



Centre for Research on Energy and Clean Air

# China energy and emissions trends

*February 2024 snapshot*

Due to the unavailability of energy and industrial raw data for January, this report only includes an analysis of air pollution. Other analyses will resume in next month's content.

# 14 provincial capitals have not met national standard for PM2.5, increased by one since last month

- In January, 14 out of 31 provincial capitals exceeded the national PM2.5 air quality standard (35  $\mu\text{g}/\text{m}^3$ ) for their 12-month moving average of PM2.5. The number of capital cities exceeding the national standard has increased by one since last month, due to Hefei, the capital of Anhui within the Yangtze river delta region, has newly entered the list.
- Shijiazhuang, Xi'an, Taiyuan, Zhengzhou and Tianjin still ranked the top five for PM2.5 pollution, and their 12-month average concentrations were 46, 46, 45, 44 and 43  $\mu\text{g}/\text{m}^3$  respectively. Among them, Shijiazhuang were the closest to its target of reducing by 20% by 2025. All of them have not reached the targets set by the Continuously Improving Air Quality Action Plan yet.
- Shanghai and Hangzhou had the worst in January since 2017.

## PM2.5 concentrations in province capitals

12-month moving average

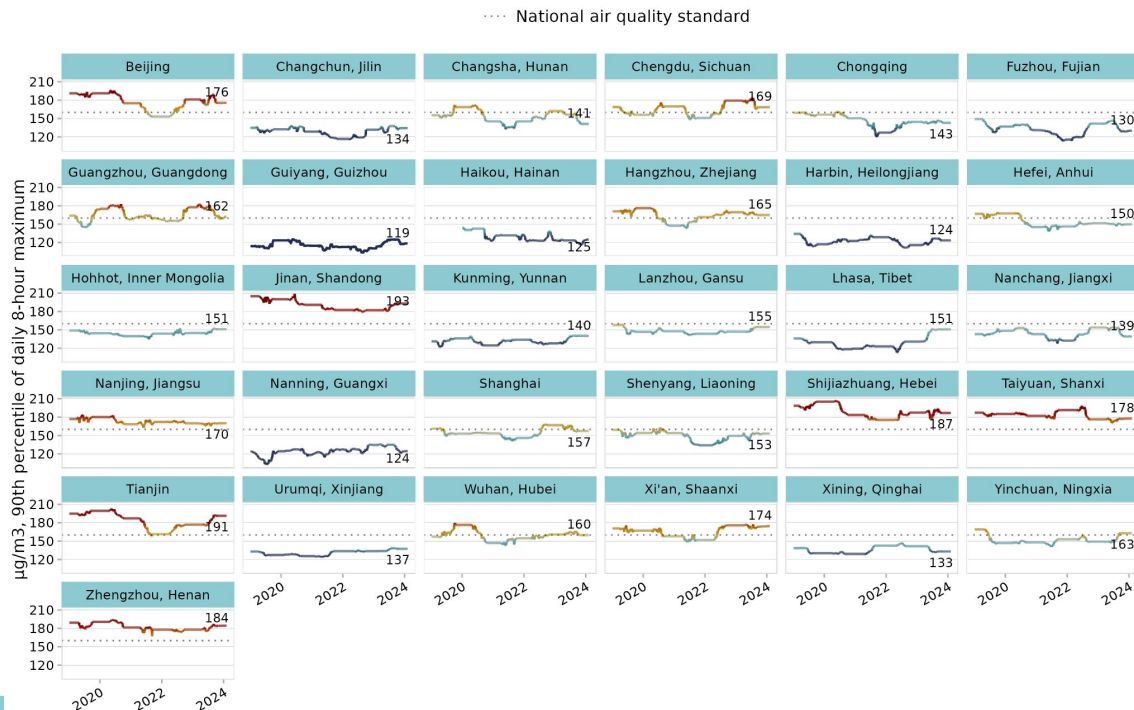


# Severe ozone pollution occupies northern regions year-round

- By the end of January, 12 provincial capitals exceeded the national standard (160 ug/m<sup>3</sup>) for ozone over the last 12 months, among which 8 are northern cities. Despite ozone pollution being low in winter due to seasonal effect, the high level of year-round ozone in northern China is highly alarming.
- Jinan, Tianjin, Shijiazhuang, Zhengzhou and Taiyuan ranked the top five for ozone pollution, with concentrations at 193, 191, 187, 184 and 178 ug/m<sup>3</sup>, respectively. The top four are all located within the Jing-jin-ji area.
- Wuhan, Shanghai and Lanzhou risked not meeting national standard for ozone, with concentrations at 160, 157 and 155 ug/m<sup>3</sup> respectively.

## Ozone concentrations in province capitals

90th percentile over 12 months

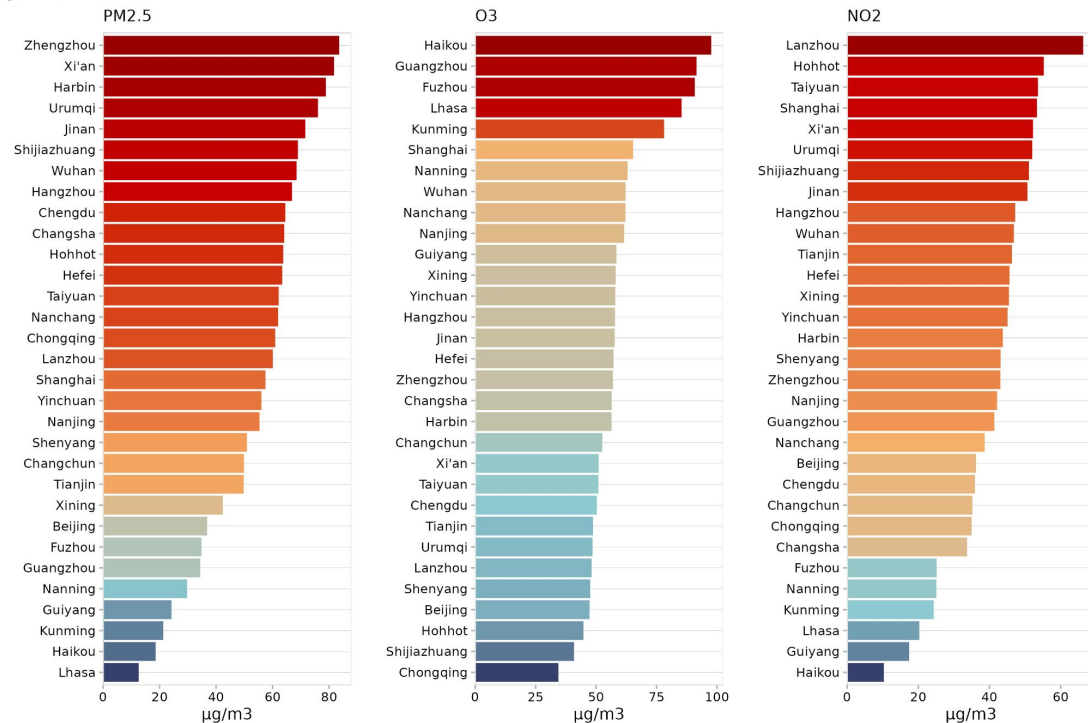


# PM2.5 pollution concentrated in Fenwei plain and the Northeast in January

- Worst PM2.5 levels were still focused in Fenwei plain and, newly, the Northeast in January. Zhengzhou, capital of Henan province, Xi'an and Harbin rose to the top. Followed by Urumqi, Jinan and Shijiazhuang.
- Ozone levels are overall low in the winter. The worst ozone levels were measured in the capitals of Hainan, Guangdong, Fujian, Tibet and Yunnan.
- Lanzhou, capital of Gansu, ranked worst for NO2 levels, followed by Hohhot and Taiyuan. NO2 contributes to PM2.5 and ozone levels, besides being a dangerous pollutant in its own right.

## Monthly average pollutant concentrations in province capitals

Jan 2024

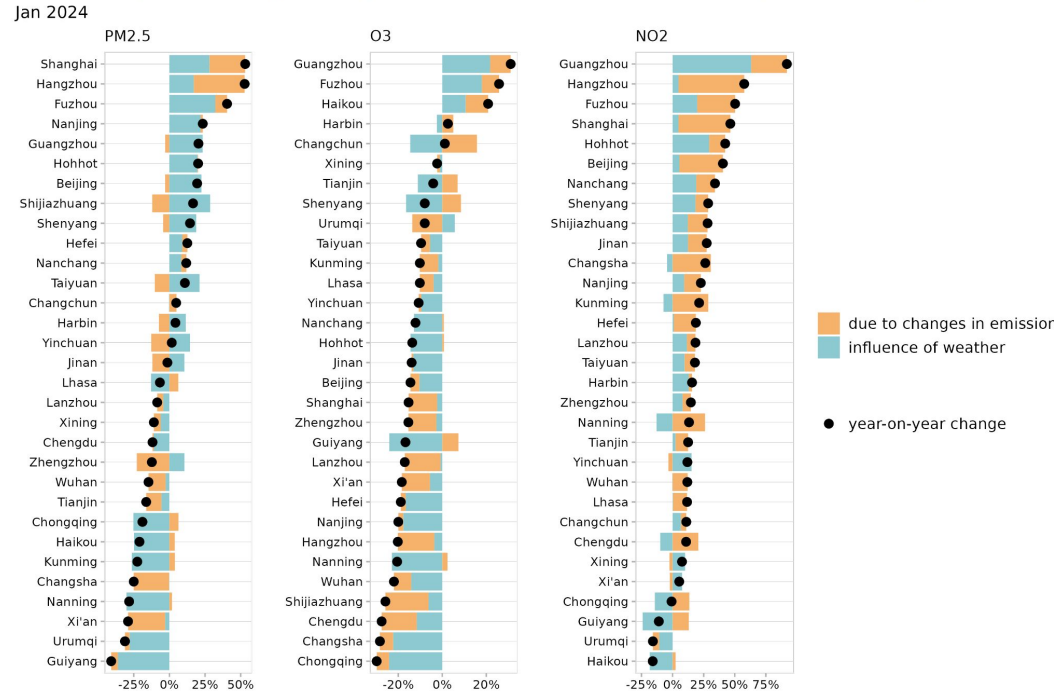


# The largest PM2.5 and NO2 increase on year took place in Shanghai and Hangzhou in January, ozone pollution improved in 80% of provincial capitals

- PM2.5 pollution increased the most in Shanghai and Hangzhou (of Zhejiang) on year, largely due to increased emissions. The year-on-year increase in PM2.5 attributable to emissions was largest in Hangzhou, Shanghai, Fuzhou and Chongqing, and are 35.7%, 25.1% and 8.3% respectively.
- NO2-contributing emissions increased in 27 provincial capitals, and was highest in Hangzhou, Shanghai and Beijing.
- Ozone pollution decreased on year in more than 80% of provincial capitals in January, though still elevated in Guangzhou, Fuzhou, Haikou, Harbin and Changchun. Among them, Changchun, Haikou and Guangzhou topped year-on-year increases attributable to emissions, which were 15.7%, 10.2% and 9.4% respectively.

*Our analysis projects the influence of weather conditions on air pollution levels using a machine-learning model trained on actual data for each city. The variation that cannot be explained by weather conditions is attributed to changes in emissions.*

Year-on-year changes in pollutant concentrations in province capitals



# Worst 7-day air pollution episodes by pollutant

## PM2.5 (excluding sandstorms)

city	province	dates	average concentration	highest daily concentration
Shihezi	Xinjiang Uygur	Jan 25 – Jan 31	192	221
Wujiaqu	Xinjiang Uygur	Jan 30 – Feb 05	190	232
Luohe	Henan	Jan 08 – Jan 14	164	268
Kaifeng	Henan	Jan 08 – Jan 14	156	308
Xuchang	Henan	Jan 08 – Jan 14	156	279

## Ozone

city	province	dates	average concentration	highest daily concentration
Dongguan	Guangdong	Jan 12 – Jan 18	160	193
Shanwei	Guangdong	Jan 06 – Jan 12	148	176
Jiangmen	Guangdong	Jan 13 – Jan 19	147	198
Zhanjiang	Guangdong	Jan 07 – Jan 13	144	181
Zhuhai	Guangdong	Jan 06 – Jan 12	142	209

## Sandstorms ( $PM_{2.5}$ )

city	province	dates	average concentration	highest daily concentration
Baiyin	Gansu	Jan 14 – Jan 20	12	60
Jiuquan	Gansu	Jan 07 – Jan 13	10	71
Jinchang	Gansu	Jan 26 – Feb 01	7	50
Zhangye	Gansu	Jan 27 – Feb 02	7	47
Guyuan	Ningxia	Jan 03 – Jan 09	6	40

## $NO_2$

city	province	dates	average concentration	highest daily concentration
Lanzhou	Gansu	Jan 06 – Jan 12	83	93
Baotou	Nei Mongol	Jan 24 – Jan 30	75	83
Hohhot	Nei Mongol	Jan 24 – Jan 30	73	77
Urumqi	Xinjiang Uygur	Jan 26 – Feb 01	71	84
Zibo	Shandong	Jan 11 – Jan 17	71	105

Unit:  $\mu\text{g}/\text{m}^3$

# Data sources

- Industrial output, power generation and power capacity additions, as well as fuel imports and exports are based on Chinese government data, through Wind Financial Terminal. Some of the data is not included in public releases.
- Measured air quality data is compiled from Chinese government air quality monitoring stations. Weather-controlled air quality is derived from CREA's [deweathering algorithm](#).