# U.S. Cities are NOT Vastly Undercounting Emissions: City climate accounting standards are consistent methods that capture emissions most policy-relevant to local governments

## Rebuttal statements are in RED typeface

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On February 2, 2021, *Nature Communications* published a study whose results indicate an under-reporting of city-level greenhouse gas (GHG) emissions across 48 U.S. cities. The GHG accounting method in the study is atypical in local GHG accounting, it is not fully comparable with city inventories, and does not address some of the key policy levers that drive cities to conduct GHG inventories and develop GHG mitigation strategies.

The approach followed in Gurney et al. (2021) is not "atypical" in the peer-reviewed scientific literature, particularly within the geophsyical disciplines. It is one approach, among a few, that are routinely used. It is referred to as a "territorial" or "Scope 1" emissions inventory using "bottom-up" techniques.

### Key Points:

- Two of the greenhouse gas (GHG) accounting protocols referenced in the Nature Communications Study, commonly used by U.S. cities, are consistent, accurate methods that capture the GHG emissions and removals that are most policy-relevant to local governments. Self-reported inventories are a management tool to prioritize action.

Gurney et al. (2021) did not offer any critique of the protocols themselves (which are akin to a recipe), other than to point out that cities were adhering to differing protocols of which a few are in common use. We examined the results of using these protocols to generate emission estimates. We did not make any claims regarding policy relevance – out study was focused on emissions data product accuracy. We consider the protocols important and useful guidance documents.

- The Nature Communications Study approach produces insights into gross GHG emission sources in one area, but it does not attribute the emissions directly to local activities. Not all CO2 emitted within a city boundary can be influenced by city policies or advocacy.

**This is incorrect**. Combustion of fuel within a given territory is, by definition, attributed to "local activity". As pointed out in Gurney et al. (2021) our study is a purely territorial or "Scope 1" emissions analysis. The emissions we quantify are directly attributed to combustion within the geographic confines of the city.

- The Nature Communications study highlights the need for innovation to make inventory development easier and more informative. ICLEI's tools, data, and partnerships remove complexities and lower costs to improve cities' ability to actively reduce their GHG emissions.

As pointed out in Gurney et al. (2021), data (availability, management, handling) is likely the largest challenge. The protocols do not provide cities with all of the necessary data by which to generate emissions estimates. We did not recommend that inventory be made "easier" but rather suggested that inventories be supplied to all cities built from a comprehensive, atmospherially-verified approach. We do agree that more informative inventories is a critical goal.

## The methods aren't wrong: cities have and use consistent protocols that measure and manage emissions and removals (see the technical FAQ)

"The common refrain 'you can't manage what you don't measure' implies that what is being measured is manageable," stated Angie Fyfe, Executive Director at ICLEI Local Governments for Sustainability USA (ICLEI). "This is why local government practitioners developed community GHG accounting protocols to provide actionable results for decision makers and align with national inventories for multi-level collaboration. To imply that cities have erred in reporting emissions is misleading and does a disservice to the thousands of local governments doing their part to solve the climate crisis."

For nearly a decade, communities have created GHG inventories using the *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions* (USCP). The USCP details science-based methodologies and best practices to guide local governments as they measure and report the GHG emissions and removals associated with their communities. ICLEI developed the USCP in 2012 with input from a "field of experts at the World Resource Institute, the US Environmental Protection Agency, and more than 80 cities, state agencies, foundations, and universities. From the ICLEI USA website alone, the protocol has been downloaded more than 5,700 times as of January 2021.

A similar Global Protocol for Community Greenhouse Gas Emissions Inventories (GPC) released in 2014 was developed through a parallel process with international stakeholders including ICLEI, the World Resource Institute, and C40. The USCP and GPC are very well aligned with each other in their focus on policy-relevant emissions accounting. There are some minor differences between the GPC and USCP in which minor emissions sources are required and the USCP includes more information on data sources available in the US.

The USCP and GPC were developed to provide local policymakers and their communities with the most appropriate understanding of how their community's activities translate into GHG emissions. It allows policymakers to focus on the actions for which they have the best opportunity to reduce emissions and increase carbon sinks.

The Gurney et al. (2021) study focused only on the results of self-reported inventories (SRIs) not on the quality of the protocols or guidelines. The SRI results are the combination of the protocol used, how closely the city adheres to the protocol guidance, which methodological choices were made generating estimates, and the data used to fulfill the methodological choices. Hence, there a a variety of reasons why the numerical results could be in error beyond the protocol recipe. We did not suggest that there is a problem with the quality of the protocols.

## The overall approach used in the Nature Communications study is not comparable to city inventories and is less policy-relevant for local governments

The study uses a new approach to CO2 monitoring that measures changes in fossil fuel-based CO2 concentration in the atmosphere over cities, and attempts to work backwards and allocate those changes to different sectoral emissions.

**This is incorrect**: This study did not use an atmospheric inverse approach (what is being referred to here). Atmospheric inverse approaches were referenced in Gurney et al. (2021) as having validated the results of the approach that *was* used in Gurney et al. (2021) which is a "bottom-up" approach, categorically similar to the approach used by cities in generating self-reported inventories.

There can be uncertainty in this backtracking approach based on assumptions made about the starting/background CO2 concentration in air, uncertainty in the location of industries even by a small distance in/out of city boundaries; consideration of power plant emissions within city boundaries even if the power is effectively exported; and potentially using different estimates of vehicle miles traveled compared to what was publicly available to cities.

None of this is relevant to the Gurney et al. (2021).

Additionally, the Vulcan method also does not capture many activities relevant to city policy such as reducing electricity use or reducing generation of municipal solid waste. It likely will provide better estimates of industrial purchases of gas and petroleum not reported to cities by utilities, and aircraft landing and take-off emissions, although some cities are going a step further and accounting for all fossil fuel used by aircrafts.

Agreed. Gurney et al. (2021) pared down the SRIs such that they reflected just the Scope 1 emissions component. This can then be fairly compared to the Vulcan Scope 1 emissions.

Vulcan currently does quantify high-resolution Scope 2 emissions (powerplant emissions allocated to the consumption point) but instead quantifies powerplant emissions at the point of release from the powerplant emissions stack. However, we have a complete space/time-resolved Scope 2 data product that will be released soon.

Furthermore, we are currently working on a complete space/time resolve Scope 3 (supply chain emissions from goods/services consumed with a city).

Regarding policy relevance: Cities have varying levels of governance control over emissions spanning Scope 1, 2 and 3. Scope 1 constitutes an important piece of what cities likely have governance control over so it remains relevant. However, including Scope 2 and Scope 3 emissions is sensible and we hope to include those scopes in future releases of our research.

"The paper presents a novel way to track CO2 emissions directly over land. However, a purely territorial approach to CO2 accounting does not fully match up with urban policy levers. Not all CO2 emitted within a city boundary, such as from ports and large exporting power plants can be in!uenced by city policies. And some of the key urban policy levers, such as energy efficient buildings that save electricity (often imported into cities), or efforts to reduce waste currently being disposed to distant landfills, would not be captured by the territorial accounting approach " said Anu Ramaswami, Professor of Civil and Environmental Engineering and the Princeton Institute for International and Regional Studies. The purely territorial approach is what the NIST / NAU team used.

Cities have policy levers that can touch upon all of the Scopes of emissions accounting – some are territorial emissions, some are electricity consumption emissions (Scope 2), some are Scope 3 (supply chain emissions associated with goods/services consume within city). The reason to start with Scope 1 is that it can be independently verified via atmospheric monitoring. The Vulcan results have been verified using this technique. Hence, it provides a foundational starting point to assess how well the inventory construction process is hewing to physical reality. If the Scope 1 inventory shows large bias, it is likely that Scope 2 and Scope 3 estimation will show equal or greater biases.

The aim of Gurney et al. (2021) was to quantify the potential errors in the current SRI results by using an independently verified emissions estimate. Its stated goal was not to replace current SRIs.

## ICLEI and cities continue to innovate to make inventories easier and more informative

GHG inventory development need not be complex or expensive. ICLEI's ClearPathTM GHG emissions management software application has been used by 738 jurisdictions to create nearly 1,000 GHG Inventories, forecasts, climate action plans, and to monitor progress over time.

Complexity is a matter of opinion. The Vulcan system has grown over the last 15 years to be a complex codebase (>10000 lines requiring multi-processor HPC system). While complexity is not required to develop emissions data products, the complexity of Vulcan is one of the reasons it is accurate when compared to independent atmospheric measurements. Vulcan was developed with Federal funds and hence the results are freely available to the public.

There is a need to improve access to the data local governments rely on for GHG inventory development and reducing emissions. First announced last September, ICLEI USA's partnership with Google's Environmental Insights Explorer is an example of a streamlined and improved GHG inventory and emissions management process. Also important will be the development of benchmarks for energy usage data from utilities and mobility data emerging from new sources, such as cell phones.

We are currently engaged in careful comparison to the Google Insights Explorer and will report the results in the coming year.

We welcome new data products and tools such as Vulcan referenced in the Nature Communications study, where they can be appropriately used to improve measurement of particular emissions sources, link to human activities on the ground, and inform policy decisions.

The USCP and GPC are designed to encourage innovation and improvement in city inventories. The the atmosphere by forests and trees, as well as emissions from loss of forests and trees.

The USCP requires all inventories to include "five emissions- generating activities associated with human activities in cities: electricity use, fuels used in buildings, on-road transportation, solid waste, and energy associated with water use. In addition, the USCP encourages cities to look at other approaches such as infrastructure supply chain and consumption-based emissions to account for goods and services consumed within the city boundary that have a carbon footprint associated with production occurring outside of the political boundary.

The USCP provides local governments with the option to include emissions associated with production occurring outside of the boundary and resulting in consumption within the boundary – food production and consumption, for example. ICLEI USA partnered with Philipstown, NY, to model such a consumption-based approach. Like the approach in the Nature Communications study, a consumption-based inventory yields different results than does a conventional inventory. It is used to identify different types of actions.

It is unclear what is being referenced with “a conventional inventory”. Inventories can be constructed many ways and there is a growing conventional typology in the peer-reviewed literature. The Vulcan results, as reported in Gurney et al. (2021) is a Scope 1 or territorial emissions data product and that was clearly stated. It was compared to the Scope 1 components of self-reported inventories with the resulting statistical differences reported. This “apples to apples” comparison illuminates potential errors.

**ICLEI USA developed this technical FAQ for local government practitioners and policymakers**

**Sincerely,**

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