

# Air quality and climate change

Project based introduction to the Sensebox technology



**I. Atmosphere**

**II. Climate**

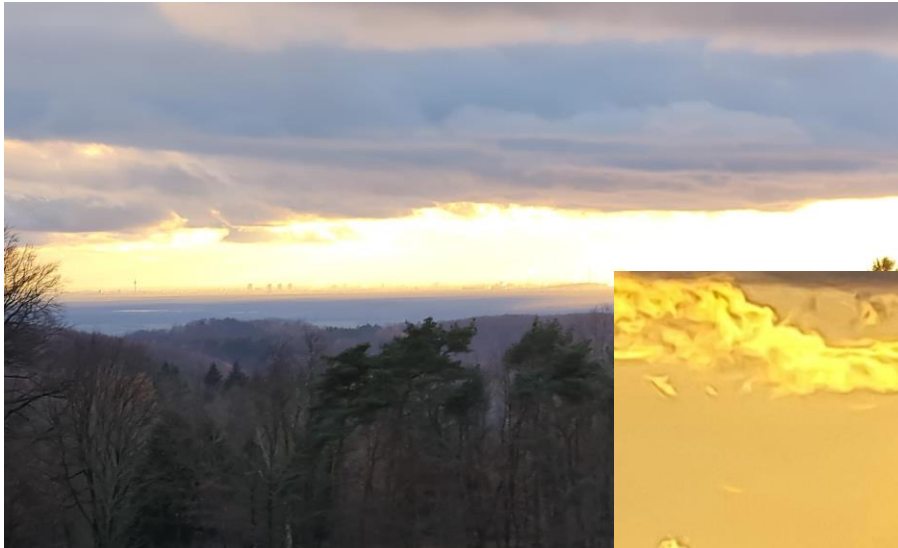
**III. Air quality**



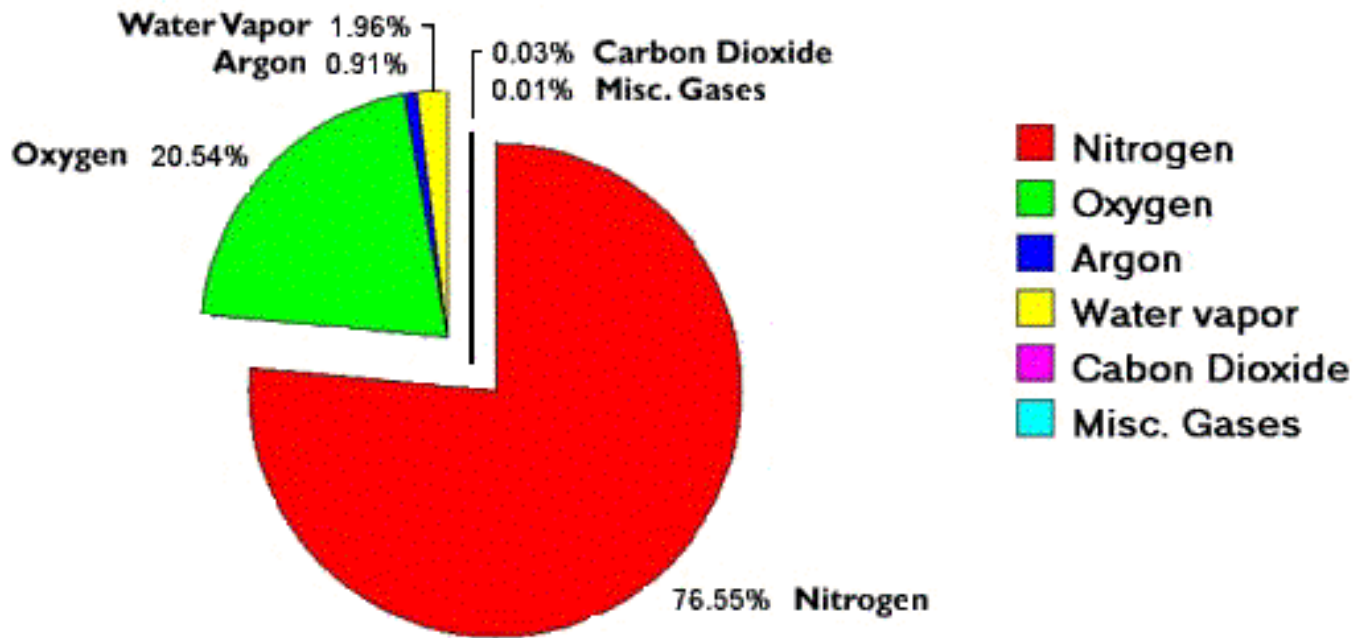
# Atmosphere



# Human impact



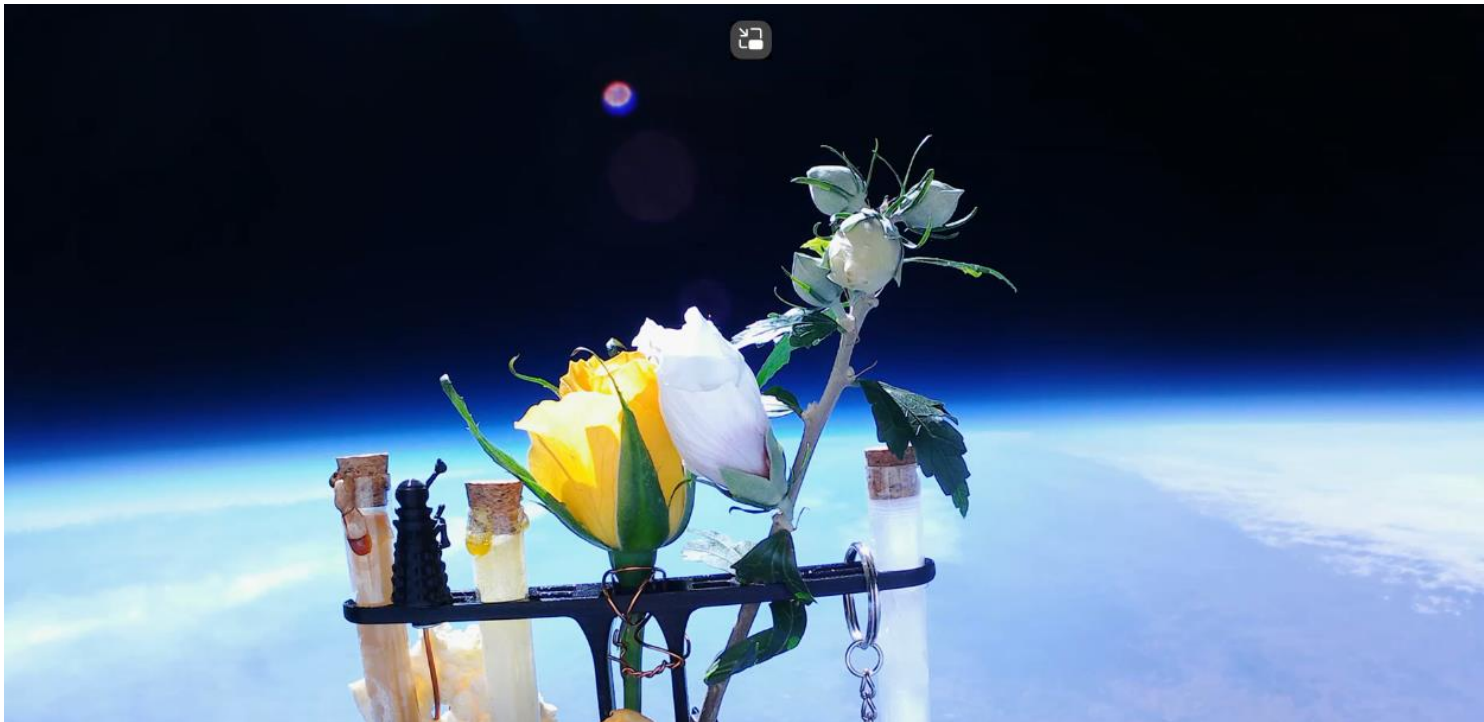
## The Gases That Comprise Earth's Atmosphere



# Atmosphere as the Earth's shell **digi\_space** der Makerspace



# Atmosphere as the Earth's shell **digi\_space** der Makerspace





# Atmosphere as the Earth's shell

Musik: Up in Flames Musiker: LAP HITS-Andrew John

# Sky's the limit



## Ballon mit Helium befüllen

# digi\_space

der Makerspace



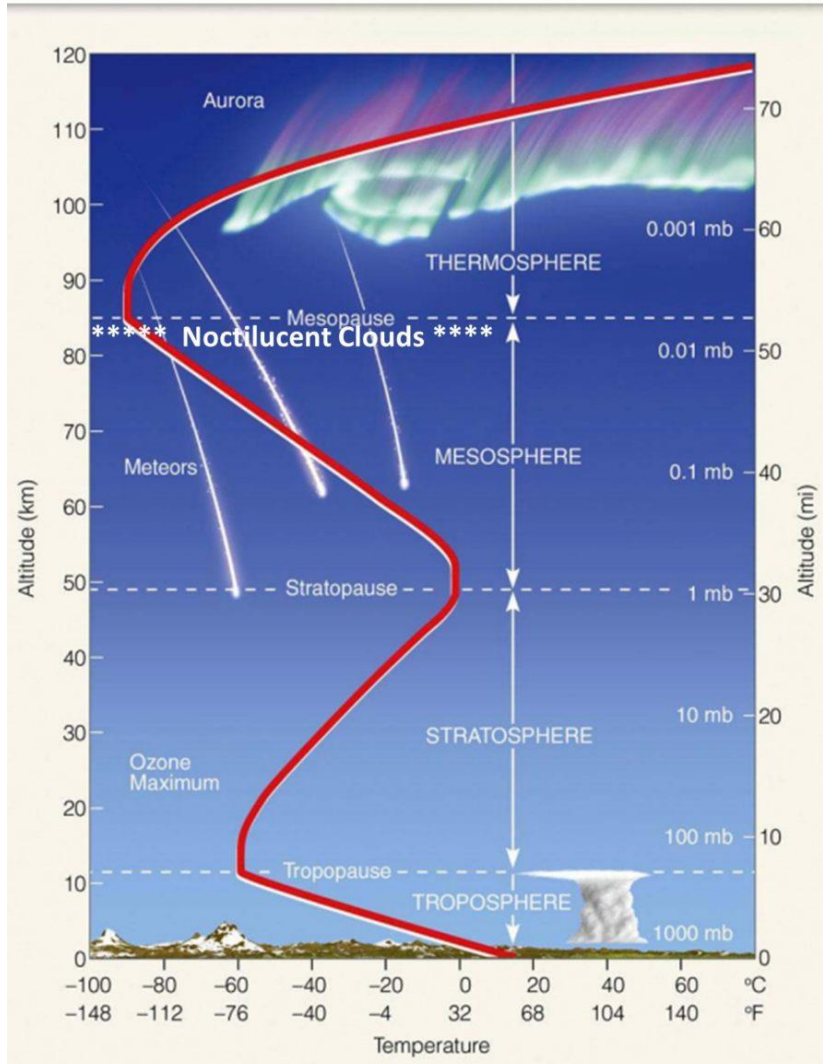


# Atmosphere function

- **Protection against radiation from outer space**
  - Absorption of high-energy particle radiation (nuclear reactions),
  - X-rays and UV radiation (radiation in the 400 - 40 nm wavelength range)
    - UV-A  $\lambda = 400 - 320$  nm
    - UV-B  $\lambda = 320 - 280$  nm
    - UV-C  $\lambda = 280 - 40$  nm
  - Protection against small to medium meteorites
- **Heat buffer** (permeability for sunlight, retention of heat radiation)
  - Balance between day and night
  - “Raises” average temperature from  $-18^{\circ}\text{C}$  to  $+15^{\circ}\text{C}$
- **Heat transport** (from equatorial regions to more temperate latitudes)
- **Water transport**
- **Storage of nitrogen,  $\text{CO}_2$  and oxygen**
- **Atmospheric chemistry** (photolysis, radical reactions, oxidation)
  - Distribution and degradation of pollutants



# Atmosphere layers

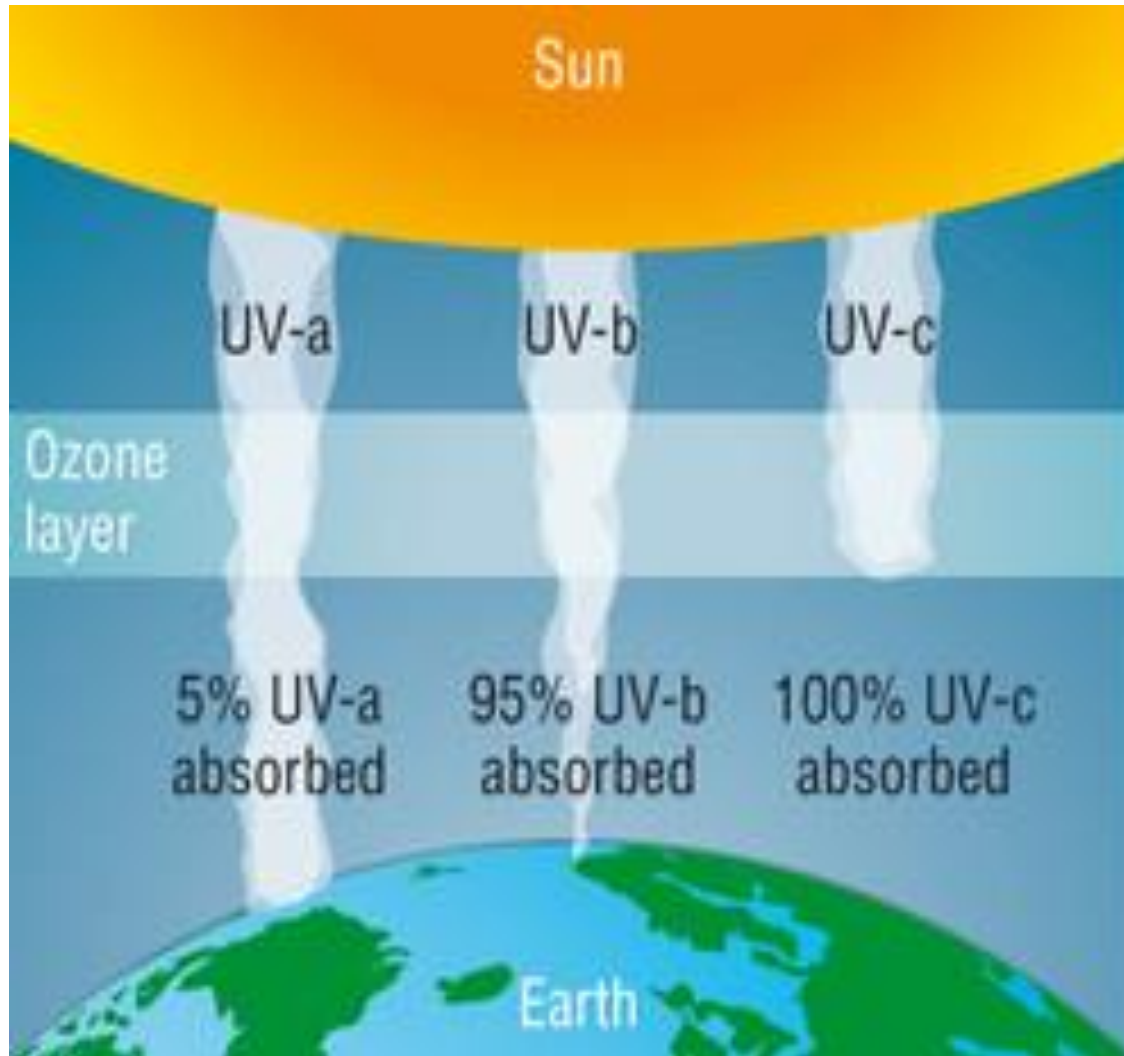


## Structured by:

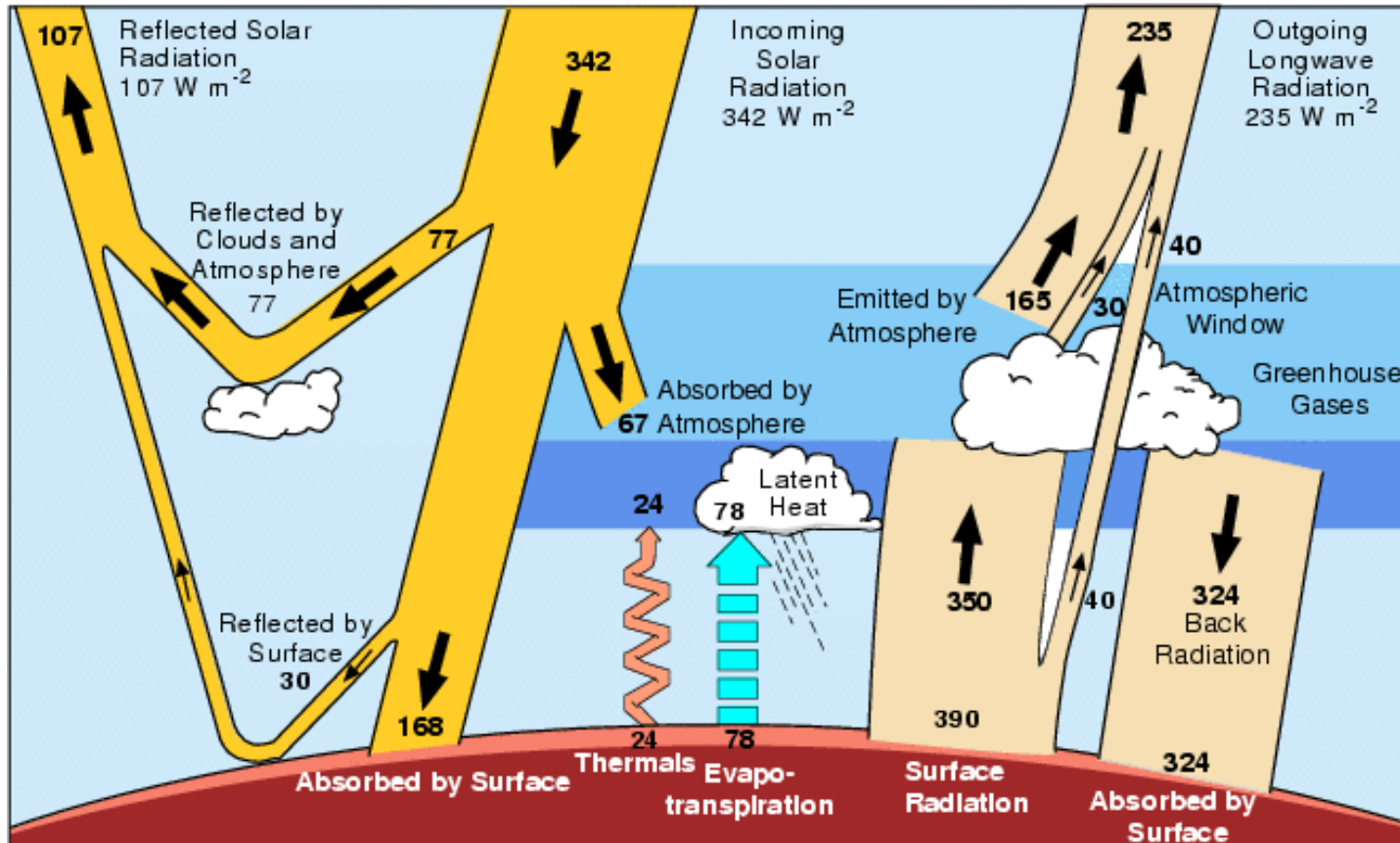
- Composition
- Temperature



# Atmosphere function II



# Greenhouse effect



# Human impact



Wednesday: Visit of „Klimaarena“





# Climate: State of the atmosphere



# Task

- Search the Internet for a **picture or graphic** on the subject of “atmosphere” that impresses you or your group.
- Discuss the reasons in your group.



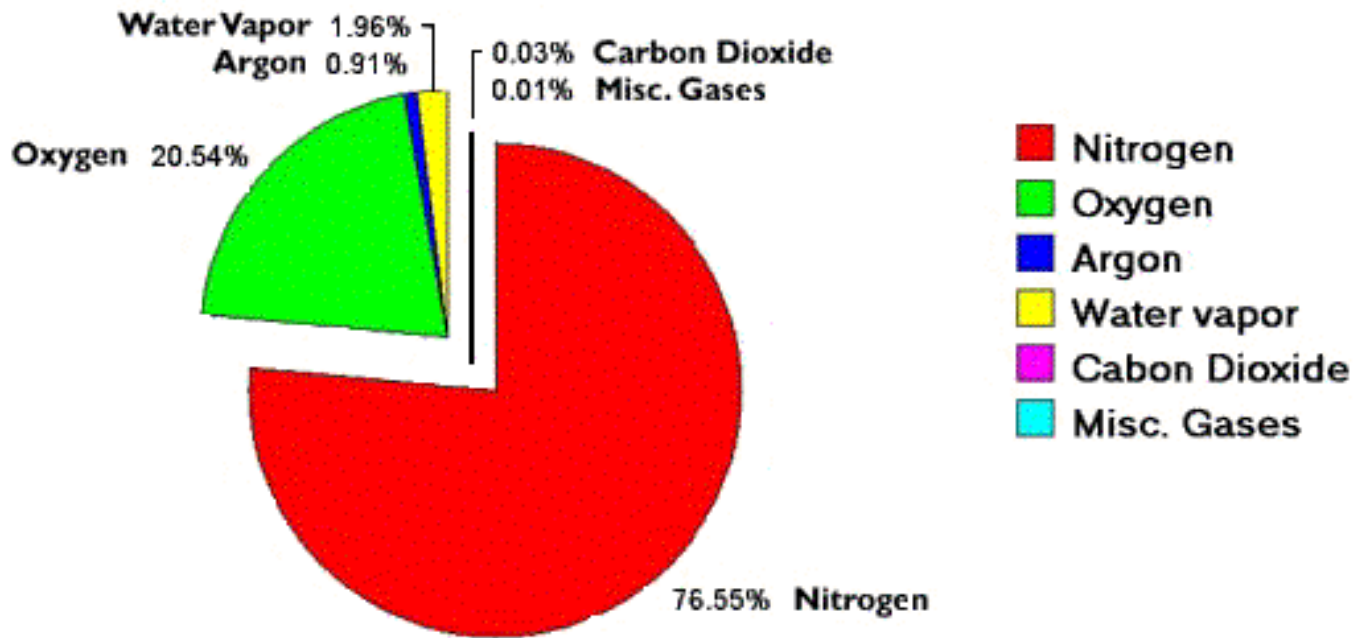


# Air quality

Pollutants, Measurements and networks



## The Gases That Comprise Earth's Atmosphere



# Main pollutants

- $O_3$
- CO
- $NH_3$
- NMVOC<sub>S</sub>
- $NO_x$
- $PM_{2.5}/PM_{10}$
- $SO_x$
- Pb



# Measurements and networks **digi\_space** der Makerspace



2024



Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra  
  
Swiss Confederation

Federal Department of Home Affairs FDHA  
Federal Office of Meteorology and Climatology MeteoSwiss

mapbox © Mapbox © WMO © OpenStreetMap

Global  
Regional  
Contributing networks  
Local  
Other networks

- Operational
- Partly operational
- ▲ Non-reporting
- ★ Closed
- ✚ Planned
- ⊕ Pre-operational
- Stand-by



Sun + Climate  
for innovation

The description of individual pollutants is usually clearly. For example, the concentrations of individual substances such as ozone, benzene or lead can be precisely determined. In the case of particulate matter, even the definition is difficult.

**There is no standardized index for assessing air quality.**

Examples of generally understandable criteria for assessing air quality are the **Vienna Air Quality Index** and the **German Federal Environment Agency's Air Quality Index**.

The following websites are suitable for gaining an understanding of the individual pollutants:



# LINKS

## **GERMANY**

Deutscher Wetterdienst

[https://www.dwd.de/DE/derdwd/messnetz/messnetz\\_node.html](https://www.dwd.de/DE/derdwd/messnetz/messnetz_node.html)

## **GERMANY/Hessia**

Hessian State Agency for nature, environment etc.

<https://www.hlnug.de/themen/luft/>

## **GERMANY**

German Federal Environment Agency

<https://www.umweltbundesamt.de/themen/luft>

## **AUSTRALIA**

NSW Government

<https://www.health.nsw.gov.au/environment/air/Pages/common-air-pollutants.aspx>

## **AUSTRIA**

Stadt Wien

<https://www.wien.gv.at/umwelt/luft/>

## **CANADA**

Government of Canada

<https://www.canada.ca/en/services/environment/weather.html>



Prepare some slides for a presentation.

- How is “air quality” described?
  - Choose one of the list at the teacher’s desk!
  - Where do official measurements take place?
- Describe your “parameter / air pollutant”
  - Choose one of the list at the teacher’s desk!
  - What is the (historical) development of concentrations?





# Next steps

- Setting up your own measuring station
- Programming
- Web connection of the measuring stations
- Presentation



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