Thirty-eight Chinese cities have reduced their emissions of planet-warming carbon dioxide (CO₂) despite growing economies and populations for at least five years—defined as proactively peaked cities, a new study reveals.

A further 21 cities have cut CO₂ emissions as their economies or populations have 'declined' over the same period—defined as passively emission declined cities.

The experts discovered that "emission peaked" cities, such as Beijing and Taizhou (Zhejiang province), achieved emission decline mainly due to efficiency improvements and structural changes in energy use, whilst "declining" cities, such as Fuxin (Liaoning province) and Shenyang (Liaoning province), are likely to have reduced emissions due to economic recession or population loss.

They recommend that instead of using a "one-size-fits-all" approach, emission targets of cities need to be set individually considering cities' resources, industrialization levels, socio-economic characteristics, and development goals.

Super-emitting cities with outdated technologies and lower production efficiency should develop stringent policies and targets for emissions reduction, while less developed regions could have more emission space for economic development.

Publishing their findings in Science Bulletin, an international team of scientists, led by the Universities of Birmingham (UK), Groningen (Netherlands), and Tsinghua University (China) analyzes comprehensive CO₂ emission inventories of 287 Chinese cities from 2001 to 2019. The authors thank the data contribution from over 190 participants to the Summer School organized by the Carbon Emission Accounts and Datasets for Emerging Economies (CEADs) at Nanjing Normal University (2017) and Tsinghua University (2018 & 2019).

All the emission inventories of cities can be downloaded free-of-charge from CEADs–Carbon Emission Accounts and Datasets for emerging economies. CEADs gathers experts from the UK, U.S., and China to work on China and other emerging economies' emission accounting methods and applications. The resource provides accurate and up-to-date carbon emission, socio-economic and trade data for academics, policy stakeholders, and public.

The first author Dr. Yuli Shan, Associate Professor in Sustainable Transitions at the University of Birmingham and subject leader of CEADs team, says that "the experiences and lessons learned from those 59 Chinese cities which have reduced their CO₂ emissions cities can be used as benchmarks for other cities. The achievements of these cities are notable for countries around the globe, as China is the world's most significant emitter of CO₂."

"The impact of emission drivers varies among these cities. Growing cities which have reduced emissions should lead in setting precedents for..."
China to reach the Dual-Carbon goals of achieving carbon emission peak before 2030 and carbon neutrality before 2060.

The scientists recommend that "declining" cities with reduced emissions face the fact that the drop in emissions is mainly caused by a recessive economy, exhausted natural resources, insufficient competitiveness of industry or even shrinking population, rather than vigorously promoting low-carbon actions.

Prof. Klaus Hubacek, one of the co-authors from the University of Groningen, says that "cities often struggle with economic decline and dwindling resources but at the same time need to keep an eye on mitigation goals and look for synergies to achieve the energy and resource transition."

Corresponding author and founder of CEADs dataset Professor Dabo Guan from Tsinghua University says that "it is not easy to reduce every ton of emissions and the reduction strategy must be individualized. China is playing an increasing role in global climate change mitigation, and local authorities need more city-specific information on the emissions trends and patterns when designing low-carbon policies."

The researchers note that cities are at the heart of climate change mitigation—emission and development hotspots with urban economic activity accounting for 80% of global GDP, 60-80% of energy consumption, and 75% of carbon emissions. However, cities have the administrative capacity to carry out targeted emission reduction measures.

Although more than 500 cities world-wide have committed to low-carbon and carbon neutrality goals, agreement is still lacking on how to best account for emissions and achieve decarbonization at the city level.


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