New Efforts to Develop International Documentary Standards for Greenhouse Gases

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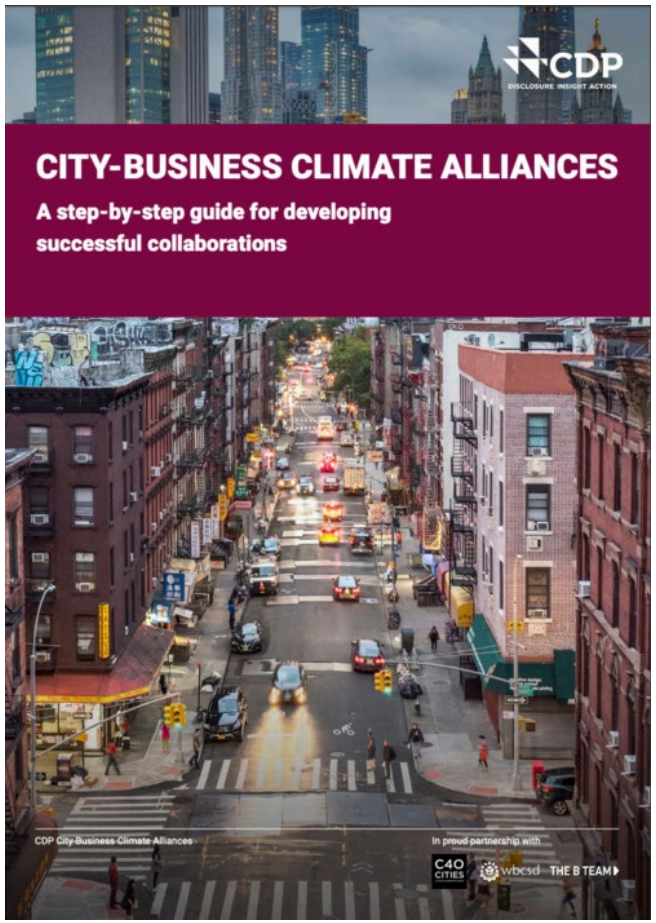
Focus on Urban Environments

- Cities account for 70% of global Greenhouse Gas (GHG) emissions
- Direct consumption of energy accounts for 73% of GHG emissions
- Attempts to mitigate GHG emissions must include major efforts in cities
- Most of the mitigation efforts have to involve the private sector
- Local and regional governments have to provide incentives to encourage efforts to reduce GHG emissions
- But…the private sector has to be provided with guidelines about assessing the impact of their efforts

There are major efforts already underway



World Business Council for Sustainable Development

C40 Cities

IPCC Guidance on Emission Inventories

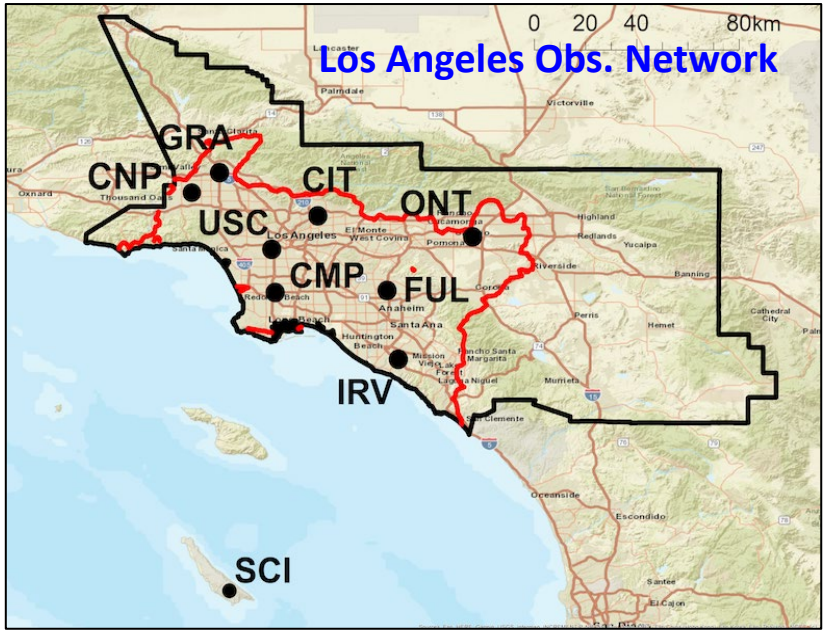
- IPCC has provided guidance on how to estimate emissions from different types of sources (power plants, industrial sites, automotive vehicles, commercial and residential buildings, etc.)
- There are many organizations providing GHG inventories for cities and other local/regional governments as well as private sector entities.
- Recent studies indicate that these inventories, which are all estimates, don't always agree with direct or indirect measurements.

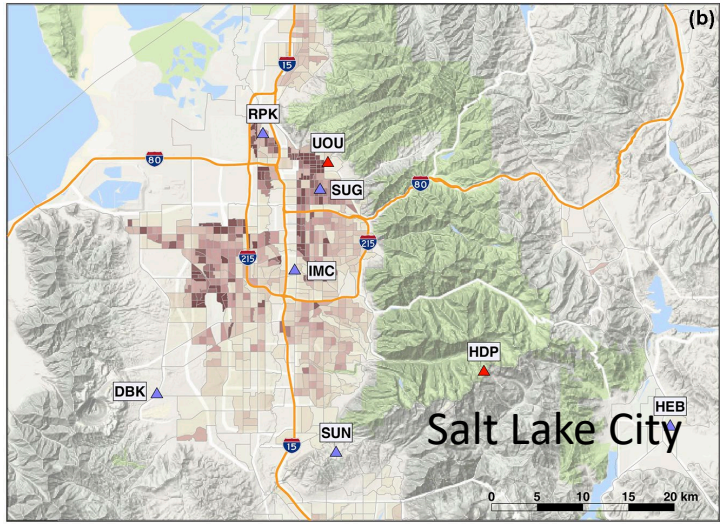
  Gurney, K.R., Liang, J., Roest, G. *et al.* Under-reporting of greenhouse gas emissions in U.S. cities. *Nat Commun* **12**, 553 (2021). https://doi.org/10.1038/s41467-020-20871-0
- 2019 Refinement of 2006 IPCC Guidelines has recognized the importance of comparing GHG emission estimates with atmospheric measurements.

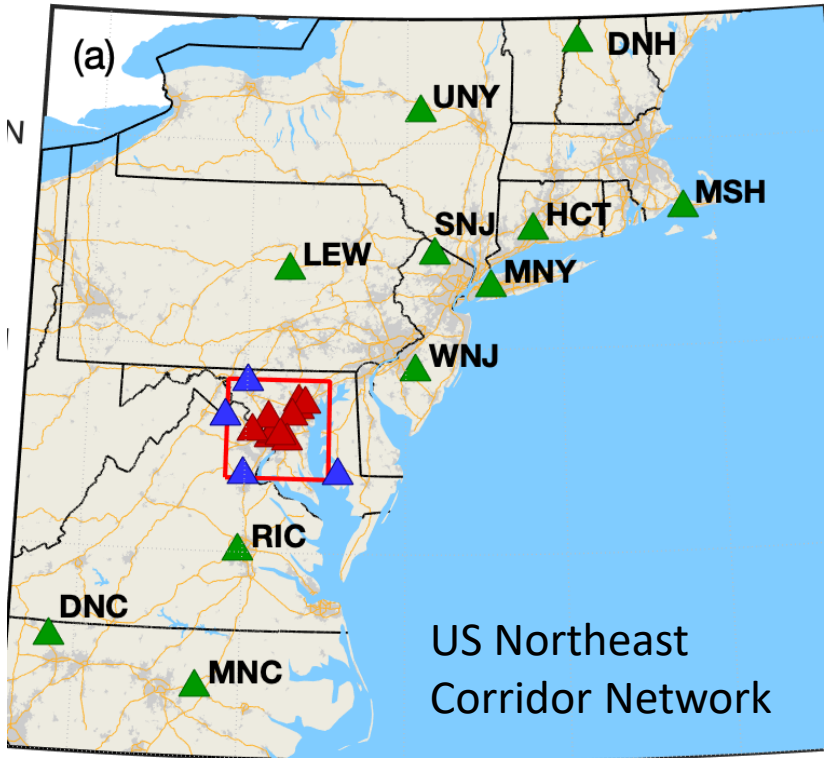
https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/

Direct Measurements Provide Credibility for the Emission Inventories, Mitigation Actions and Carbon Credit Claims

There are several efforts around the globe to monitor GHG emissions in urban environments.



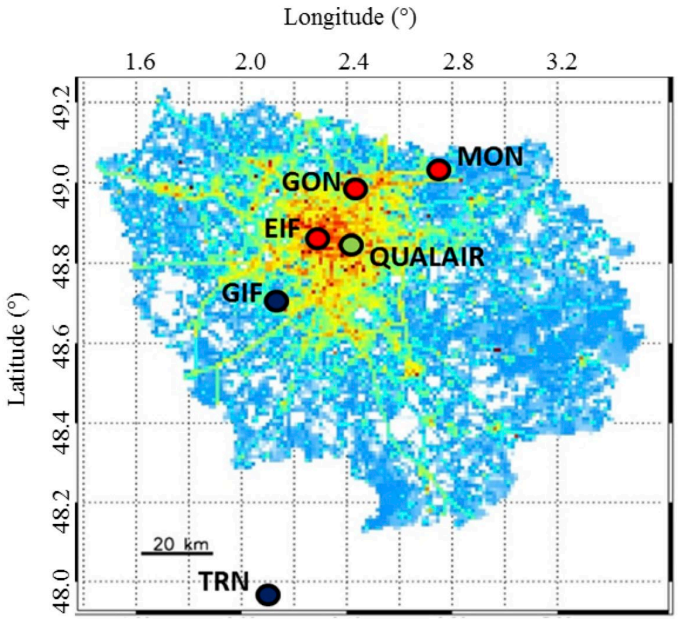




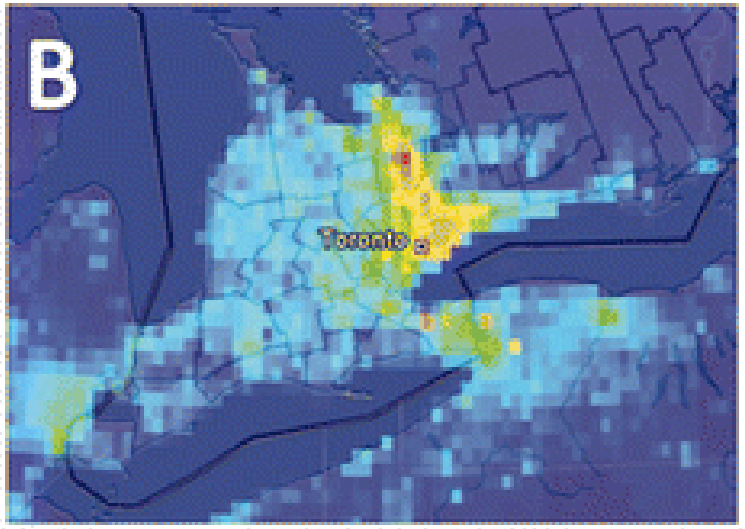
In the USA, Urban Testbeds have been established in Salt Lake City, Indianapolis, Los Angeles Megacity, and the Northeast Corridor (extending from Washington, DC & Baltimore, MD, towards Philadelphia, New York and Boston)

NIST
National Institute of Standards and Technology
U.S. Department of Commerce

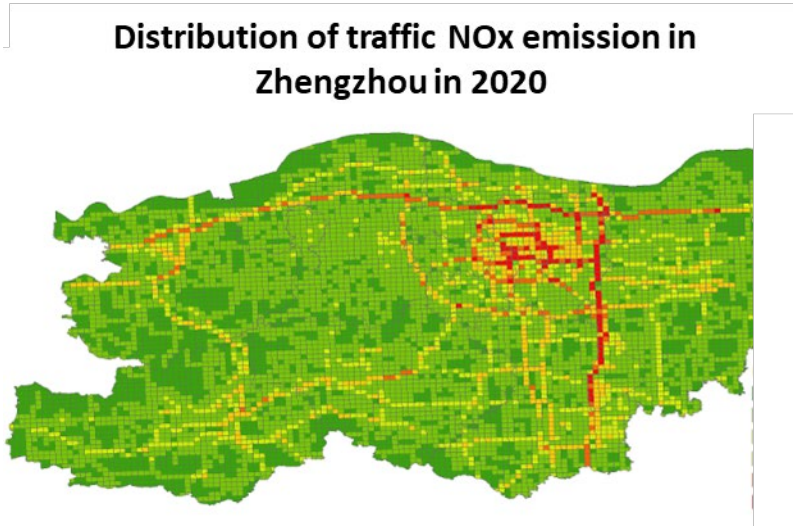
There are many new efforts to monitor GHG emissions from cities



Paris, France



Toronto, Canada



Zhengzhou, China

There is also an ***Integrated Carbon Observation System*** (ICOS) in Europe with 14 member countries and 39 atmospheric measurement stations; they provide mostly regional measurements. However, they have recently started a pilot program in cities like Paris, Zurich and Munich.

But…there are no standards to ensure consistency in such efforts

There are some existing ISO Documentary Standards

- **ISO 14064**, Parts 1,2 & 3 – Specifications with guidance at the organizational level for quantification and reporting of GHG emissions and removals
- **ISO 14065** – GHG – Requirements for validation and verification bodies for use in accreditation or other forms of recognition
- **ISO 14066** – GHG – Competence requirements for validators and verifiers
- **ISO 14067** – GHG – Carbon footprint of products: Requirements and guidelines for quantification
- **ISO 14069** - GHG – Quantification and reporting of GHG emissions for organizations
- **ISO 14080** – GHG management and related activities
- **ISO 14090,1,2** –Adaptation to climate change – Principles, requirements and guidelines
- **ISO 14097** – GHG management and related activities-Framework including principles and requirements for assessing and reporting investments and financing activities

There are some New Standards being developed

- ISO 14068 – GHG management and climate change management and related activities – Carbon neutrality
- ISO 14082 – Radiative Forcing Management – Guidance for the quantification and reporting of radiative forcing-based climate footprints and mitigation efforts
- ISO 14093 - Mechanisms for financing local adaption to climate change- Performance based climate resilience grants
- ISO 14002- Environmental management systems – Guidelines for using ISO 14001 to address environmental aspects….Part 3 - Climate
- BSI/ISO – IWA 42 on “Net-Zero Guiding Principles”

None of these standards provide guidelines for measurement and/or estimation of GHG emissions. Without such guidance, credibility of mitigation and carbon credit claims will remain questionable.

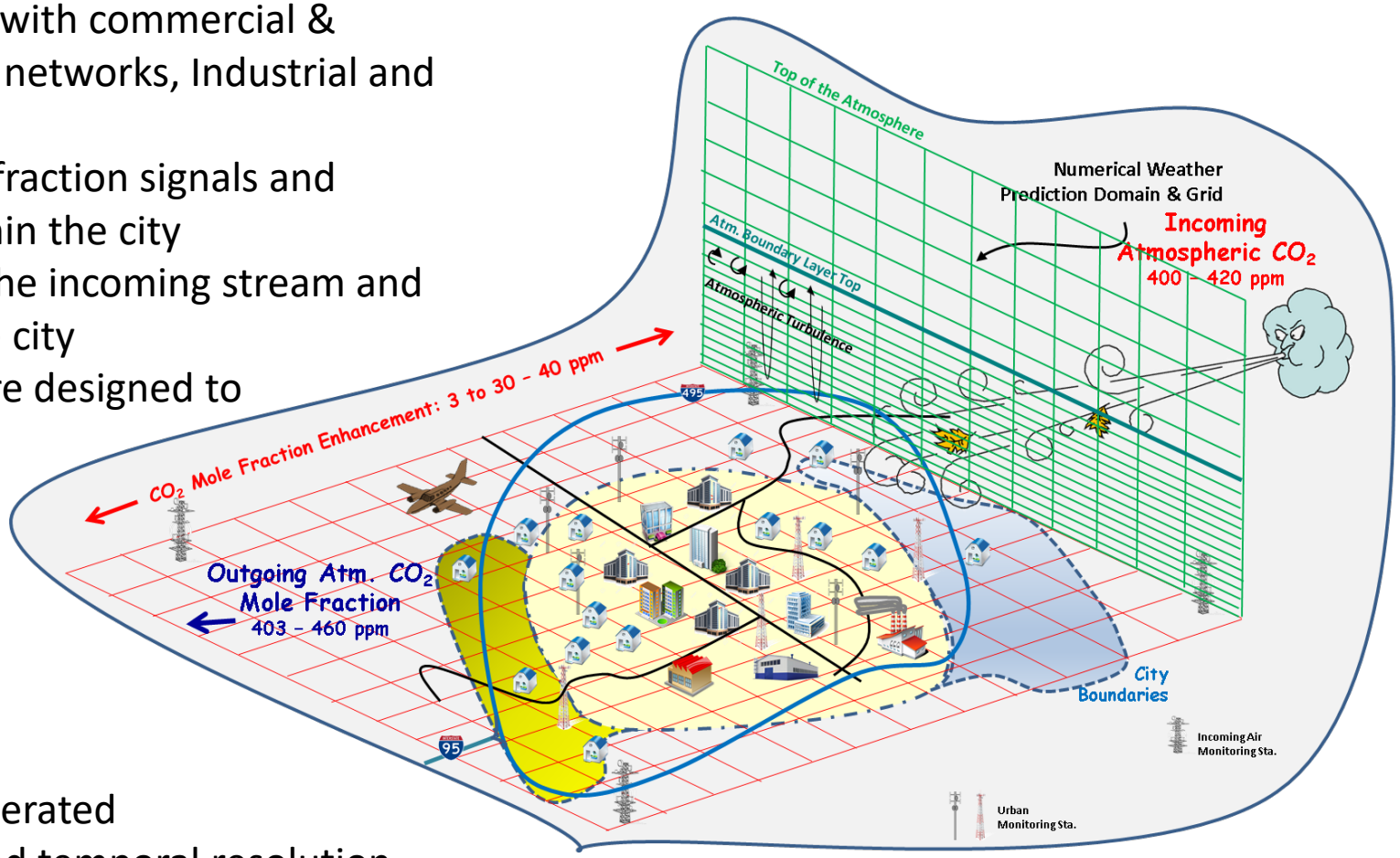
WMO/IG3IS Efforts to develop “Best Practices”

- There is an international effort, led by WMO’s IG3IS*, to develop Best Research Practices for Observation and Monitoring of GHGs in Urban Environments. https://library.wmo.int/index.php?lvl=notice_display&id=22120#.YxC70nbMKUl
- Researchers from more than 30 countries are participating in this effort.
- We need more participation from the metrology community.
- This effort can provide the foundation for development of ISO Standards for GHG Measurements in Urban Environments.

IG3IS - Integrated Global Greenhouse Gas Information System

Atmospheric Observation Approach for a City

- Cities and urban centers are complex with commercial & residential buildings, road and transit networks, Industrial and power generation plants
- Incoming winds bring trace gas mole fraction signals and mix these with emissions/uptake within the city
- An observing network must capture the incoming stream and trace gas signals generated within the city
- Tower-based observation networks are designed to identify source locations & emissions
- Coupled numerical weather prediction and dispersion models and statistical optimization are used to predict GHG emissions
- Combinations of models and measurements are used to quantify incoming, outgoing and internally generated GHG streams with sufficient spatial and temporal resolution



Expect Development of a Series of Standards

A series of standards will be developed on:

- GHG measurements in the atmosphere of urban areas
- Models to provide accurate estimates of GHG emissions in urban environments
- Emission models to provide accurate estimates, with high spatial resolution, of biogenic GHG sources and sinks
- Models for atmospheric transport and data analysis methods to determine GHG fluxes and source apportionment

Standard Development Process

- A New Work Item Proposal (NWIP) submitted by NIST to US TAG to ISO TC 207/SC 7 (GHG and Climate Change Management and Related Topics)
- A convener (Benoit Desforges from Canada) and a secretariat (NIST) has been identified
- A Working Group is to be formed and members invited.
- Participation from the metrology as well as the meteorology communities will be critical for the success of this effort.

Thank You!

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