

EGU2020-1643

<https://doi.org/10.5194/egusphere-egu2020-1643>

EGU General Assembly 2020

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The CO₂ Emissions of US Cities: Status, Dynamics, and Comparisons

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Urban areas are rapidly growing and are acknowledged to dominate greenhouse gas (GHG) emissions to the Earth's atmosphere. They are also emerging as centers of climate mitigation leadership and innovation. However, fundamental quantitative analysis of urban GHG emissions beyond individual city case studies remains challenging due to a lack of comprehensive, quantitative, methodologically consistent emissions data, raising barriers to both scientific and policy progress. Here we present the first such analysis across the entire US urban landscape, answering a series of fundamental questions about emissions responsibility, emissions drivers and emissions integrity. We find that urbanized areas in the U.S. account for 68.1% of total U.S. fossil fuel carbon dioxide (CO₂) emissions. Were they counted as a single country, the 5 largest urban emitters in the US would rank as the 8th largest country on the planet; the top 20 US cities as the 5th largest. In contrast to their dominant overall proportion, per capita FFCO₂ emissions in urbanized areas of the US are 7% less than the country as a whole, particularly for onroad gasoline emissions (-12.3%).

Contrary to previous findings, we find that emissions grow slower than urban population growth in Eastern US cities, particularly for larger urban centers. The Western US, by contrast, shows emissions growing proportionately with population. Much of the difference between Eastern versus Western cities is determined by the onroad emissions sector. This finding, in particular, suggests that "bigger is better" when considering GHG emissions and U.S. urban population growth.

Finally we find large and persistent differences between the results presented here and 57 self-reported urban inventories. The mean difference between the self-reported inventories and the analysis here is -24% (mean absolute difference: 44.3%) with the majority of self-reported values lower than quantified in this study.