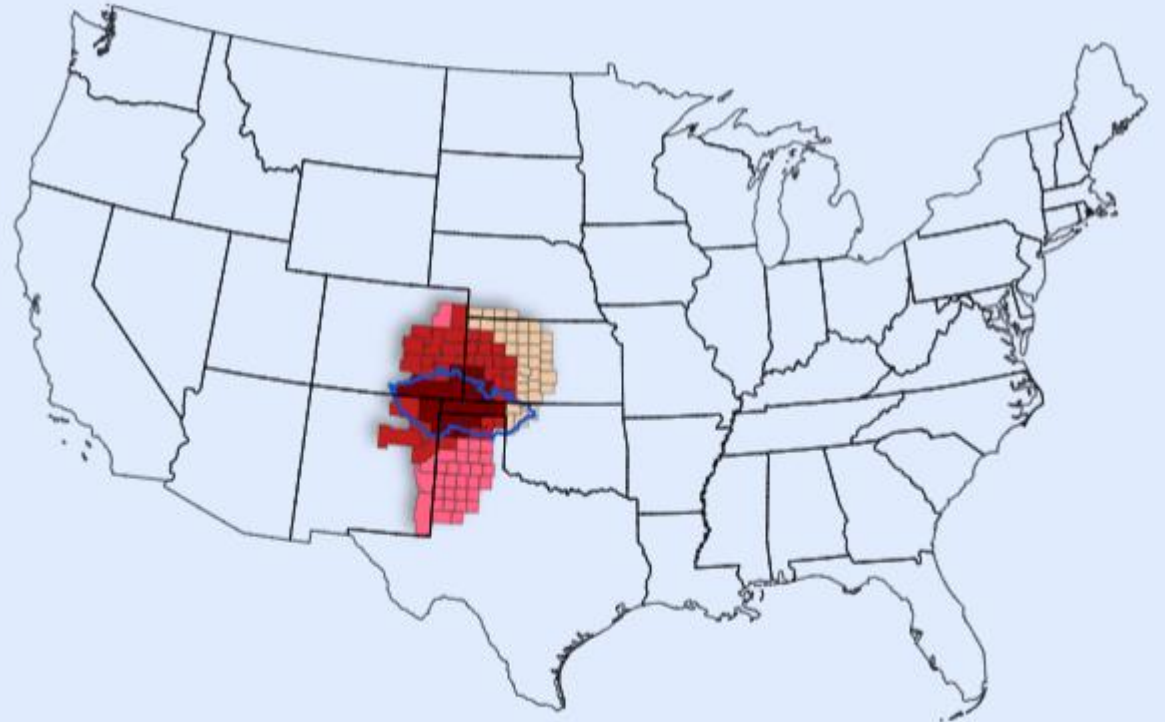
- Malnutrition, respiratory diseases, deaths

## Dust Bowl

Postižené okresy v různých obdobích

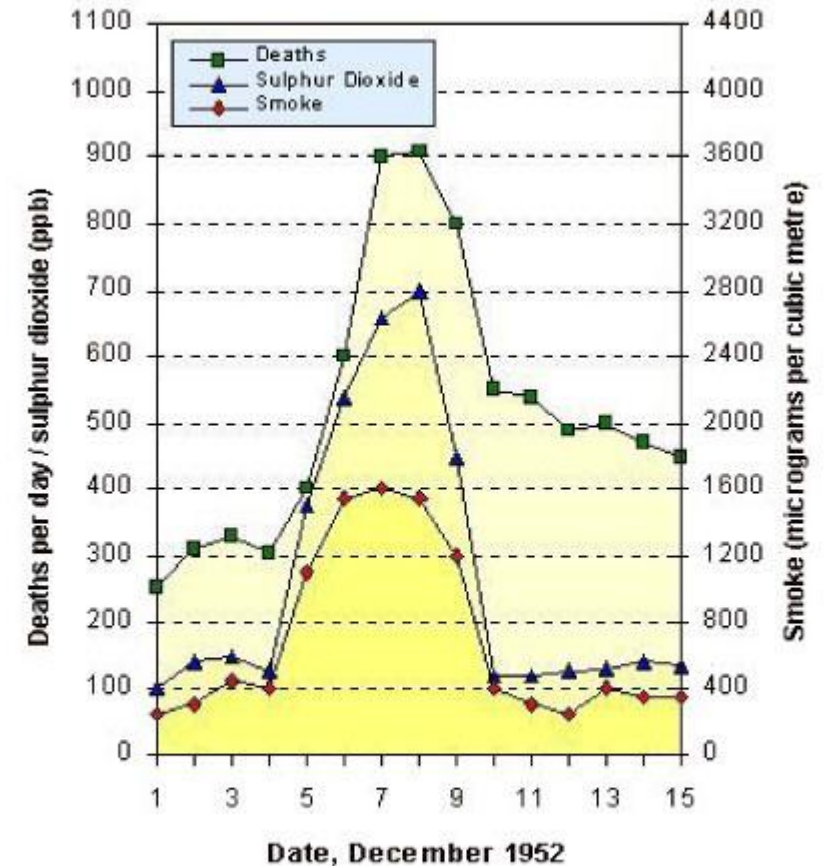
Velikost postiženého území v porovnání s Českem

- Silná větrná eroze (1935-36)
- Silná větrná eroze (1935-38)
- Nejsilnější větrná eroze (1935-38)
- Silná větrná eroze (1938)



# The Great Smog (1952)

- Smog in **London** between **5–9 December 1952**, responsible for **12 000** deaths
- Caused by **anticyclonic weather** with **inversion, fog, cooling** (300% increase in coal fumes and 700% increase in  $\text{SO}_2$ ) and replacement of trams with **diesel buses**



The relationship between smoke, sulphur dioxide (in parts per billion – ppb) and number of deaths during the Great London Smog, December 1952. (After Wilkins, 1954, p. 170)

# The Great Smog (1952)

- Temporary **traffic restrictions**, stopping cultural events inside the buildings
- **Impuls** for a change in the approach to the environment (Stockholm Declaration)
- **Regulations restricting** the use of polluting fuels (UK, 1956, 1968)



## Question of the day

In your opinion, are there other milestones that should be included in this review?



# References

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- Sanford, J. C., et al. (2016): The Cretaceous-Paleogene boundary deposit in the Gulf of Mexico: Large-scale oceanic basin response to the Chicxulub impact, *J. Geophys. Res. Solid Earth*, 121, 1240–1261
- Uekötter, F. (2013): What Should We Remember? A Global Poll Among Environmental Historians. *Global Environment*, 6, 11, 184–214

**Thank you for your attention**