

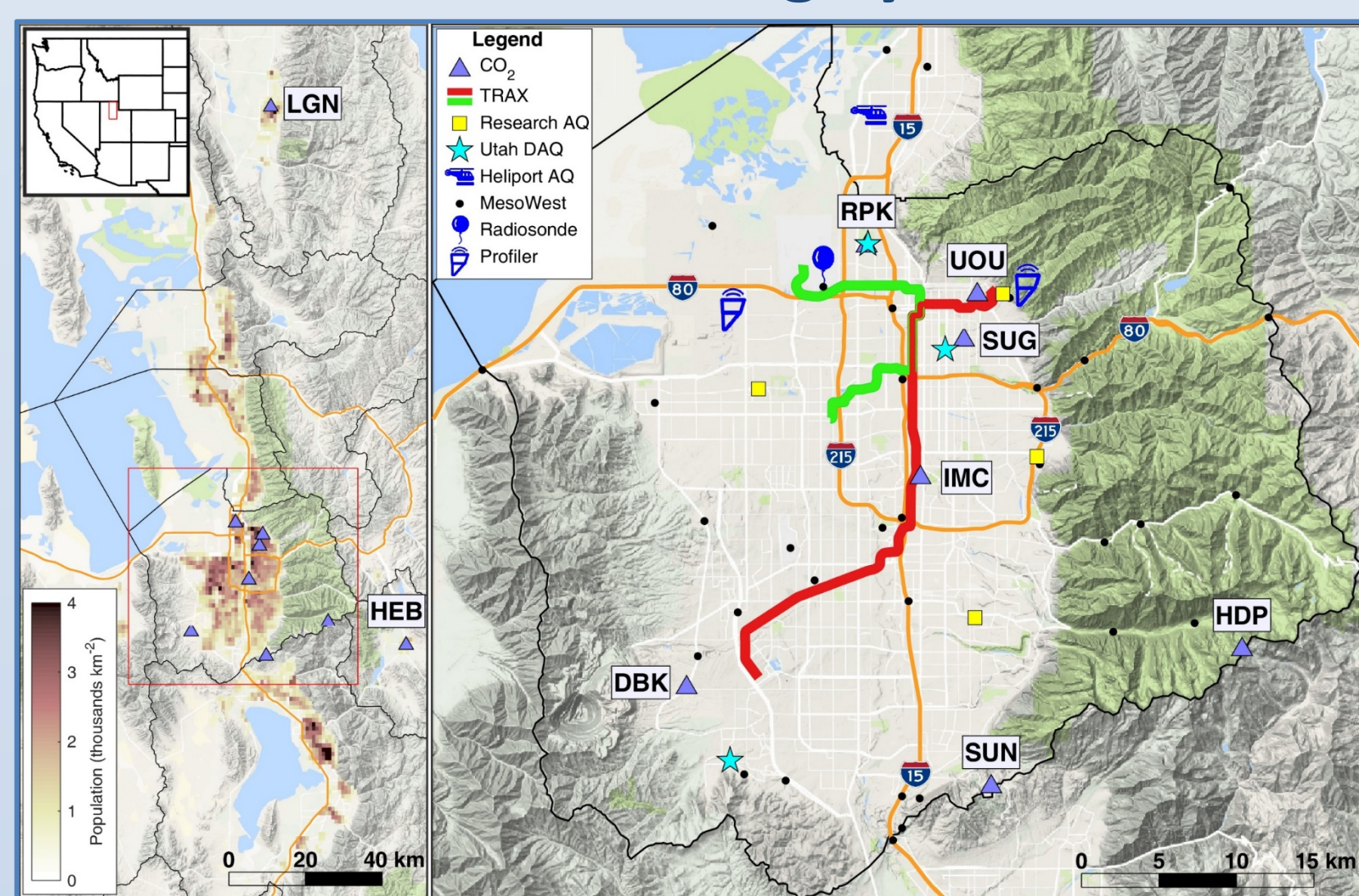
CO₂ Urban Synthesis & Analysis Network (CO₂-USA)



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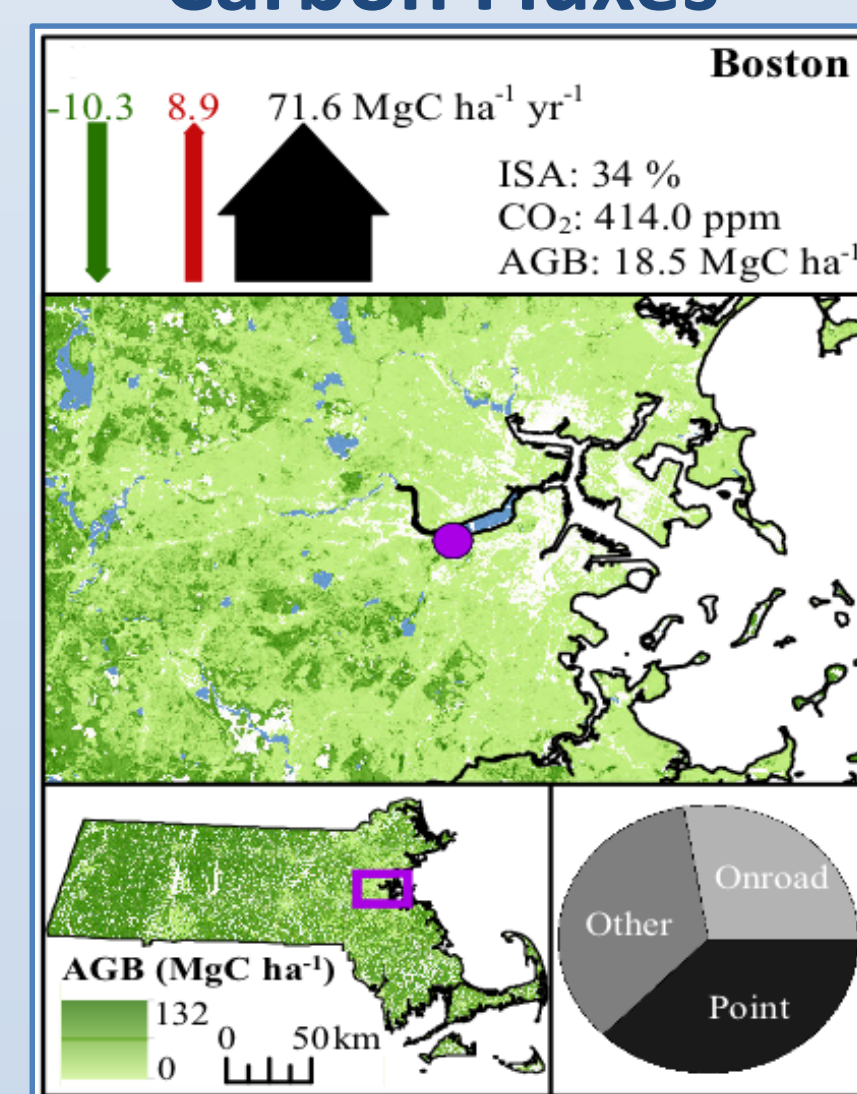
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Salt Lake Area Greenhouse Gas Monitoring System



Lin et al., 2018

Boston Above Ground Biomass & Carbon Fluxes



Hardiman et al., 2017

1. Workshops

Workshop 1: Build a community and shared datasets (Nov 6-7, 2017 @ NIST in Gaithersburg, MD)
Focus on research coordination, development of common standards, data sharing, and cross-city analyses.



Workshop 2: Scalable & transferable atmospheric modeling (Oct 24-25, 2018 @ University of Utah in Salt Lake City, UT)
Focus on development, application, testing, and scalability of an extendable model/data framework. Contact John Lin, Logan Mitchell, or someone else on the project if you are interested in attending!

Workshop 3: Synthesize across cities with user communities (TBA 2019 @ Boston University in Boston, MA)
Focus on scientific synthesis across the data-rich U.S. cities, comparison with results from US and international collaborators, and extension to national and international scales. Carbon emissions from the various cities will be estimated and compared, and the results presented.

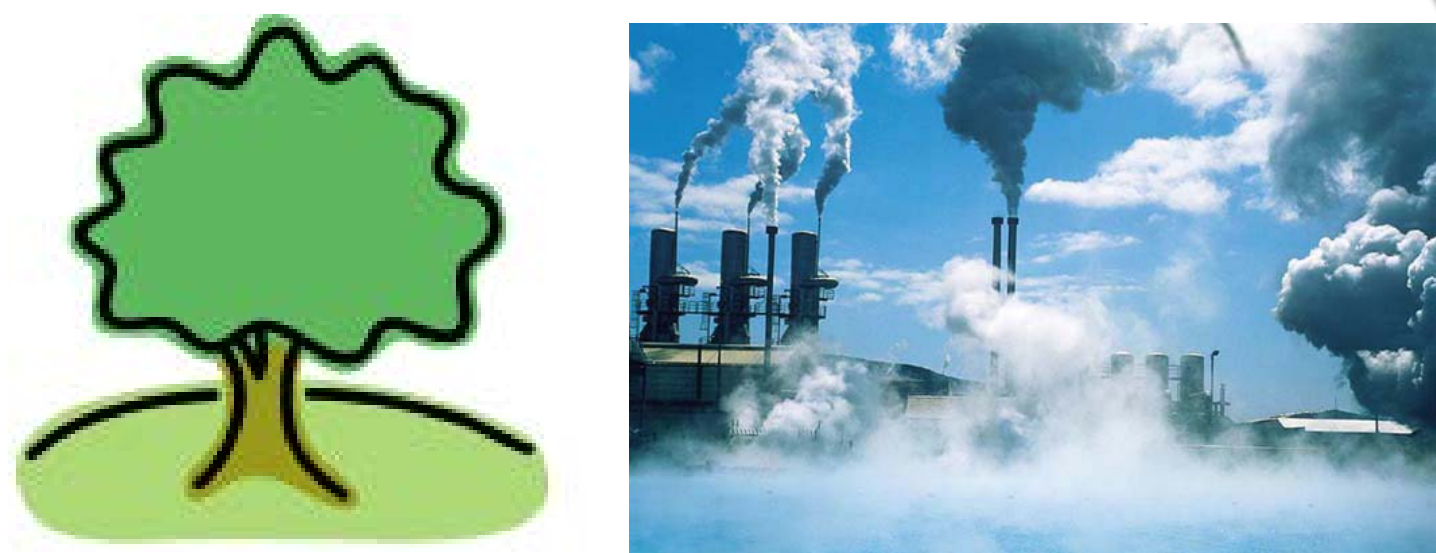
Main Objectives of CO₂-USA:

- Leverage existing scientific infrastructure and investments in GHG work over the past few years
- Quantify & understand similarities/differences in CO₂ and CH₄ fluxes across cities
- Foster a community of urban carbon cycle researchers and generate collaborative studies
- Engage stakeholders to link them with data, syntheses, and insights into urban emissions

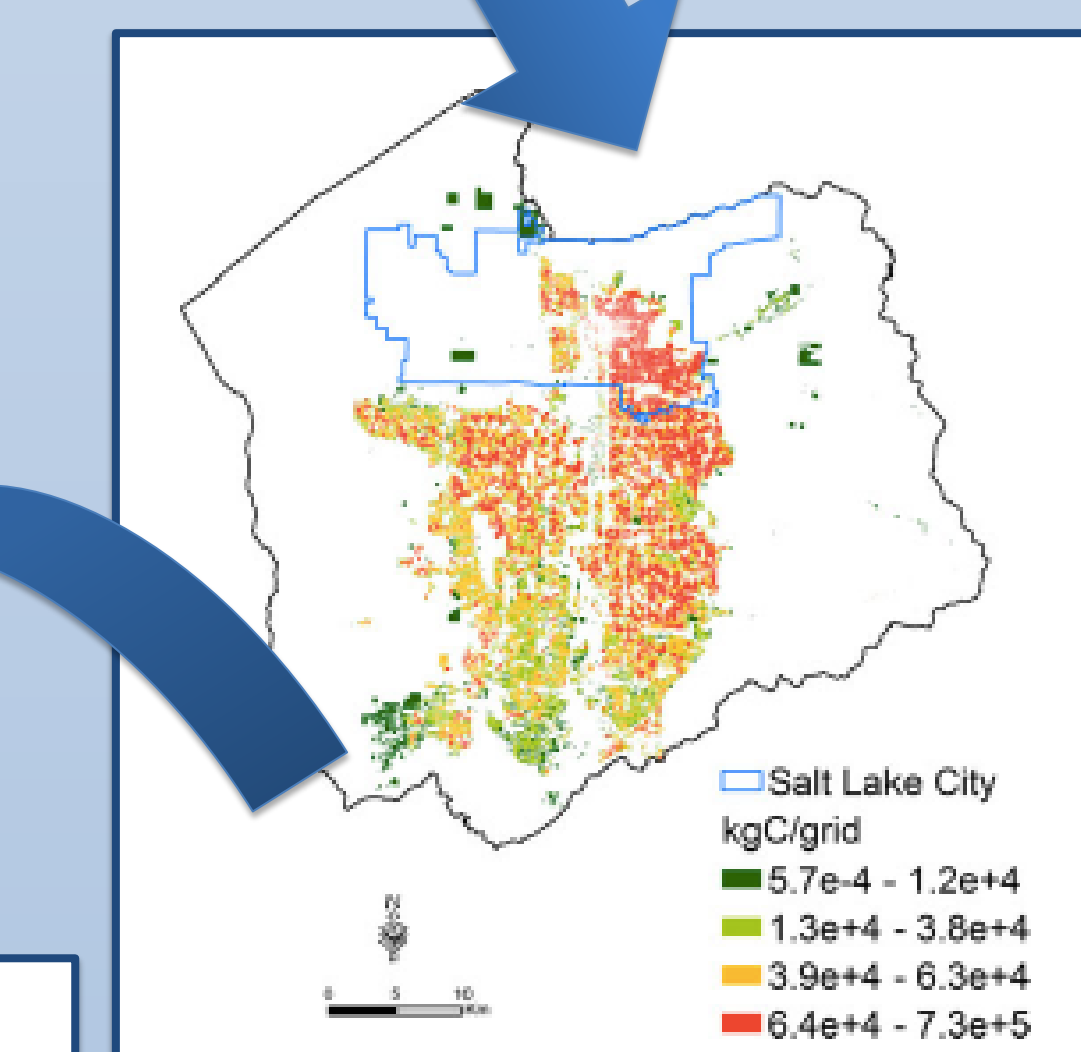
[2] Harmonized Multi-city Atmospheric CO₂ & CH₄ dataset



[3] Biospheric & Anthropogenic Inventories



[1] Workshop



[5] Inverse estimates of carbon emissions

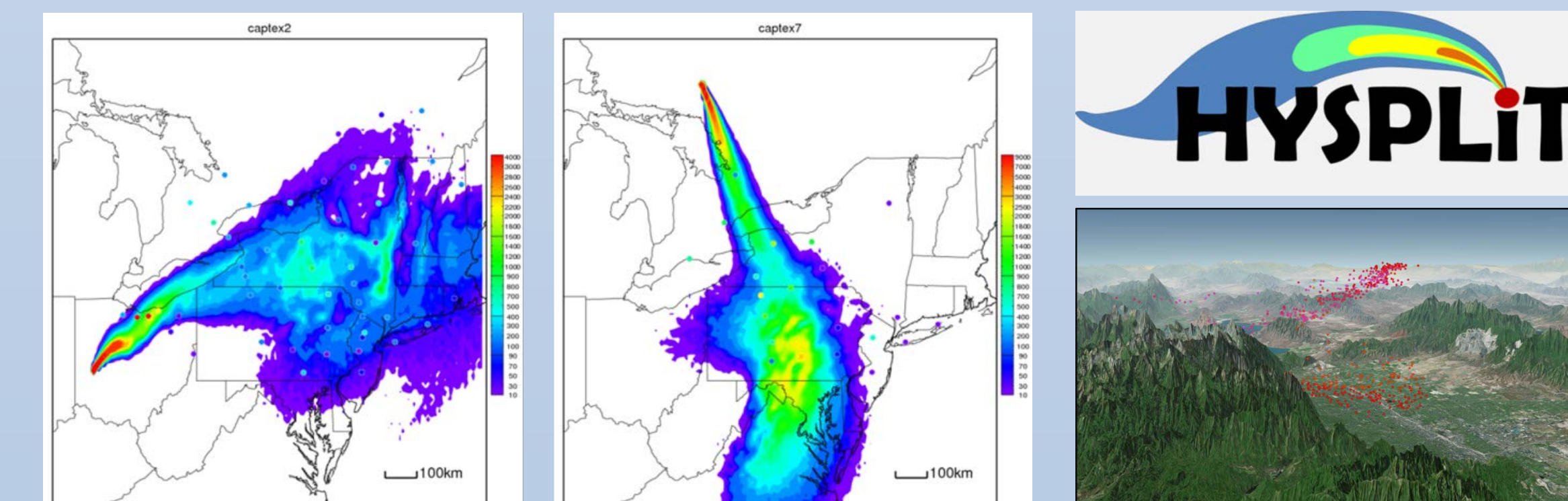


[6] Stakeholders, Citizens

4. Atmospheric Modeling System

Atmospheric Transport Working Group
Objective: This group seeks to arrive at a cross-city atmospheric modeling system and evaluate the modeling system (Stein et al., 2015) against meteorological observations, leveraging NOAA-ARL's HYSPLIT-based modeling system that allows multiple meteorological fields and tracer release datasets to evaluate dispersion. Capabilities within the STILT model (Lin et al., 2003) are also being incorporated within HYSPLIT. New-to-HYSPLIT features include:

- New particle dispersion options
- New scheme to calculate vertical & horizontal velocity variances
- Option for calculating 3D Lagrangian timescale from the standard deviation of vertical velocity
- Two new convection options
- New method for calculating mixed layer height
- New option for interpolating WRF-ARW meteorology onto the HYSPLIT domain
- New option for incorporating uncertainties due to observed wind error & boundary layer height errors
- Increase in the precision of meteorological variables input into HYSPLIT
- New capability for modeling hemispheric modeling domains.



4. Inverse Estimates of Carbon Emissions

Atmospheric Inversion Working Group
Objective: This group seeks to compare different atmospheric inversion techniques and results in different cities. Ultimately this will lead to lower barriers of entry to conduct this research in new cities.

This working group is being led by Dr. Kim Mueller (NIST) and has held approximately monthly telecons. The recent telecons have featured work in L.A., Boston, and Salt Lake City. This working group will continue to conduct online telecons during the upcoming year. If you are interested in joining the group, contact John Lin or Kim Mueller.

2. Harmonized Multi-City Atmospheric CO₂ & CH₄ dataset

Data Synthesis Working Group
Objective: Create a shared dataset of CO₂ and CH₄ (where available) measurements and associated tracers in multiple U.S. cities (and potentially beyond). This working group will focus on developing a common data format, reporting of standards and calibrations, QA/QC, data archive location, fair use policy, and creating a data registry for ancillary datasets including aircraft and ground-based surveys, meteorology, satellite data, and inventories.

- Working group has held 6 telecons to date
- Arrived at a candidate data format (netCDF and text based)
- Anticipated completion of synthesis data set by Fall 2018 (in time for 2nd workshop)
- The ORNL DAAC will host the data synthesis archive
- Anticipate a community manuscript describing the synthesis archive as well as some cross-city comparisons

3. Biospheric & Anthropogenic Inventories

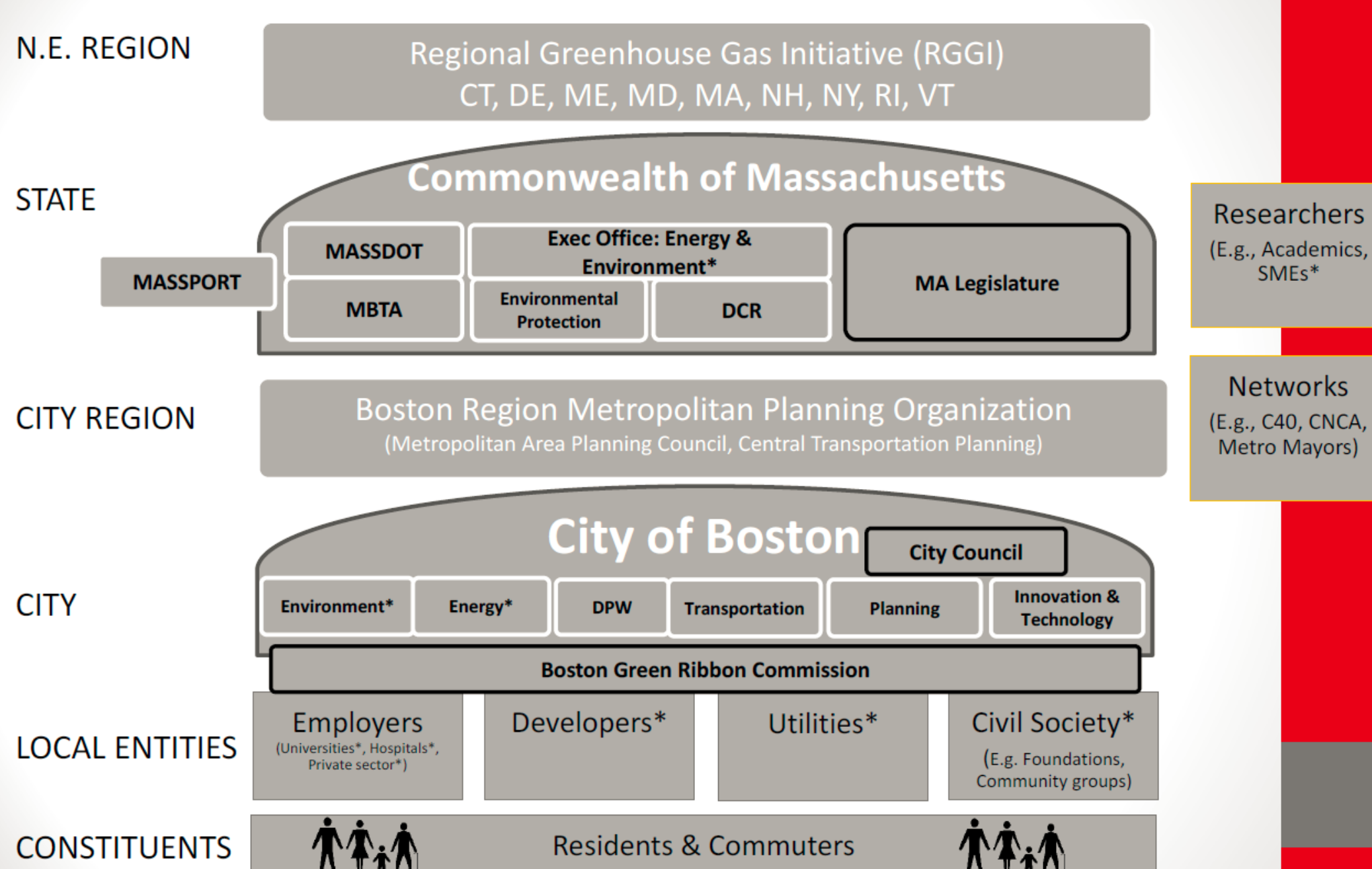
Biosphere:

- Built an Urban VPRM model for Boston (Hardiman et al., 2017)
- Streamlined model code to make it operational across cities
- Determined appropriate temperature, radiation, & MODIS model inputs
- Model evaluation underway. Anticipated urban-VPRM model runs by summer 2018 for all CO₂-USA cities.

Anthropogenic:

- Published ACES (Anthropogenic Carbon Emissions) in 2017 (Gately et al., 2017)
- Continued development and expansion on model coverage over time and space
- On pace to complete the updated model inventory by Fall 2018

Boston Region: Stakeholder Mapping



*Member Boston Green Ribbon Commission
Example of a stakeholder map for Boston (Lusk & Ogino, CO₂-USA Workshop 1 presentation, 2017)

6. User Community & Stakeholder Engagement

Value proposition to cities:

- 1) Retrospective: Assessment of economic/social values of emission reduction efforts
- 2) Diagnostic & Prognostic: Mitigation guidance-estimated impacts, prioritization and cost/benefit analysis
- 3) Trend detection
- 4) Policy relevant timescales
- 5) Evaluation of scope 1 inventory
- 6) Hot spots/attribution - bias & knowledge gaps
- 7) Value of carbon sinks

- Developed project website. Includes Resources for cities to ensure data is visible & accessible to stakeholders
- Paper summarizing Workshop 1 highlights has been submitted to Earth's Future (Gately et al., in review)
- Educated scientific community on stakeholder needs
 - Workshop 1 included a presentation from the San Francisco Sustainability Manager & others working with cities domestically & globally on climate mitigation & adaptation
 - Stakeholder mapping exercises, presentations on city-level tools, data methods, governance, maturity on climate issues, recommendations for engagement
- Plan to gain deeper understand of stakeholder needs via a survey to the Urban Sustainability Directors Network
- Foster new connections between the scientific community and relevant stakeholders:
 - Presentation at IPCC Cities & Climate Change Science Conference in Edmonton, Canada
 - Connections made with C40 Cities Head of Modelling efforts, and ICLEI USA Program Director for Tools and Technical Innovation
 - Outreach to local communities: Hutyra (outreach to City of Boston & Green Ribbon Commission), Lin (outreach to Salt Lake City Sustainability Department and Salt Lake County Health Department)

Additional Resources

- 1) CO₂-USA website: <http://sites.bu.edu/co2usa/>
- 2) Resources for cities: <http://sites.bu.edu/co2usa/resources-for-cities/>
- 3) Greenhouse Gas Data Registry: <https://ghgr.nist.gov/>
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