CREA

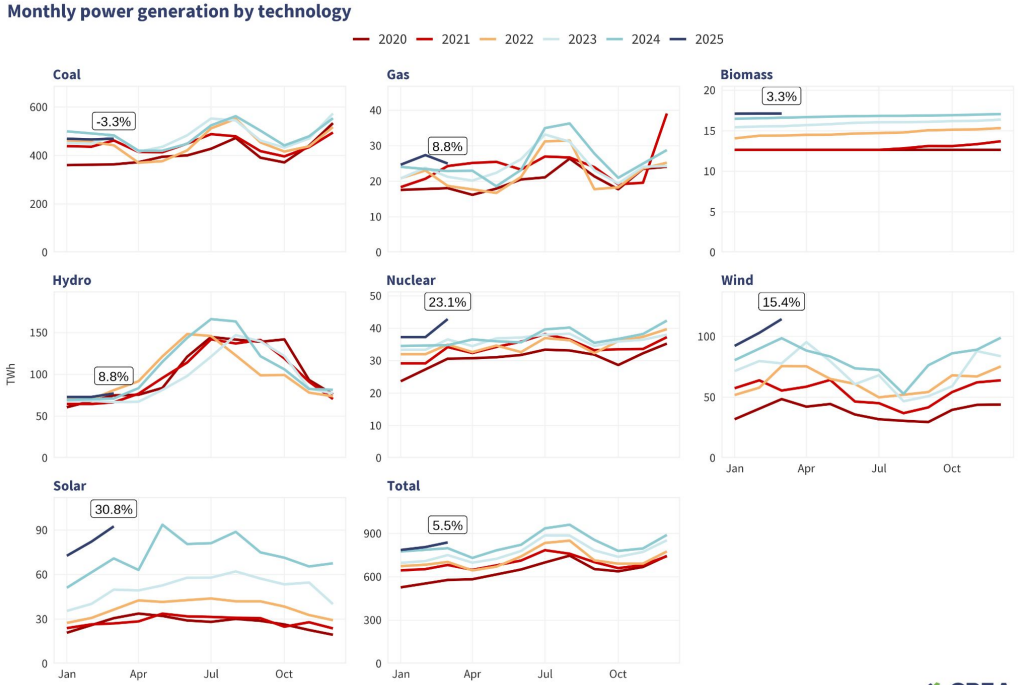
Centre for Research on Energy and Clean Air

China energy and emissions trends

April 2025 snapshot

Renewable power meets total demand growth as coal power declines

- Total power generation* increased by 5.5%, while large-scale power generation only grew by 1.8%, indicating most power generation growth comes from solar and wind installations that are outside of the industrial production statistics.
- Coal power generation decreased by 3.3% while hydro, wind and solar power generation* increased by 8.8%, 15.4% and 30.8% respectively, covering total power demand growth.
- Nuclear power generation increased by 23.1%, while gas power generation increased by 8.8%.



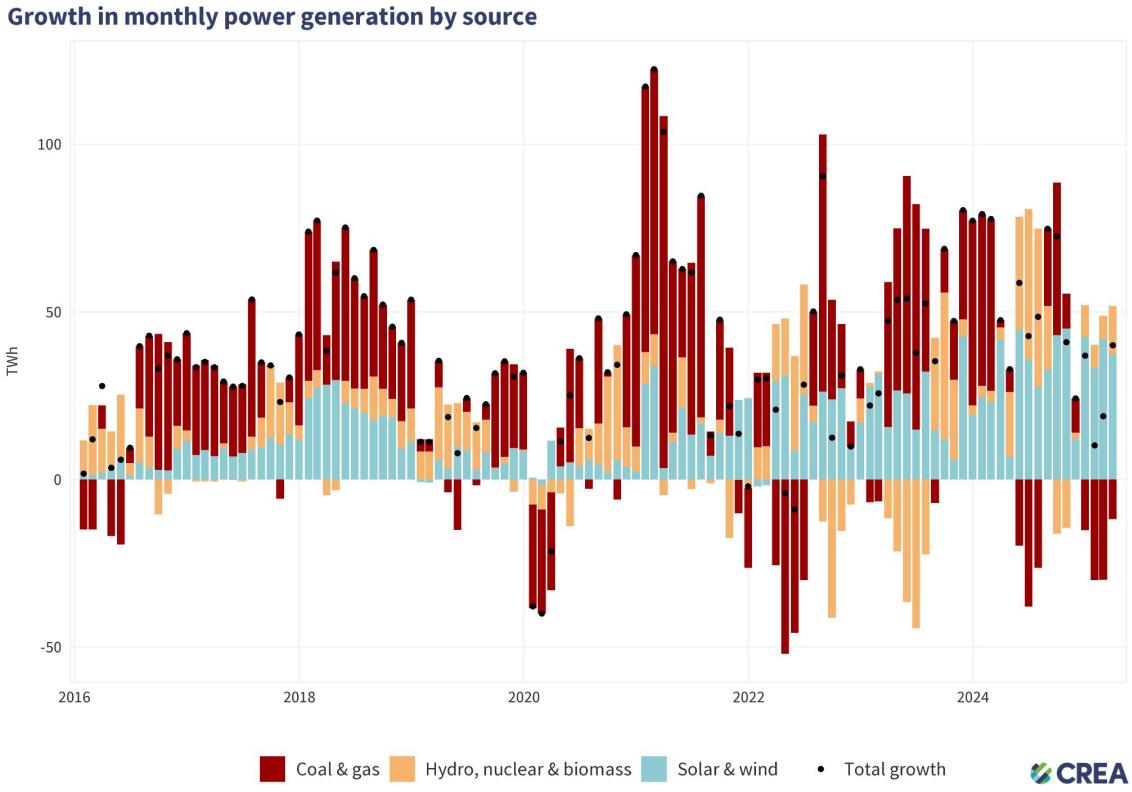
*This is a prediction based on the assumption that there wasn't a major increase in wind and solar curtailment compared with the same period last year.

National Bureau of Statistics (NBS) underreports wind and solar generation, particularly from rooftop and smaller solar plants. Find CREA's methodology for power generation here.

Renewables dominate power demand growth

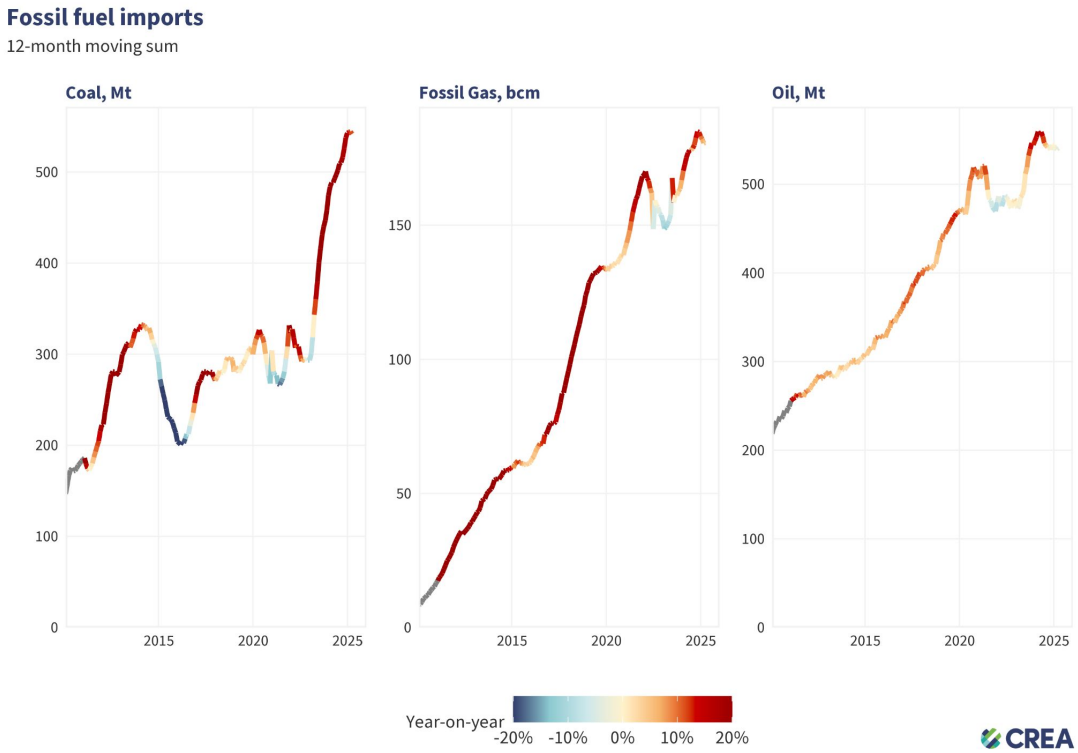
- Wind and solar* accounted for 93.2% of total power generation growth in March. With additional increases from hydropower and nuclear, coal power's share of total generation dropped by 5 percentage points year-on-year, from 61% to 55%.
- In 2025 Q1, solar and wind power accounted for 23% of total electricity generation, up 4 percentage points from a year earlier. Their output grew much faster than overall power demand during the quarter.

**This is a prediction based on the assumption that there wasn't a major increase in wind and solar curtailment compared with the same period last year.*



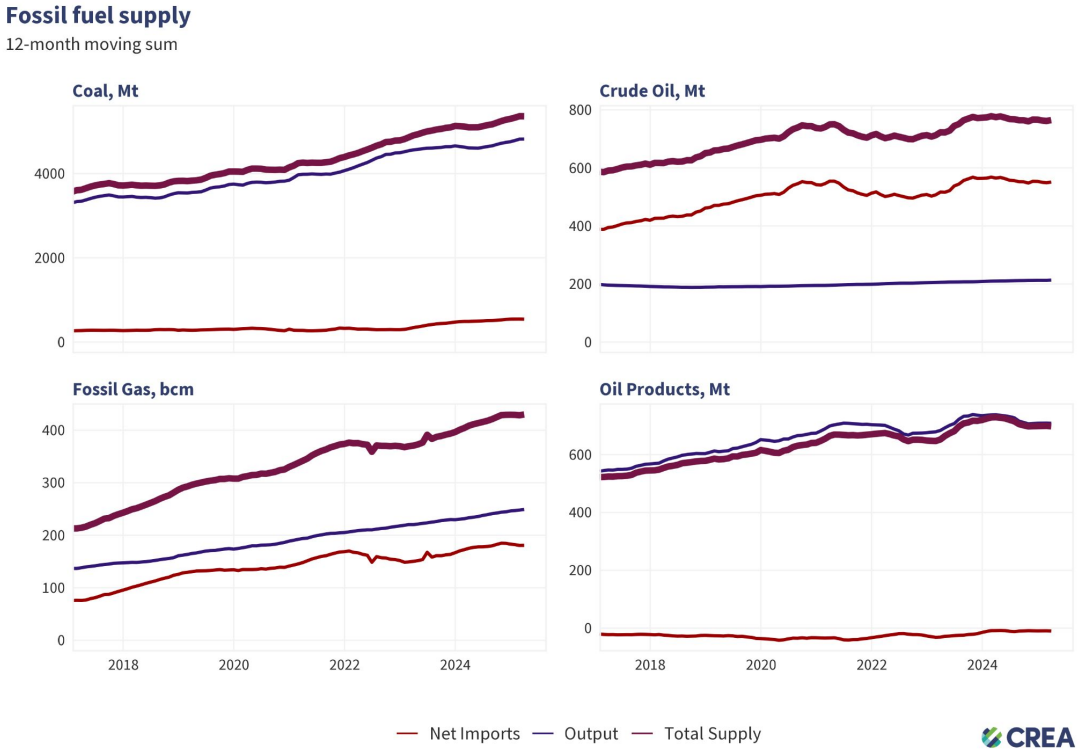
Coal imports see first post-COVID drop

- Coal imports in March fell 6.4%, after China's domestic coal associations called for controlling coal imports.
- Crude oil imports rebounded sharply from the previous two months, rising nearly 5% year-on-year. The increase was driven primarily by a surge in Iranian oil shipments and a recovery in supplies from Russia. Imports reached their highest level since August 2023.
- Natural gas imports fell by 15%, as a warmer winter and high inventory levels reduced demand. Since March, no U.S.-sourced LNG cargoes have arrived in China.



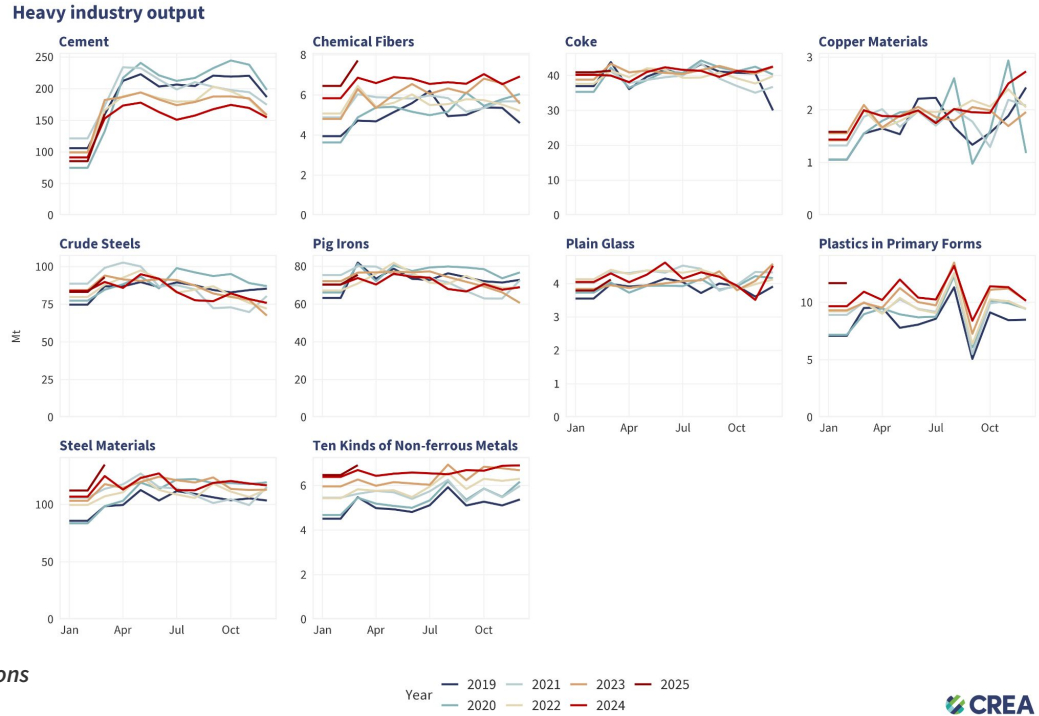
Coal output remains strong, oil demand rebounds modestly

- Coal supply rose by around 8% year-on-year. In March, coal production saw a strong 9.6% increase, following calls from the national coal association, while imports shifted from growth to decline.
- Despite weak demand, domestic natural gas production increased by 5%, while gas imports declined to ease pressure on domestic suppliers.
- Crude oil production increased by 3.5%, accompanied by a rise in imports.
- Oil refinery runs rose just 0.4% year-on-year from a low base, reflecting the dampening impact of electrification on oil demand.



Industrial materials rebound, while real estate drag persists

- In March, pig iron, crude steel and steel product increased 3.1%, 4.6%, and 8.3%, respectively.
- With real estate sector still shrinking significantly, steel demand is likely being driven by autos, machinery, and other manufacturing sectors. Rising steel exports in March also suggest that production exceeded domestic consumption.
- After a year of consistent declines, cement production edged up by 2.5% in March, albeit compared to a particularly low level in March 2024.
- Chemical fiber and non-ferrous metal output grew by 6.3% and 3.7% in March.
- Due to the continued downturn in the real estate market, plain glass production fell by 6.7% year-on-year.



The steel and cement industries are the largest CO2 emitters in China, when emissions from their electricity use are included. They are also bellwethers of real estate, infrastructure and other fixed asset investments that play an outsized role in China's emissions and economy.

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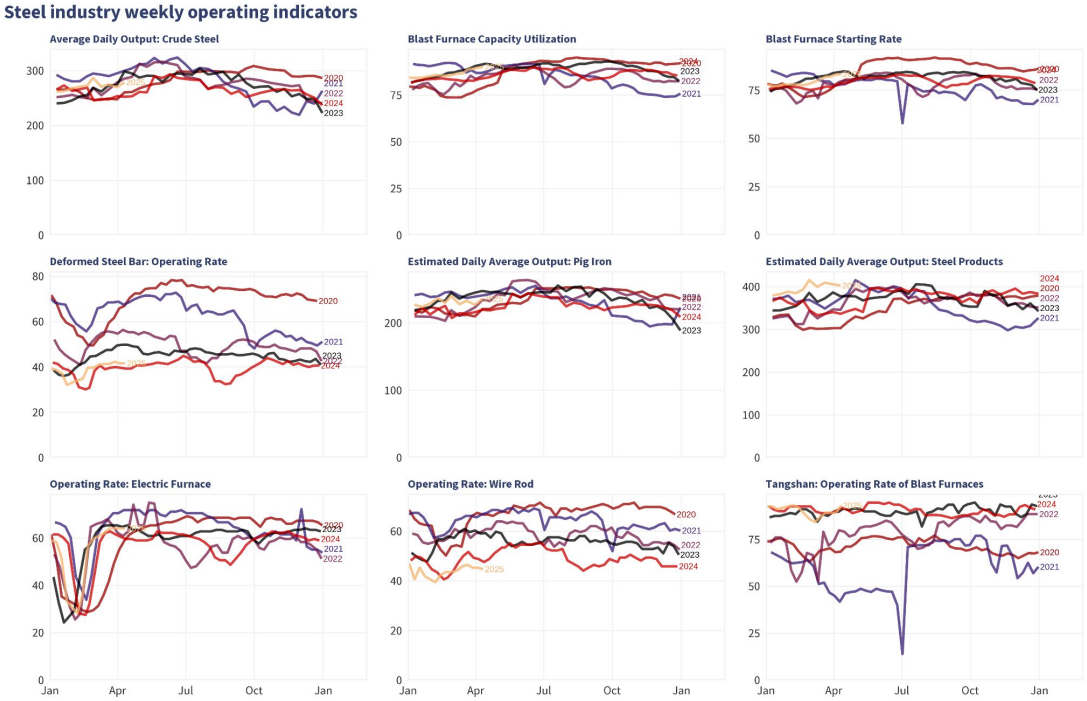
Steel demand sees modest recovery

- Blast furnace operating rates and utilization levels were both higher than the same period last year, while electric furnace operating rates and utilization saw a slight increase.
- Since the beginning of 2025, steel demand has continued to recover, and inventories have started to decline.
- The operating rate of blast furnaces in Tangshan, China's 'steel capital' and an important source of air pollution in Beijing, reached a record high for the first week of April.
    - Hebei industrial output is a bellwether of national priorities: when air quality and emissions are the priority, it is the most tightly regulated area due to its impact on Beijing's pollution levels.

Urge for reform: blast furnace glut in China erodes profitability and hinders green steel transition. Read more here.



Source: Wind Information

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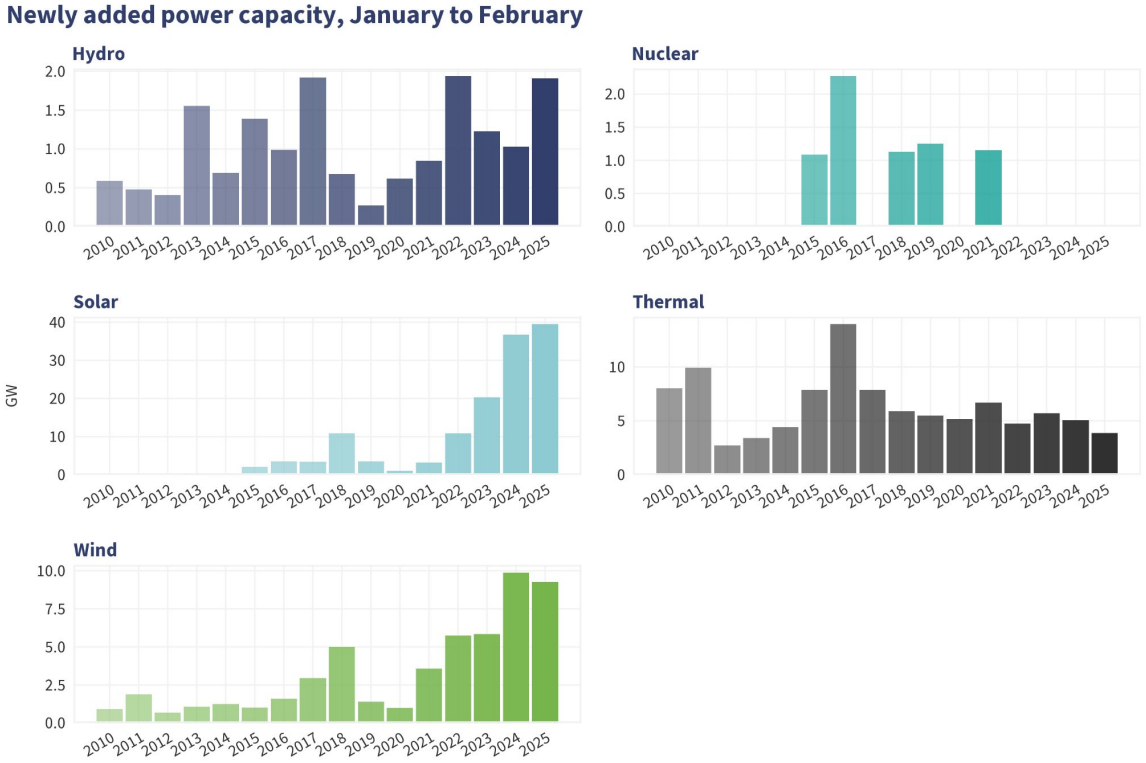
Rapid growth in solar and wind continues

In the first two months of 2025, China added:

- 39.5 gigawatts (GW) of solar power capacity, up 8% from last year.
- 9.3GW of wind power capacity, down 6% from last year.
- 3.9 GW of thermal power capacity, decreased 24% from last year.
- 1.91 GW of hydro power capacity, up 85% from last year.
- 0 GW of nuclear power capacity, unchanged from last year.



Read more: [Clean energy contributed a record 10% of China's GDP in 2024](#).

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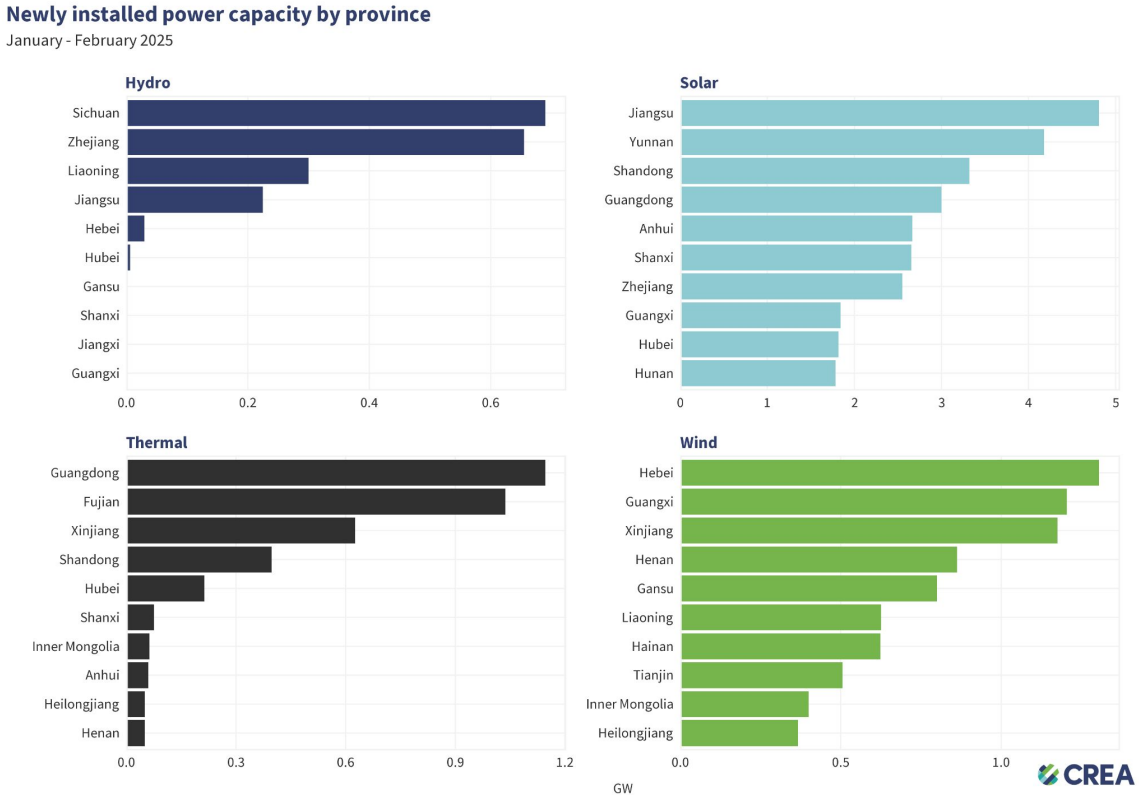
Distributed solar and coastal wind take the lead

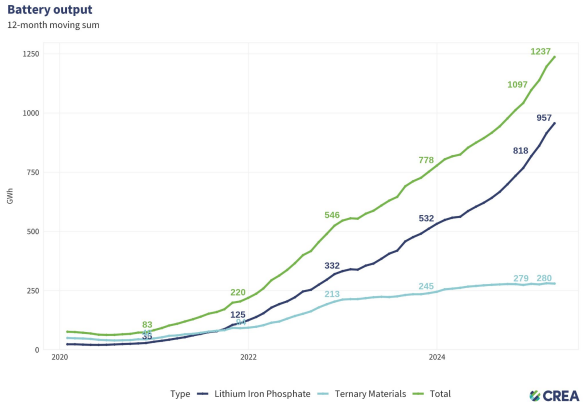
- Solar power installations are led by Jiangsu, Yunnan, and Shandong. The top-ranking provinces for solar power installations in January and February were mostly those with a strong focus on distributed solar.
- Hebei, Guangxi and Xinjiang lead in wind development. Hebei and Guangxi are key provinces for offshore wind development, while Xinjiang is part of the large-scale clean energy bases initiative.
- Thermal (coal) power additions accelerated in Guangdong, Fujian and Xinjiang. In recent years, Guangdong has led the country in new thermal power capacity additions, undermining its clean energy performance and leading to signs of coal power overcapacity in 2024.

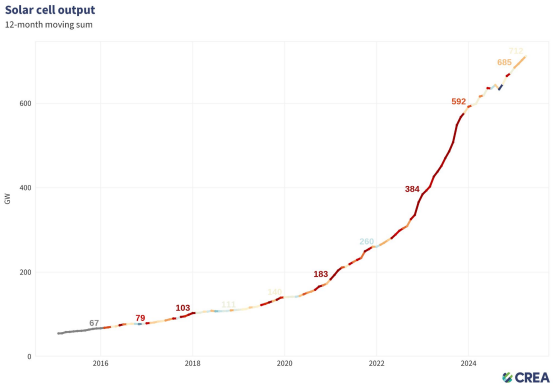
Read more: China's north cleans up its power mix as the south lags



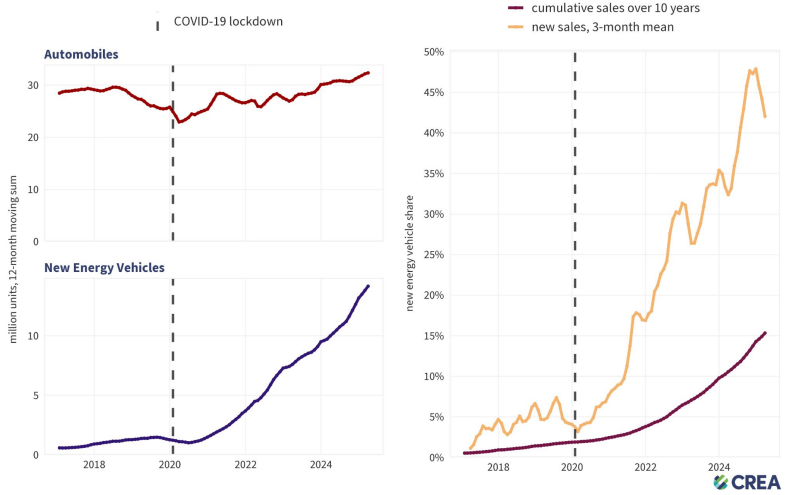
Solar cell output surges ahead of June 2025 policy change

- In March, the 12-month moving sum of solar cell production reached 712 GW, up 15% from a year earlier, reflecting a strong push to complete installations before new pricing rules for solar and wind take effect on 1 June 2025.
- In March, new energy vehicles (NEVs) production increased by 48%, while export in the first quarter of 2025 increased by 44%.
- NEV sales increased by 40% in March; the market share of NEVs in new sales was 41%, due to the impact of the Chinese New Year holiday. Year-end car buyers tend to be more price-sensitive and often opt for internal combustion engines (ICEs) with larger discounts. Similar declines were observed during the first three months in both 2024 and 2023.



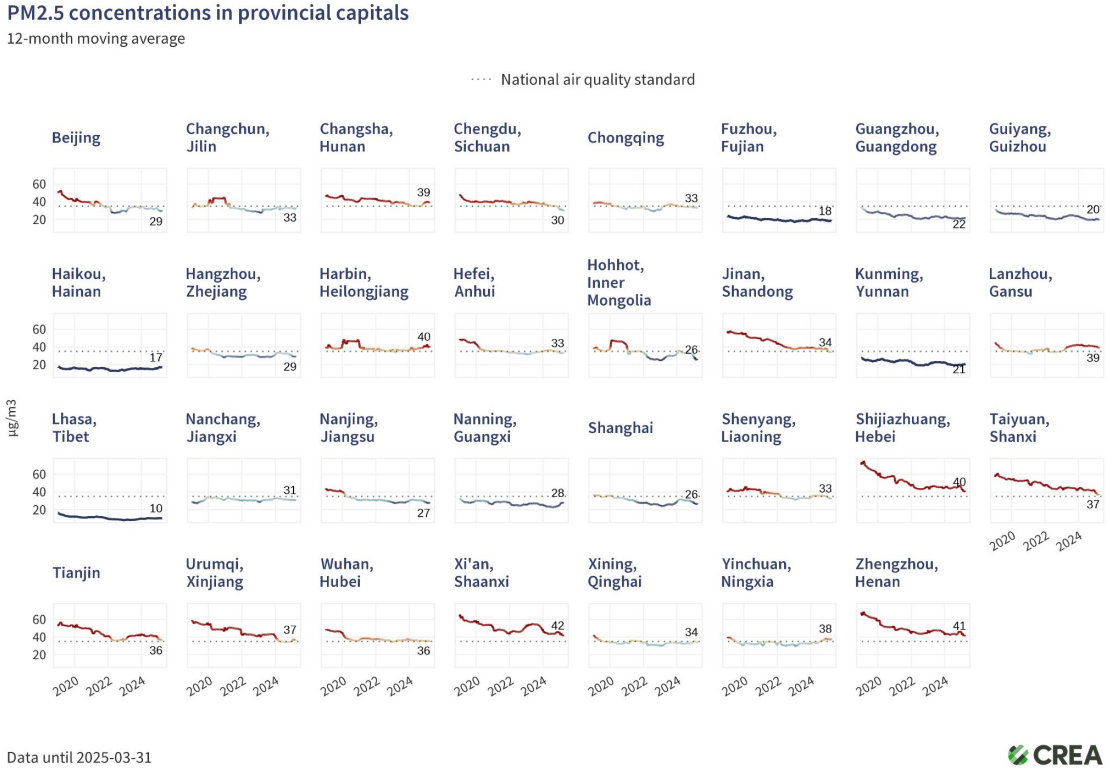


Vehicle production



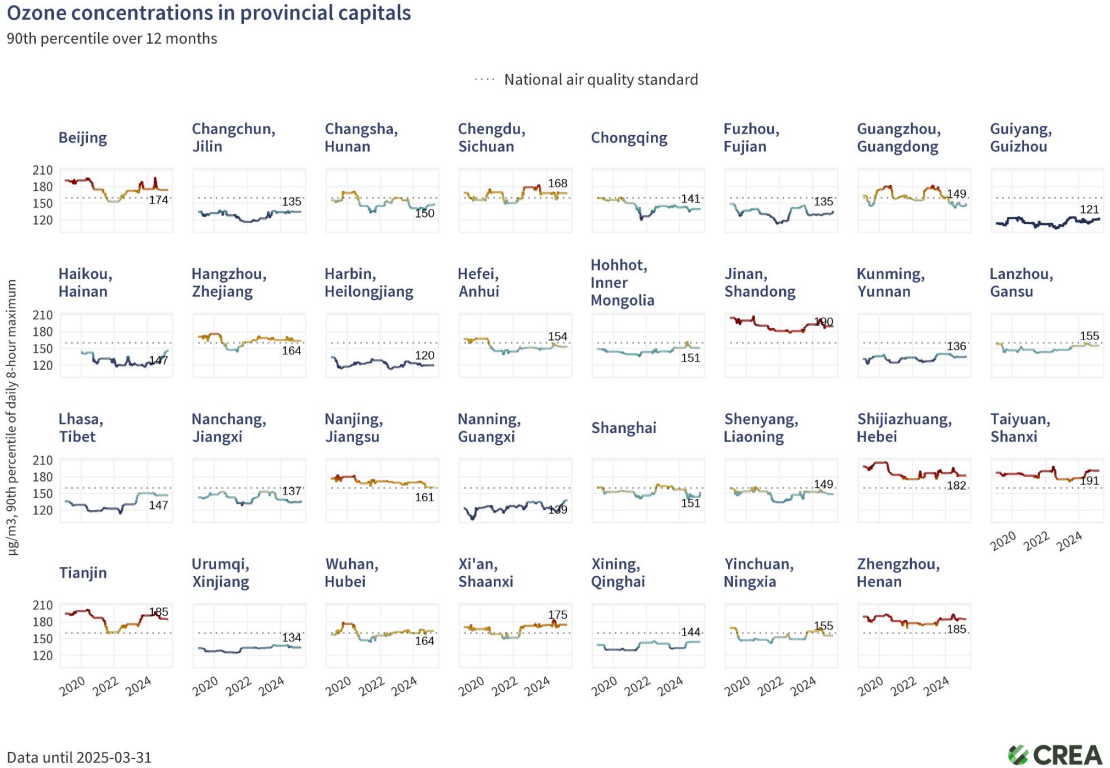
PM2.5 annual average exceeds national standard in 11 Chinese provincial capitals, with northern cities ranking the top

- As of the end of March 2025, 11 out of 31 provincial capital cities in China had a 12-month moving average PM2.5 concentration exceeding the national standard of 35 μg/m³.
- The cities with the highest average PM2.5 concentrations were primarily located in northern China, including the capitals of Shaanxi, Henan, Heilongjiang, Hebei, and Hunan, with annual averages of 42, 41, 40, 40, and 39 μg/m³, respectively.
- Additionally, five provincial capitals—Inner Mongolia, Yunnan, Liaoning, Ningxia, and Jilin—saw an increase in their 12-month moving average PM2.5 concentrations compared to the previous month. While 10 provincial capitals experienced a decline.



11 provincial capitals exceed 12-month ozone limit, and 10 report rising levels since last month

- As of the end of March, 11 out of 31 provincial capitals in China had annual ozone assessment values exceeding the national standard of 160 μg/m³.
- Ozone pollution was particularly severe in northern provincial capitals, with Shanxi, Shandong, Henan, Tianjin, and Hebei recording the highest 12-month 90th percentile ozone concentrations at 191, 190, 185, 185, and 182 μg/m³, respectively.
- Compared to the previous month, 10 provincial capitals saw an increase in 12-month 90th percentile ozone concentrations, with Shanghai, Guangzhou, Fujian, and Hunan experiencing the largest rises. None of the provincial capitals saw a decline.



Data until 2025-03-31

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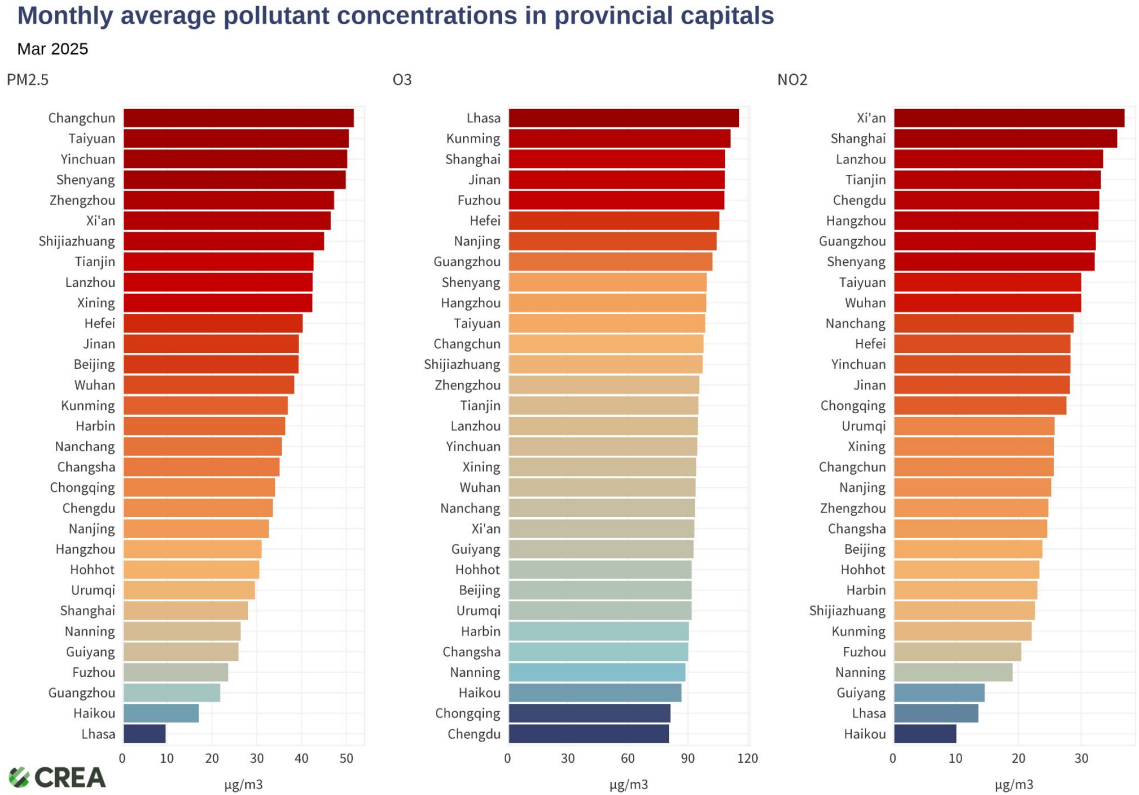
Shanghai ranks top three for both O_3 and NO_2 in March 2025, underscoring the urgent need to cut NOx emissions – A key ozone precursor

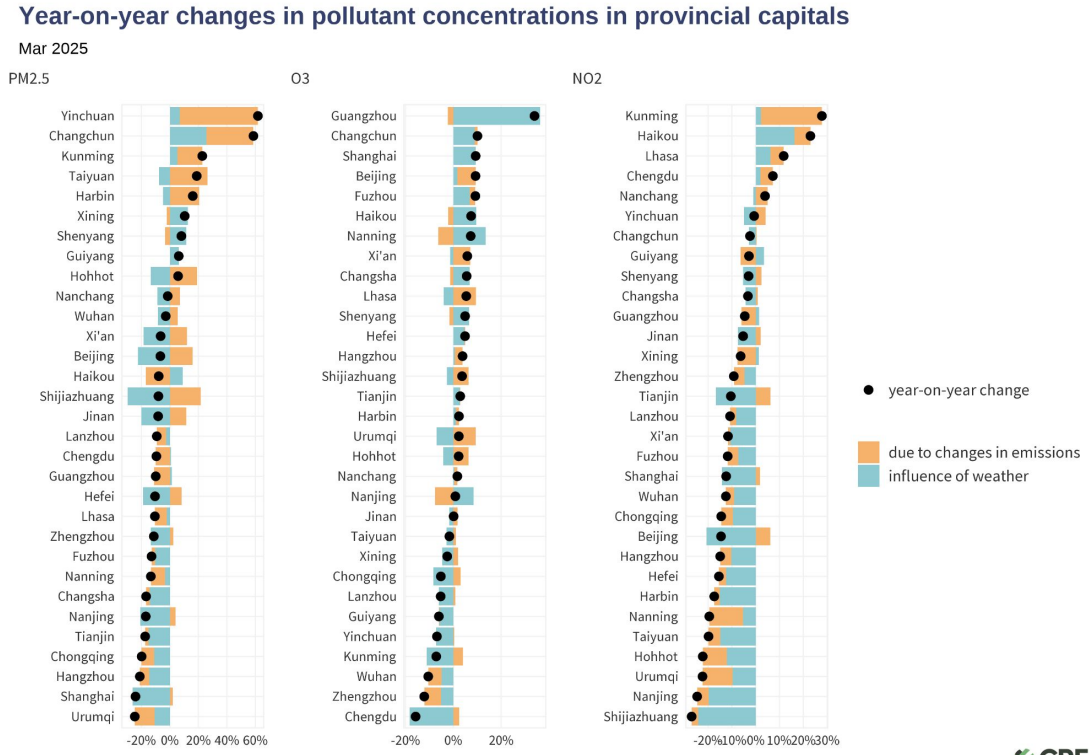
- In March, Jilin's capital had the highest PM2.5 pollution in China, averaging 52 μg/m³—1.5 times the national standard. The capitals of Shanxi and Ningxia followed at 51 and 50 μg/m³. Almost half of provincial capitals exceeded the PM2.5 standard, mostly in northern and central China.
- Shaanxi's capital led in NO_2 pollution at 37 μg/m³, followed by Shanghai and Lanzhou at 36 and 34 μg/m³. NO_2 harms health and contributes to PM2.5 and ozone formation.
- Ozone levels were highest in Tibet, Yunnan, and Shanghai. High NO_2 levels in Shanghai—mainly from transport and industry—highlight its role as a key ozone precursor and the need to cut NO_x emissions to reduce ozone pollution.



Yunnan's provincial capital saw sharp PM2.5 and NO_2 rise driven by increased anthropogenic emissions in March

- The capitals of Ningxia, Jilin, and Yunnan saw the largest year-on-year increases in PM2.5 pollution, stemming from higher anthropogenic emissions. Their PM2.5 levels increased by 62%, 59%, and 23%, respectively. Since February, the central government lifted the full ban on straw burning, which could have led to more biomass burning during the spring ploughing season in these agriculturally active provinces.
- In March, ozone concentrations rose sharply in the capitals of Guangdong (+34%), Jilin (+10%), and Shanghai (+9%), driven by unfavourable weather conditions.
- Yunnan's capital saw the highest NO_2 increase (+28%), followed by Hainan (+23%) and Tibet (+12%). In Kunming, 26% of the rise was driven by human-induced emissions, while increases elsewhere were primarily influenced by meteorological conditions.

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 variations that cannot be explained by weather conditions are attributed to changes in emissions.



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Worst 7-day air pollution episodes by pollutant

PM2.5 (excluding sandstorms)

city	province	dates	average concentration	highest daily concentration
Siping	Jilin	Mar 20 – Mar 26	104	204
Tieling	Liaoning	Mar 20 – Mar 26	104	180
Wujiaqu	Xinjiang	Feb 23 – Mar 01	100	165
Anyang	Henan	Feb 24 – Mar 02	91	144
Baoding	Hebei	Feb 24 – Mar 02	89	187

Ozone

city	province	dates	average concentration	highest daily concentration
Qingyuan	Guangdong	Mar 20 – Mar 26	204	257
Guangzhou	Guangdong	Mar 19 – Mar 25	192	235
Dongguan	Guangdong	Mar 19 – Mar 25	189	219
Jiangmen	Guangdong	Mar 19 – Mar 25	187	246
Zhaoqing	Guangdong	Mar 19 – Mar 25	185	210

Sandstorms ($PM_{2.5}$)

city	province	dates	average concentration	highest daily concentration
Wuhai	Inner Mongolia	Mar 21 – Mar 27	105	232
Shizuishan	Ningxia	Mar 21 – Mar 27	95	172
Wuzhong	Ningxia	Mar 21 – Mar 27	87	171
Zhangye	Gansu	Mar 06 – Mar 12	81	121
Zhongwei	Ningxia	Mar 22 – Mar 28	79	171

NO_2

city	province	dates	average concentration	highest daily concentration
Nantong	Jiangsu	Mar 20 – Mar 26	67	80
Wuzhou	Guangxi	Mar 20 – Mar 26	62	73
Tianjin	Tianjin	Feb 24 – Mar 02	54	82
Baoding	Hebei	Feb 24 – Mar 02	53	77
Shanghai	Shanghai	Mar 20 – Mar 26	53	69

Unit: μg/m³

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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.