Co-funded by the
Erasmus+ Programme
of the European Union

Clean Air

CLEAN AIR CURRICULUM AS A BASE FOR CLEAN ENVIRONMENT

What pollutes the air?

Topics:

a) What substances pollute the air? - **air pollutants**

b) **Basic definitions** in the field of air pollution: smog, particulate matter, benzo(a)pyrene, emission, concentration.

c) The **main causes of air pollution**.

d) **Air quality** in the city and in the countryside.

Film: https://www.youtube.com/watch?v=SXbbowLXL9o

Co-funded by the
Erasmus+ Programme
of the European Union

AIR POLLUTANTS

There are various substances which pollute our air, for example:

particulate matter - a mixture of various small particles suspended in the air. PM10 dust is particles with a diameter of 10 micrometers and less, while PM2.5 - particles with a diameter of 2.5 micrometers or less. It can carry various dangerous substances (f. ex. benzo(a)pyrene).

PAHs - polycyclic aromatic hydrocarbons, for example benzo(a)pyrene - a carcinogenic and mutagenic chemical compound

sulfur dioxide - is produced as a by-product of the burning of fossil fuels contaminated with sulfur compounds. Inhaling sulfur dioxide is associated with increased respiratory symptoms and disease, difficulty in breathing, and premature death

Co-funded by the
Erasmus+ Programme
of the European Union

AIR POLLUTANTS

nitrogen oxides - for the general public, the most prominent sources of NO2 are internal combustion engines burning fossil fuels. Outdoors, NO 2 is a result of traffic from motor vehicles. For the public, chronic exposure to NO2 can cause respiratory effects including airway inflammation in healthy people and increased respiratory symptoms in people with asthma.

ozone - its formation is caused by NO2. Exposure to ozone is linked to premature death, asthma, bronchitis, heart attack, and other cardiopulmonary problems.

heavy metals - e.g. mercury, lead, cadmium, chromium, nickel, copper, zinc. Their toxic effects are related to with the ability to accumulate in the body, including bones, kidneys, and the brain.

Co-funded by the
Erasmus+ Programme
of the European Union

BASIC DEFINITIONS

Smog - this term was created from the combination of two English words: smoke and fog.

Smog is, in simple words, an unnatural and dangerous phenomenon, during which there is a combination of significant air pollution and adverse weather conditions, conducive to the accumulation of pollutants.

There are various dangerous substances in our smog.

Co-funded by the
Erasmus+ Programme
of the European Union

BASIC DEFINITIONS

Particulate matter - a mixture of various small particles suspended in the air. It is not a homogeneous group of substances: it can be dust particles, ash, sand, pollen, as well as soot, worn tires or brake pads of vehicles. Importantly, very often such particles include (or settle on their surface) various dangerous substances, for example heavy metals or polycyclic aromatic hydrocarbons (PAHs), which can then be inhaled together with suspended dust and thus get into the body.

PM10 dust is particles with a diameter of 10 micrometers and less, while PM2.5 - particles with a diameter of 2.5 micrometers or less.

Co-funded by the
Erasmus+ Programme
of the European Union

BASIC DEFINITIONS

benzo(a)pyrene - a carcinogenic and mutagenic chemical compound that is a representative of polycyclic aromatic hydrocarbons (PAHs). The main source of this substance in the air is the combustion of solid fuels at low temperature, that is carbon and wood in domestic heating installations. Benzo(a)pyrene is also found in cigarette smoke.

Benzo(a)pyrene shows low acute toxicity and high chronic toxicity, which is related to its cumulative capacity in the body.

Check how many cigarettes you would have to smoke to inhale the dose you breathe! https://www.omnicalculator.com/ecology/smog-benzoapiren

BASIC DEFINITIONS

emission of pollutants - determines the amount of pollutants introduced directly into the air.

pollutant immission (concentration of pollutants) - determines the amount of dust or gas pollution in a unit of atmospheric air volume.

The concentration of pollutants depends on the size of the emissions as well as on the conditions of spreading, including topography of the area and meteorological factors.

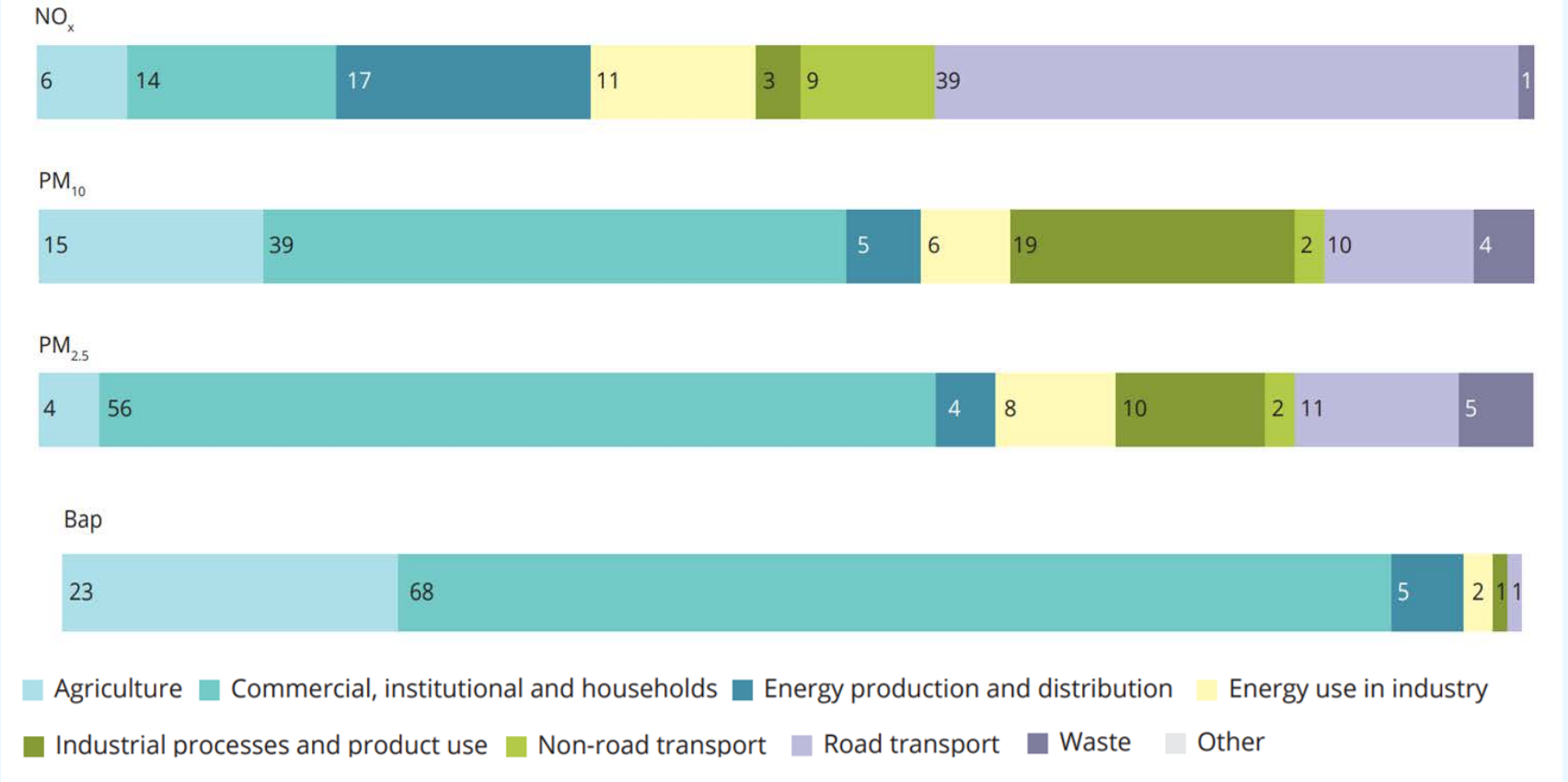
Co-funded by the
Erasmus+ Programme
of the European Union

Clean Air

Clean air curriculum as a base
for clean environment

MAIN SOURCES OF AIR POLLUTION

Share of major sectors in emissions of particular air pollutants in 2016 in Europe



Source: https://www.eea.europa.eu/publications/air-quality-in-europe-2019

Co-funded by the Erasmus+ Programme of the European Union

AIR QUALITY IN RURAL AND URBAN AREAS

There is still a strong belief in clean and healthy air in the villages and small towns. In fact, there are no large factories and huge traffic, which could indicate a simultaneous lack of harmful emissions to the air.

However, it should be remembered that the main source of particulate matter and benzo(a)pyrene in the European air is not industry and energy, but the so-called low-stack emission, i.e. that coming from our domestic chimneys. This means that in rural areas the air might be worse than in big cities, because there are more numerous clusters of houses heated with ofted outdated, high-emission heating devices for solid fuels. Sometimes people burn there even waste.

In addition, the level of air pollution in rural areas is underestimated, as air quality monitoring stations are usually located in large cities.

Co-funded by the Erasmus+ Programme of the European Union

AIR QUALITY IN RURAL AND URBAN AREAS

In conclusion:
In large cities, the problem is transport emissions (mainly responsible for high concentrations of nitrogen oxides) and industry, and in small towns, in rural areas, the society is struggling with low emission, ie emissions from household furnaces for solid fuels, responsible for high concentrations of particulate matter and carcinogenic benzo(a)pyrene.

It is a myth that air quality in rural areas is always better than in the city. Very often it happens that in smaller towns and villages concentrations of pollutants significantly exceed acceptable levels, especially in terms of PM and B(a)P.

Co-funded by the
Erasmus+ Programme
of the European Union

Clean Air

Clean air curriculum as a base
for clean environment

ANTI-SMOG CAMPAIGN

Pollutant	Averaging period	Permissible / target level
PM10	24 hours	50 µg/m3
	A year	40 µg/m3
PM2.5	A year	25 µg/m3
Benzo(a)pyrene	A year	1 ng/m3
NO2	1 hour	200 µg/m3
	A year	40 µg/m3
SO2	1 hour	350 µg/m3
	24 hours	125 µg/m3

Source: https://powietrze.gios.gov.pl/pjp/content/annual_assessment_air_acceptable_level

AIR QUALITY MEASUREMENT CALENDAR

Date	Mean daily concentration of PM 10	% of the norm

Co-funded by the
Erasmus+ Programme
of the European Union

Clean Air

Clean air curriculum as a base
for clean environment

THANK YOU FOR COOPERATION!