City of Cambridge
Getting to Net Zero Action Plan 5-Year Review

Meeting 2:
Assessing NZAP Impacts

December 10, 2020

Meeting Objectives

- Explore the drivers behind recent GHG emissions trends
- Review and collect feedback from NZTF on the impacts of NZAP Actions to-date
- Familiarize NZTF with frames of reference for determining adjustments to NZAP actions going forward

Meeting Agenda

- Part 1: Recap of Meeting 1
- Part 2: Review Building Sector GHG Emission Trends
- Part 3: In-depth Review of Actions to-date
- Part 4: Review Framework for Determining NZAP Adjustments
- Part 5: Public Comment

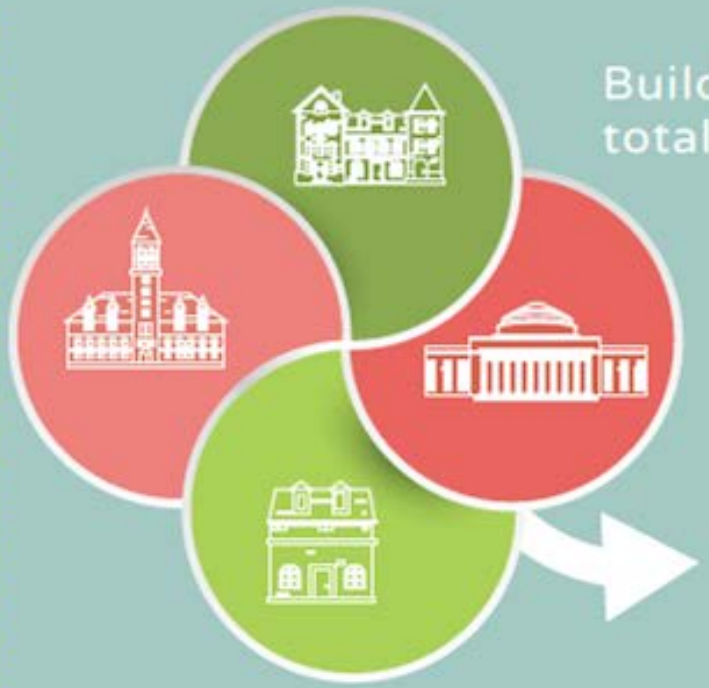
Part 1

MEETING 1 RECAP

1 THE CLIMATE IMPERATIVE

Climate change poses a growing set of risks and challenges to cities.

Combating climate change needs to **start locally**



Buildings generate over 80% of Cambridge's total greenhouse gas emissions.

That is why it is Cambridge's aim to achieve

NET ZERO EMISSIONS

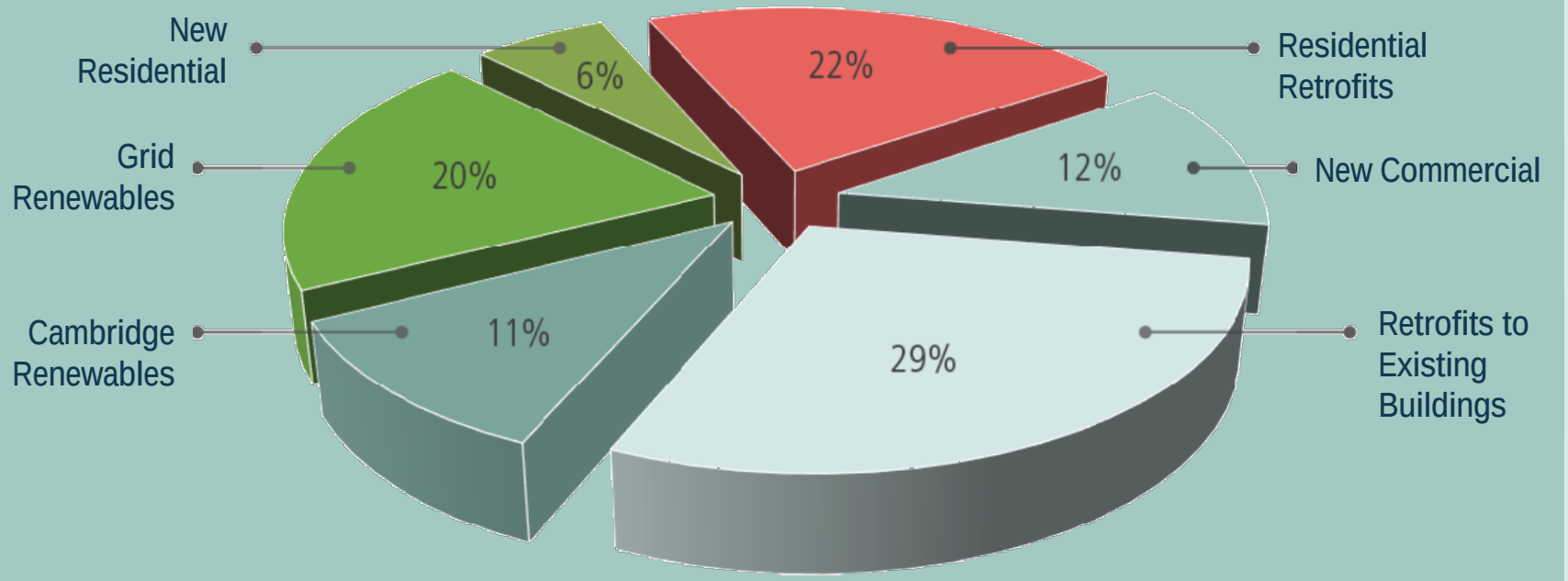
from buildings.

Residents, universities, businesses and the City are collaborating to address the immediacy of the climate imperative.

NZAP Action Impacts

Key Actions:

1. Retrofits to Existing Buildings
2. Net-Zero New Construction
3. Energy Supply
4. Local Carbon Fund
5. Engagement & Capacity Building



Science, Policy, Tech, Equity Lens

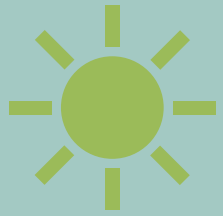
Science

Latest scientific assessments tell us emissions need to be reduced 45% below 2010 levels by 2030 and 100% by 2050 to stay below a 1.5-degree increase.

Policy

What Federal, State and Local Policies have changed that support our effort to reach the goals (e.g. building energy codes)

Technology



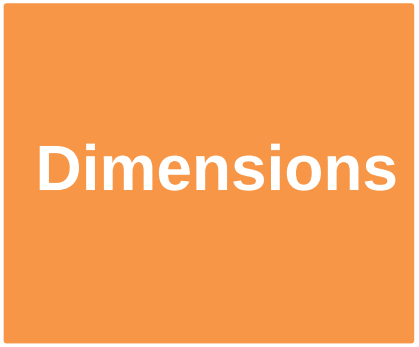
What enabling technologies have emerged since the 2015 NZAP efforts that may affect our strategy

Equity

We must recognize the social equity implications of policy choices and use an equity assessment framework to help guide our process

Equity Assessment Framework

The checklist provides a method to ensure a robust treatment of climate and social equity.

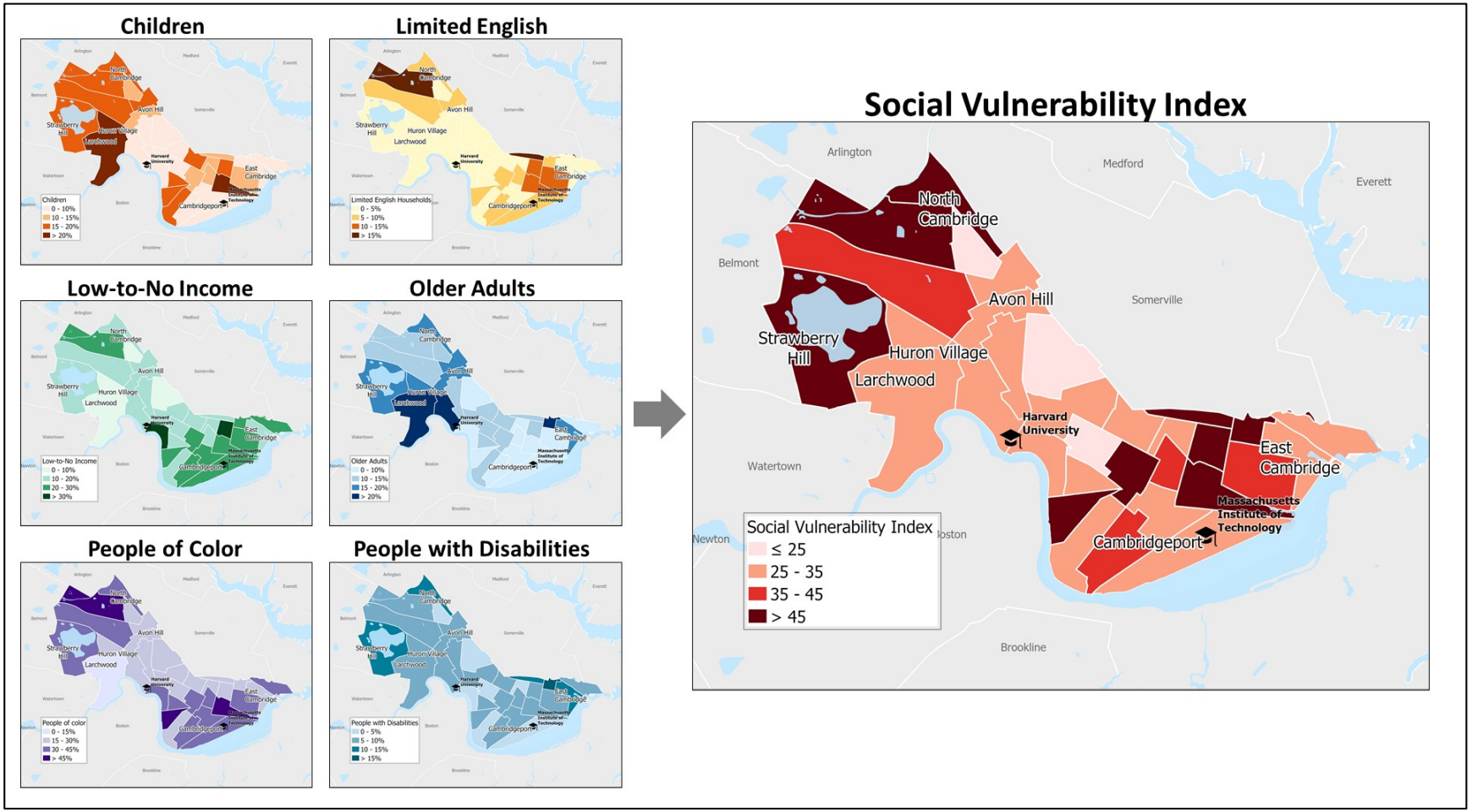


Social equity cuts across many dimensions, each of which requires consideration.

Each equity dimension has common equity pitfalls that should be acknowledged, addressed, and intentionally mitigated should they arise.

Applied Economics Clinic
Economic and Policy Analysis of Energy, Environment and Equity

Cambridge social vulnerability index



Source: AEC calculations using American Community Survey 1-Year Estimates Subject Tables. 2019. Race [Table B02001], Poverty Status in the Past 12 Months [Table S1701], Limited English Speaking Households [Table S1602], Disability Characteristics [Table S1810], Age and Sex [Table S0101].

Applied Economics Clinic
Economic and Policy Analysis of Energy, Environment and Equity

Net Zero Action Plan Principles:

- Supports **climate goals** and **healthy economic** strategies
- Uses **science, market, and data-driven** analysis to inform decision making
- Support an openness **to new ideas** when circumstances change
- Commitment to allowing the principle of **offsets**
- Commitment to **measuring and monitoring** impact over time
- Ensures consultation is comprehensive and **engages affected stakeholders**
- Commitment to developing informative and **replicable models**
- **NEW**: Commitment to implementing the Net Zero Action Plan through a **racial equity and social justice lens**

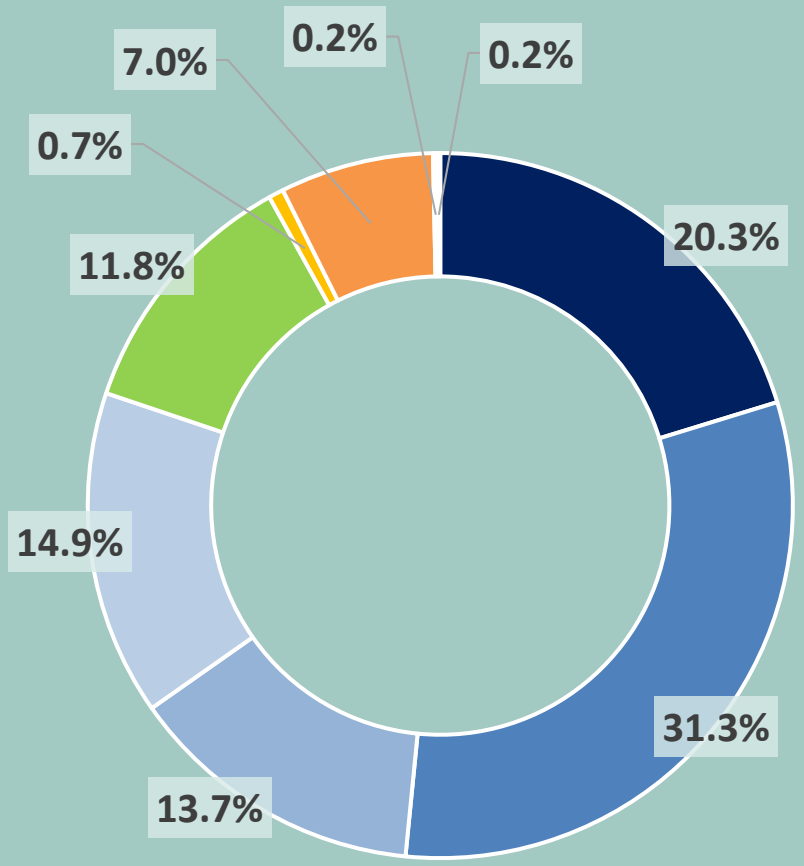
Recap Questions

- What is your overall impression of the NZAP?
- Do the original guiding principles (used to determine the actions to be implemented in the original NZAP) still apply? If not, why?
- What are the key aspects of the NZAP that we need to consider with respect to equity going forward?

Part 2

BUILDING SECTOR GHG EMISSION TRENDS

Cambridge Community GHG Inventory



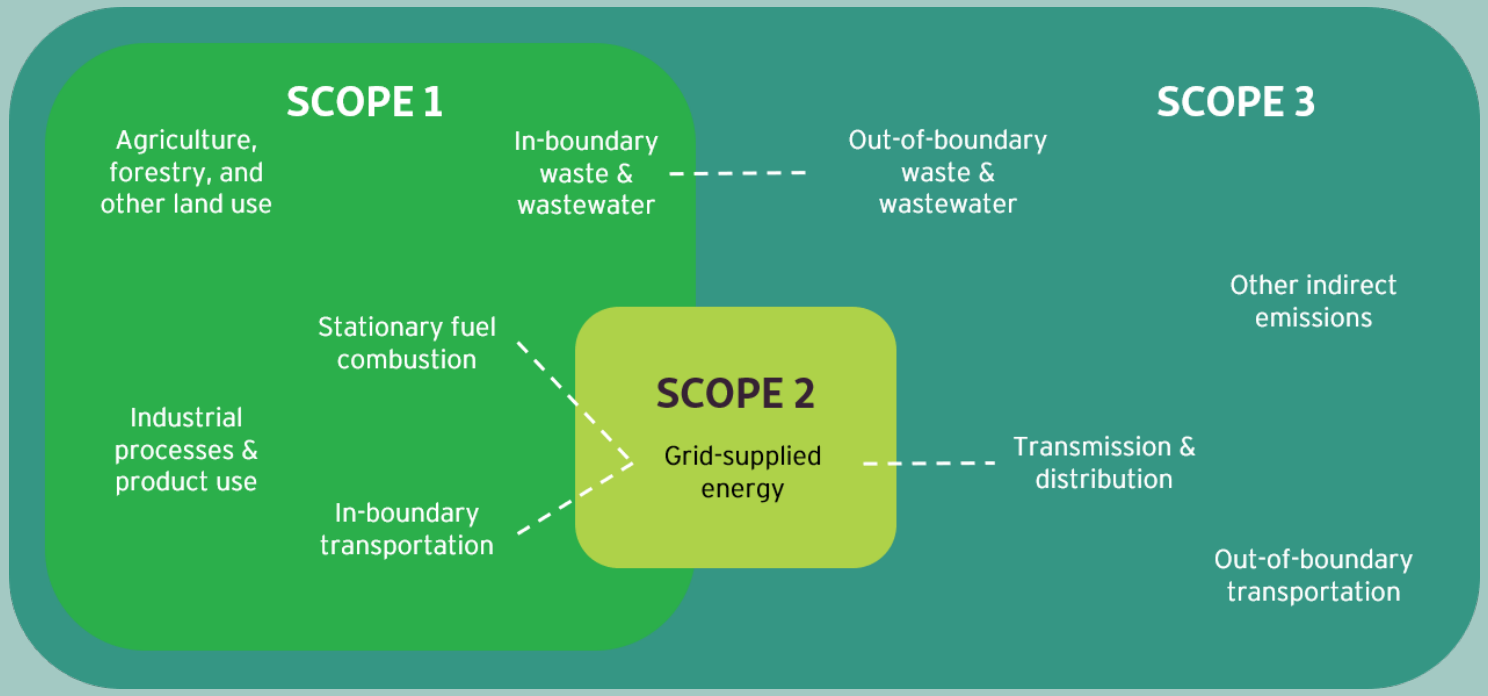
Cambridge Community-wide Emissions by sub-sector (2012)

Over 80% of Community-wide GHG Emissions are from the Building Sector

- Residential Buildings
- Commercial & Institutional Buildings
- Manufacturing Industries & Construction
- Energy Industries
- On-road Vehicles
- Railways
- Solid Waste Disposal
- Incineration and Open Burning
- Wastewater Treatment and Discharge

Community-wide GHG Inventory

- Based Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC)
- Uses a scopes-based approach for emissions from energy use, transportation and waste
- Boundary is the jurisdictional boundary of Cambridge



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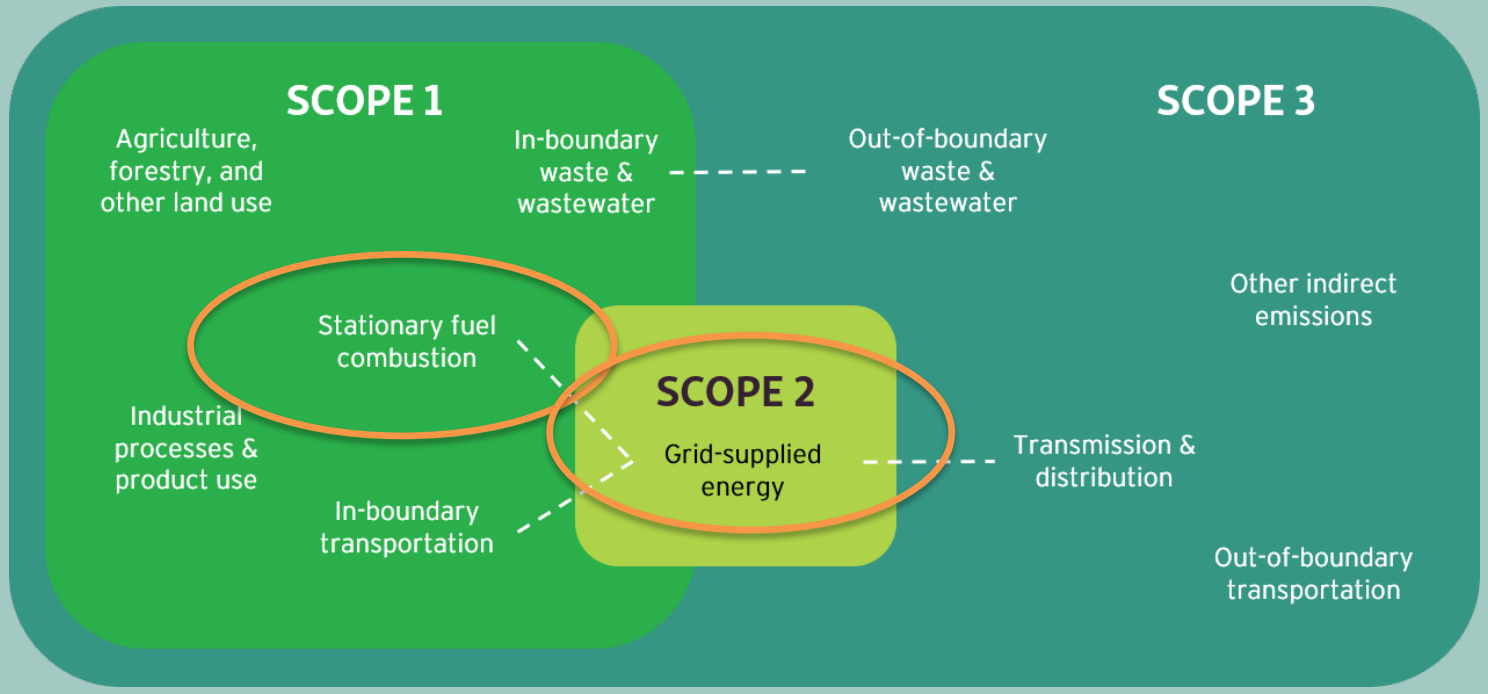
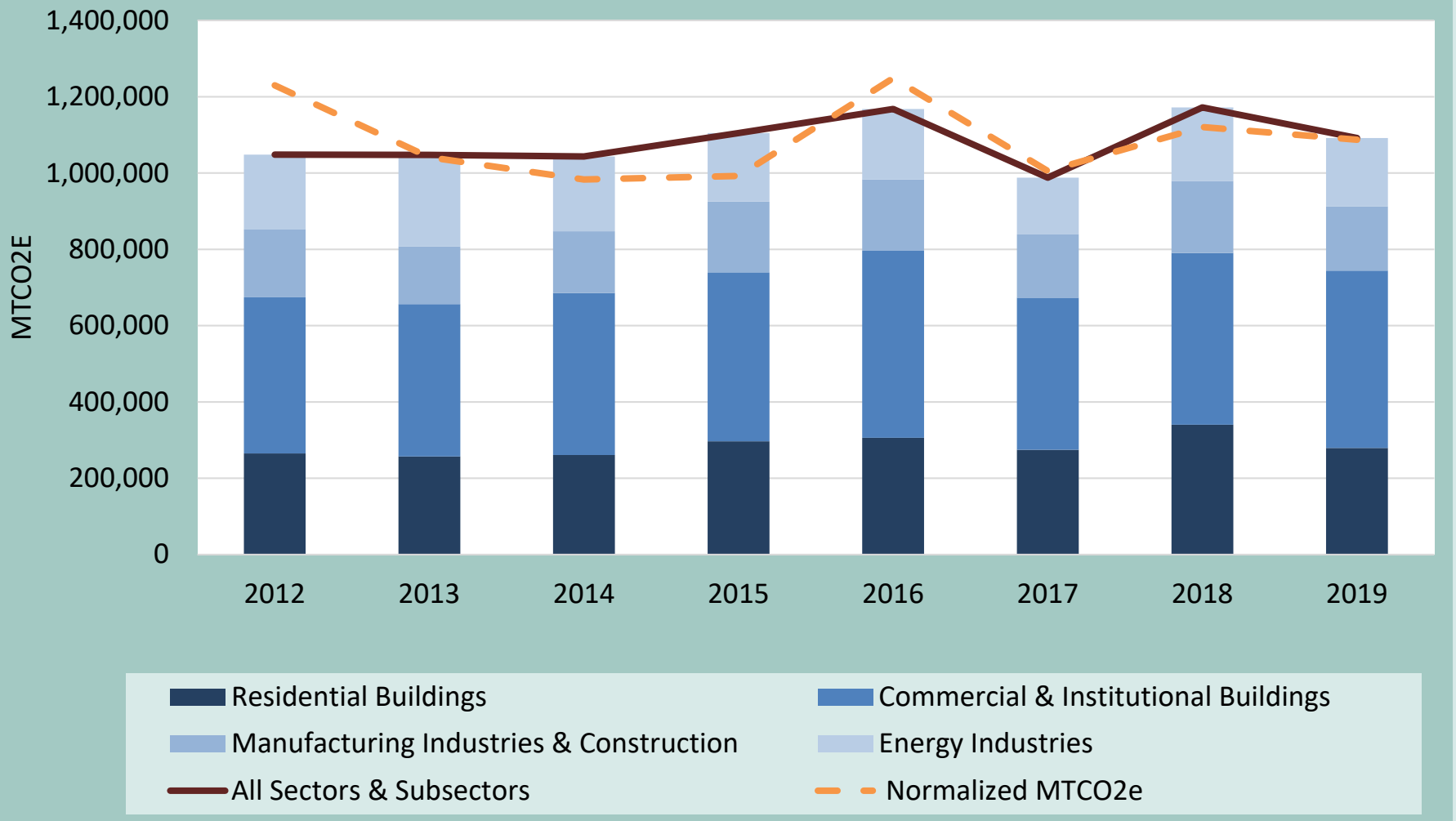


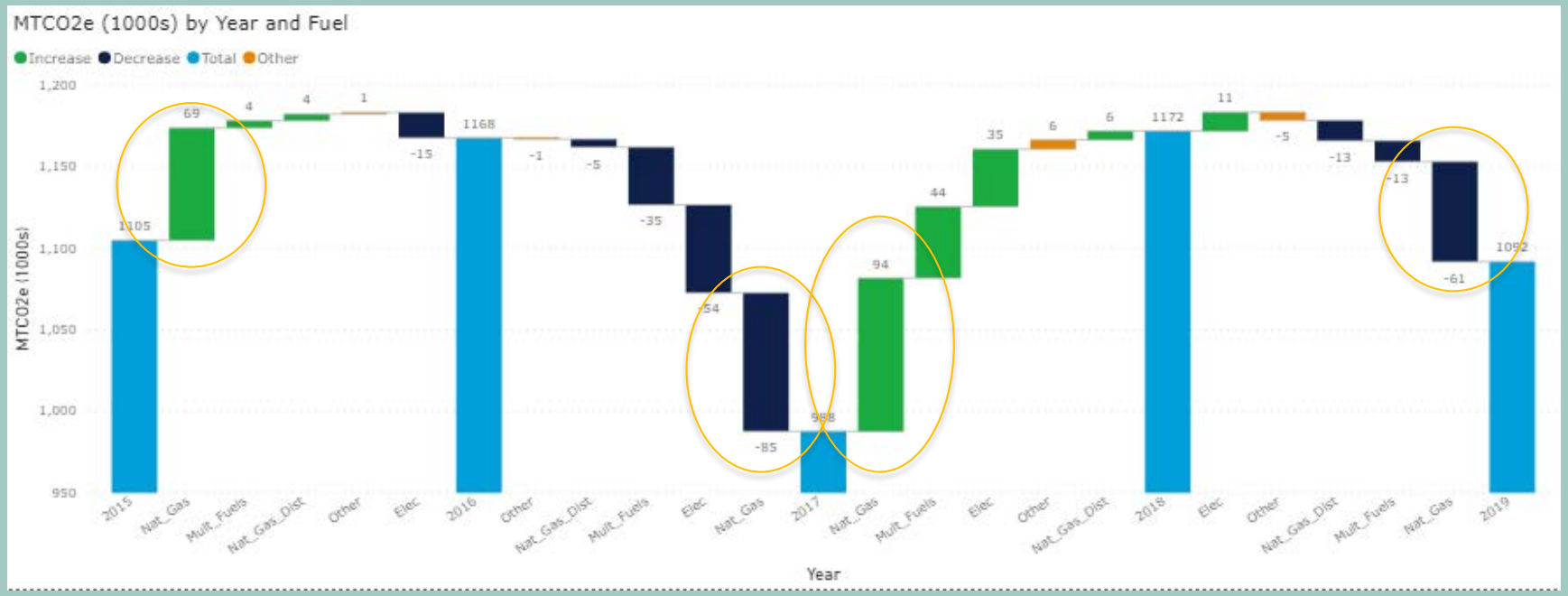
GHG Emissions Trends from Building Stock



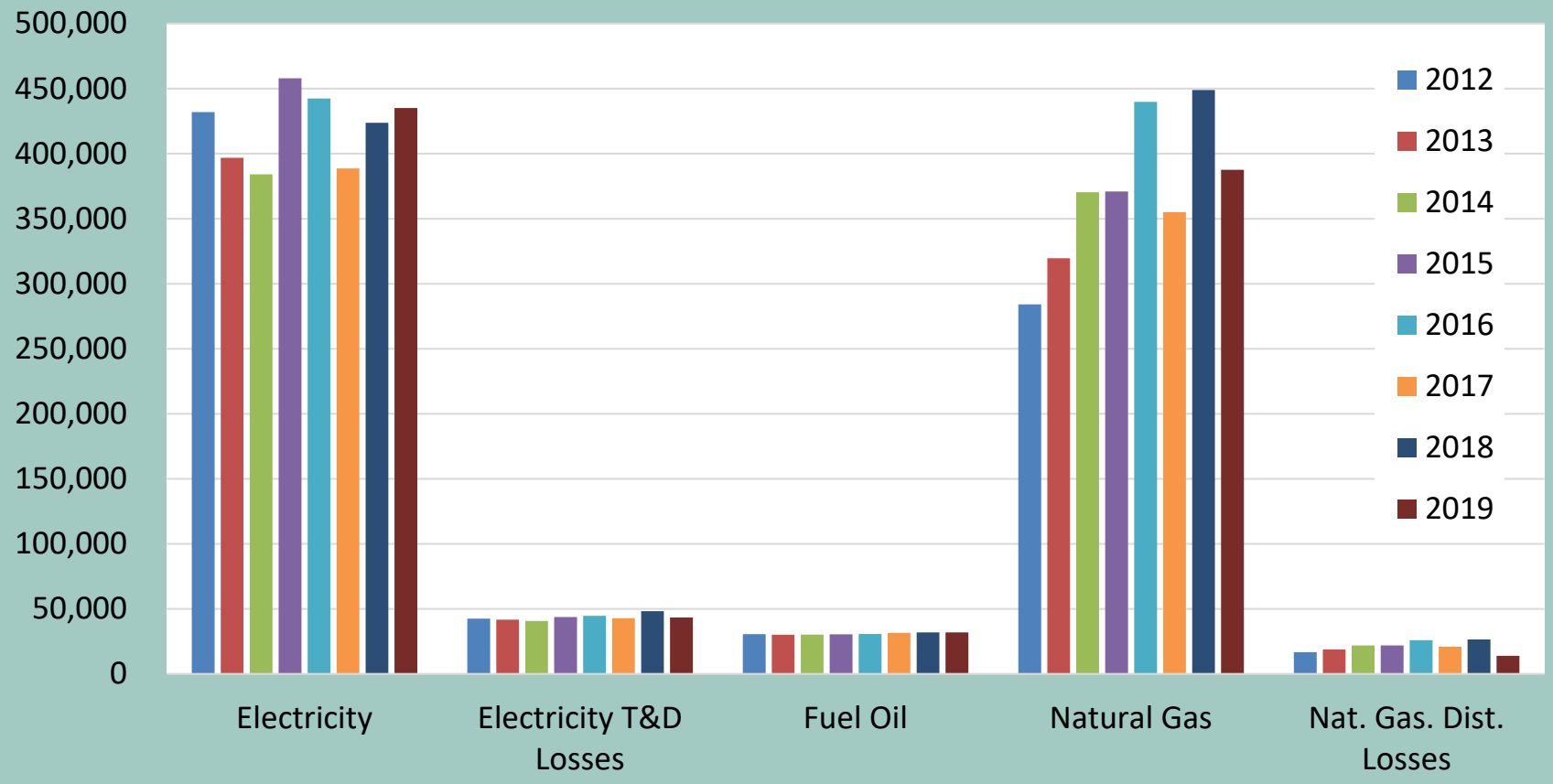
Building Sector CO2e emissions 2012-2019

Emissions by Fuel 2016-2019

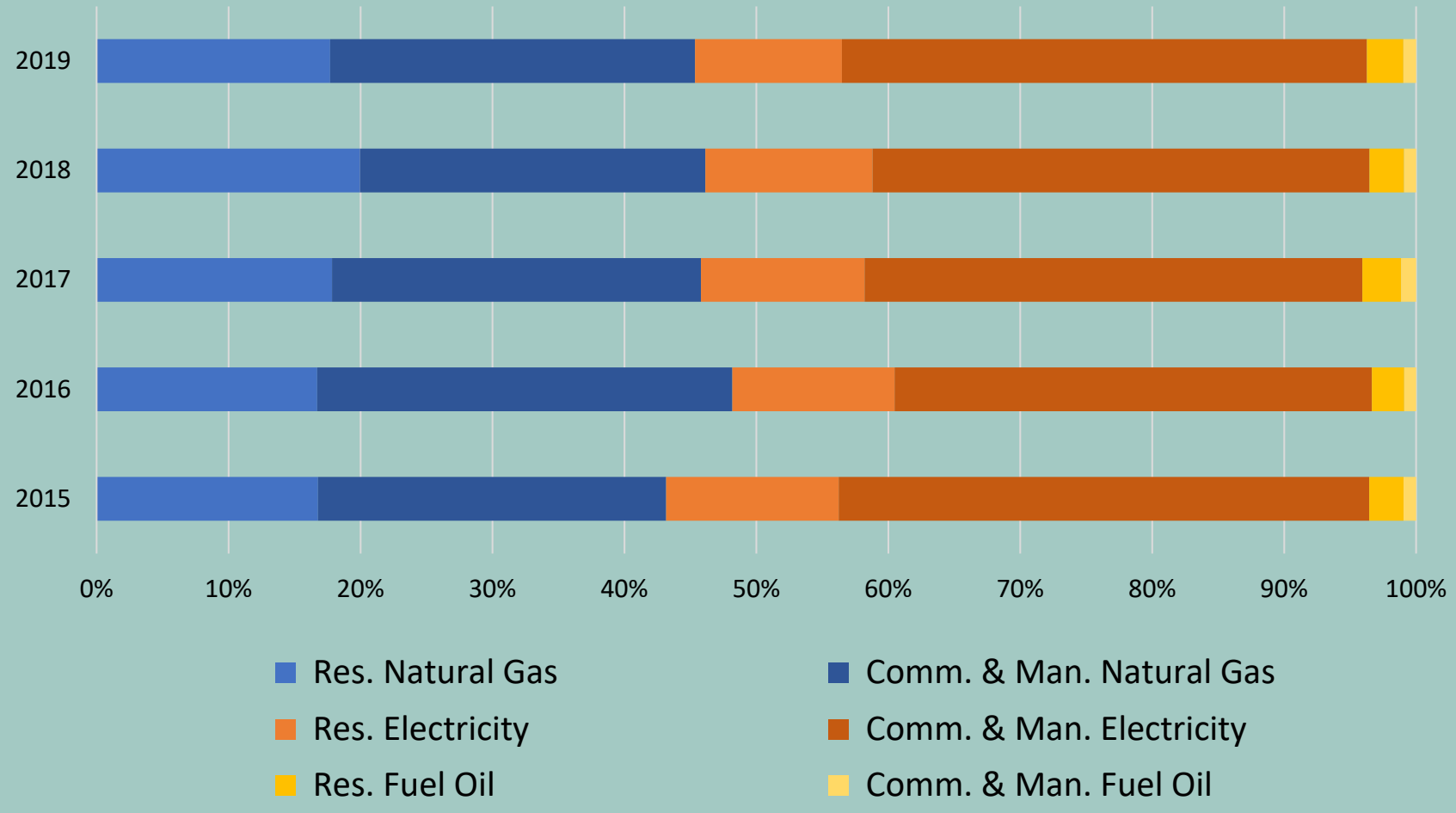
- 2015-2016 (moderate increase): Driven by commercial natural gas emissions
- 2016-2017 (large decrease): Driven by commercial natural gas emissions
- 2017-2018 (large increase): Driven by resi. and comm. natural gas emissions
- 2018-2019 (moderate decrease): Driven by residential natural gas emissions



GHG Emissions Y-o-Y Trends by Fuel

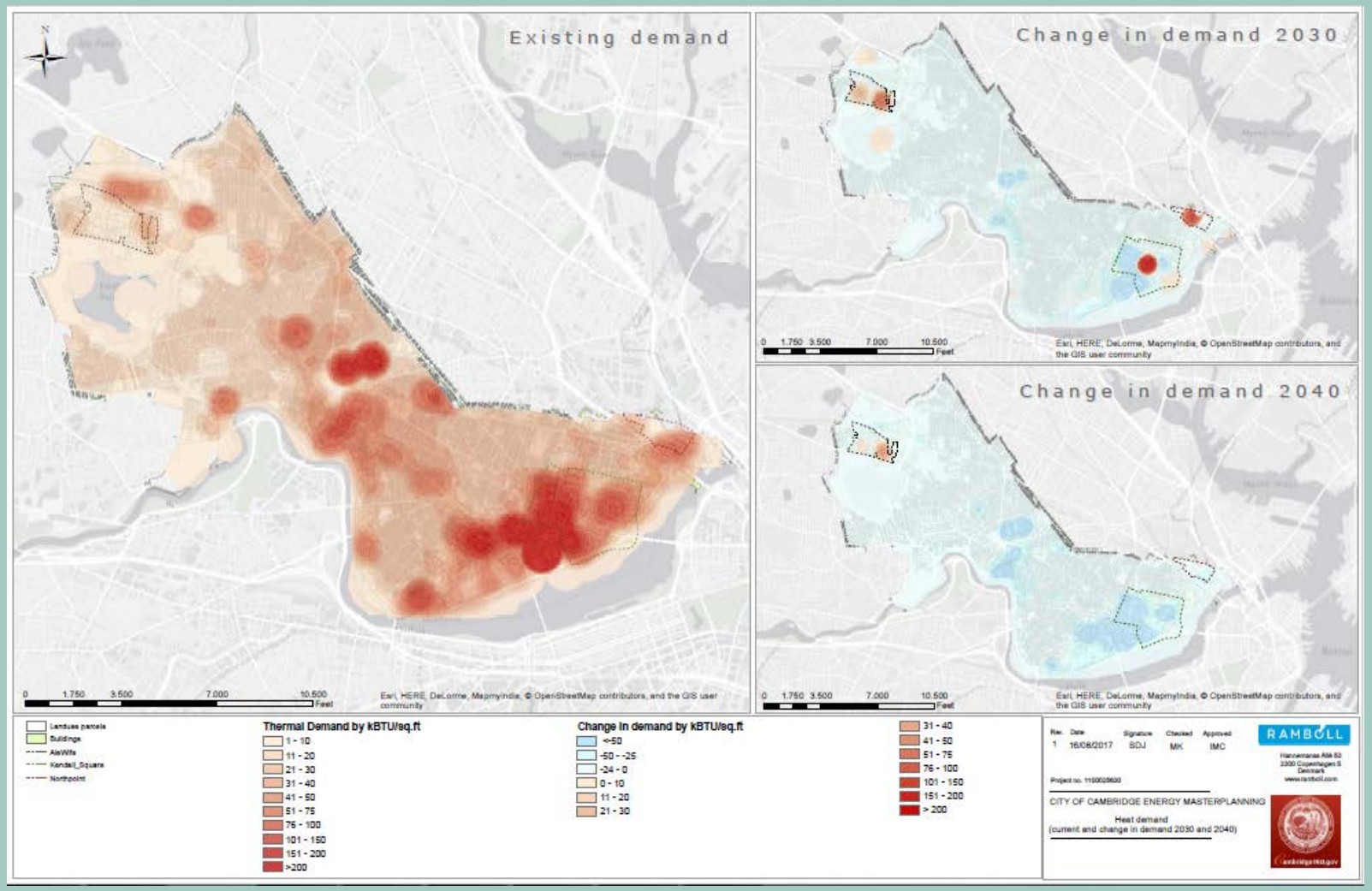


% of GHG Emissions by Fuel

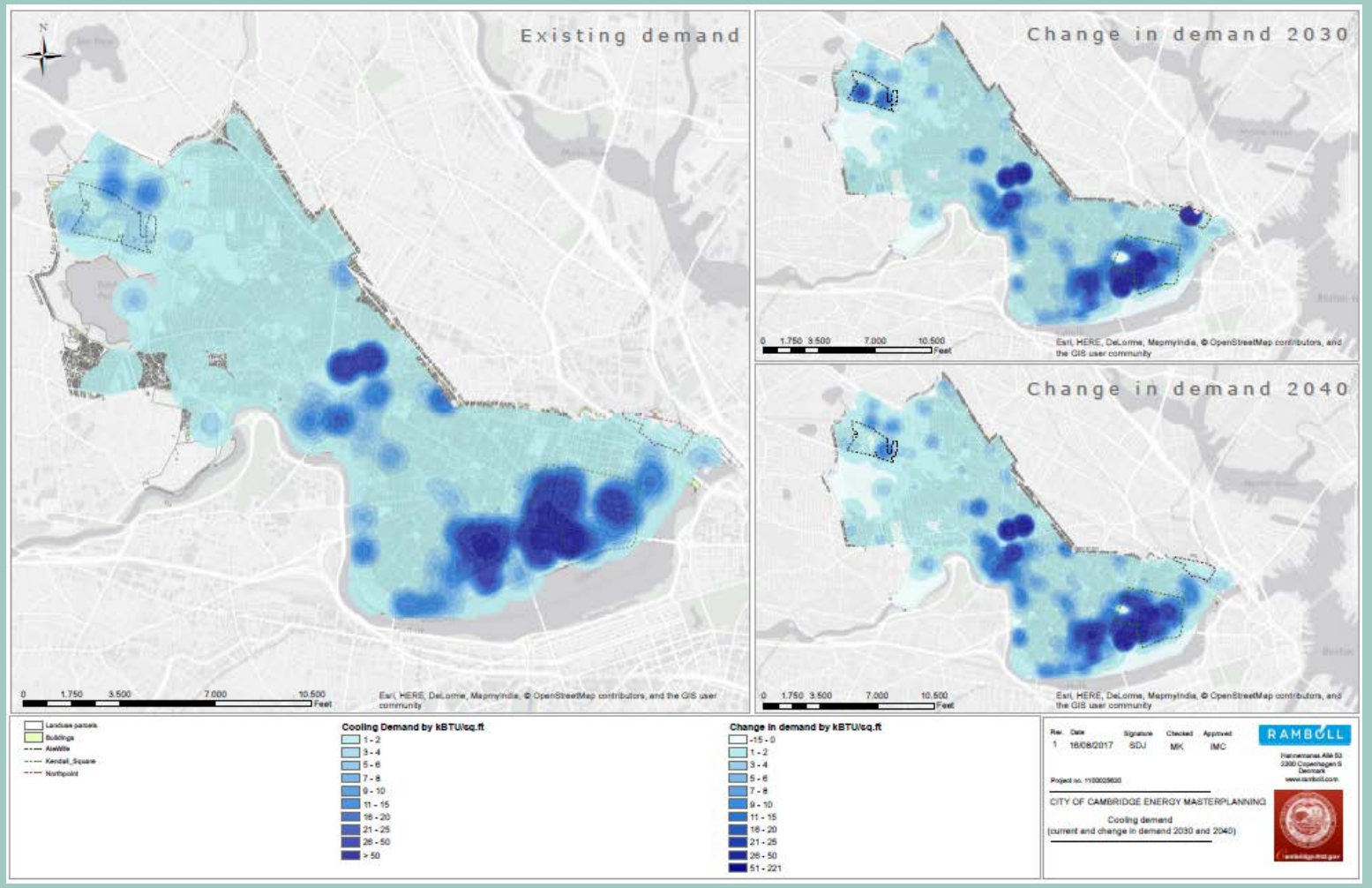


ENERGY USE IN CAMBRIDGE

Cambridge heat demand: Today, 2030, 2040

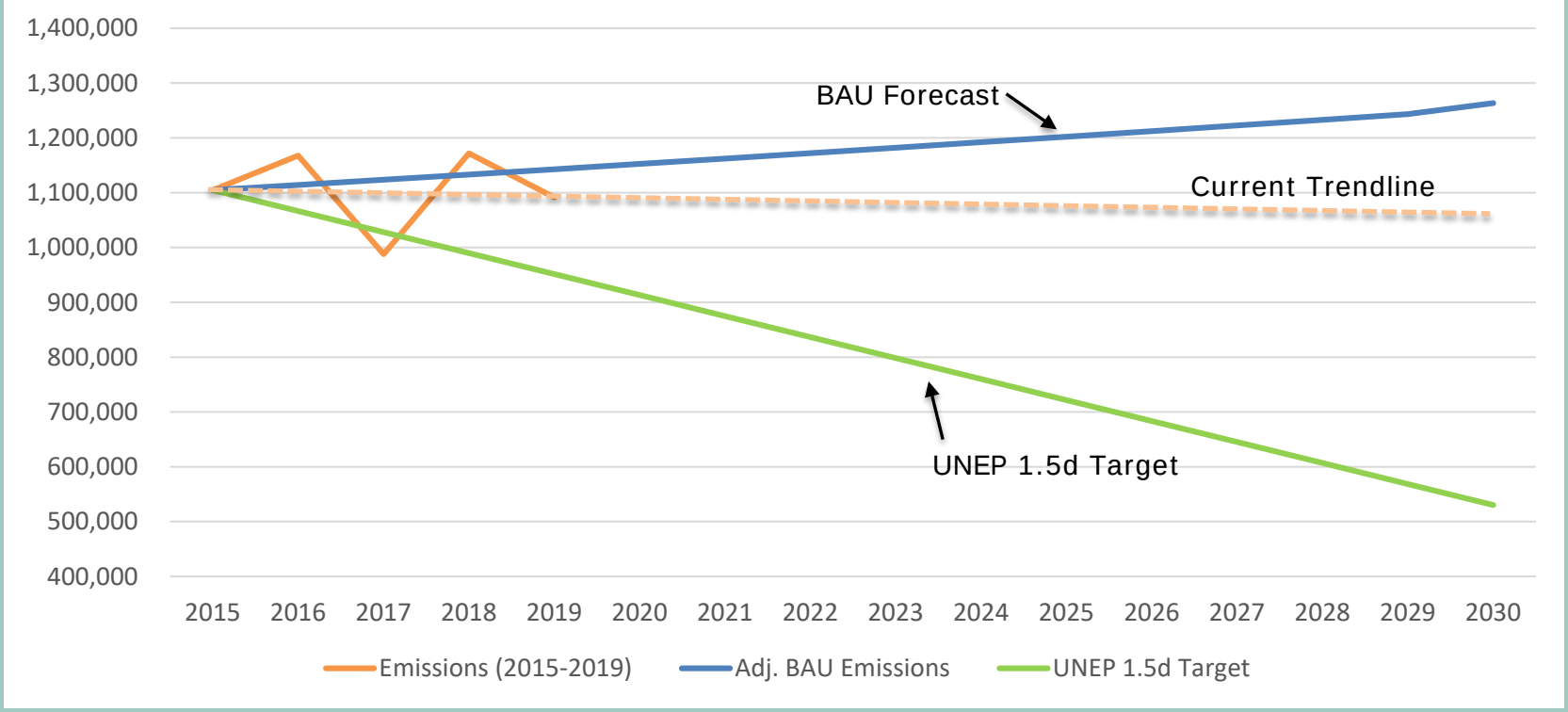


Cambridge Cooling demand: Today, 2030, 2040



GHG Emissions Goals

- It's difficult to conclude the impacts of NZAP on building sector overall but if the current trends continue, the city will not achieve our GHG reduction goals
- To reach 1.5d Target for the buildings sector, 580,000 MT of CO2e emissions need to be removed by 2030



Part 3:

IN-DEPTH REVIEW OF ACTIONS TO-DATE

NZAP Actions

Categories of actions:

- Action 1 – Energy Efficiency in Buildings
- Action 2 – Net Zero New Construction
- Action 3 – Energy Supply
- Action 4 – Low Carbon Fund
- Action 5 – Engagement and Capacity Building

Status of NZAP Actions

Legend:
- In progress
- Behind Schedule
P - Parked

Action 1 – Energy Efficiency in Buildings

Action No.	Action	Description	Stage	Impact	Status as of 2020
1.1.1	Custom Retrofit Program	Multi-Family Energy Pilot in implementation. Custom Retrofit Program for BEUDO* buildings in implementation	Implementation	Medium	
1.1.2	Additional BEUDO Requirements	Amendment proposal is ready to move forward but behind original schedule	Regulatory	High	
1.1.3	Upgrades at Time of Renovation or Sale	Time of Renovation or Sale requirement feasibility assessment completed through Zero Cities project	Feasibility	High	
1.1.4	O&M Plan Requirement	BEUDO process included the creation of O&M plan template	N/A	Low	P

Status of NZAP Actions

Action 2 – Net Zero New Construction

Action No.	Action	Description	Stage	Impact	Status as of 2020
2.1	Net Zero New Construction	Technical and economic feasibility study for net zero small residential buildings (1-3 units) completed	Feasibility	Low	
2.2.1	Market Based Incentive Program	Completed feasibility study of market incentives for new buildings	N/A	Low	P
2.2.2	Height and FAR Bonus	Determined not to be desirable as standalone policy given upcoming requirements	N/A	Low	P
2.3	Article 22 Green Building Requirements	Previously delayed requirements have been adopted	Implementation	Medium	

Status of NZAP Actions

Action 2 – Net Zero New Construction (cont.)

Action No.	Action	Description	Stage	Impact	Status as of 2020
2.4.1	Net Zero Requirement for New Const. of Municipal Buildings	New municipal buildings being designed to achieve net zero emissions	Implementation	Low	
2.4.2	Renewal of Municipal Building	Continued implementation of Municipal Facilities Improvement Plan	Implementation	Low	
2.5	Removal of Barriers to Increased Insulation	Previously delayed requirements have been adopted	Regulatory	Low	

Status of NZAP Actions

Action 3 – Energy Supply

Action No.	Action	Description	Stage	Impact	Status as of 2020
3.1	Low Carbon Energy Supply	Implementation of multiple study recommendations in progress	Implementation	High	
3.2	Rooftop Solar Ready Requirements	Solar installation requirement technical analysis completed	Feasibility	Medium	
3.3	Develop a Memorandum of Understanding with Local Utilities	Pursue project-specific collaboration in place of overarching MOU	N/A	Supporting Action	

Status of NZAP Actions

Action 4 – Low Carbon Fund

Action No.	Action	Description	Stage	Impact	Status as of 2020
4	Investigate Local Carbon Fund	Virtual pilot complete but behind implementation schedule	Design	High	

Status of NZAP Actions

Action 5 – Engagement and Capacity Building

Action No.	Action	Description	Stage	Impact	Status as of 2020
5.1	Communications Strategy	Implementation of multi-faceted communication strategy ongoing	Implementation	Supporting Action	
5.2	Develop Ongoing Capacity to Manage Getting to Net Zero Project	Program Wide Review delayed due to COVID-19	Implementation	Supporting Action	
5.3	Net Zero Labs Standards	In progress through Compact for a Sustainable Future workplan	Design	Medium	

Summary

- Of the 17 NZAP Actions, most are at different stages of implementation but some of the key actions fallen behind schedule

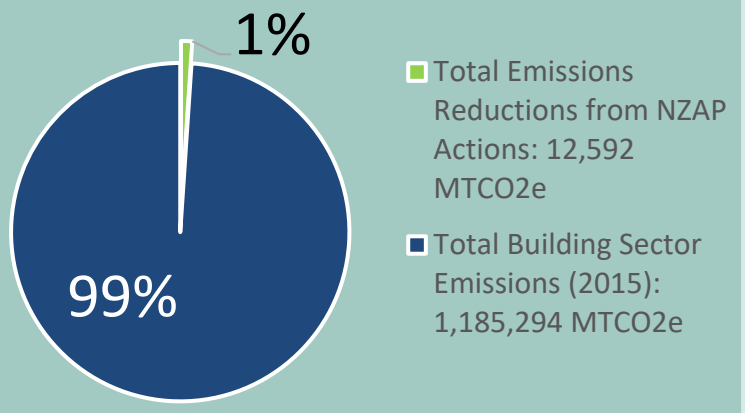
- Currently, the four actions that represent highest potential to reduce emissions are:
  - BEUDO retrofit and performance requirements (Actions 1.1.1 & 1.1.2)
  - Energy Efficiency Upgrades at Time of Sale (Action 1.1.3)
  - Low Carbon Energy Supply (Action 3.1)
  - Local Carbon Fund (Action 4)

Measurable Results To-date

- Of the 17 NZAP Actions, 4 NZAP Actions were found to have measurable results to-date
    - Custom Retrofit Program (Action 1.1.1)
    - Green Building Requirements (Action 2.3)
    - Renewal of Municipal Building (Action 2.4.2)
    - Rooftop Solar Ready Requirements (Action 3.2)

Measurable Results To-date

- **1,450 units** in the Custom Retrofit Program (Action 1.1.1)
- **54 projects** completed under Article 22, Green Building Requirements representing over **8 million SF** (Action 2.3)
- **78 projects** completed as part of the Renewal of Municipal Buildings Action **saving 4 million kWh** of electricity (Action 2.4.2)
- **445 Rooftop PV systems** installed under the Cambridge Solar programs, **~5 MW of capacity**
- **12,592 MTCO2e** estimated emissions reduced from these actions or **~1% of all building sector emissions**



Measurable Results To-date

Other notable items:

Action 2.4.1, Net Zero Requirement for New Construction of Municipal Buildings: Has influenced the standards for design for new municipal buildings. Projects that align with these standards include:

- The King Open School (2019) – Fossil fuel free
- 859 Mass Ave (2017) – Deep energy retrofit with GSHPs
- Martin Luther King School (2016) – 69% energy performance improvement

Building Energy Use Disclosure Ordinance (BEUDO)

- Enacted in 2016 has led to nearly 1,100 buildings in the city that now report their energy and water usage to the city annually

- While no emissions savings are currently attributed at this time, we anticipate that the addition of the performance improvement requirement will result in significant impacts in the coming years

Key Takeaways

- Of the 17 NZAP Actions, 4 NZAP Actions now have measurable results
- The long lead time in obtaining project performance data makes it difficult to determine the real impacts of the program over the initial five-year period.
- While it is expected the emissions trajectory will turn downward in the coming years as more actions are implemented, we need to find additional ways to cut emissions

Breakout

- Considering the current list of actions; Which of the current actions do you see as having the greatest potential impact going forward to meet our science-based targets?

- Based on current Policy or Technology trends where do you see adjustments to actions could be made to further reduce emissions?

Part 4:

REVIEW FRAMEWORK FOR DETERMINING NZAP ADJUSTMENTS

Frames of Reference when Considering Adjustments

- Original NZAP Principles
- Current Science, Policy, Technology and Equity conditions
- Overall potential impacts including co-benefits to the community

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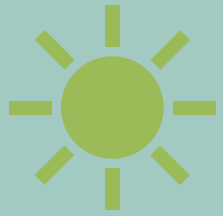

What enabling technologies have emerged since the 2015 NZAP efforts that may affect our strategy

Equity

We must recognize the social equity implications of policy choices and use an equity assessment framework to help guide our process

Evaluating NZAP Adjustments

- What is the potential for emissions reductions from an Action?
- What is the technical and economic feasibility of implementing the Action when reflecting upon current Policy and available Technology?
- What other benefits to the community might be realized by pursing an Action?

All adjustments need to be evaluated for equity implications

Co-benefits of NZAP Actions

Consider Each through an Equity Lens		
Government and Policy Development	Economic	Environmental
Leadership by example	Employment Growth	Reduction in Water Use
Promotes Collaboration	Enhanced Economic Competitiveness	Less Materials Use Impacts
Facilitates Public Participation	Reduction in Operation Costs	Reduction in Waste
Enhances Policy Evaluation	Reduction in Cost of Public Infrastructure	Lowers air pollution from generation assets
Enhanced data availability and access	Decreased Energy Costs	Life-cycle Carbon Emissions Reductions
Health and Wellbeing	Climate Resilience	Access and Engagement
Promotes Healthy Lifestyle for Residents	Increased Energy Security	Improved Access to Public Space
Lowers Combustible Gases in Buildings	Provides opp. for hardening infrastructure	Improved Access to Public Transit
Improves Community Aesthetics	Provides opp. for improved building resilience	Improved Access to Employment /Training
Improved Building Comfort/IAQ	Reduces Risk for Vulnerable Populations	Engagement of Local Women/Minority Owned Businesses

Breakout

- What are your top priorities for co-benefits that we need to consider when assessing actions?
- Are there other co-benefits that should be considered?
- What other ways might we evaluate adjustments to NZAP actions?

Part 5:

PUBLIC COMMENT

Thank You!

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