

CO₂-Urban Synthesis and Analysis (CO₂-USA) Project

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Land-Atmosphere Interactions Research (LAIR) Group

Salt Lake City, October 24th, 2018

CO₂-Urban Synthesis and Analysis (CO₂-USA) Project

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**Global Change &
Sustainability Center**

THE UNIVERSITY OF UTAH

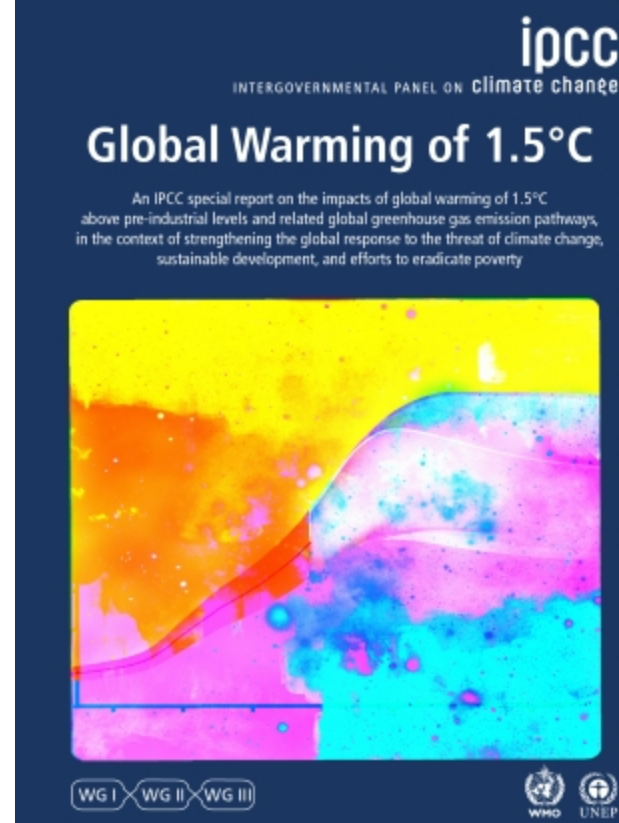
Motivation



NASA Earth Observatory/NOAA NGDC

- Urban areas are responsible for significant quantities of carbon emissions
- Increased population residing in cities
- Understanding *how much, where, and why* a particular city emits carbon remain scientific goals
- Cities have emerged as leading players in reducing greenhouse gas emissions

- This report compares the impacts of 1.5°C vs. 2°C warming
 - The impacts are large. Sea level rise, stronger storms, extreme precipitation & drought, heat caused death, worse air quality, etc.
- ***“In model pathways with no or limited overshoot of 1.5°C, global net anthropogenic CO₂ emissions decline by about 45% from 2010 levels by 2030, reaching net zero around 2050”***
- Cities are the world’s laboratories where solutions to climate change will be incubated.
 - Cities are on the front lines.
 - If anything, **cities need to meet these goals earlier** than rural or suburban communities that may need more time to reduce emissions.
 - This will be a **massive economic opportunity** for cities because of their human capital and investment capacity.
- The questions that we should be focused on in this workshop is:
 - What **data streams** are needed?
 - What **knowledge gaps** need to be addressed?
 - What **tools and policy levers** need to be evaluated?
 - What **intermediate goals** (1-5 yr) are needed to meet city objectives?





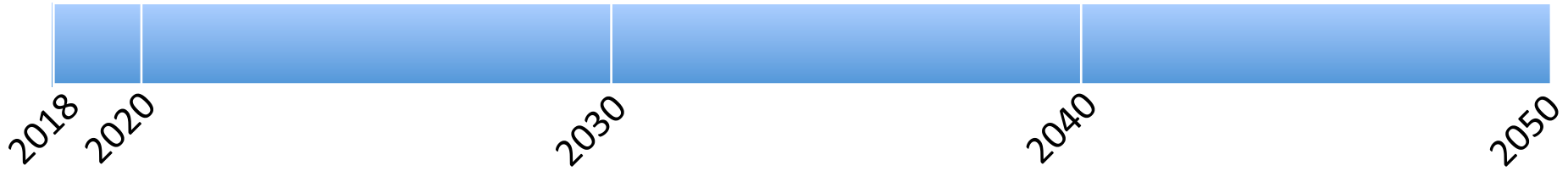
By Johan Rockström,¹ Owen Gaffney,^{1,2}
Joeri Rogelj,^{3,4} Malte Meinshausen,^{5,6}
Nebojsa Nakicenovic,⁴ Hans Joachim
Schellnhuber^{1,5}

CLIMATE POLICY

A roadmap for rapid decarbonization

- Roadmaps are useful policy tools that link short-term targets to long term goals.
- A “carbon law” is where carbon emissions are cut in half every decade. (similar to Moore’s Law)
 - Consistent with the IPCC’s model pathways to stay under 1.5°C
- What would that look like and what intermediate targets are needed to reach this goal?

A Roadmap for Rapid Decarbonization



2018-2020: No-brainers

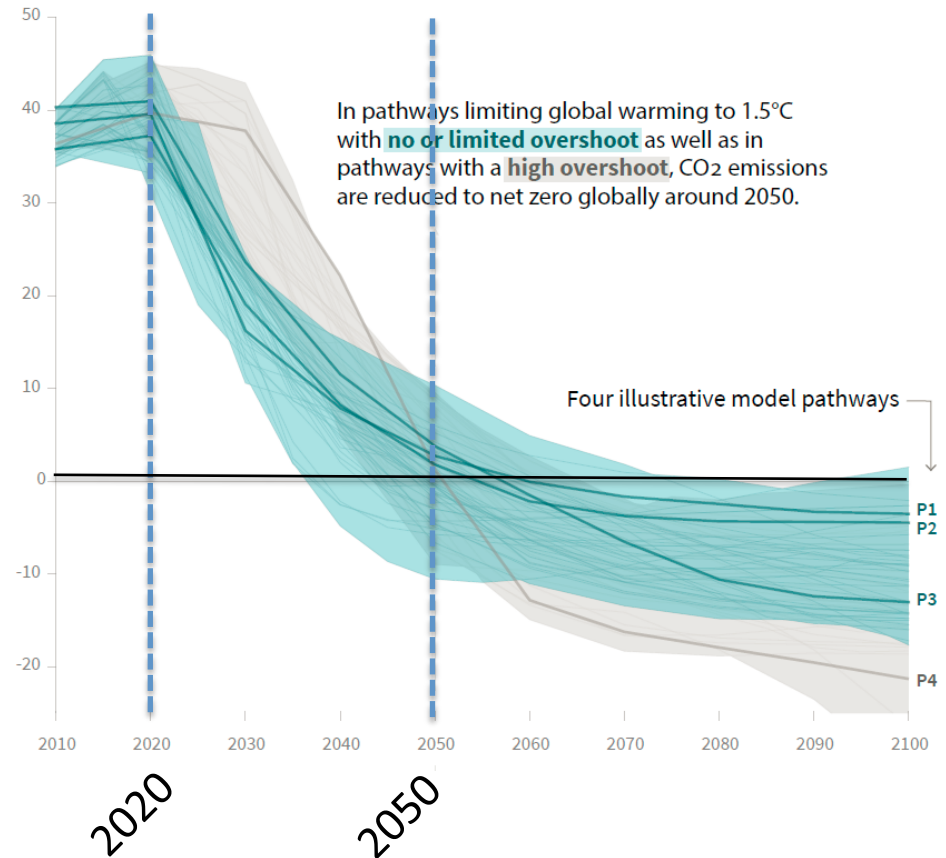
Annual emissions from fossil fuels must start falling by 2020. Well-proven (and ideally income-neutral) policy instruments such as carbon tax schemes, cap-and-trade systems, feed-in tariffs, and quota approaches should roll out at wide scale. Even

By 2020, all cities and major corporations in the industrialized world should have decarbonization strategies in place.

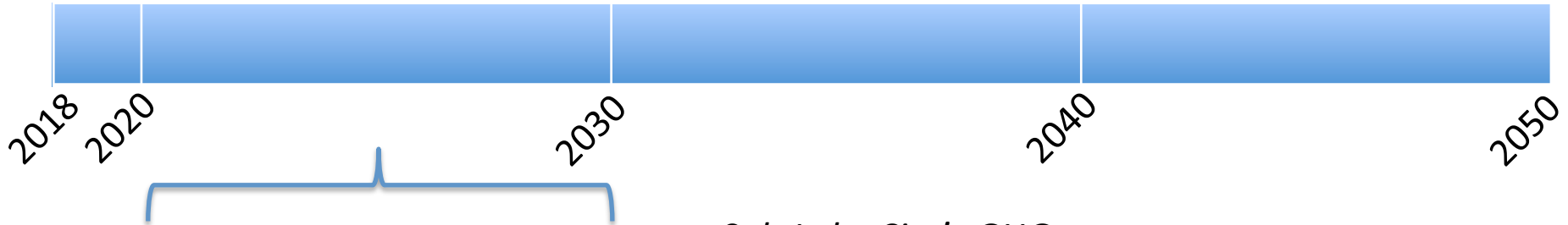
“You can’t manage what you don’t measure”

Global total net CO₂ emissions

Billion tonnes of CO₂/yr



A Roadmap for Rapid Decarbonization



2020-2030: Herculean Efforts

In the 2020s, carbon pricing across the world must expand to cover all GHG emissions, starting at \$50 per metric ton at least and exceeding \$400 per ton by mid-century.

By the end of that decade, coal will be about to exit the global energy mix, cities like Copenhagen and Hamburg will be fossil-fuel free, and cap-and-trade regimes should be

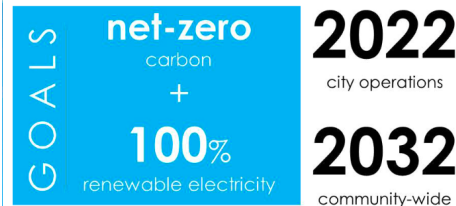
Countries should follow Norway, Germany, and the Netherlands and announce the phase-out of internal combustion engines in new cars by 2030 at the latest. Decarbon-

Salt Lake City's GHG targets:

2. 80 X 2040: 80% Reduction in Community Greenhouse Gas Emissions by 2040, Compared to 2009 Baseline

- Goal includes at least 50% reduction in community footprint by 2030

Park City:



Boston:

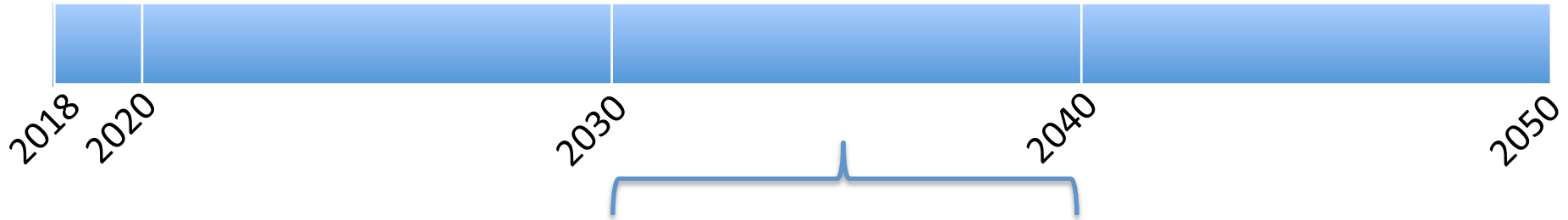
CLIMATE ACTION PLAN

The Climate Action Plan serves as Boston's blueprint for reaching its goals of reducing greenhouse gas emissions 25 percent by 2020 and carbon neutral by 2050. We want to make sure the City is prepared for the impacts of climate change.

San Francisco:

The 2013 Climate Action Strategy puts San Francisco on a path to meet the City's GHG emissions reduction targets of 25% below 1990 levels by 2017, and 40% below 1990 levels by 2025. Additional actions beyond those outlined here will be needed to meet the goal of an 80% reduction below 1990 levels by 2050.

A Roadmap for Rapid Decarbonization



2030-2040: Many Breakthroughs

By 2040, oil will be about to exit the global energy mix. Several vanguard countries (such as

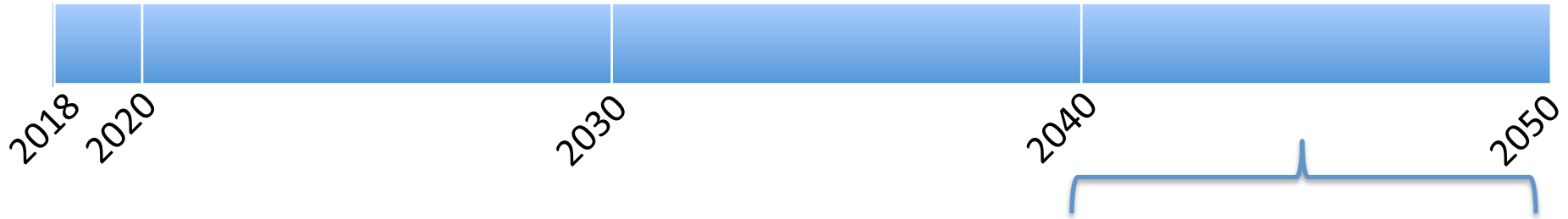
entirely emissions-free or close to it. Internal combustion engines for personal transport will have become rare on roads worldwide.

After 2030, all building construction must be carbon-neutral or carbon-negative.

BECCS schemes totaling 1 to 2 GtCO₂/year would roll out, and R&D should focus on doubling the annual rate of CO₂ removal.

- BECCS = Bioenergy with carbon capture & sequestration.

A Roadmap for Rapid Decarbonization



2040-2050: Revise, Reinforce

plified. All major European countries become close to net-zero carbon states early in the 2040s; market dynamics push North and South America and most of Asia and Africa to this goal by the end of the decade. Natural

By 2050, the world will have reached net-zero CO₂ emissions, with a global economy powered by carbon-free energy and fed from carbon-sequestering sustainable agriculture. Meanwhile, BECCS schemes have

rather than wishful thinking. The very nature of disruptive progress requires revising the narrative of a detailed roadmap every 2 years, correcting near-term targets to reach the ultimate goal by evolutionary management.

Motivation!

- The scale of climate change is massive
- Cities are up for the challenge!
- The scientific community can help find solutions, and help evaluate progress

Guest opinion: When it comes to climate solutions, there's nothing like what Utah can offer

Utah Cities and Mayors
Published: August 30, 2018 2:30 pm

    Comments



Adobe Stock

There are not enough examples of Americans coming together to discuss climate change and creatively forge solutions. There are not enough examples like what Utah can offer.

Climate change needs Utah.

It needs Utah to lead locally and forge solutions aligned with our values and strengths. It needs bipartisan solutions that break down artificial political silos. It needs us to act today so healthy communities still exist tomorrow.

As local government leaders from 16 Utah communities, we applaud the state Legislature in its 2018 passage of [House Concurrent Resolution 7](#). The resolution encourages the "use of sound science to address the causes of a changing climate and support innovation ..." and it garnered national attention. If Utah surprised the rest of the country by our ability to transcend politics and adopt this resolution, we are excited to see reactions as we act on those intentions.

Related Links

Warmer soil releasing more carbon, worsening climate change

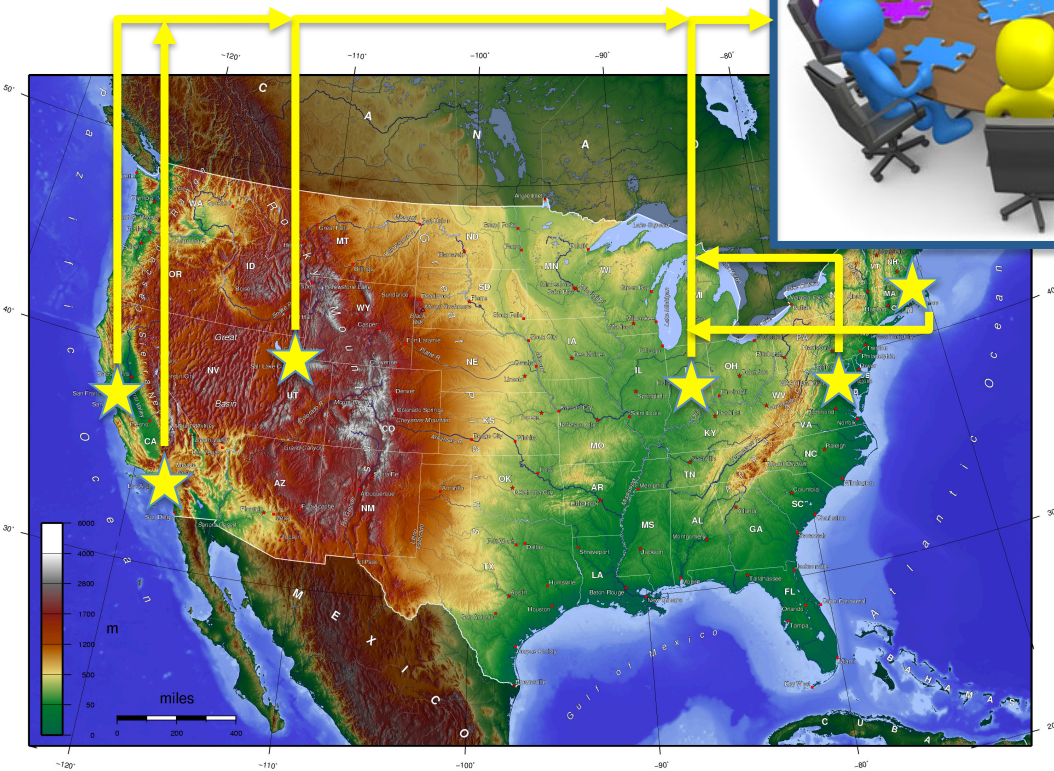
Letter: Utah Republicans come together on climate change

<https://www.deseretnews.com/article/900029921/guest-opinion-when-it-comes-to-climate-solutions-theres-nothing-like-what-utah-can-offer.html>

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

[1] Workshop



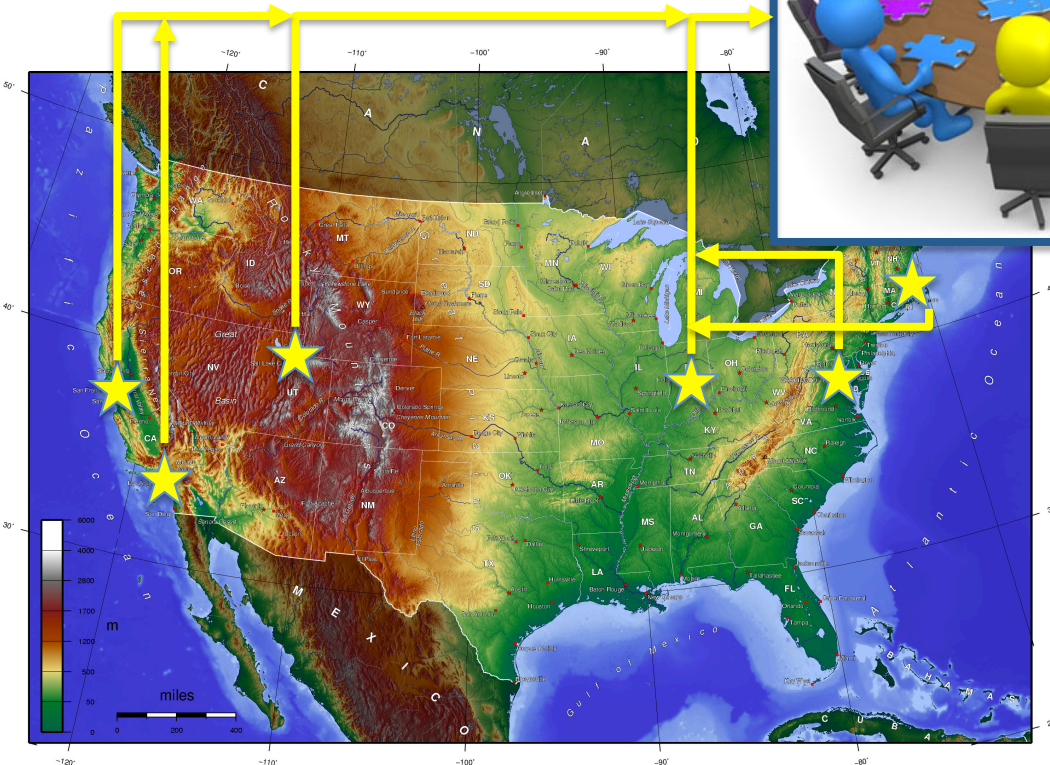
**[2] Harmonized
Multi-city
Atmospheric CO₂ &
CH₄ dataset**



**[3] Biospheric & Anthropogenic
Inventories**



[1] Workshop



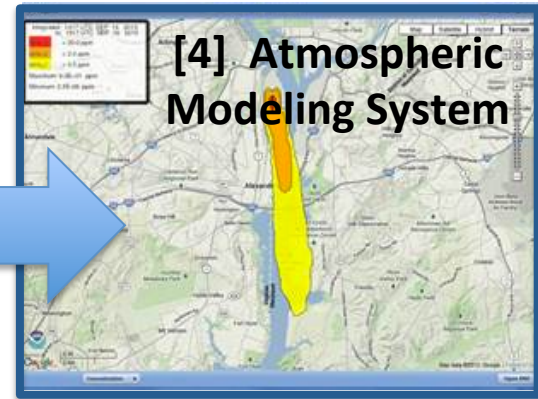
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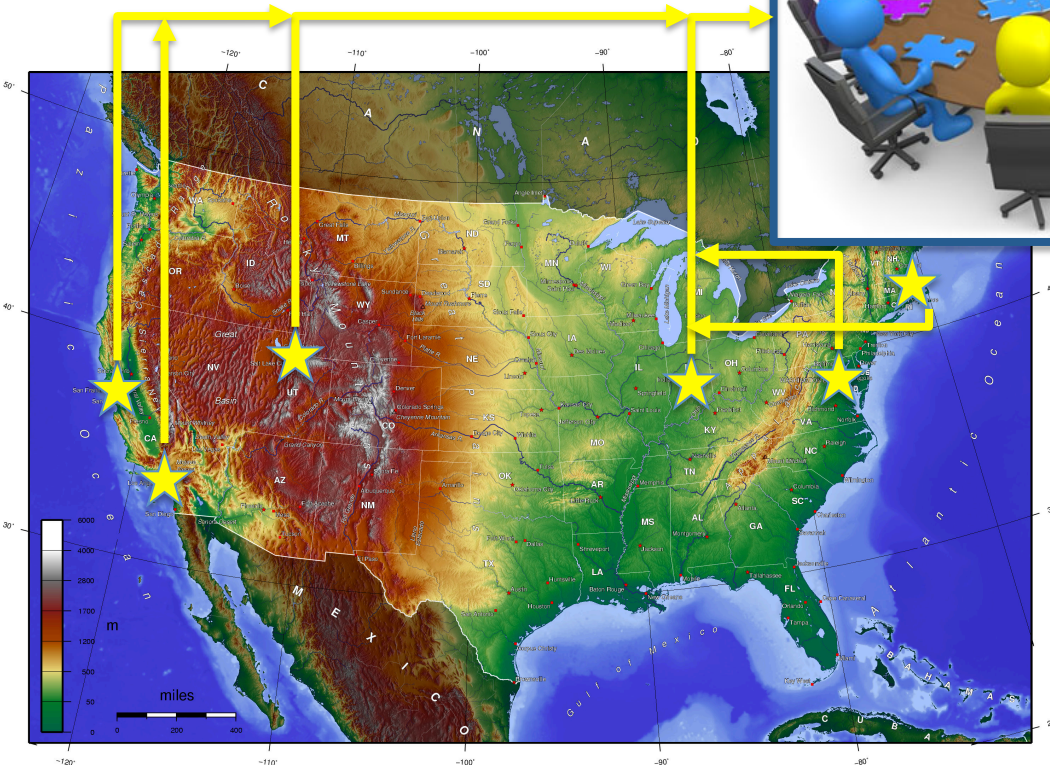
**[3] Biospheric & Anthropogenic
Inventories**



**[4] Atmospheric
Modeling System**



[1] Workshop



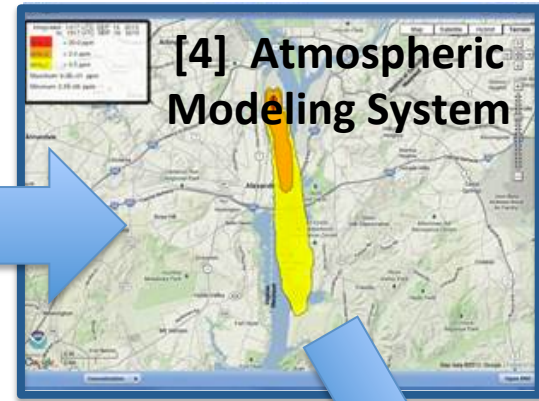
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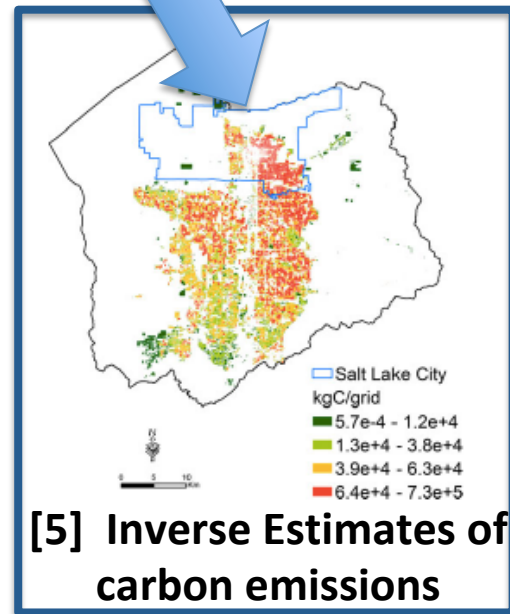
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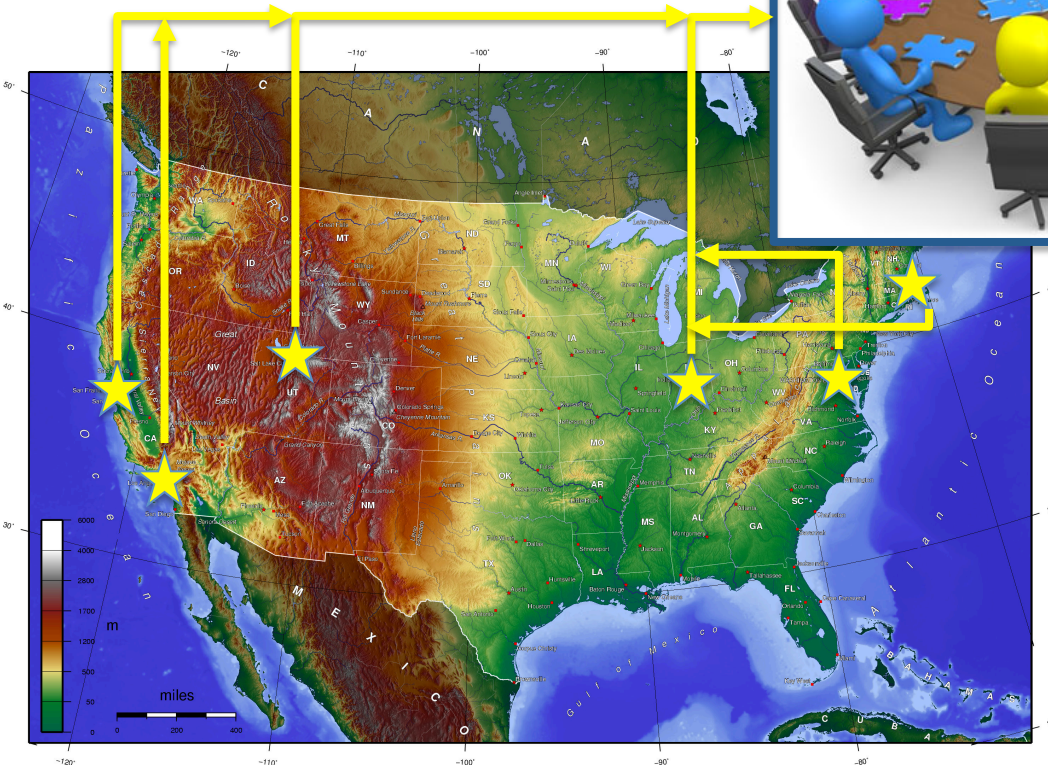
**[4] Atmospheric
Modeling System**



[1] Workshop



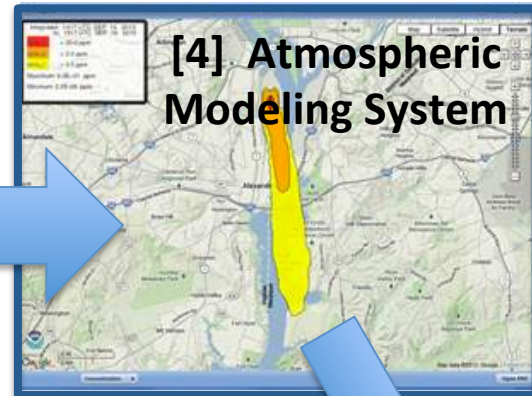
**[5] Inverse Estimates of
carbon emissions**



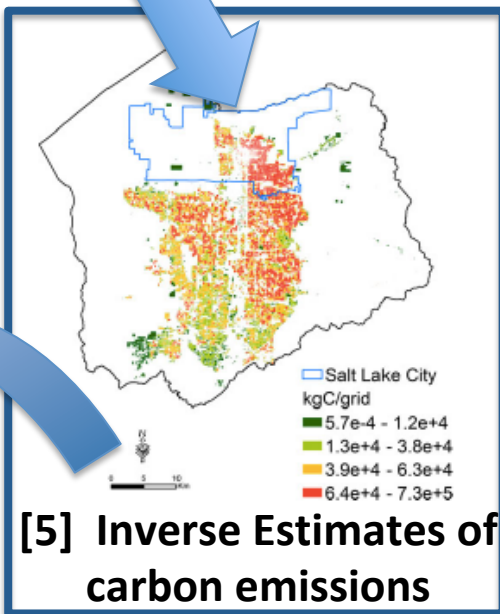
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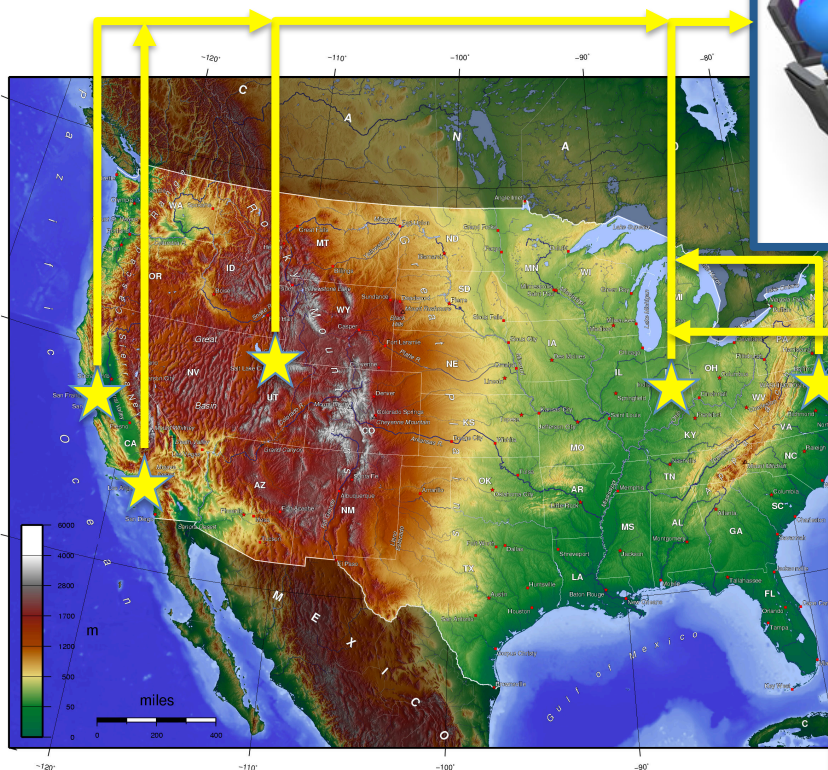
**[3] Biospheric & Anthropogenic
Inventories**



[1] Workshop



**[5] Inverse Estimates of
carbon emissions**



[6] Stakeholders, Citizens



Objectives of This Workshop



DAY 1: Facilitate conversations between scientists, stakeholders, and policy makers about:

- current state of knowledge of urban GHG emissions
- knowledge gaps
- data and resource needs
- useful decision support for cities, counties, and beyond

Objectives of This Workshop



DAY 2 Objectives:

- Report progress on urban GHG synthesis activities
- Identify remaining holes and uncertainties
- Create plan for inter-city analyses and synthesis activities in the coming year