11.3 European Air Quality Index

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European Air Quality Index	Air Quality

Description and justification	The European Air Quality Index allows users to understand more about air quality where they live, work or travel. Displaying up-to-date information for Europe, users can gain insights into the air quality in individual countries, regions and cities.
	
	The Index is based on concentration values for up to five key pollutants, including:
	
	    ▪ Particulate matter (PM_{10});
	    ▪ Fine particulate matter ($PM_{2.5}$);
	    ▪ Ozone (O_3);
	    ▪ Nitrogen dioxide (NO_2);
	    ▪ Sulphur dioxide (SO_2).
	
	It reflects the potential impact of air quality on health, driven by the pollutant for which concentrations are poorest due to associated health impacts.
	
	The index is calculated hourly for more than two thousand air quality monitoring stations across Europe, using up-to-date data reported by EEA member countries. These data are not formally verified by the countries.
	
	By default, the air quality index depicts the situation 3 hours ago. Users can then select any hour in the preceding 48 hours and view forecast values for the following 24 hours.
	
	The user can filter the selection by country and by station type. Stations are classified in relation to the predominant emission sources, including traffic, industry and background where the pollution level is dominated neither by traffic nor by industry. The user can view all stations, traffic stations only or non-traffic stations only (i.e., industrial, urban or regional background stations).
	
	European Union legislation sets air quality standards for both short-term (hourly or daily) and long-term (annual) air quality levels. Standards for long-term levels are stricter than for short-term levels, since serious health effects may occur from long-term exposure to pollutants.
	
	The Index indicates the short-term air quality situation. It does not reflect the long-term (annual) air quality situation, which may differ significantly.

	The air quality index is not a tool for checking compliance with air quality standards and cannot be used for this purpose.
Definition	European Air Quality Index
Strengths and weaknesses	+ Based on the reported monitoring data by Member States - Some of the measurement systems can be expensive and they need constant management and upkeep.
Measurement procedure and tool	The Index uses 'up-to-date' air quality data officially reported every hour by EEA member countries, complemented where necessary by modelled air quality data from the European Union's Copernicus Atmosphere Monitoring Service (CAMS). Additionally, can be complemented with local air quality data from equipments installed in NBS locations. Concentrations values for up to five key pollutants determine the index level that reflects air quality at each monitoring station. The index corresponds to the poorest level for any of five pollutants, according to the table shown below. Circles on the map represent the locations of air quality monitoring stations. The colours reflect air quality at the given hour at that station. **Calculating the index for traffic stations** When calculating the index for traffic stations we only use data for NO_2 and PM (either $PM_{2.5}$, PM_{10} or both). This is because SO_2 concentrations can be high in localized areas and distort the picture of local air quality, while ozone levels are normally very low at traffic stations. **Calculating the index for industrial and background stations** At industrial and background stations, the index is calculated for those stations with data (either measured or modelled) for at least the three pollutants NO2, O3 and PM (either $PM_{2.5}$, PM_{10} or both). **Stations missing data for certain pollutants** To avoid leaving out stations that do not report data for all pollutants or for which missing data cannot be gap-filled, the index is calculated for all monitoring stations with data for at least one pollutant. Those stations that do not report data or for which data cannot be gap-filled for the minimum pollutants for that station type are depicted as transparent dots, indicating that the index is not calculated with the minimum range of pollutants. **Averaging time for pollutants**

For NO_2, O_3 and SO_2, hourly concentrations are fed into the calculation of the index.

For PM_{10} and $PM_{2.5}$, the 24-hour running means for the past 24 hours are fed into the calculation of the index.

Bands of concentrations and index levels

The bands are based on the relative risks associated to short-term exposure to $PM_{2.5}$, O_3 and NO_2, as defined by the World Health Organization in its report on the Health Risks of Air Pollution in Europe project (HRAPIE project report).

The relative risk of exposure to $PM_{2.5}$ is taken as basis for driving the index, specifically the increase in the risk of mortality per 10 µg/m3 increase in the daily mean concentration of $PM_{2.5}$.

Assuming linearity across the relative risks functions for O_3 and NO_2, we calculate the concentrations of these pollutants that pose an equivalent relative risk to a 10 µg/m3 increase in the daily mean of $PM_{2.5}$.

For PM_{10} concentrations, a constant ratio between PM_{10} and $PM_{2.5}$ of 1:2 is assumed, in line with the World Health Organization´s air quality guidelines for Europe.

For SO_2, the bands reflect the limit values set under the EU Air Quality Directive.

Health messages

The index bands are complemented by health related messages that provide recommendations for both the general population and sensitive populations. The latter includes both adults and children with respiratory problems and adults with heart conditions.

Pollutant	Index level (based on pollutant concentrations in µg/m3)					
	Good	Fair	Moderate	Poor	Very poor	Extremely poor
Particles less than 2.5 µm ($PM_{2.5}$)	0-10	10-20	20-25	25-50	50-75	75-800
Particles less than 10 µm (PM_{10})	0-20	20-40	40-50	50-100	100-150	150-1200
Nitrogen dioxide (NO_2)	0-40	40-90	90-120	120-230	230-340	340-1000
Ozone (O_3)	0-50	50-100	100-130	130-240	240-380	380-800
Sulphur dioxide (SO_2)	0-100	100-200	200-350	350-500	500-750	750-1250

AQ index	General population	Sensitive populations
Good	The air quality is good. Enjoy your usual outdoor activities.	The air quality is good. Enjoy your usual outdoor activities.
Fair	Enjoy your usual outdoor activities	Enjoy your usual outdoor activities
Moderate	Enjoy your usual outdoor activities	Consider reducing intense outdoor activities, if you experience symptoms.
Poor	Consider reducing intense activities outdoors, if you experience symptoms such as sore eyes, a cough or sore throat	Consider reducing physical activities, particularly outdoors, especially if you experience symptoms.
Very poor	Consider reducing intense activities outdoors, if you experience symptoms such as sore eyes, a cough or sore throat	Reduce physical activities, particularly outdoors, especially if you experience symptoms.
Extremely poor	Reduce physical activities outdoors.	Avoid physical activities outdoors.

Scale of measurement	District to region scale
Data source	
Required data	Pollutant measurement data from municipalities and regional, national and European authorities.
Data input type	Quantitative
Data collection frequency	Continuous measurements with hourly, daily, monthly, and yearly averages
Level of expertise required	Moderate
Synergies with other indicators	Number of days during which air quality parameters exceed threshold values and the other indicators of the Air Quality group.
Connection with SDGs	SDG 3 Good health and well-being, SDG 15 Life on land
Opportunities for participatory data collection	No opportunities identified

Additional information	
References	https://airindex.eea.europa.eu/Map/AQI/