Embracing Austin's Net Zero Carbon Charge: Challenges and Opportunities for Climate Leadership

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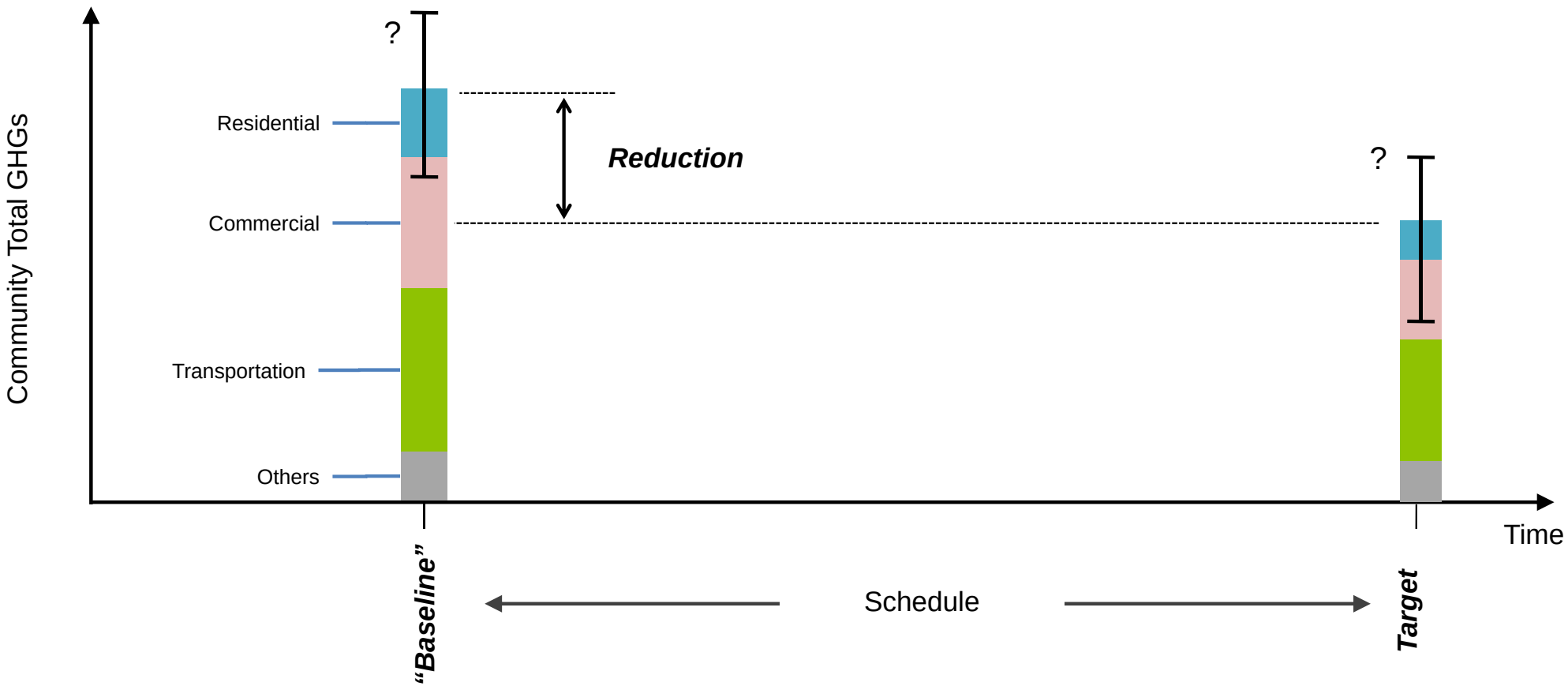
Overview

- Review
  - Limitations of dominant planning paradigm adopted by other cities
  - Observed drivers of energy use and emissions
  - Planning implications of exogenous change or “business-as-usual” forecasting
  - Deterministic versus probabilistic greenhouse gas inventories
  - Policy implications of mitigation measures

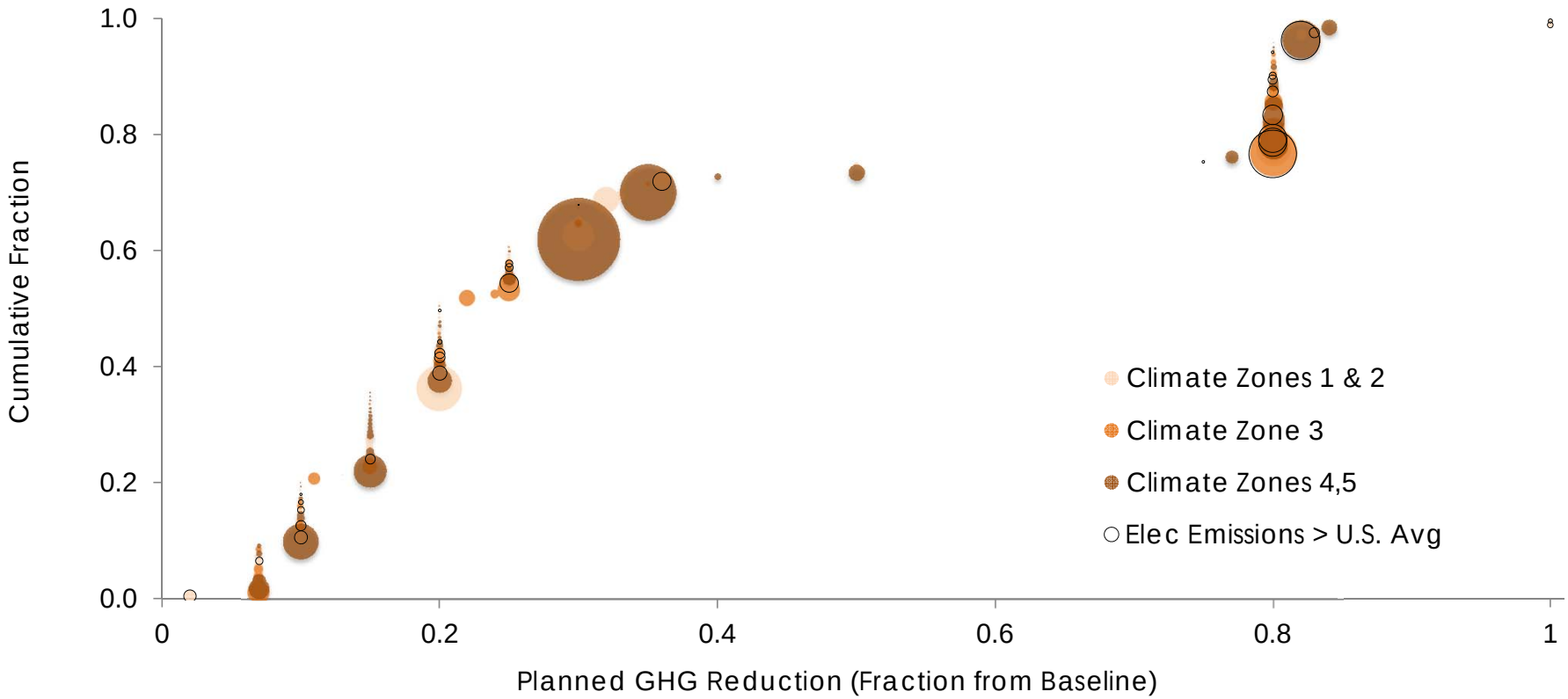
- *Overriding objective is to encourage a more robust and realistic planning and emissions measurement framework*

Current Dominant Planning Paradigm



ICLEI Membership as of 2010

- 145 / 153 following deterministic, absolute reduction planning paradigm



Mitigation Planning Summary Statistics

Statistic	Sample Size	Avg	Median	Std Dev
Planning horizon	143	25 years	20 years	15 years
1st Reduction Target	143	15%	17%	14%
2nd Reduction Target	51	30%	38%	24%
3rd Reduction Target	27	80%	75%	20%
Average reduction rate	143	1.3% per year	1.3% per year	0.6% per year
Austin's resolution		*2.8% per year*		

What influences local GHG emissions?

Energy Elasticities

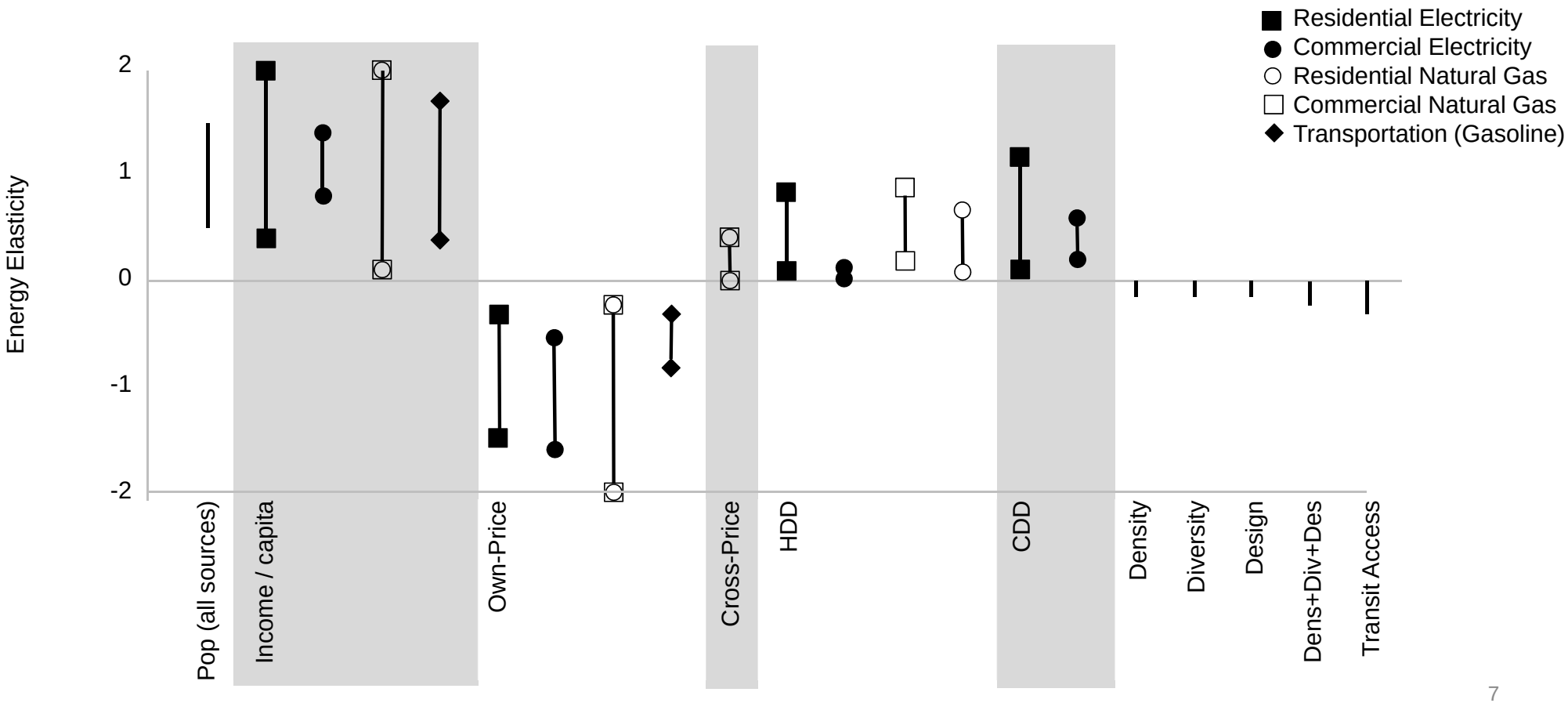
$$\text{Elasticity} = \frac{\text{percent change in X}}{\text{percent change in Y}}$$

- Example: The price elasticity of electricity consumption is often estimated at -10%.

$$10\% = \frac{\text{percent change in electricity consumption}}{\text{percent change in price}}$$

- OR
  - A 100% increase (doubling) in the price of electricity will decrease consumption by 10%.

Observed Energy Elasticities



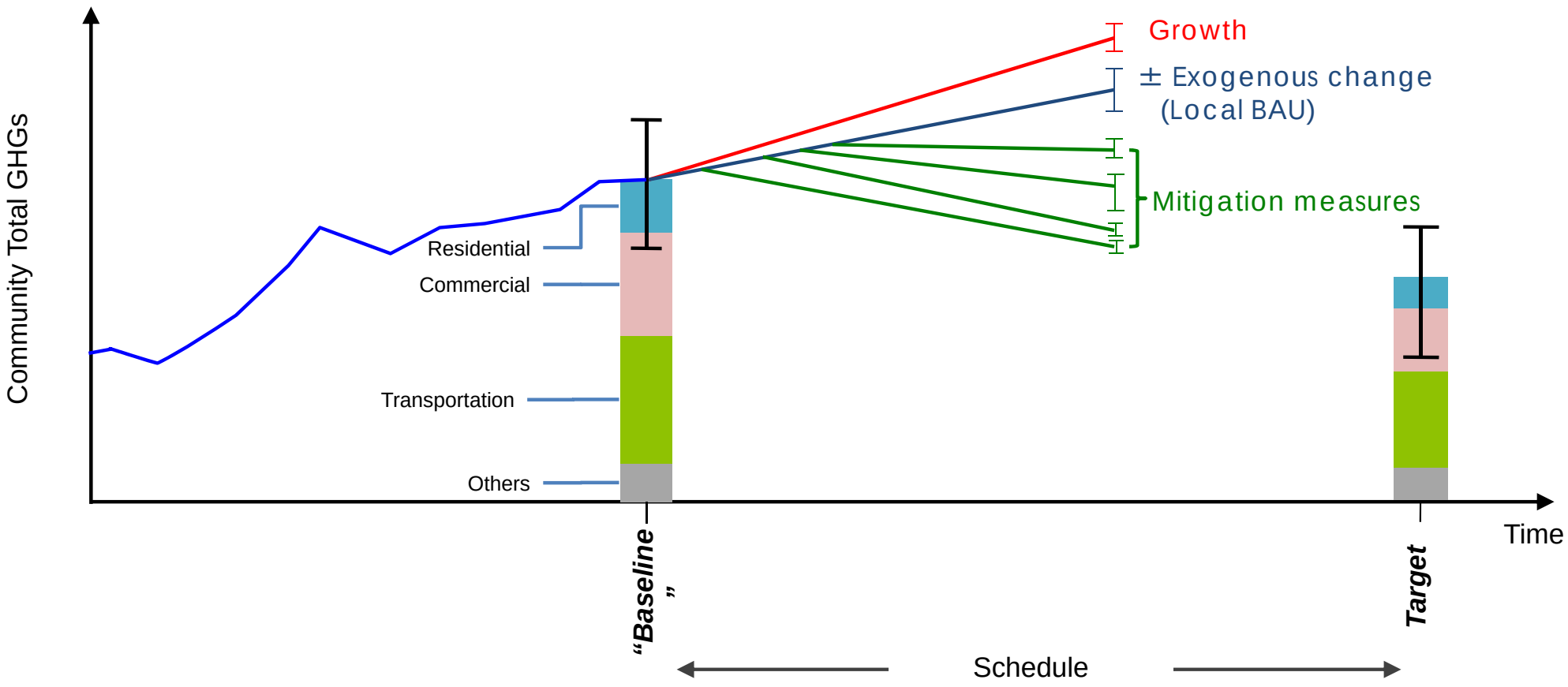
Exogenous versus Endogenous Drivers

Driver	Sector	Exogenous or Endogenous?	Local Jurisdiction	Sign of Elasticity	Uncertainty
Population	All	Semi-exogenous	Growth policies	+	M
Income	All	Semi-exogenous	Growth policies	+	M
Electricity Prices	R, C, T	Mostly endogenous	Utility rates (limited by nodal market)	-	L
Natural Gas Prices	R, C	Exogenous	None	-	H
Gasoline	T	Exogenous	None		M
Renewable prices	R, C	Semi-exogenous	Incentives	? energy elasticity - likely for GHG elasticity	H
Degree Days	R, C	Exogenous	None	+	H
Density	T	Endogenous	Land use policies	-	L
Diversity	T	Endogenous	Land use policies	-	L
Design	T	Endogenous	Land use policies	-	L
Transit Access	T	Endogenous	Transit & land use policies	-	M
Efficiency	R, C, T	Mixed	Building codes for new construction Incentives for retrofits	- (likely)	H
Grid emissions, Energy sources	R, C, T	Semi-exogenous	Incentives for renewables Green pricing program Constrained by nodal market		H

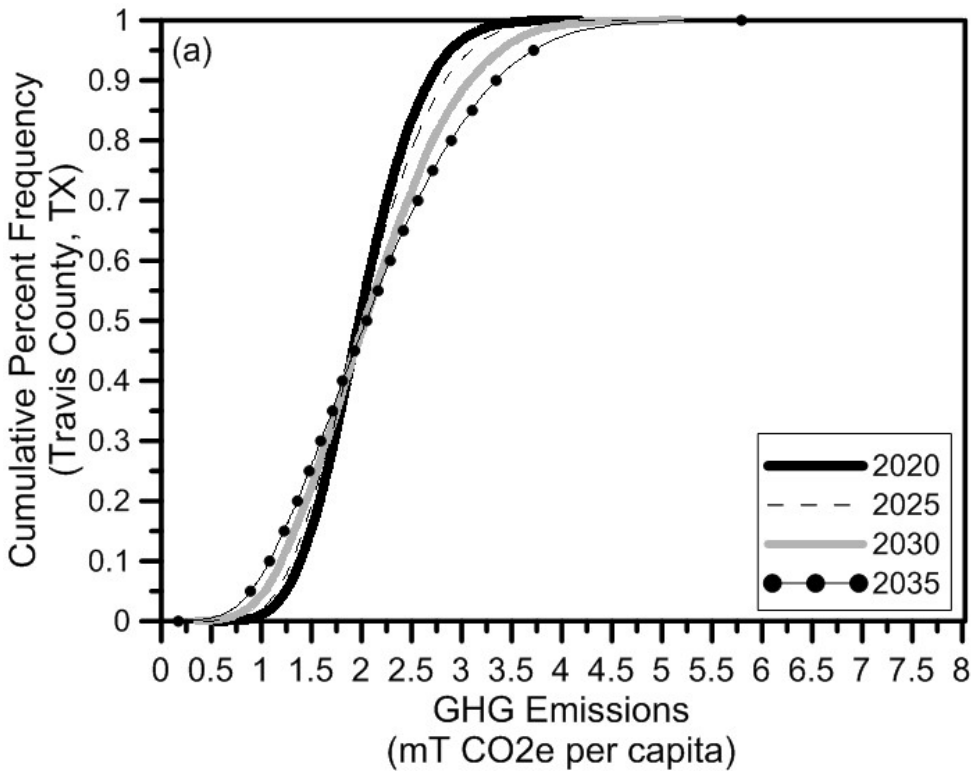
How does this affect us?

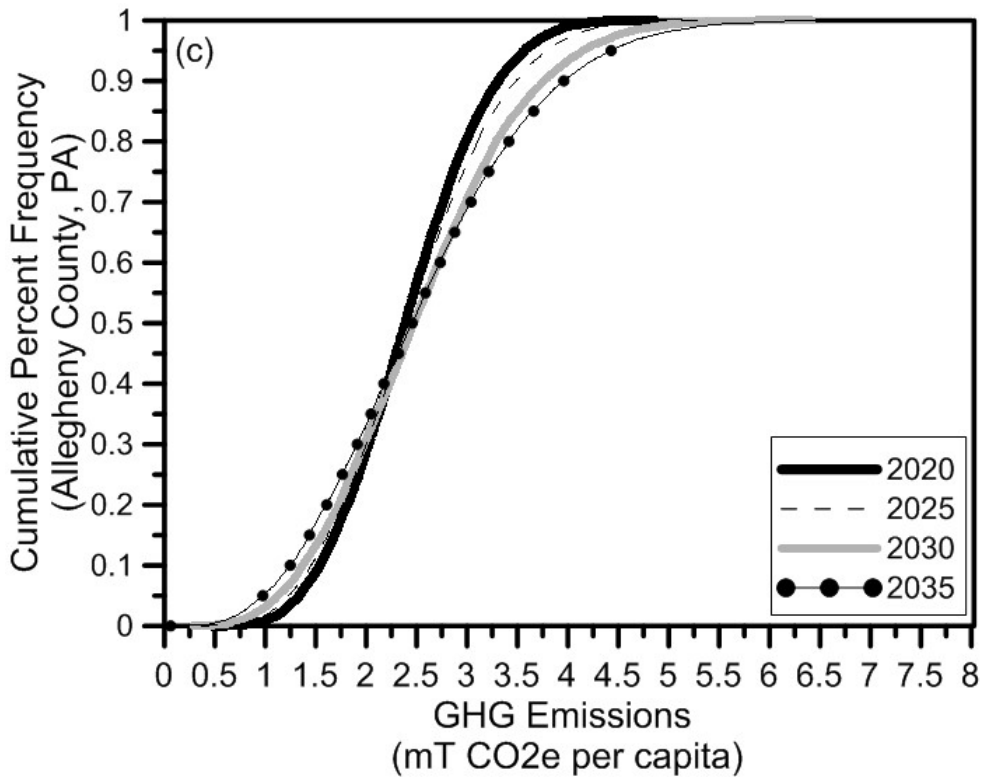
Challenge	Opportunity
Endogenous drivers of GHG emissions will continue	Adopt planning paradigm the reflects exogenous change, often called “business as usual” scenario planning
A single GHG emissions inventory may not reflect typical conditions	Adjust GHG inventories to ensure we (1) measure “typical” conditions and (2) better isolate the effect of local policy interventions
Does “net zero carbon” apply to typical or extreme conditions?	Develop leadership in climate action planning. Absolutely no discussion of this in practice or literature to my knowledge.

A more realistic planning paradigm



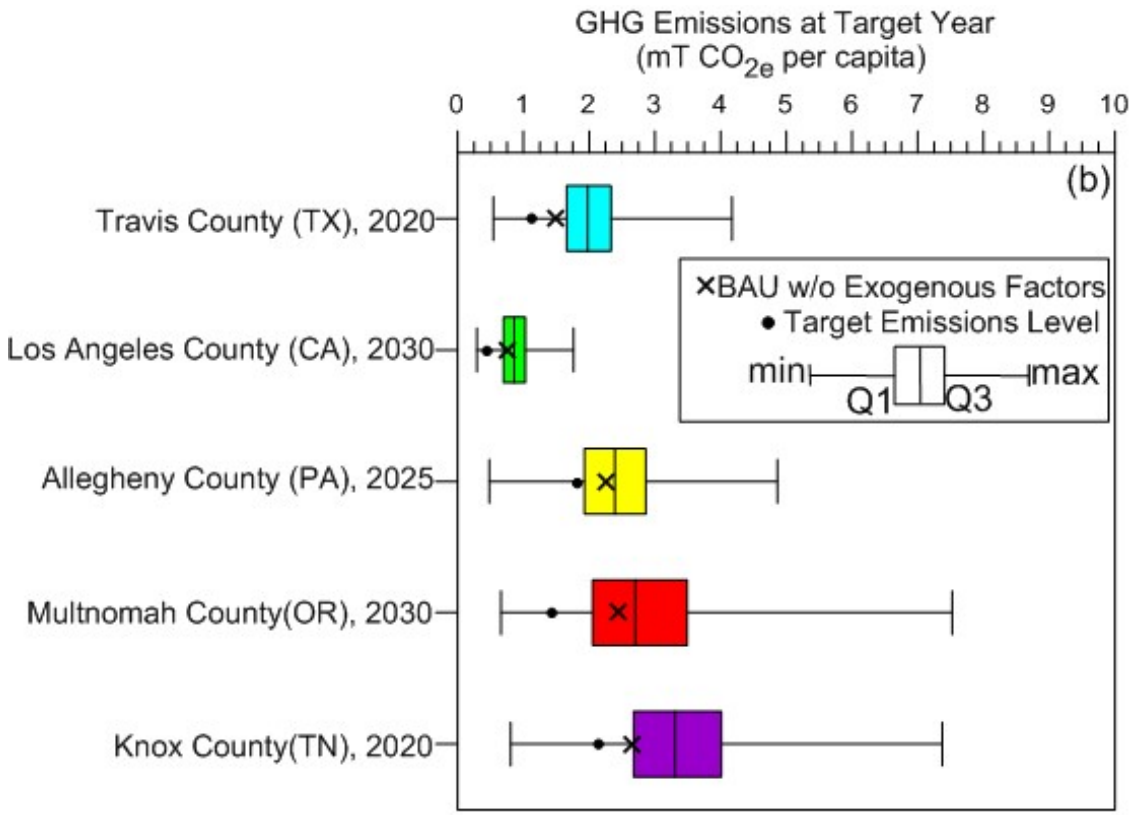
Business-As-Usual Example Scenarios





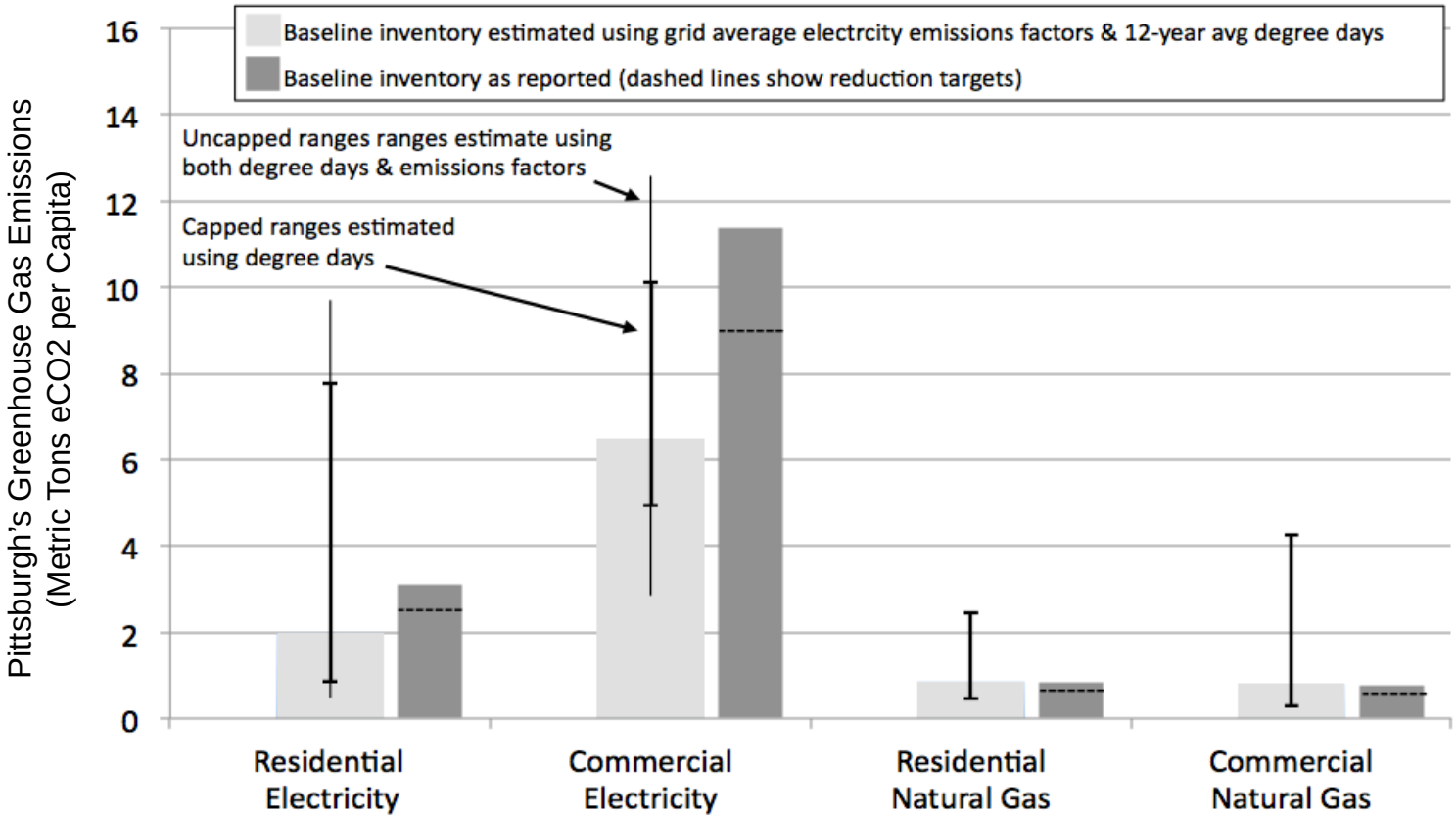
Taylor-Lange and Blackhurst, unpublished manuscript

Comparing Planning Paradigms



Taylor-Lange and Blackhurst, unpublished manuscript

Adjusting GHG Inventories for Representative Conditions



Blackhurst 2010

Mitigation Measures

- Supply side
  - Low(er) carbon sources (short-term)
  - Zero carbon sources (long-term)

- Demand side
  - Pricing
  - Efficiency
  - Peak load management
  - Trip length & frequency
  - Mode shifting

- Offsets

- Shrink

There's no magic.
Mitigation measures will fall into one of these categories.

Considerations for Mitigation Measures

- Constraint on renewables
- Unclear if efficiency + standard of living within this constraint
- Who pays? Net zero will cost more than business-as-usual scenario
  - General revenue + incentives
  - Common and control
  - Tax (not likely)
  - Voluntary
  - Etc.

The policy mechanisms supporting technology change will also influence GHG emissions. Everything is connected to everything… what a headache!

- Retrofits are more difficult (and expensive) than new construction!
- Recommend deferring changes to long-lived infrastructure

Energy Efficiency in Buildings Sector

- Investment of $15M-$25M annually could lead to a 15%-40% GHG reduction below current levels
  - Assuming
    - Complete penetration of “standard’ above-code technologies
    - No behavior change
    - Stock is replaced as it retires
  - Ranges depend on
    - Performance of existing stock
    - Performance and cost of above code stock

Challenges for Scope

- Pass-through emissions (regional road and air travel)
- Non-transportation, distributed point sources (lawnmowers, grills, etc)
- Emissions that cross Austin Energy and ERCOT boundary (“use” electricity emissions or scope 2)

Takeaways

- The sources and magnitude of emissions will change independent of local policy
- A single GHG inventory may not represent
  - Typical conditions
  - The effect of local policy
- Technology and energy source choices alone cannot fully describe mitigation; policy mechanisms themselves matter, too
- There are no “right” ways to do this; just shades of better

THANKS!

Questions :: Comments

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