West Coast Climate
& Materials Management Forum

05 March 2019

Consumption Based Emissions – Part 2: New Tools

West Coast Climate and Materials Management Forum

The West Coast Climate and Materials Management Forum is a collaboration of state, local, and tribal government

- Develop ways to institutionalize sustainable materials management practices.
- Develop tools to help jurisdictions reduce the GHGs associated with materials

West Coast Climate & Materials Management Forum

Check out the Forum's Resources

- Original Report Connecting Materials/Climate
- Research Summaries
- Turn-key Materials Management Presentation
- Climate Action Toolkit
- Food: Too Good to Waste Toolkit
- Climate Friendly Purchasing Toolkit
- Reducing GHGs Through Composting and Recycling

www.westcoastclimateforum.com

West Coast Climate
& Materials Management Forum

West Coast Climate Forum
Webinar Series Disclaimer

This webinar is being provided as part of the West Coast Climate and Materials Management Forum Webinar Series. The Forum is a collaboration of state, local, and tribal governments. We invite guest speakers to share their views on climate change topics to get participants thinking and talking about new strategies for achieving our environmental goals. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Please note the opinions, ideas, or data presented by speakers in this series do not represent West Coast Climate and Materials Management Forum members policy or constitute endorsement by the forum.

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This is the second webinar is a series focused on consumption-based emissions inventories and what they reveal about new opportunities to reduce greenhouse gas emissions. Part 1 (October 2, 2018) featured findings from recent inventories completed for Oregon and the San Francisco Bay Area. This webinar will focus on new analytical tools and approaches to help cities assess local policies and programs aimed at reducing consumption-based emissions. Climate action leaders are increasingly considering consumption-based emissions in addition to production or activity-based emissions that have typically formed the basis of climate action planning. Consumption-based emissions inventories attribute all global emissions to the ultimate end user, so that, in addition to transportation and housing, the supply chain emissions that occur throughout the lifecycle of goods, food, and services consumed in a jurisdiction are included.

Tuesday 05 March 2019

West Coast Climate & Materials Management Forum

Today's Speakers

Derik Broekhoff has 20 years of experience on energy and climate policy, with an emphasis on greenhouse gas accounting, emissions trading, and carbon offsets. Prior to joining Stockholm Environment Institute, Derik was Vice President for Policy at the Climate Action Reserve in Los Angeles, where he oversaw development of the Reserve's voluntary carbon offset program and its transition into California's regulatory cap-and-trade program. Before that, he led work on the Greenhouse Gas Protocol Initiative at the World Resources Institute, where he also managed work on the design of emissions trading programs, registry systems, and standards for carbon offsets. He has advised numerous state, national, and multi-national climate policy initiatives. . Derik holds a master's degree in public policy (MPP) from the University of California at Berkeley, and a bachelor's degree in International Relations and German Studies from Stanford University.

Chris Jones is Director of the CoolClimate Network, a university-government-industry partnership at the University of California, Berkeley. Jones lead the development of the first carbon footprint calculators to account for the greenhouse gas emissions of all transportation, energy, food, goods and services purchased by households and businesses. This comprehensive method, called "consumption-based greenhouse gas accounting," powers a suite of online tools that allow households, businesses and communities to estimate their complete carbon footprints, compare their results to similar users, and develop personalized climate action plans to reduce their contribution to climate change. Jones holds a Ph.D. in Energy and Resources from UC Berkeley and serves as program chair (9th year) of the Behavior, Energy and Climate Change Conference.

Today's Speakers

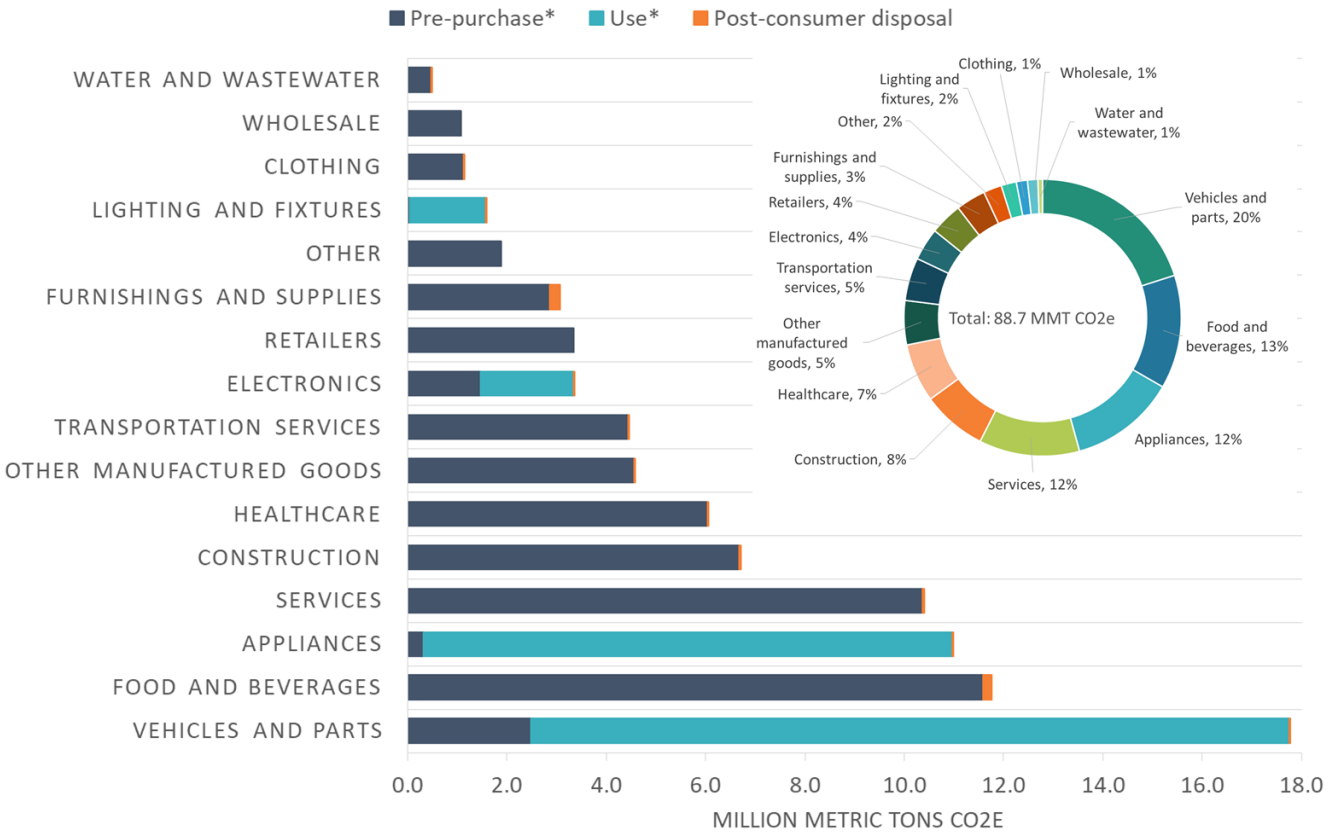
- **Moderator: Babe O'Sullivan** is a Sustainable Consumption Specialist with the Oregon Department of Environmental Quality, Materials Management Program. She's worked as a consultant for the Urban Sustainability Directors' Network (USDN), leading the Sustainable Consumption in Cities project, a multi-year initiative exploring the role of cities in advancing sustainable consumption. She helped to design and launch the USDN Sustainable Consumption Toolkit providing guidance and resources to cities. Previously, Babe was the Sustainability Liaison for the City of Eugene, Oregon and a solid waste and recycling program coordinator for the City of Portland, Oregon. She holds an MBA from the University of California, Berkeley and a Bachelor of Science degree in Environmental Policy from the University of California, Davis.

Consumption Based Emissions – Part 1

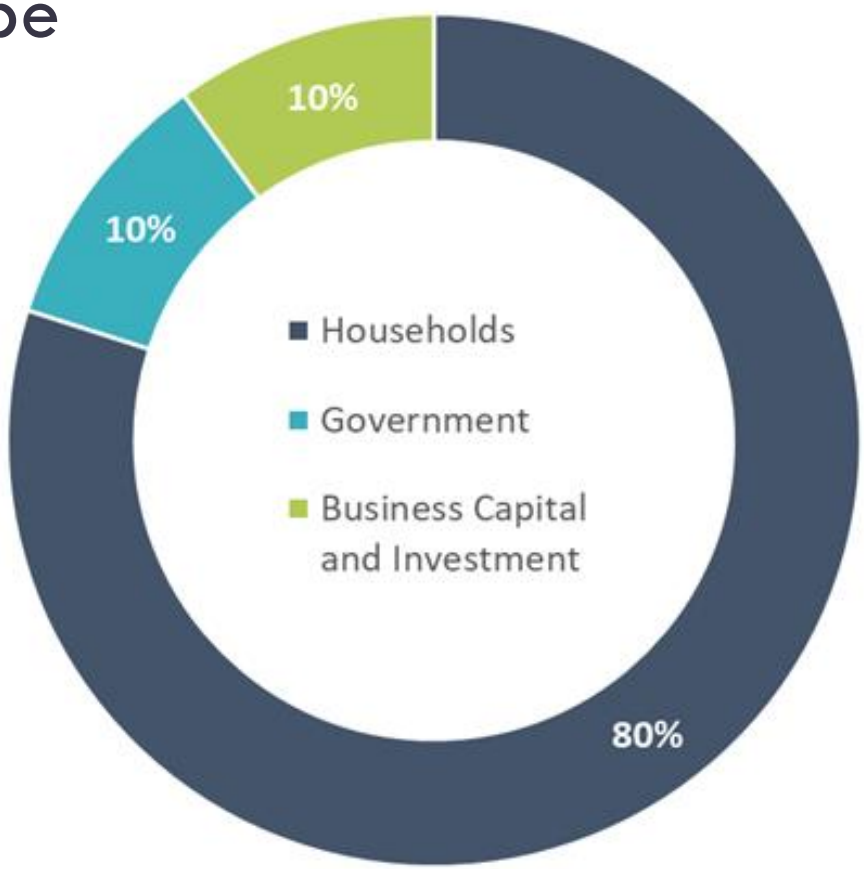
Value of CBEI

- Complement to sector based analyses
- Sheds lights on consumption as a root driver of emissions
- New opportunities to reduce life cycle emissions
- Lots of cool data!

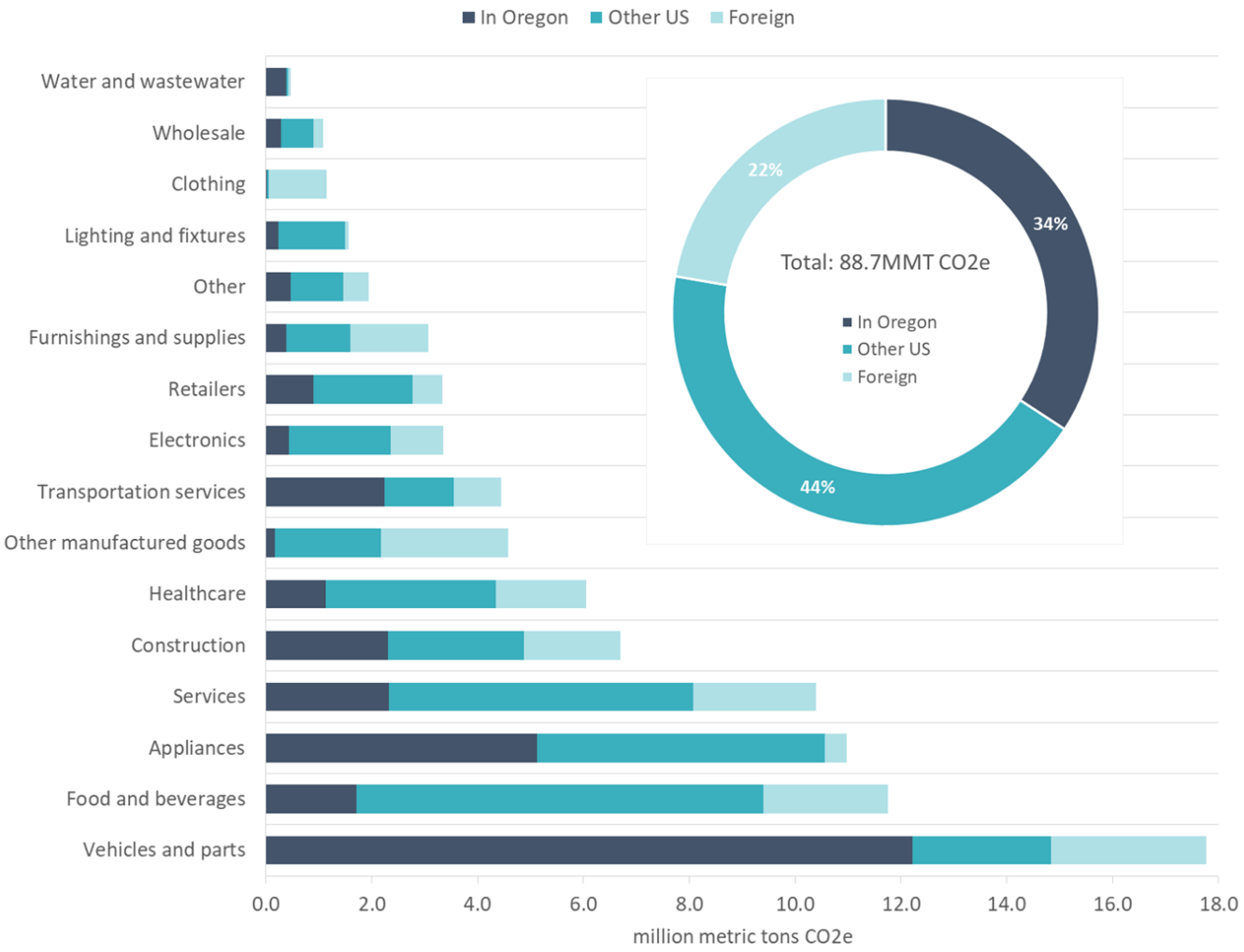
Oregon 2015 consumption-based GHG emissions, by category of consumption and life cycle stage



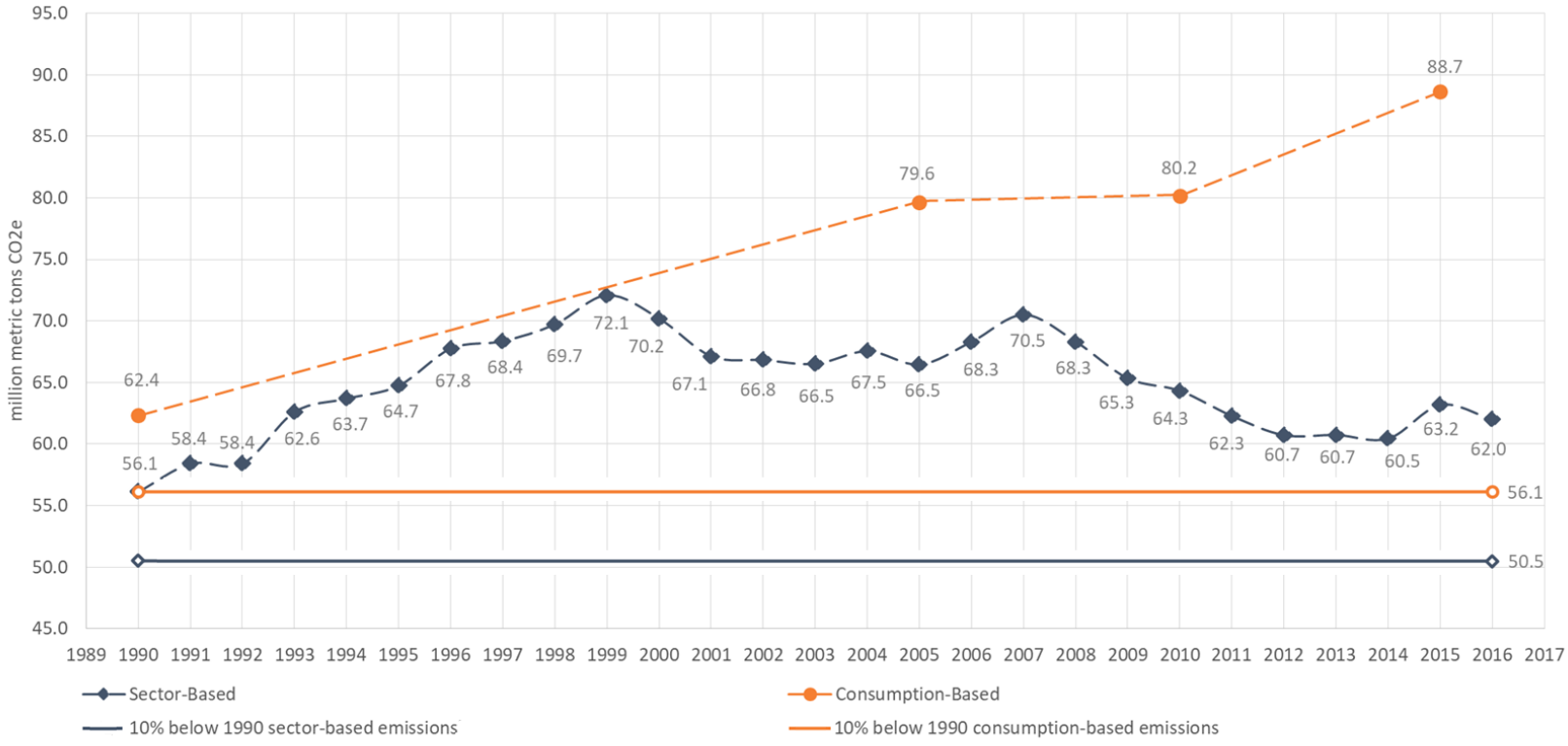
Oregon 2015 consumption-based GHG emissions, by consumer type



2015 Oregon consumption-based GHG emissions, by location of emission



Oregon sector-based and consumption-based GHG emissions, 1990 - 2016



Supporting the field of practice

How can we use this wealth on new information to inform climate action plans?

- Goals and targets
- Emission reduction measures
- Materials management solutions

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Q&A

Derik Broekhoff
Stockholm Environment Institute

Chris Jones
CoolClimate Network

Babe O'Sullivan
Oregon Department of Environmental Quality

West Coast Climate & Materials Management Forum

Q&A

Links for more information:

- coolclimate.berkeley.edu/scenarios
- sustainableconsumption.usdn.org/climate/cbei-guidebook/overview
- oregon.gov/DEQ/mm/Pages/Consumption-based-GHG.aspx

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Next Up:

Oregon DEQ's Sustainability Frameworks White Paper: "A Review of Materials Sustainability Frameworks"

April 2019: Check back for date

More to come in the Webinar series in 2019:

May 2019: Preventing the Wasting of Food

June 2019: Food and Environment Product Footprint Research

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THANK YOU!

Please fill out the survey you receive after the webinar.

For more information, visit www.westcoastclimateforum.com

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& Materials Management Forum

CoolClimate Network

Smart Tools for a *Cooler* Planet

A University - Government - Business - NGO Partnership
at the University of California, Berkeley

CoolClimate Consumption-Based GHG Policy Tool

West Coast Climate Forum
March 5, 2019

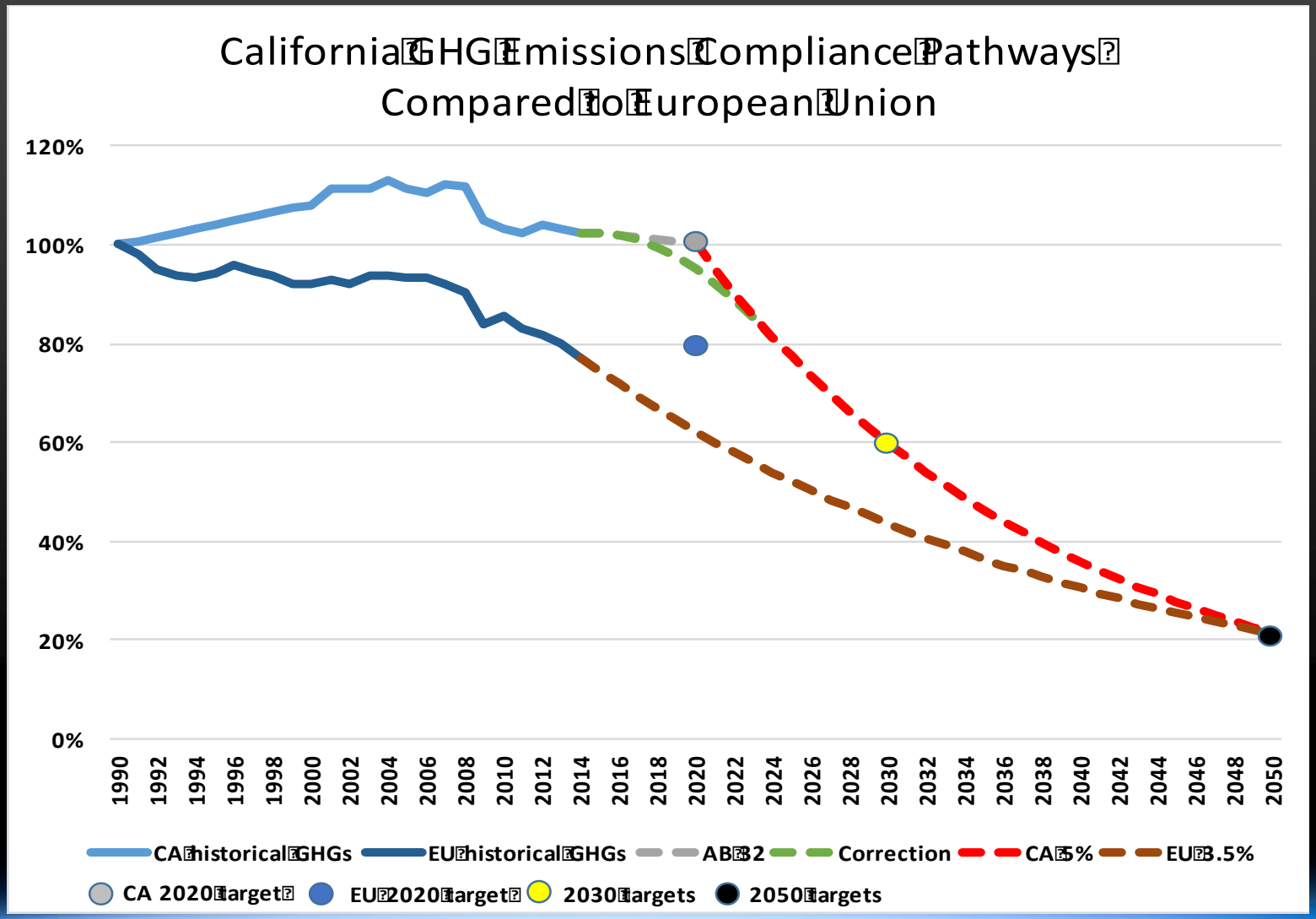
CoolClimate.org Network

Spheres of influence

A Socio-Ecological Model of Human Behavior

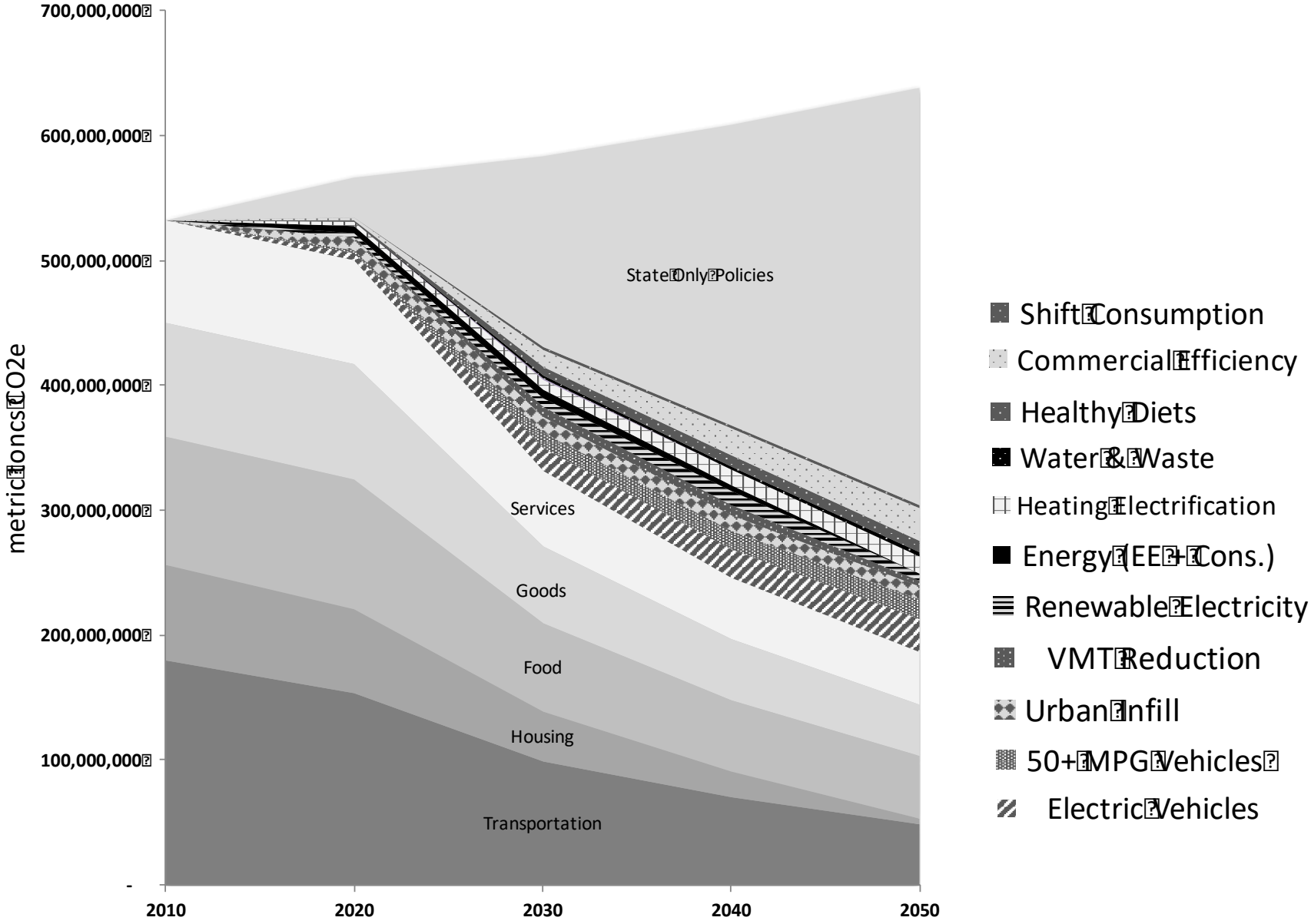
Adapted from Bronfenbrenner's Ecological Framework for Human Development

5% Annual GHG Abatement Needed to Meet Targets



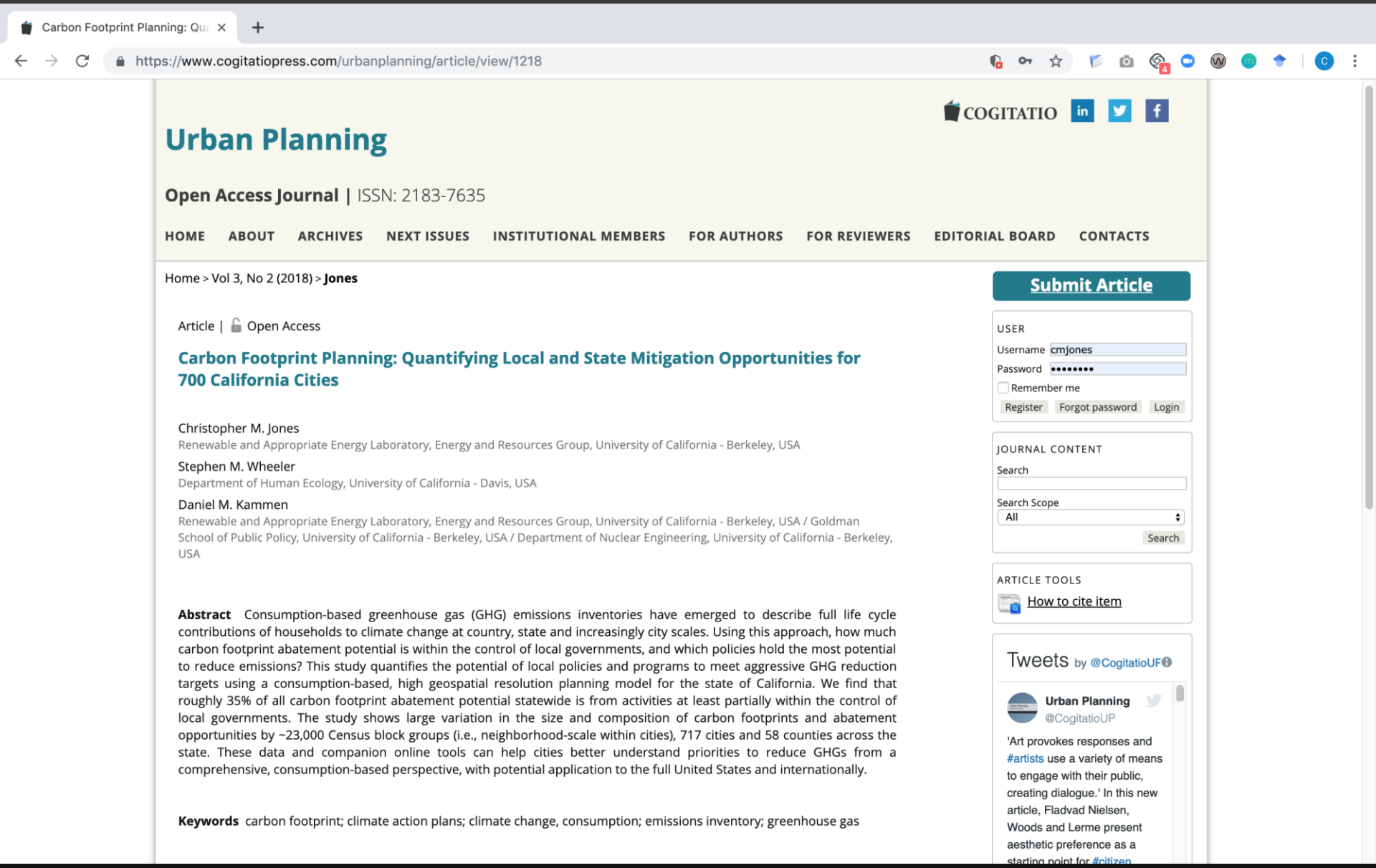
Source: Jones and Kammen, 2019. In Review

35% of GHG Reduction Potential is Within Control of Local Governments



Source: Jones, C., Wheeler, S., & Kammen, D. (2018). Carbon Footprint Planning: Quantifying Local and State Mitigation Opportunities for 700 California Cities. Urban Planning, 3(2), 35-51

Carbon Footprint Planning: An Open Source Publication



Carbon Footprint Planning: Qua

https://www.cogitatiopress.com/urbanplanning/article/view/1218

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Urban Planning

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Article | Open Access

Carbon Footprint Planning: Quantifying Local and State Mitigation Opportunities for 700 California Cities

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Stephen M. Wheeler
Department of Human Ecology, University of California - Davis, USA

Daniel M. Kammen
Renewable and Appropriate Energy Laboratory, Energy and Resources Group, University of California - Berkeley, USA / Goldman School of Public Policy, University of California - Berkeley, USA / Department of Nuclear Engineering, University of California - Berkeley, USA

Abstract Consumption-based greenhouse gas (GHG) emissions inventories have emerged to describe full life cycle contributions of households to climate change at country, state and increasingly city scales. Using this approach, how much carbon footprint abatement potential is within the control of local governments, and which policies hold the most potential to reduce emissions? This study quantifies the potential of local policies and programs to meet aggressive GHG reduction targets using a consumption-based, high geospatial resolution planning model for the state of California. We find that roughly 35% of all carbon footprint abatement potential statewide is from activities at least partially within the control of local governments. The study shows large variation in the size and composition of carbon footprints and abatement opportunities by ~23,000 Census block groups (i.e., neighborhood-scale within cities), 717 cities and 58 counties across the state. These data and companion online tools can help cities better understand priorities to reduce GHGs from a comprehensive, consumption-based perspective, with potential application to the full United States and internationally.

Keywords carbon footprint; climate action plans; climate change, consumption; emissions inventory; greenhouse gas

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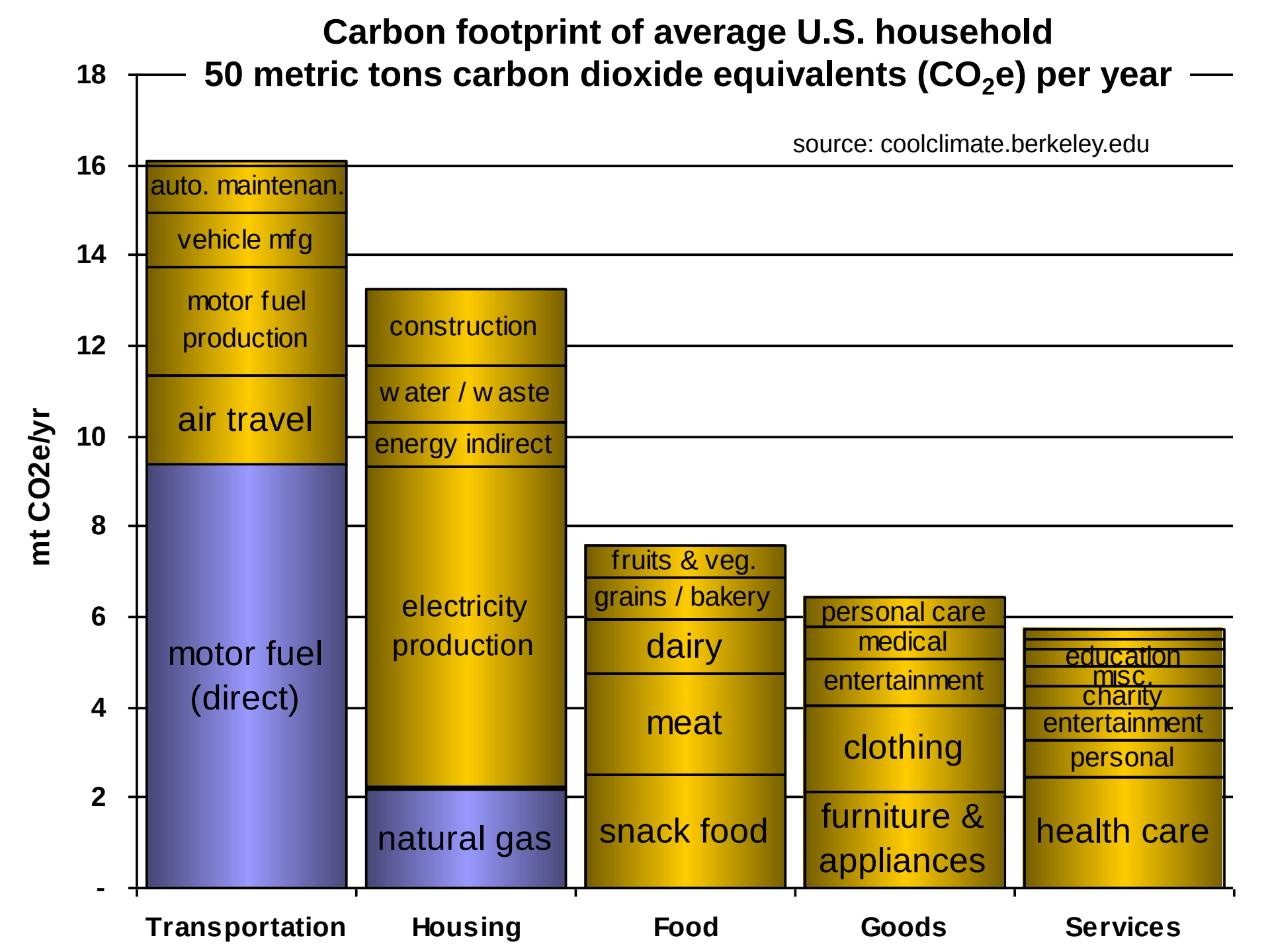
Tweets by @CogitatioUP

Urban Planning
@CogitatioUP

'Art provokes responses and #artists use a variety of means to engage with their public, creating dialogue.' In this new article, Fladvad Nielsen, Woods and Lerme present aesthetic preference as a starting point for #citizen

Source: Jones, C., Wheeler, S., & Kammen, D. (2018). Carbon Footprint Planning: Quantifying Local and State Mitigation Opportunities for 700 California Cities. Urban Planning, 3(2), 35-51.


Carbon footprint of average U.S. household
50 metric tons carbon dioxide equivalents (CO_2e) per year
source: coolclimate.berkeley.edu
mt CO2e/yr
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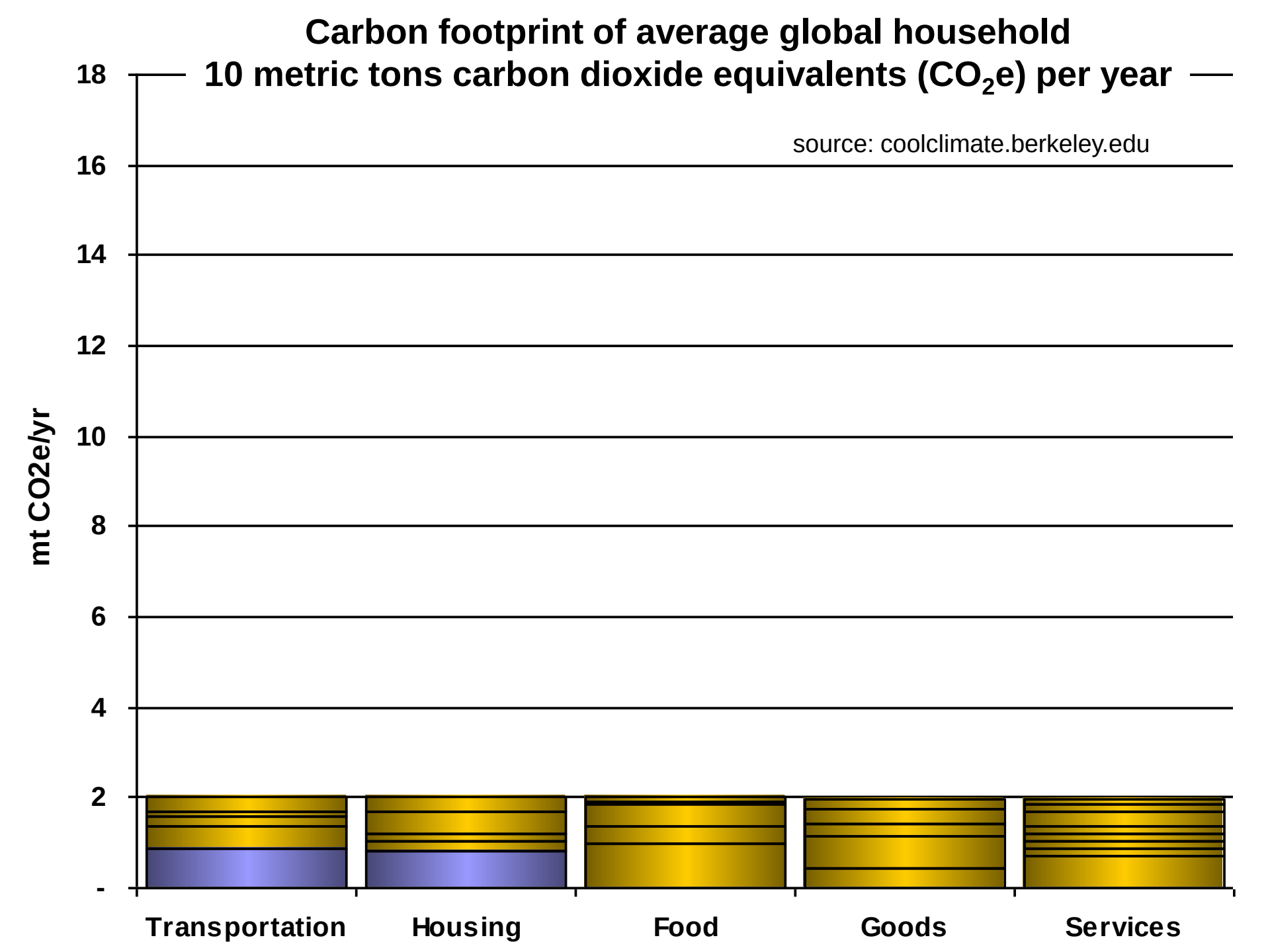
auto. maintenan.
vehicle mfg
motor fuel production
air travel
motor fuel (direct)
construction
water / waste
energy indirect
electricity production
natural gas
fruits & veg.
grains / bakery
dairy
meat
snack food
personal care
medical
entertainment
clothing
furniture & appliances
education
misc.
charity
entertainment
personal
health care
Transportation
Housing
Food
Goods
Services


Carbon footprint of average global household
10 metric tons carbon dioxide equivalents (CO_2e) per year
source: coolclimate.berkeley.edu
mt CO2e/yr
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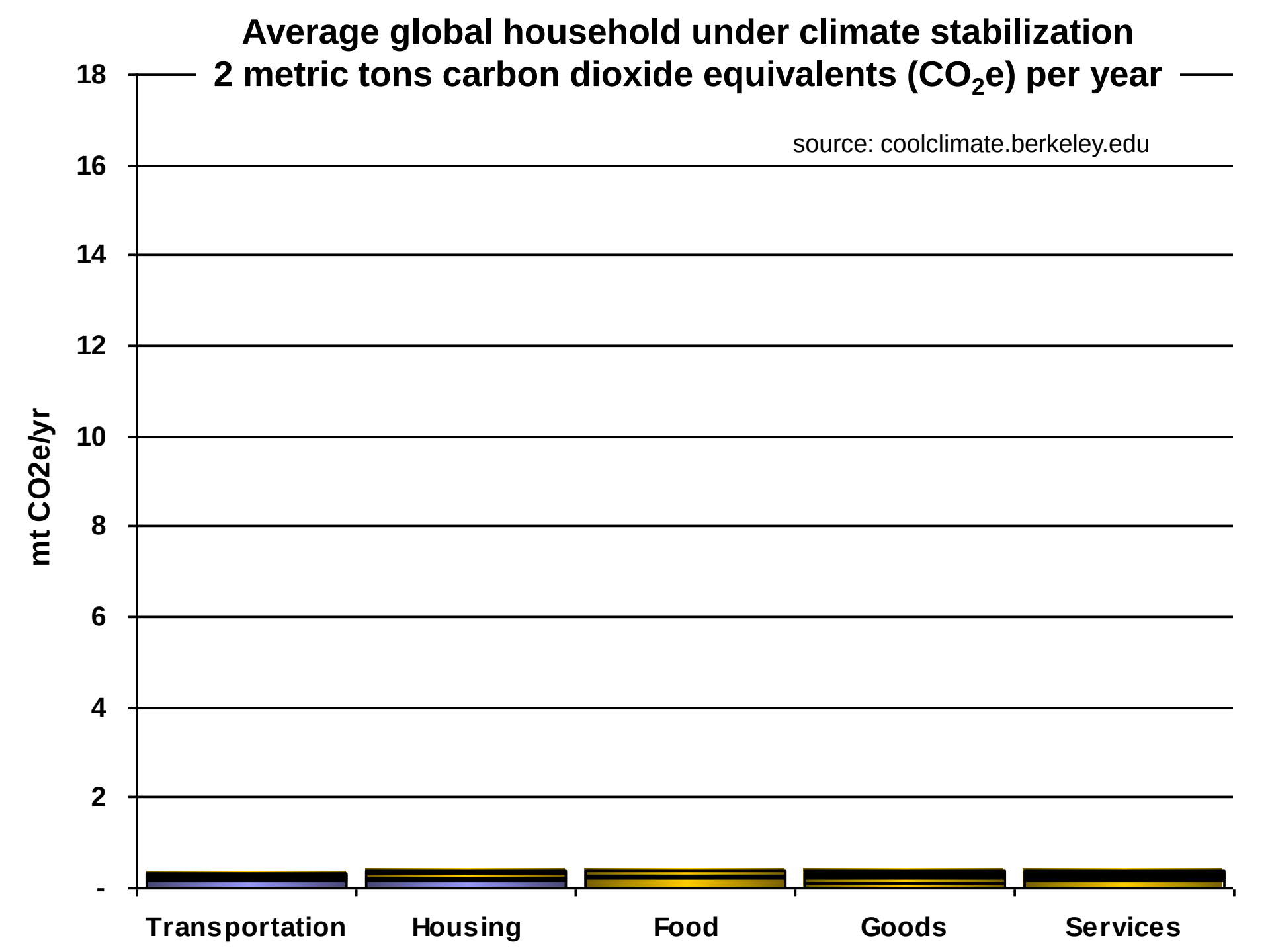
Transportation
Housing
Food
Goods
Services


Average global household under climate stabilization
2 metric tons carbon dioxide equivalents (CO_2e) per year
source: coolclimate.berkeley.edu
mt CO2e/yr
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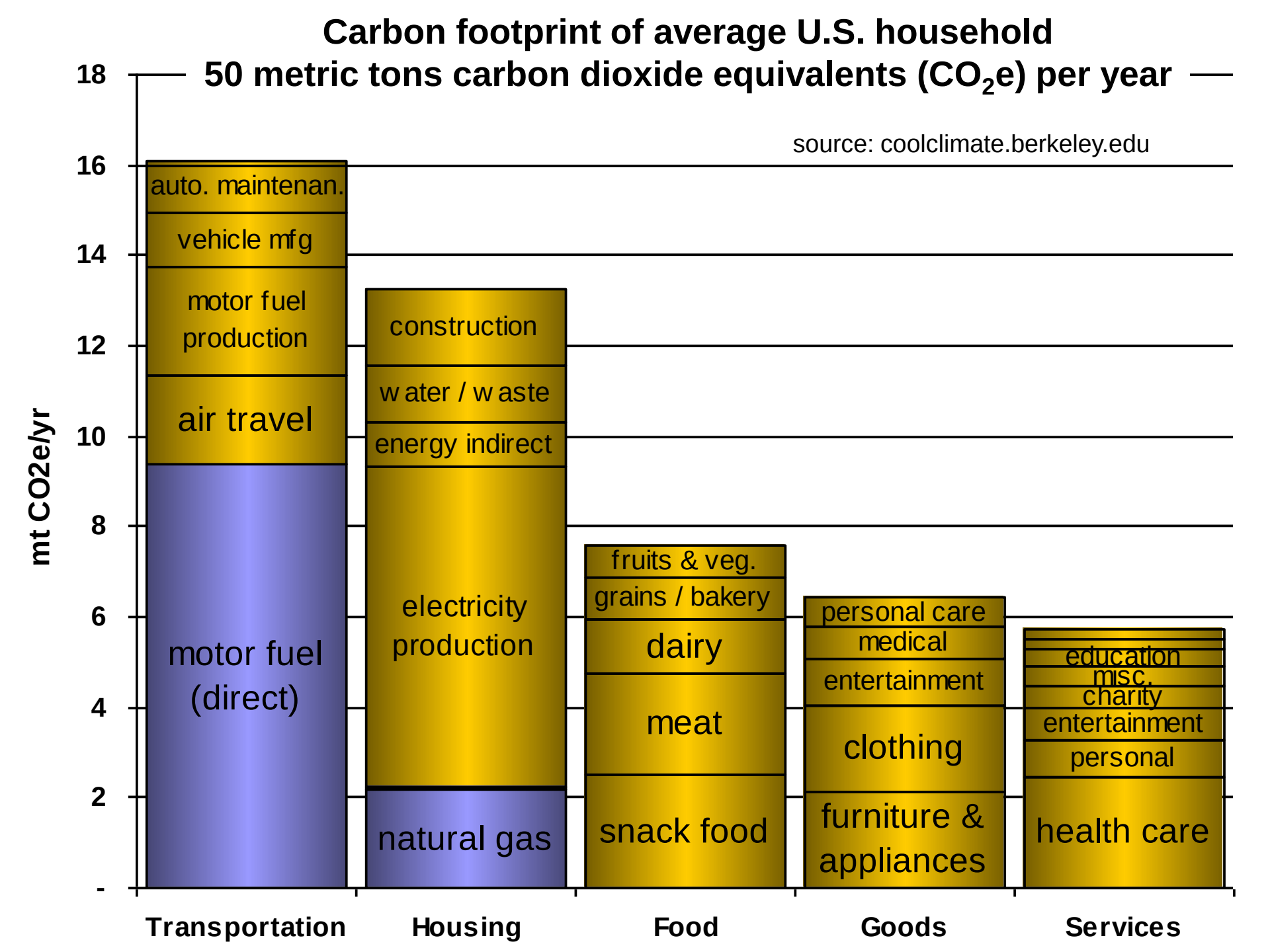
Food
Goods
Services


Carbon footprint of average U.S. household
50 metric tons carbon dioxide equivalents (CO_2e) per year
source: coolclimate.berkeley.edu
mt CO2e/yr
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motor fuel production
air travel
motor fuel (direct)
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water / waste
energy indirect
electricity production
natural gas
fruits & veg.
grains / bakery
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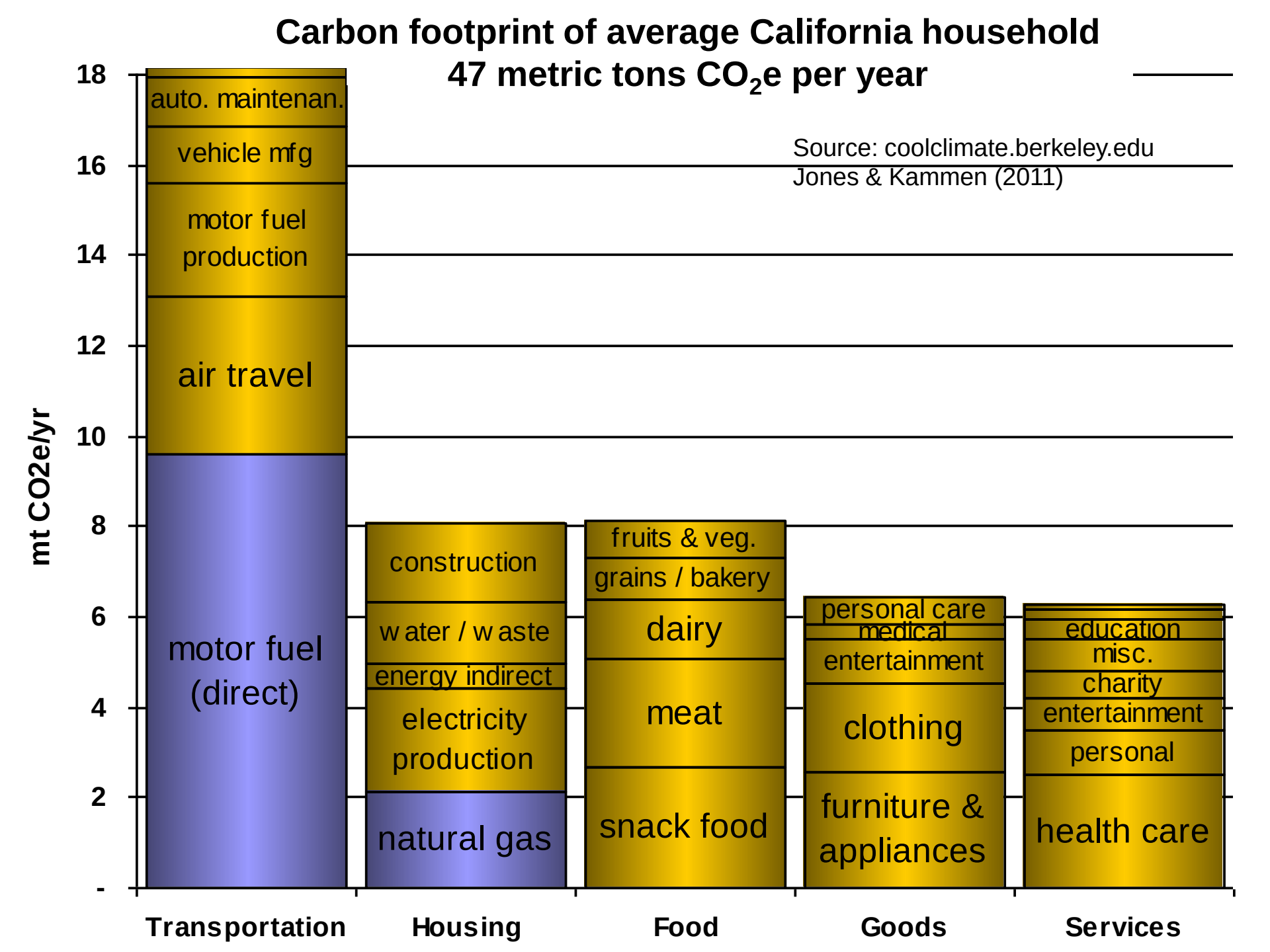
meat
snack food
personal care
medical
entertainment
clothing
furniture & appliances
education
misc.
charity
entertainment
personal
health care
Transportation
Housing
Food
Goods
Services


Carbon footprint of average California household
47 metric tons CO_2e per year
Source: coolclimate.berkeley.edu
Jones & Kammen (2011)
mt CO2e/yr
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auto. maintenan.
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motor fuel production
air travel
motor fuel (direct)
construction
water / waste
energy indirect
electricity production
natural gas
fruits & veg.
grains / bakery
dairy
meat
snack food
personal care
medical
entertainment
clothing
furniture & appliances
education
misc.
charity
entertainment
personal
health care
Transportation
Housing
Food
Goods
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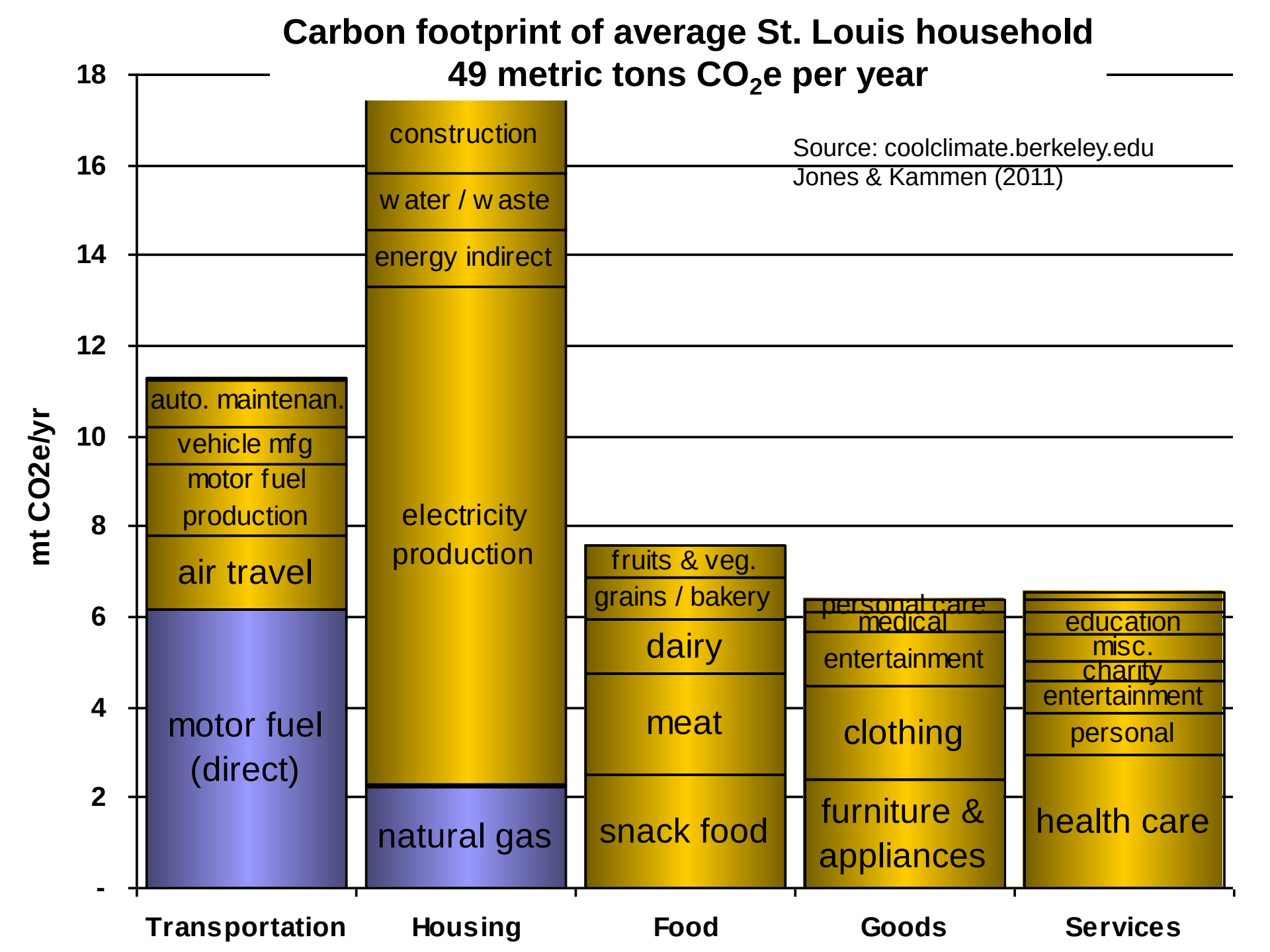
Carbon footprint of average St. Louis household
49 metric tons CO2e per year
Source: coolclimate.berkeley.edu
Jones & Kammen (2011)
mt CO2e/yr
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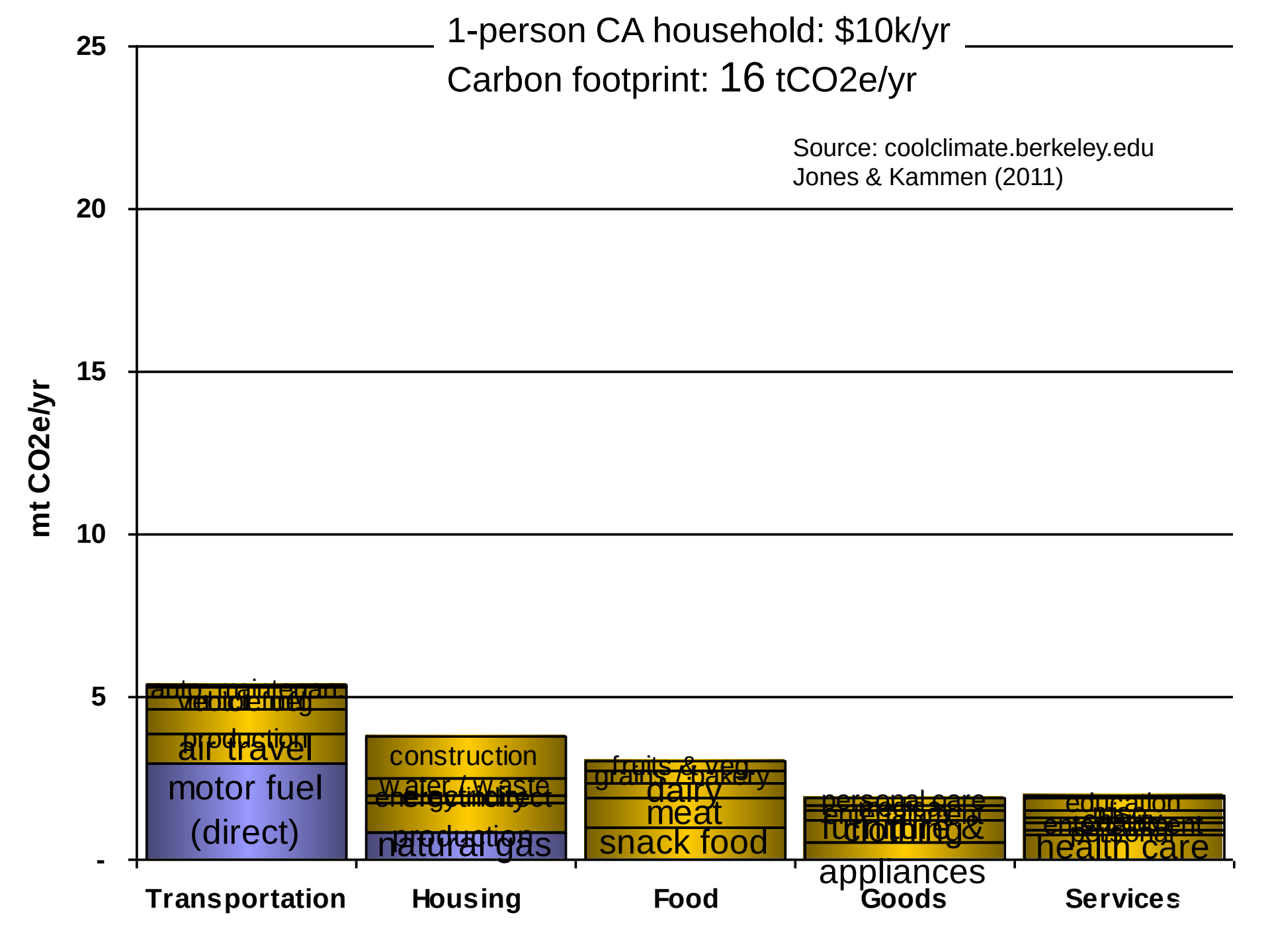
auto. maintenan.
vehicle mfg
motor fuel production
air travel
motor fuel (direct)
construction
water / waste
energy indirect
electricity production
natural gas
fruits & veg.
grains / bakery
dairy
meat
snack food
personal care
medical
entertainment
clothing
furniture & appliances
education
misc.
charity
entertainment
personal
health care
Transportation
Housing
Food
Goods
Services


1-person CA household: $10k/yr
Carbon footprint: 16 tCO2e/yr
Source: coolclimate.berkeley.edu
Jones & Kammen (2011)
mt CO2e/yr
25
20
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air travel
motor fuel (direct)
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meat
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appliances
health care
Transportation
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Food
Goods
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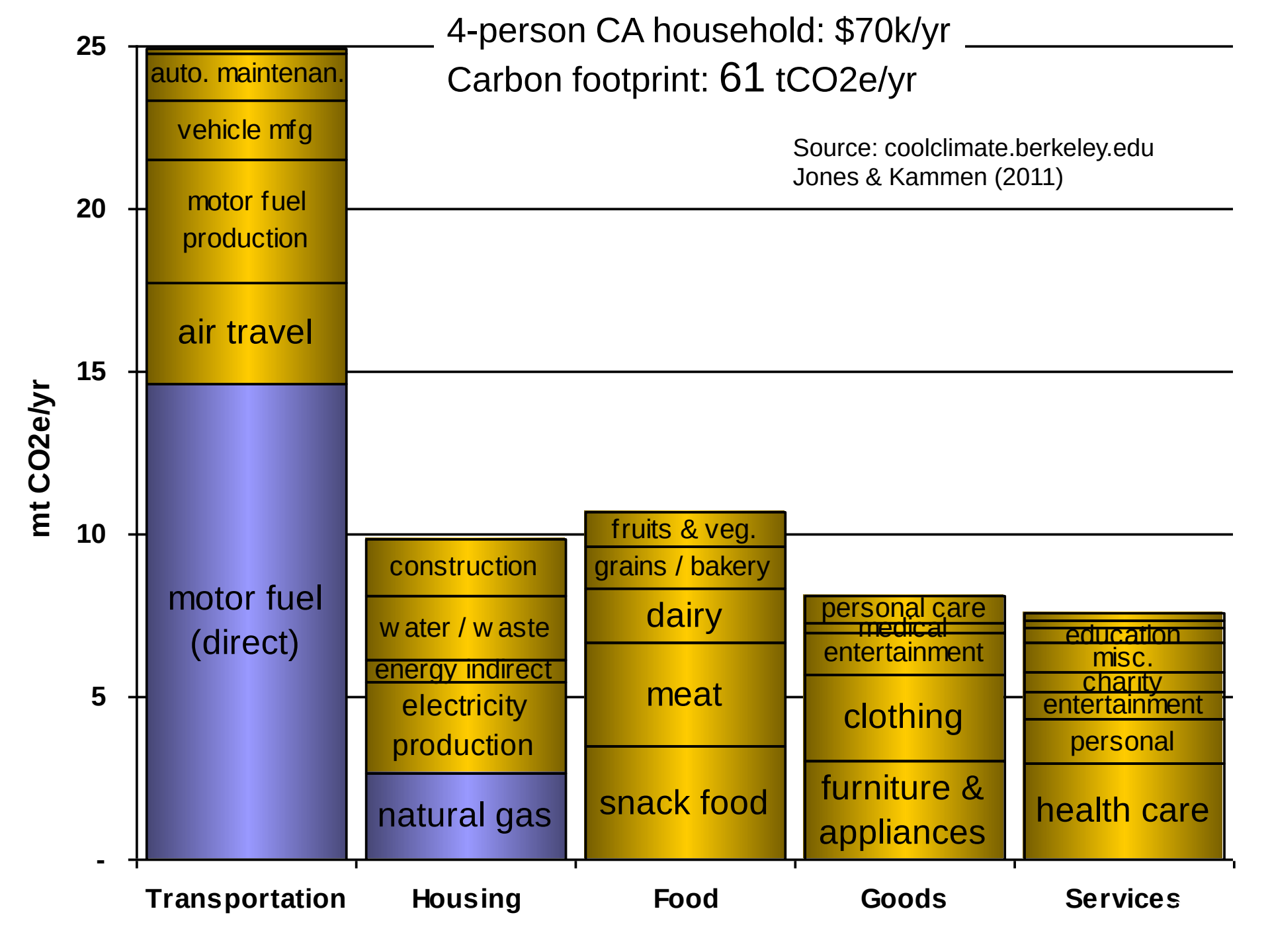
4-person CA household: $70k/yr
Carbon footprint: 61 tCO2e/yr
Source: coolclimate.berkeley.edu
Jones & Kammen (2011)
mt CO2e/yr
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vehicle mfg
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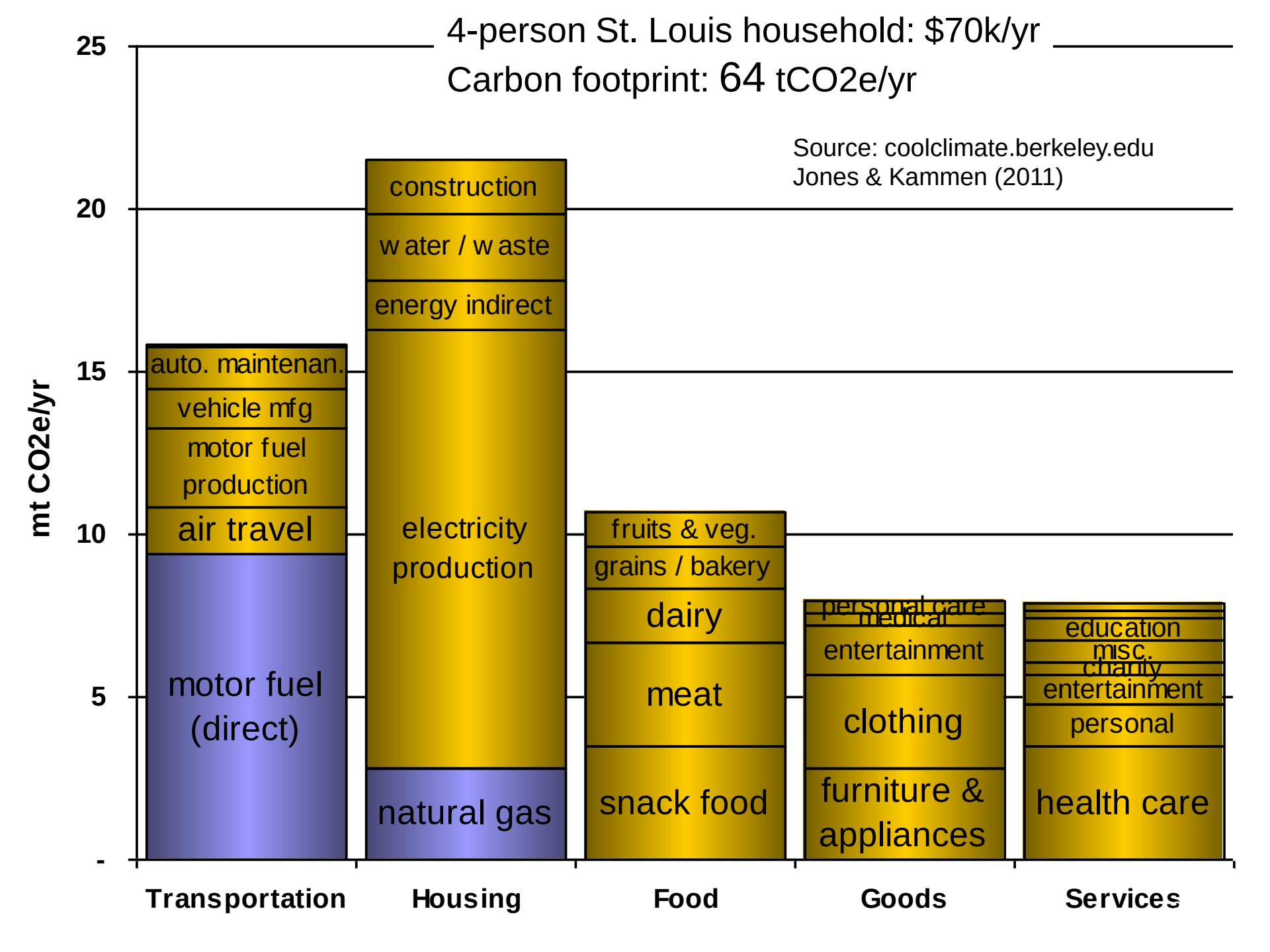
4-person St. Louis household: $70k/yr
Carbon footprint: 64 tCO2e/yr
Source: coolclimate.berkeley.edu
Jones & Kammen (2011)
mt CO2e/yr
25
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auto. maintenan.
vehicle mfg
motor fuel production
air travel
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construction
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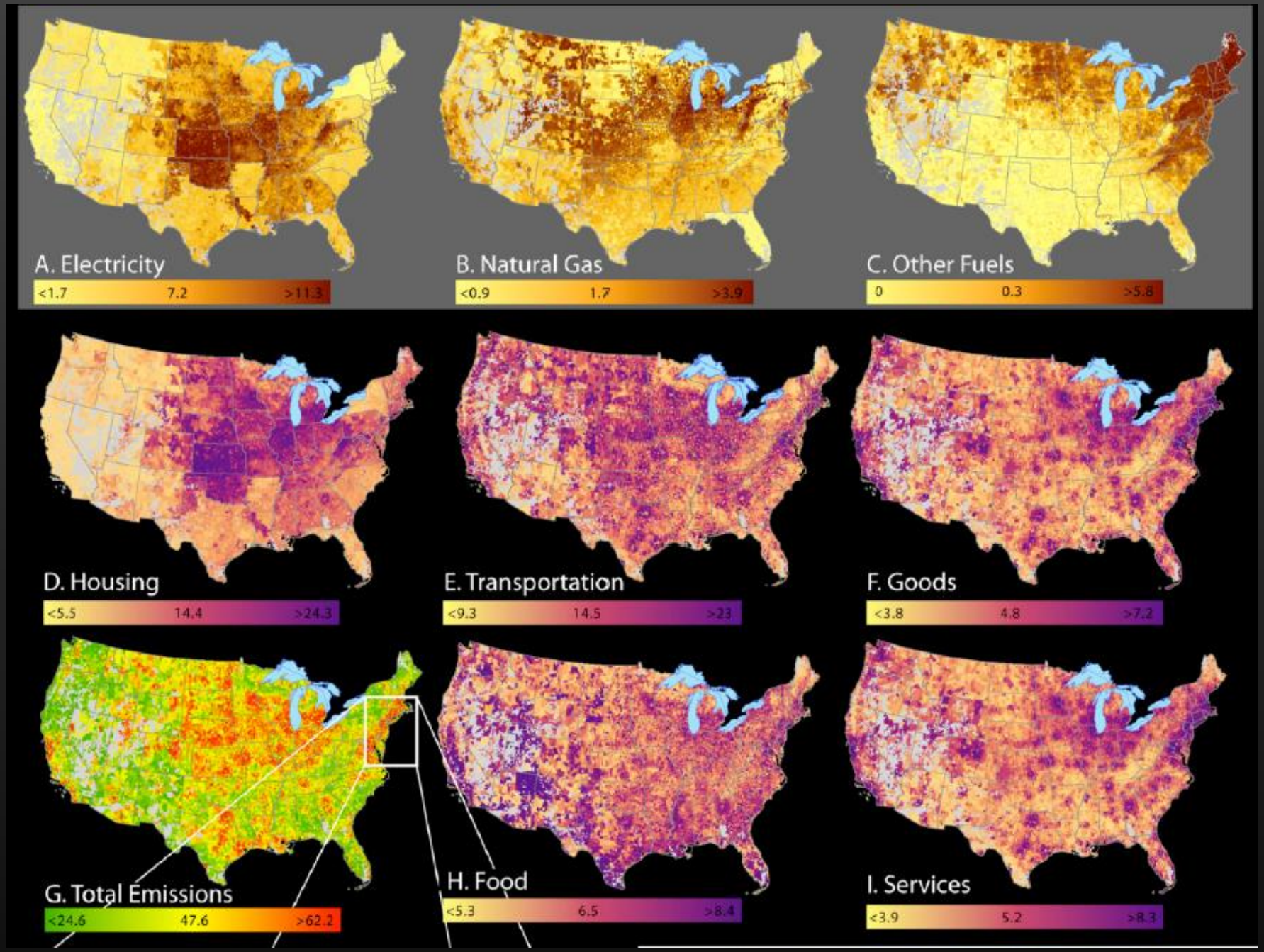
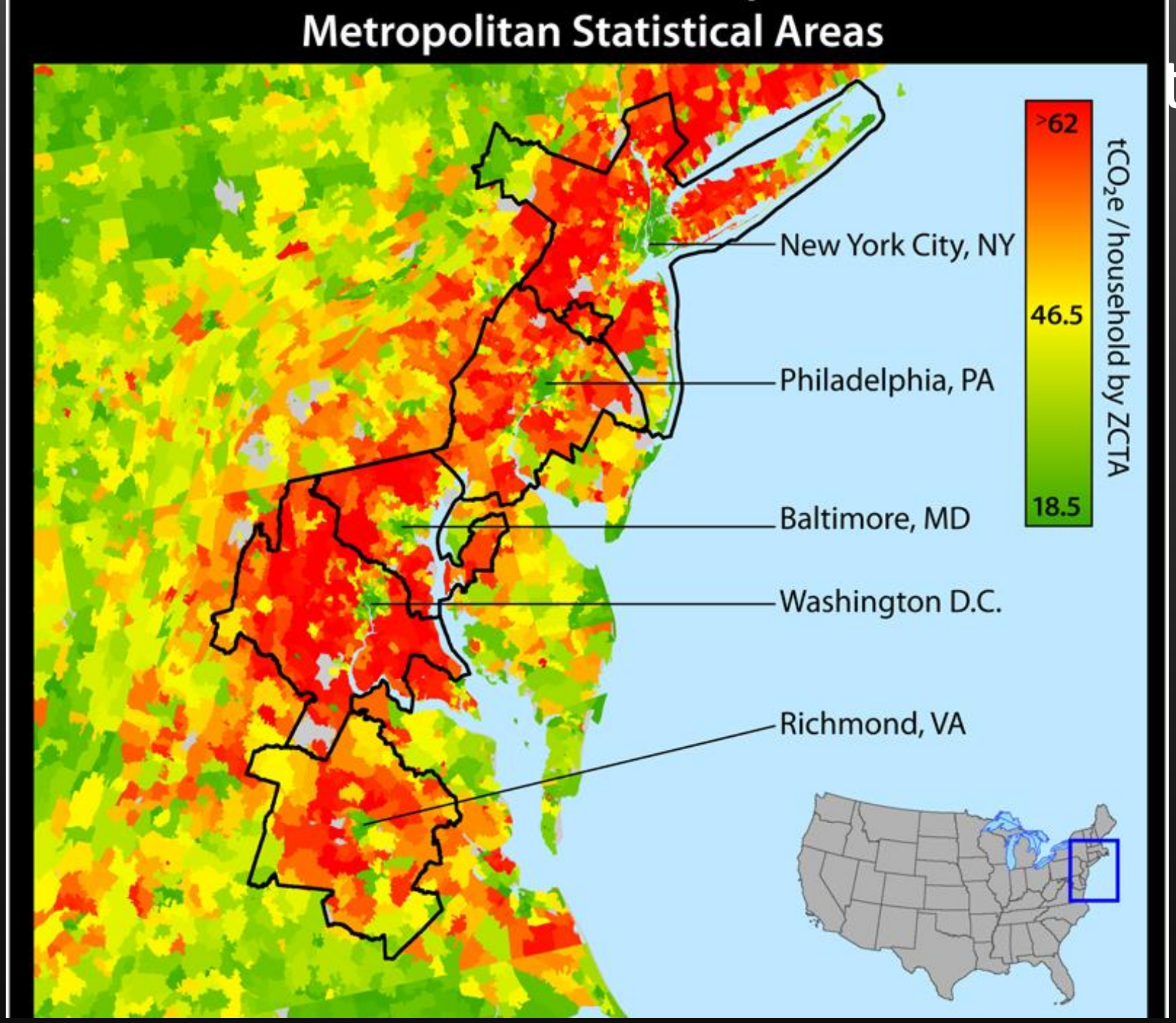


Source: Jones and Kammen (2014) *Env. Sci & Tech.*


Metropolitan Statistical Areas
New York City, NY
Philadelphia, PA
Baltimore, MD
Washington D.C.
Richmond, VA
>62
46.5
18.5
tCO2e /household by ZCTA

Household Carbon Footprints in SF Bay Area

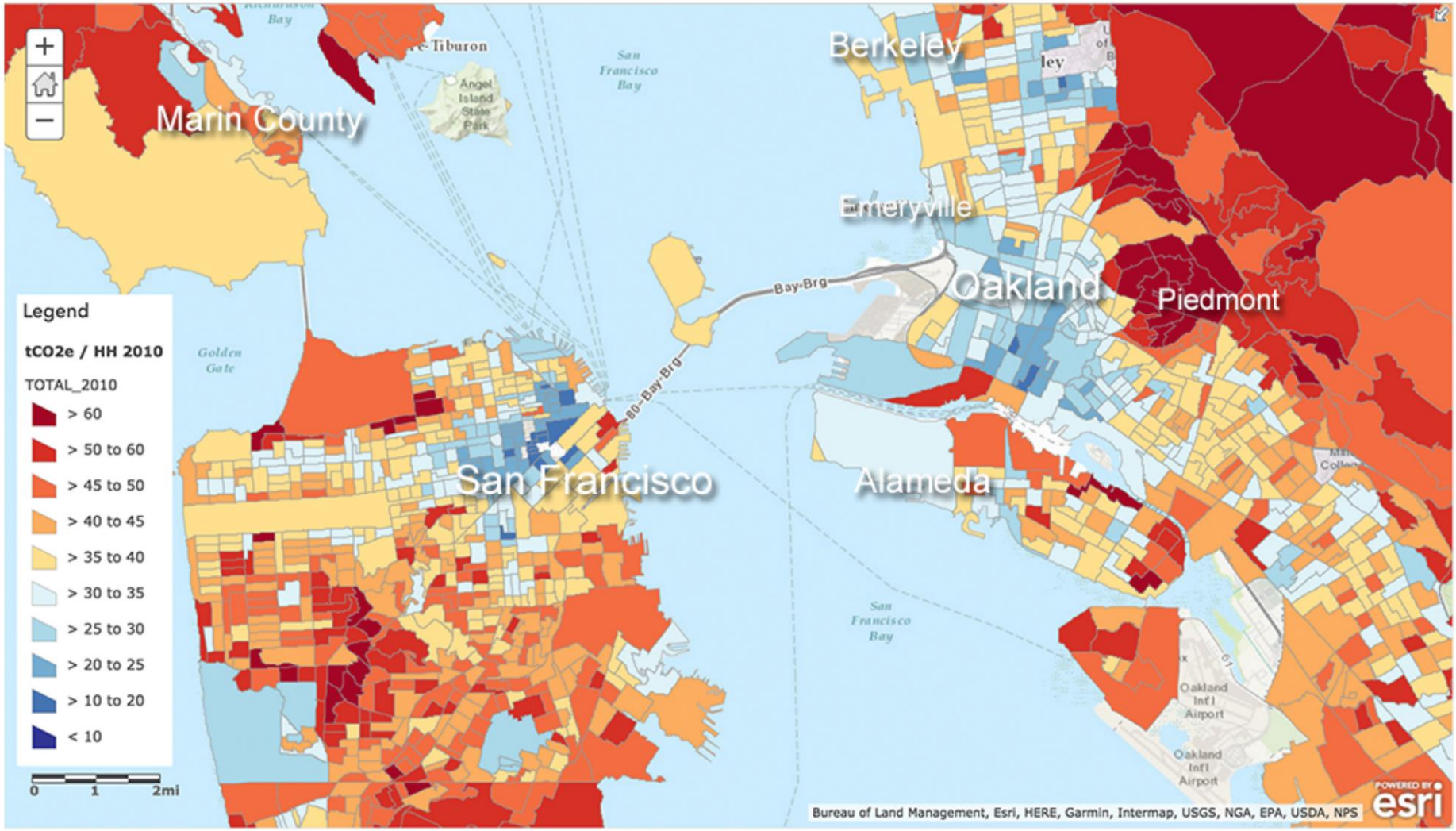
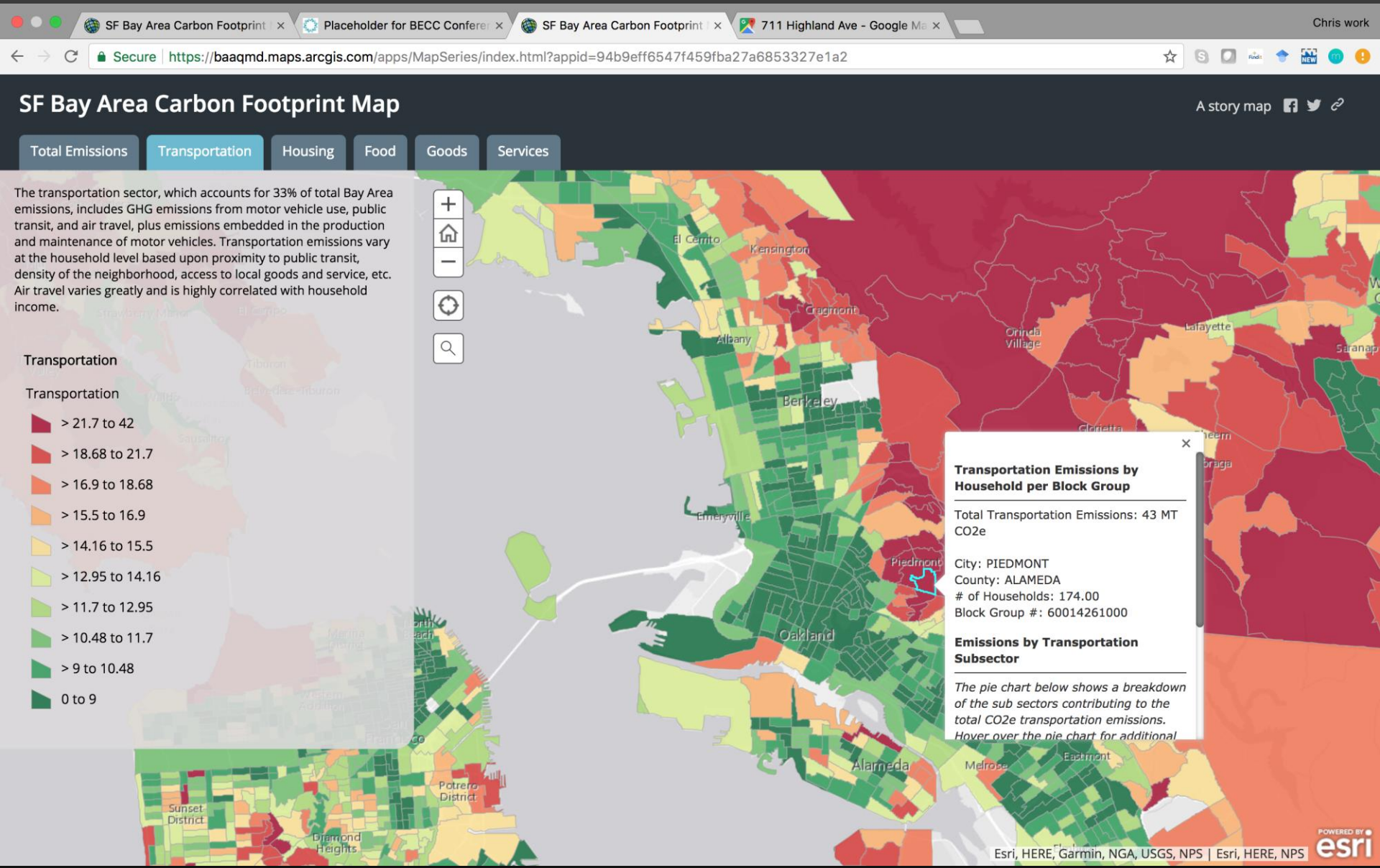
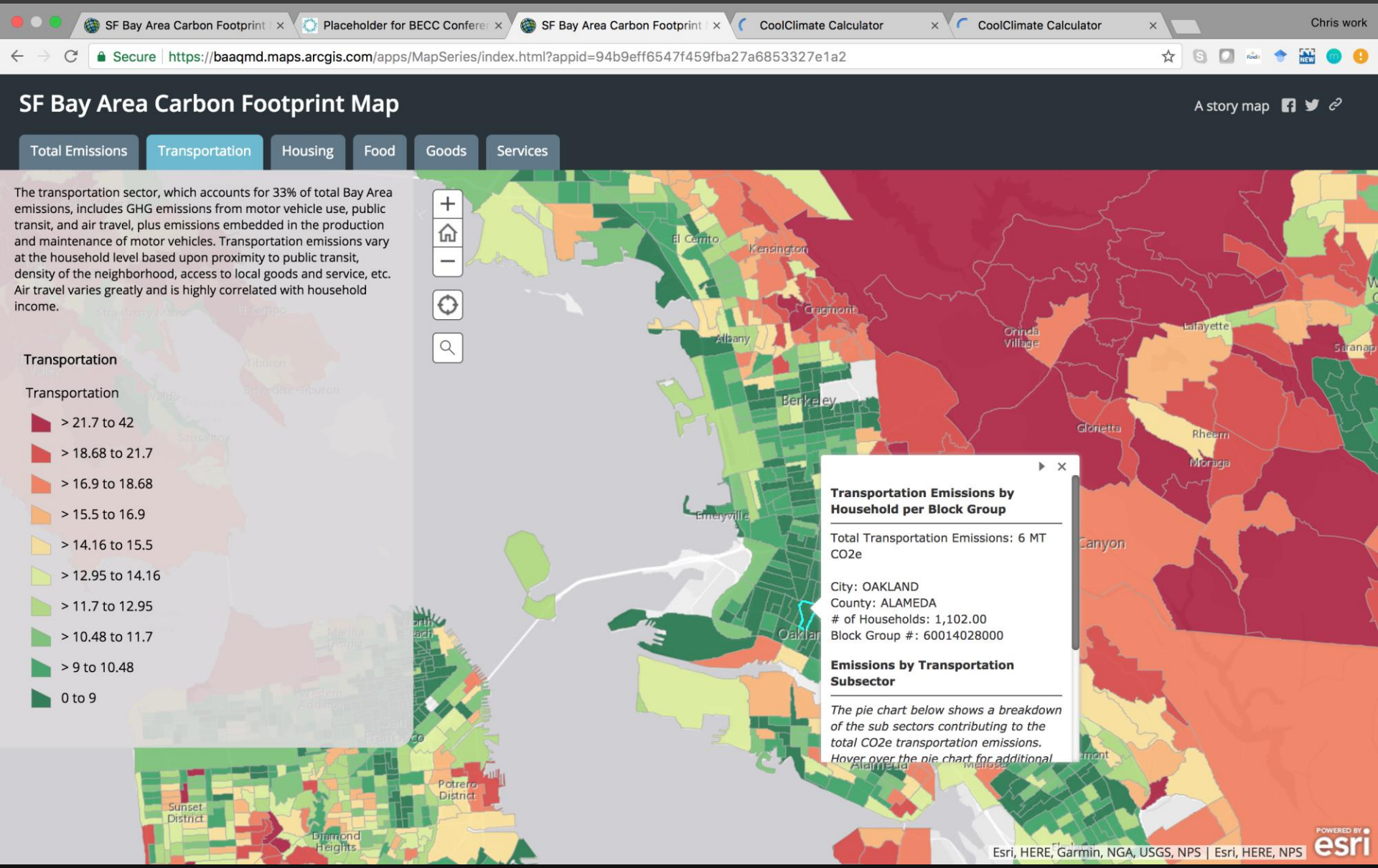


Figure 2. Carbon footprint of S.F. Bay Area households by Census block group.

Source: Jones, C., Wheeler, S., & Kammen, D. (2018). Carbon Footprint Planning: Quantifying Local and State Mitigation Opportunities for 700 California Cities. Urban Planning, 3(2), 35-51


SF Bay Area Carbon Footprint
Placeholder for BECC Confere
SF Bay Area Carbon Footprint
711 Highland Ave - Google Ma
Chris work
Secure | https://baaqmd.maps.arcgis.com/apps/MapSeries/index.html?appid=94b9eff6547f459fba27a6853327e1a2
SF Bay Area Carbon Footprint Map
A story map
Total Emissions
Transportation
Housing
Food
Goods
Services
The transportation sector, which accounts for 33% of total Bay Area emissions, includes GHG emissions from motor vehicle use, public transit, and air travel, plus emissions embedded in the production and maintenance of motor vehicles. Transportation emissions vary at the household level based upon proximity to public transit, density of the neighborhood, access to local goods and service, etc. Air travel varies greatly and is highly correlated with household income.
Transportation
Transportation
> 21.7 to 42
> 18.68 to 21.7
> 16.9 to 18.68
> 15.5 to 16.9
> 14.16 to 15.5
> 12.95 to 14.16
> 11.7 to 12.95
> 10.48 to 11.7
> 9 to 10.48
0 to 9
El Cerrito
Kensington
Albany
Cragmont
Orinda Village
Lafayette
Berkeley
Emeryville
Piedmont
Oakland
Alameda
Melrose
Eastmont
Sunset District
Potrero District
Diamond Heights
Transportation Emissions by Household per Block Group
Total Transportation Emissions: 43 MT CO2e
City: PIEDMONT
County: ALAMEDA
# of Households: 174.00
Block Group #: 60014261000
Emissions by Transportation Subsector
The pie chart below shows a breakdown of the sub sectors contributing to the total CO2e transportation emissions. Hover over the pie chart for additional
Esri, HERE, Garmin, NGA, USGS, NPS | Esri, HERE, NPS
POWERED BY esri


SF Bay Area Carbon Footprint
Placeholder for BECC Confere
SF Bay Area Carbon Footprint
CoolClimate Calculator
CoolClimate Calculator
Chris work
Secure | https://baaqmd.maps.arcgis.com/apps/MapSeries/index.html?appid=94b9eff6547f459fba27a6853327e1a2
SF Bay Area Carbon Footprint Map
A story map
Total Emissions
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> 12.95 to 14.16
> 11.7 to 12.95
> 10.48 to 11.7
> 9 to 10.48
0 to 9
El Cerrito
Kensington
Albany
Cragmont
Orinda Village
Lafayette
Berkeley
Glorietta
Rheem
Moraga
Emeryville
Alameda
Potrero District
Sunset District
Diamond Heights
Transportation Emissions by Household per Block Group
Total Transportation Emissions: 6 MT CO2e
City: OAKLAND
County: ALAMEDA
# of Households: 1,102.00
Block Group #: 60014028000
Emissions by Transportation Subsector
The pie chart below shows a breakdown of the sub sectors contributing to the total CO2e transportation emissions. Hover over the pie chart for additional
Esri, HERE, Garmin, NGA, USGS, NPS | Esri, HERE, NPS
POWERED BY esri

Table 1. Adoption rates of intervention areas in the year 2050.

		BAU	State Only	Local	Total
Urban Infill	New Growth in Low Carbon Zones	10%	0%	70%	80%
	Smaller Home Sizes (new)	0%	0%	25%	25%
Conservation	VMT Reduction	0%	5%	20%	25%
	Air Travel Reduction	0%	5%	20%	25%
	Energy Conservation	0%	0%	20%	20%
	Shift Consumption	0%	0%	25%	25%
	Healthy Diets	0%	0%	20%	20%
	Waste Conservation	0%	0%	30%	30%
	Water Conservation	0%	0%	30%	30%
Efficiency	50+ MPG Vehicles	10%	35%	5%	50%
	Energy Efficiency (new)	10%	20%	20%	50%
	Energy Efficiency (existing)	0%	20%	40%	60%
	Air Travel Efficiency	0%	30%	0%	30%
	Commercial Efficiency	10%	25%	25%	60%
	Waste Efficiency	0%	0%	40%	40%
	Industrial Efficiency	10%	50%	0%	60%
	Agricultural Efficiency	5%	50%	0%	55%
Renewable Energy	Electric Vehicles	5%	30%	15%	50%
	Zero Carbon Fuels	0%	30%	0%	30%
	Low Carbon Electricity	35%	25%	40%	100%
	Heating Electrification	0%	0%	100%	100%

Notes: Adoption rates of policy intervention areas expressed as a percentage of full adoption in the year 2050 (e.g., VMT will be reduced by 25%, and 50% of vehicles will be electric by 2050). Adoption rates under BAU, state only policies, local interventions and total (sum of each jurisdiction) is expressed in columns.

Table 2. Climate policy intervention areas by major category of household carbon footprints.

	Urban Infill	Conservation	Efficiency	Renewable Energy
Transportation	• Shorter travel distances	• Reduce VMT (transit, demand-side management)	• Fuel economy (or efficiency) standards	• Low carbon fuel standards • Electric vehicles
Energy	• Smaller homes • Adjusting thermostats	• Turning off lights • Energy efficiency standards	• Home retrofits • Heating Electrification	• Renewable energy
Food/Diets	• Smaller household sizes • Urban agriculture	• Eating less • Reducing food waste • Reducing meat, dairy & processed foods	• Buy organic, local, efficiently produced food	• Support farmers that have methane capture or renewable energy
Consumption & Waste	• Smaller household sizes • Smaller homes • Higher cost of living	• Improve conservation in commercial sector • Shift consumption to more services • Recycling	• Improve efficiency of local services • Encourage local services	• Electrification and renewable energy in commercial sector

Note: Examples of state and local policies are included in each box.

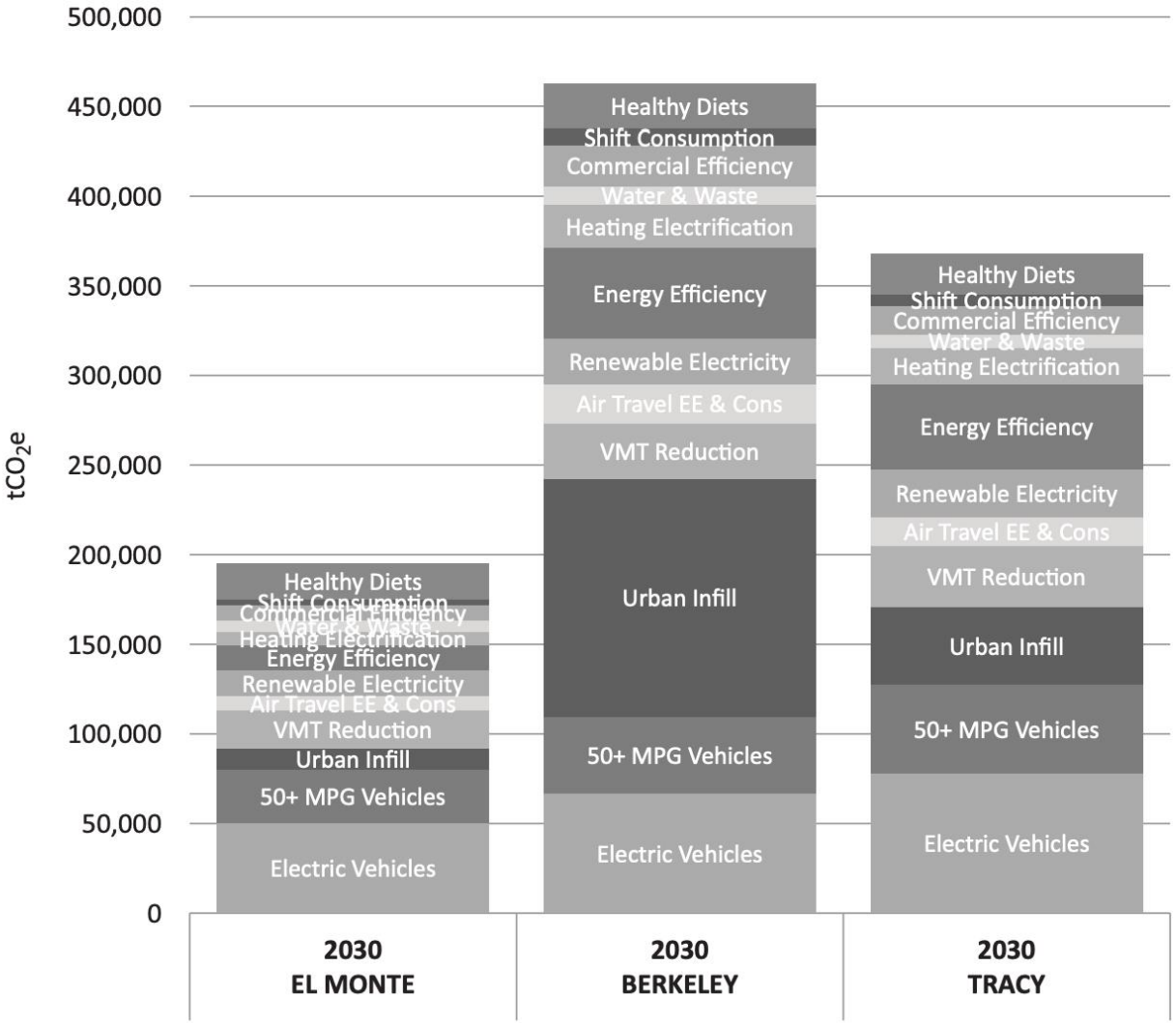


Figure 5. Carbon footprint abatement opportunities for selected cities with ~100,000 population.

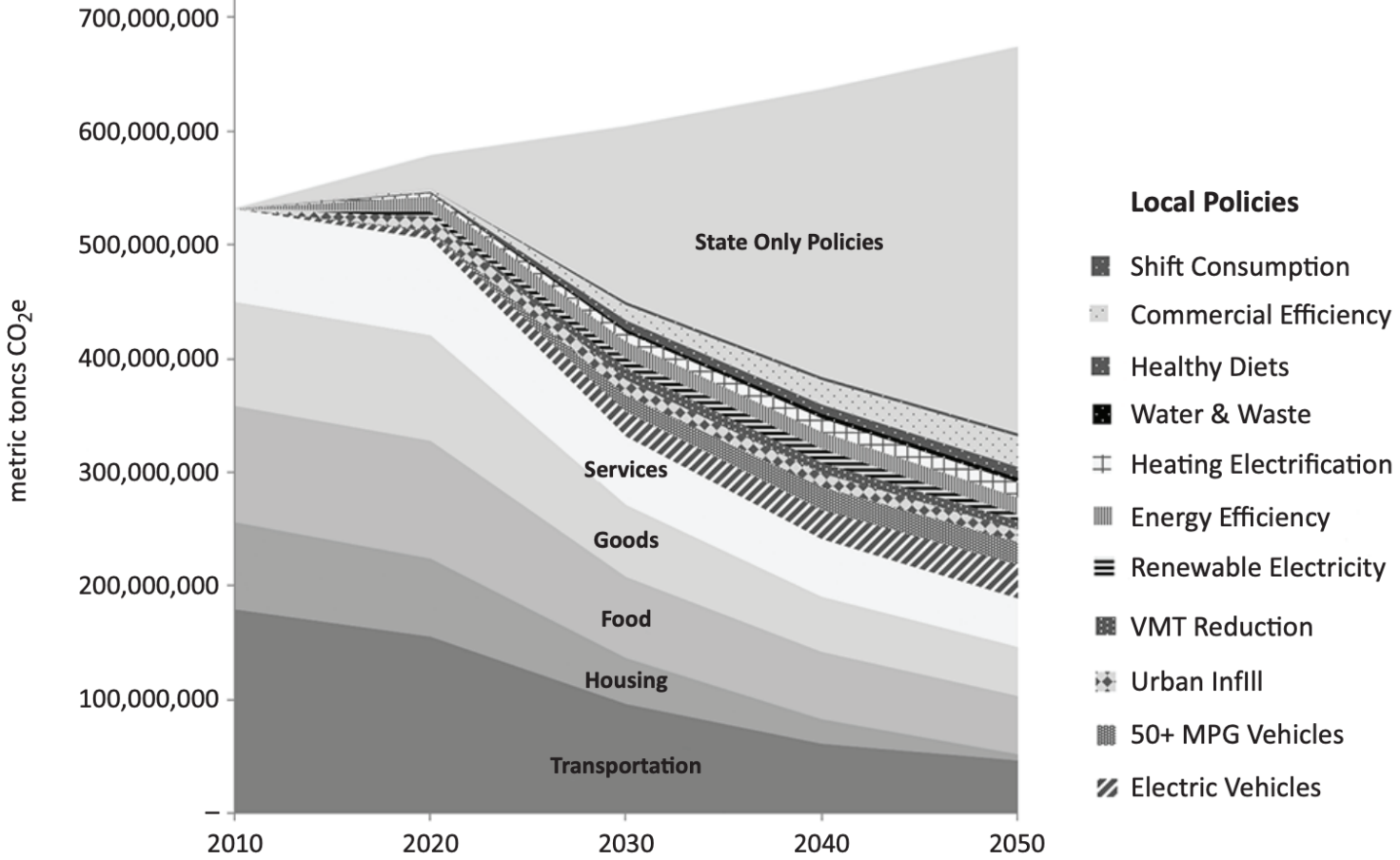
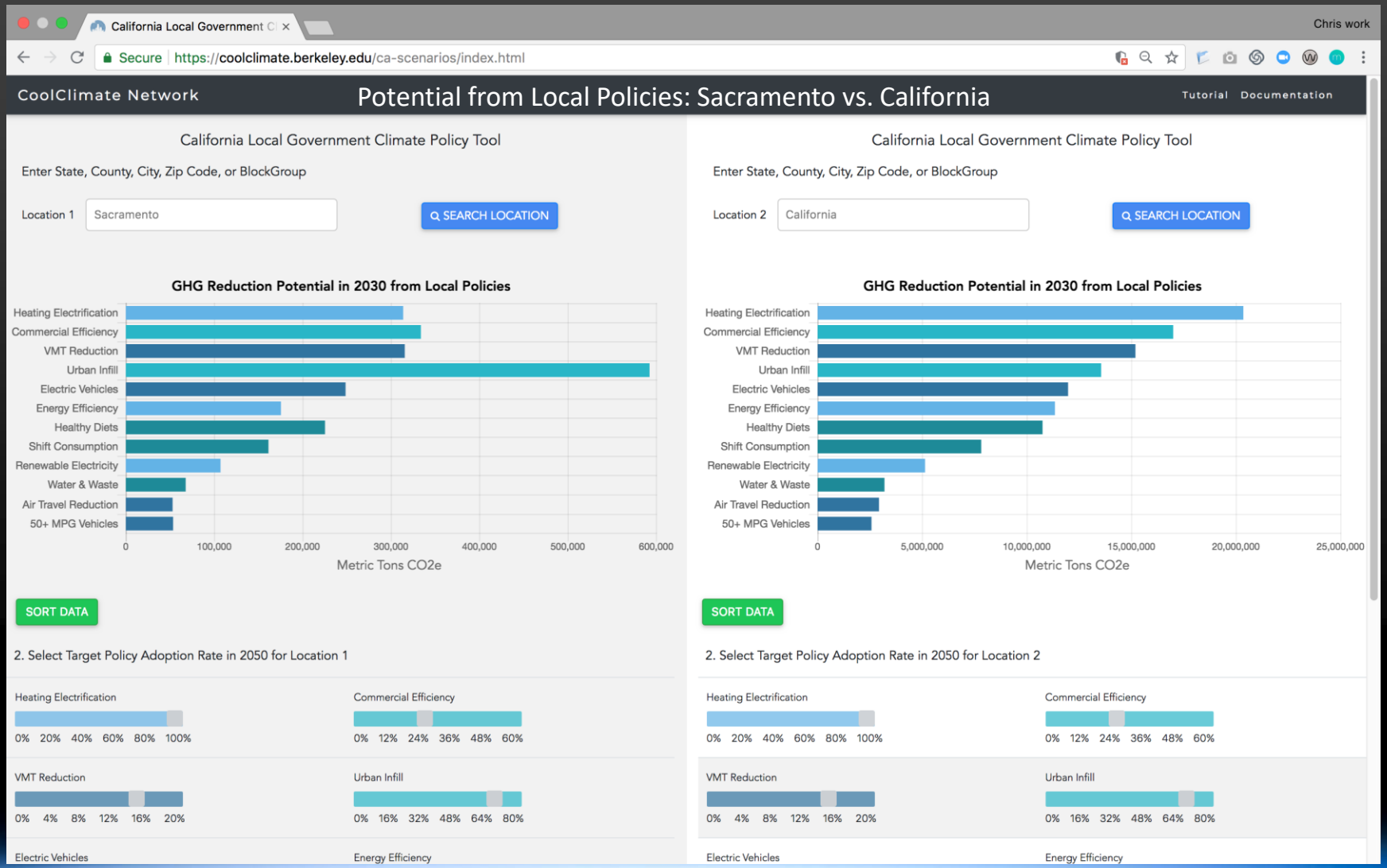


Figure 3. Carbon footprint abatement opportunities from local and state polices for state of California.

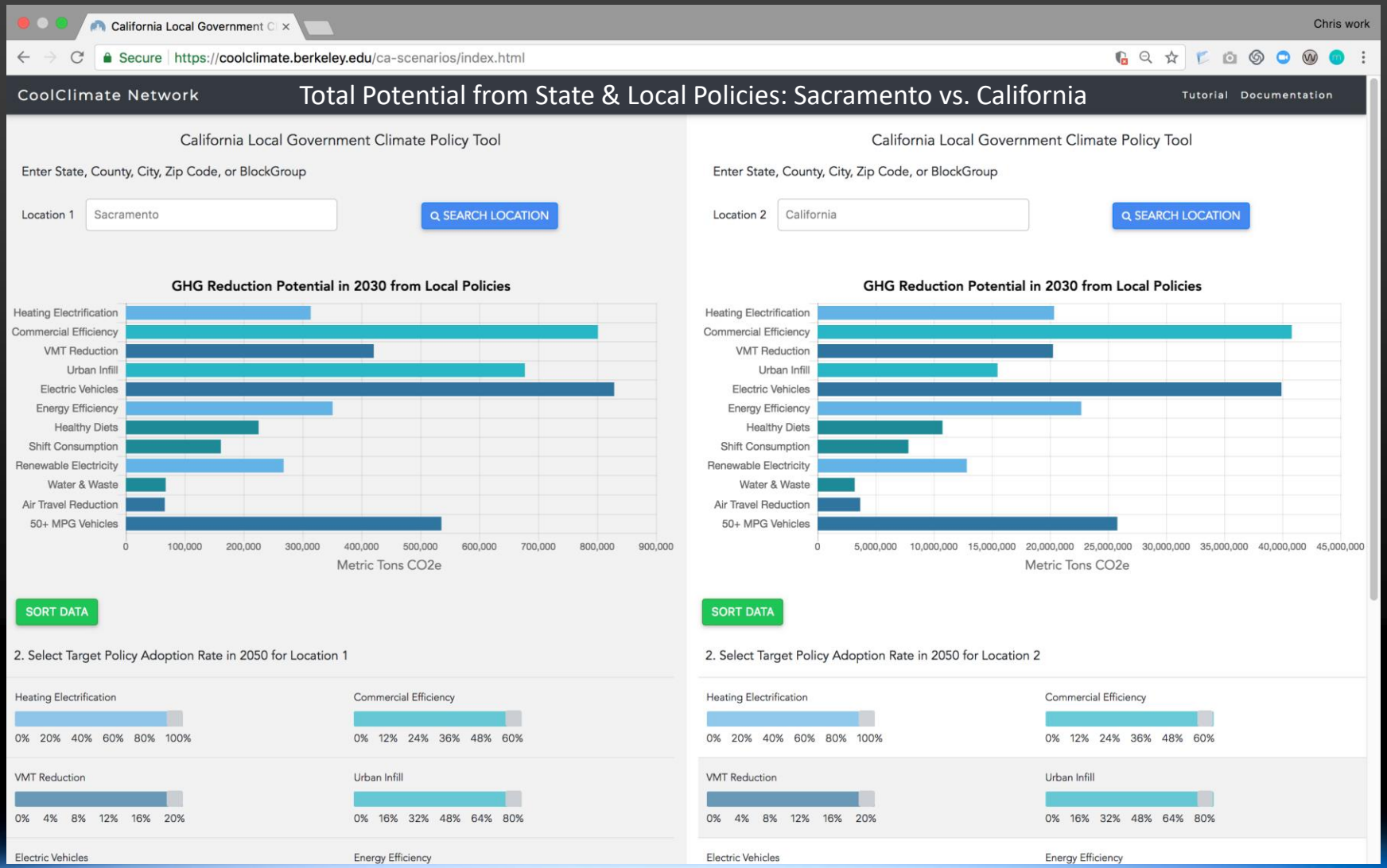
Table 3. Local GHG abatement potential in 2030 (million metric tons CO_2e) by carbon footprint category and intervention area.

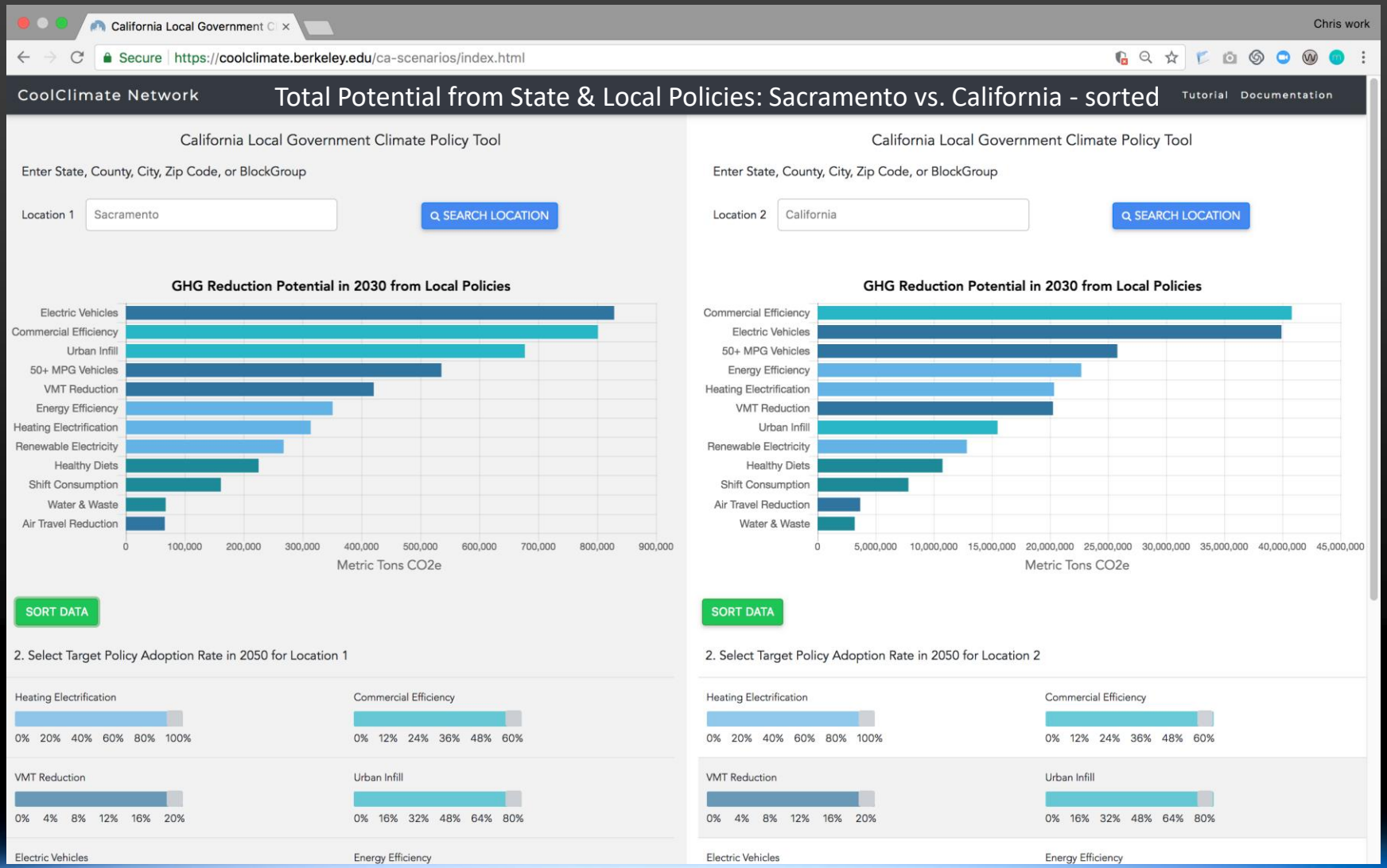
	Urban Infill	Conservation	Efficiency	Renewable Energy	Total
Transportation	2.5	5.4	15.6	21.1	50.5
Energy & Water	1.3	2.9	5.2	15.1	24.5
Food/Diets	1.8	7.3	—	—	9.1
Goods & Services	1.7	2.0	14.4	—	16.3
TOTAL	7.3	23.3	35.4	36.2	102.2

Potential from Local Policies: Sacramento vs. California



Total Potential from State & Local Policies: Sacramento vs. California

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Chris work
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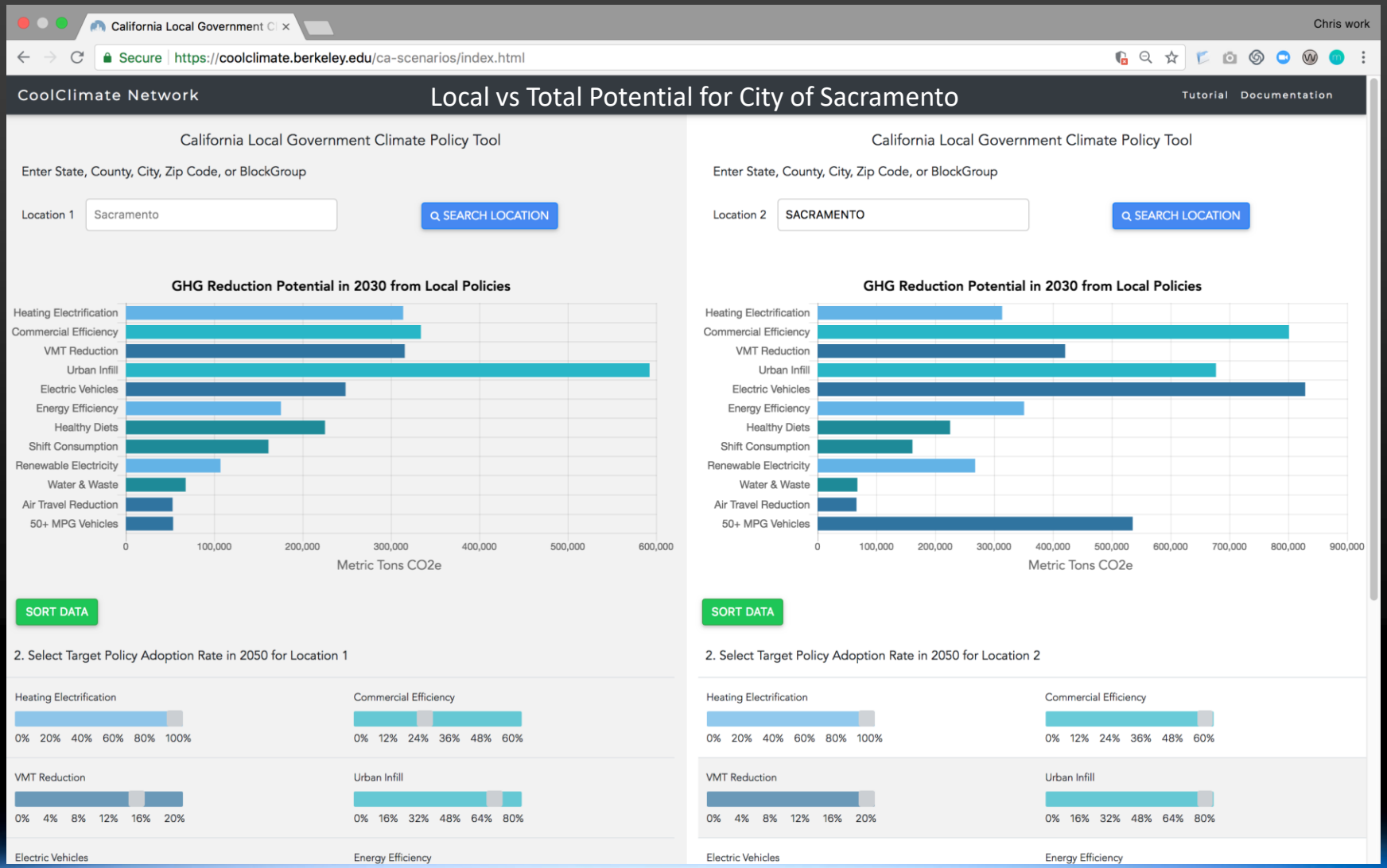
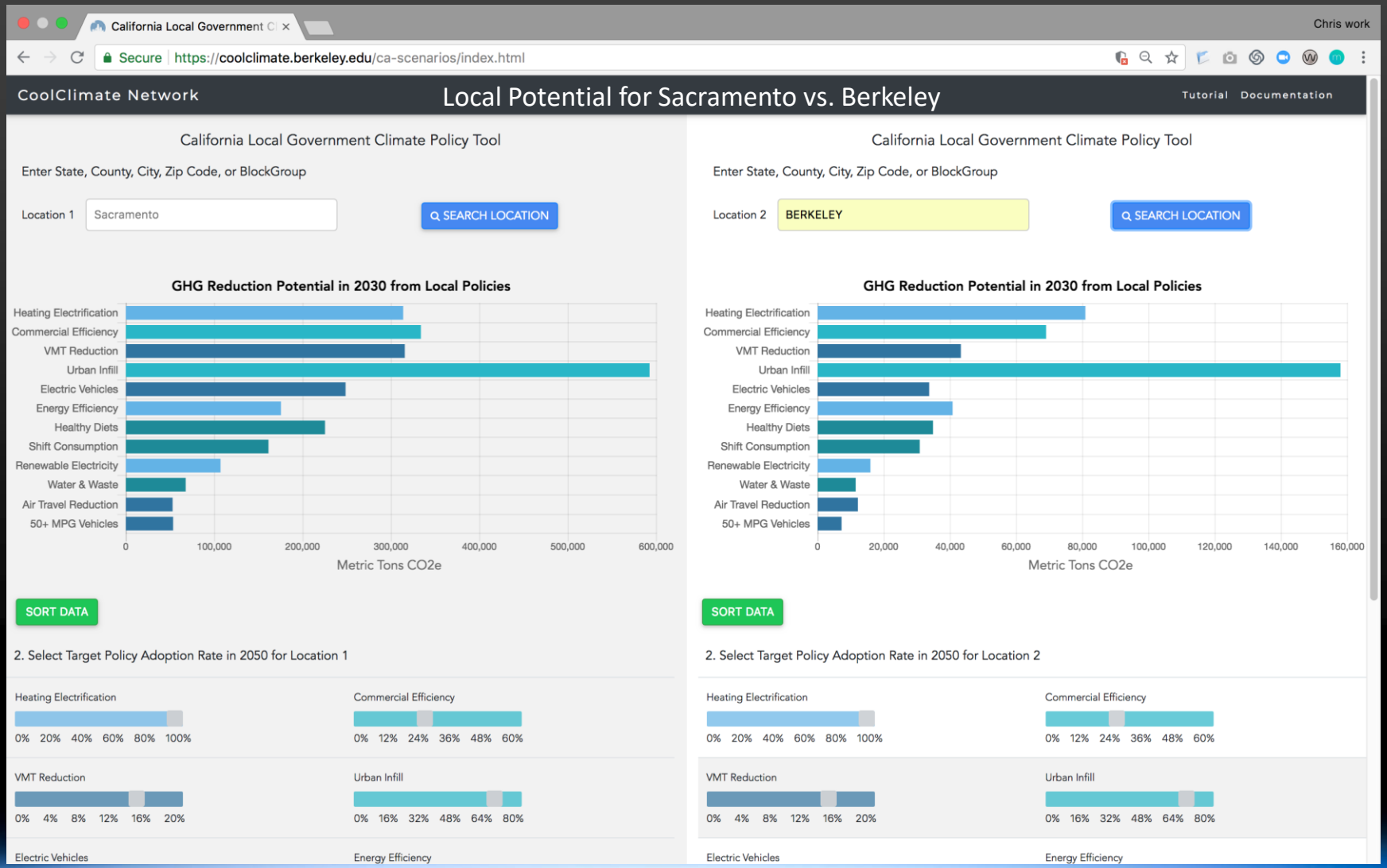
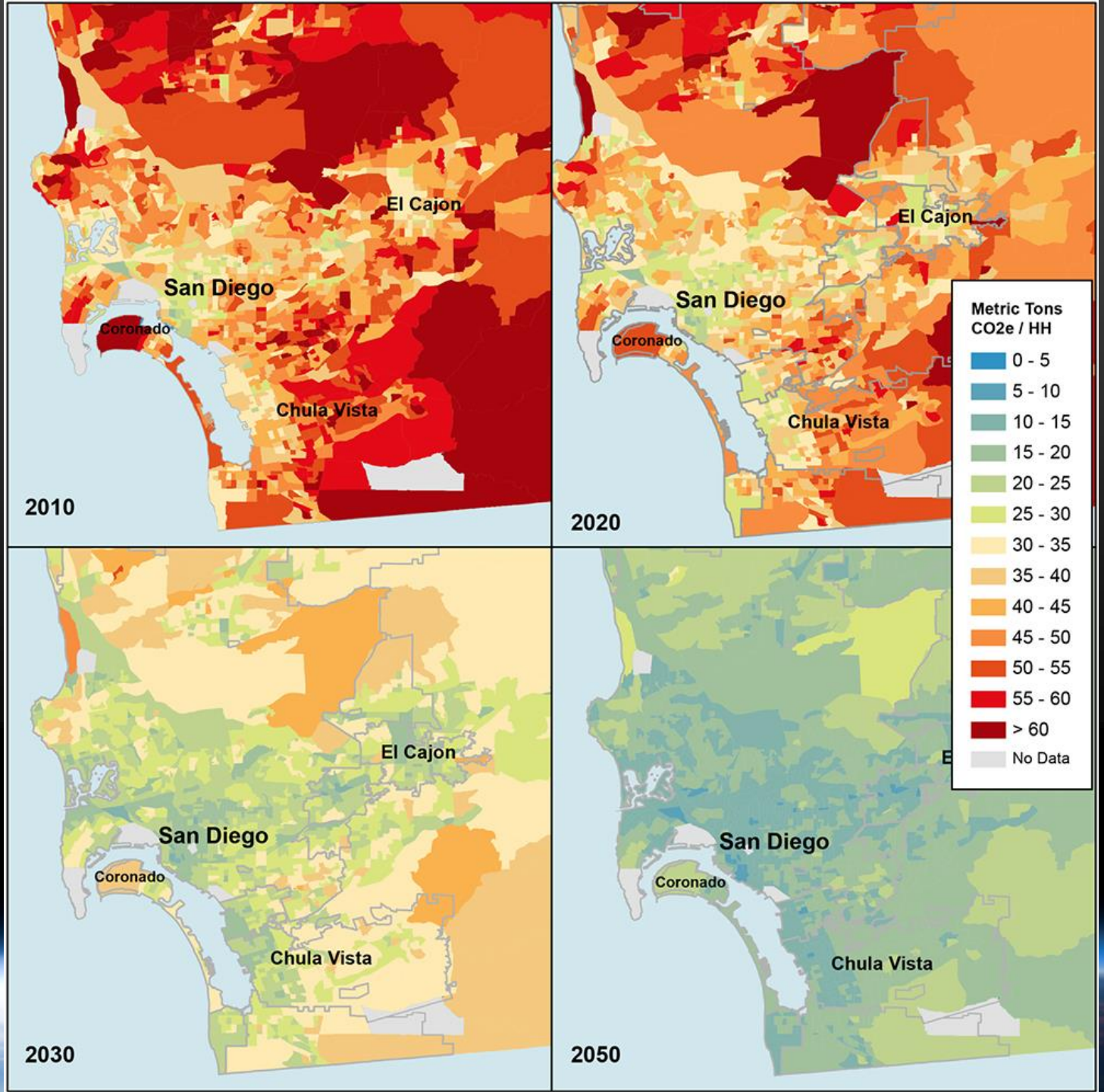
CoolClimate Network
Total Potential from State & Local Policies: Sacramento vs. California - sorted
Tutorial Documentation
California Local Government Climate Policy Tool
Enter State, County, City, Zip Code, or BlockGroup
Location 1
Sacramento
SEARCH LOCATION
GHG Reduction Potential in 2030 from Local Policies
Electric Vehicles
Commercial Efficiency
Urban Infill
50+ MPG Vehicles
VMT Reduction
Energy Efficiency
Heating Electrification
Renewable Electricity
Healthy Diets
Shift Consumption
Water & Waste
Air Travel Reduction
0 100,000 200,000 300,000 400,000 500,000 600,000 700,000 800,000 900,000
Metric Tons CO2e
SORT DATA
2. Select Target Policy Adoption Rate in 2050 for Location 1
Heating Electrification
0% 20% 40% 60% 80% 100%
Commercial Efficiency
0% 12% 24% 36% 48% 60%
VMT Reduction
0% 4% 8% 12% 16% 20%
Urban Infill
0% 16% 32% 48% 64% 80%
Electric Vehicles
Energy Efficiency
California Local Government Climate Policy Tool
Enter State, County, City, Zip Code, or BlockGroup
Location 2
California
SEARCH LOCATION
GHG Reduction Potential in 2030 from Local Policies
Commercial Efficiency
Electric Vehicles
50+ MPG Vehicles
Energy Efficiency
Heating Electrification
VMT Reduction
Urban Infill
Renewable Electricity
Healthy Diets
Shift Consumption
Air Travel Reduction
Water & Waste
0 5,000,000 10,000,000 15,000,000 20,000,000 25,000,000 30,000,000 35,000,000 40,000,000 45,000,000
Metric Tons CO2e
SORT DATA
2. Select Target Policy Adoption Rate in 2050 for Location 2
Heating Electrification
0% 20% 40% 60% 80% 100%
Commercial Efficiency
0% 12% 24% 36% 48% 60%
VMT Reduction
0% 4% 8% 12% 16% 20%
Urban Infill
0% 16% 32% 48% 64% 80%
Electric Vehicles
Energy Efficiency

Local vs Total Potential for City of Sacramento

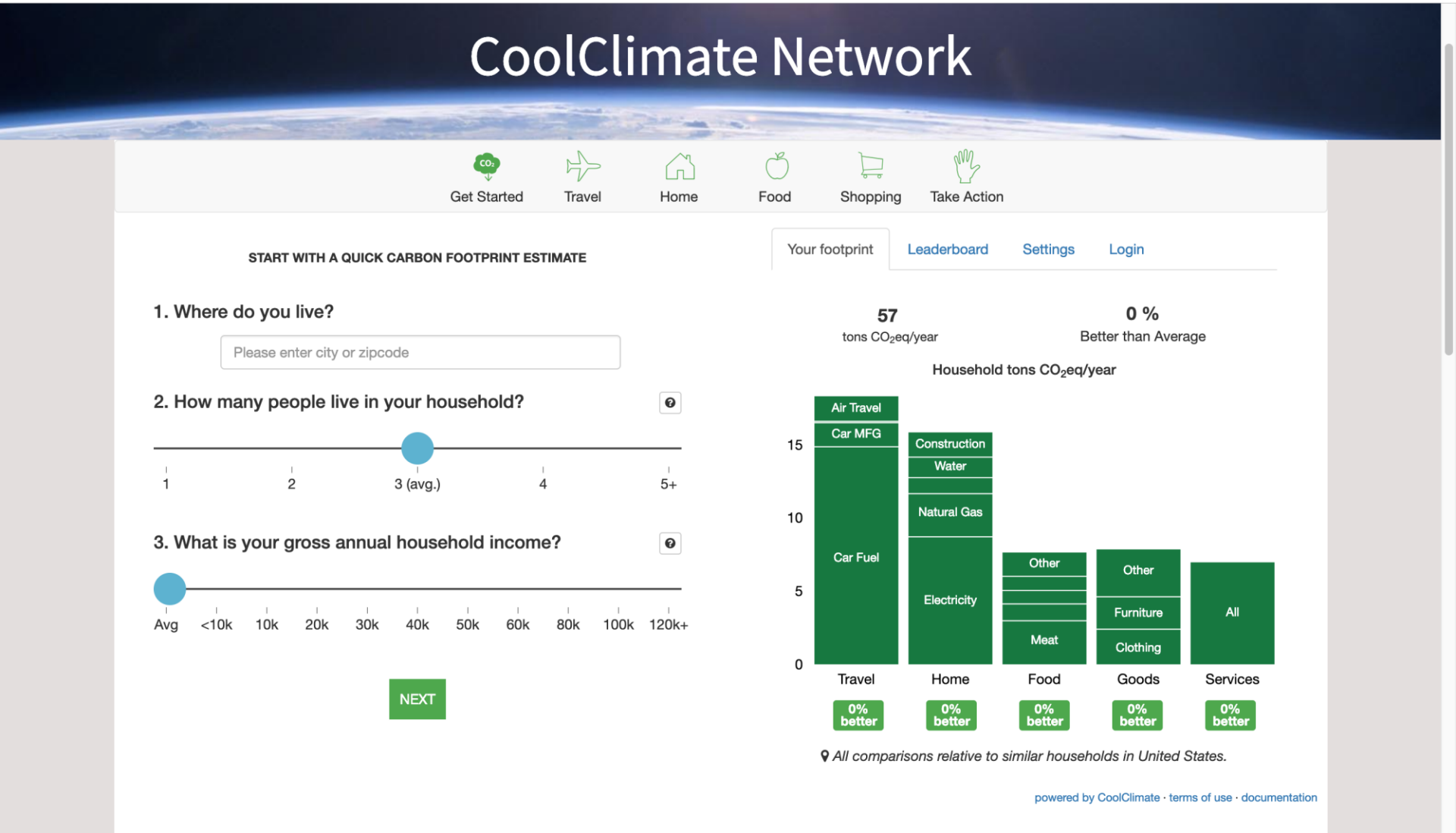


Local Potential for Sacramento vs. Berkeley




El Cajon
San Diego
Coronado
Chula Vista
2010
El Cajon
San Diego
Coronado
Chula Vista
2020
Metric Tons CO2e / HH
0 - 5
5 - 10
10 - 15
15 - 20
20 - 25
25 - 30
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
> 60
No Data
El Cajon
San Diego
Coronado
Chula Vista
2030
San Diego
Coronado
Chula Vista
2050

CoolClimate Network



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SPECIAL CALL FOR STATE AND LOCAL PRESENTATIONS ABSTRACTS

Behavior, Energy and Climate Change Conference

SAVE THE DATE: November 17-20, 2019 - Sacramento, CA

Abstracts due by March 25. More details: BECCconference.org

Energy and Sustainability Professionals

please share your insights and experience with behavior-related:

--Climate action
--Energy choice and efficiency programs
--Transportation
--Planning and policy design
--Communications and social media
--Green buildings
--Research and evaluation
--Equity, diversity and Inclusion
--Collaborations and partnerships

We Want to Hear from State and Local Governments and Communities

--Sustainability professionals
--Program directors and managers
--Regulators
--Researchers
--Communicators
--Implementers
--Other involved in climate and energy

Why Attend BECC

Bring home actionable strategies and programs for encouraging pro-environmental behavior in your community. Join Behavioral scientists for a powerful exchange of ideas and strategies. BECC 2018 included sessions on:

--The Roles and Potential of Local Government
--Building Political Bridges over Climate Change
--New Mobility
--Stimulating Behavior Change in Homes and Neighborhoods
--Opportunities to Serve Hard to Reach Communities
--Using Schools to Motivate Community Change
--Hard to Reach and Hard to Change: Examples of Behavior Change Success

About BECC

The BECC advances behavioral research, policy and action to speed climate solutions. The conference boasts over 200+ extraordinary presentations, alongside great networking opportunities, good food, and a fun social program.

Submit Abstracts of 250-500 words for presentations, panels or poster sessions

Presenters always get the early bird price!

Submit by March 25
at BECCconference.org

BECC is convened by UC Berkeley, Stanford University and the American Council for an Energy-Efficient Economy
November 17 – 20, 2019, Hyatt Regency, Sacramento, CA, USA
For more information, go to BECCconference.org

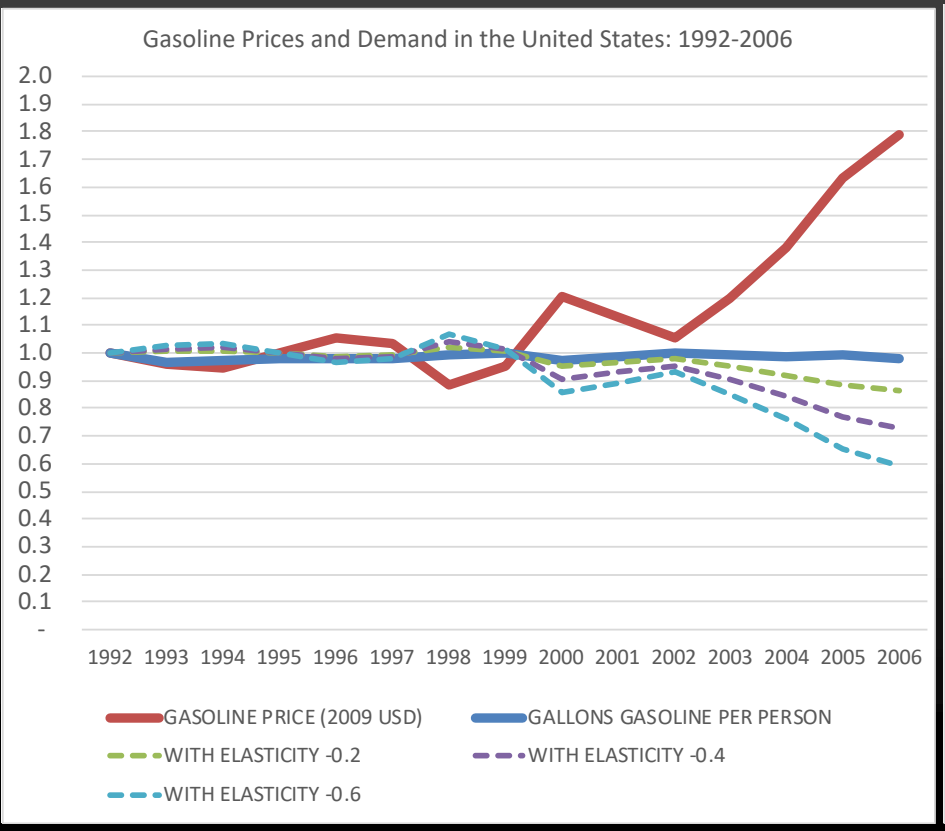
Thank you!

Chris Jones, Ph.D.
Director, CoolClimate Network
University of California, Berkeley

cmjones@berkeley.edu

CoolClimate.org Network

Fossil Fuels are VERY inelastic



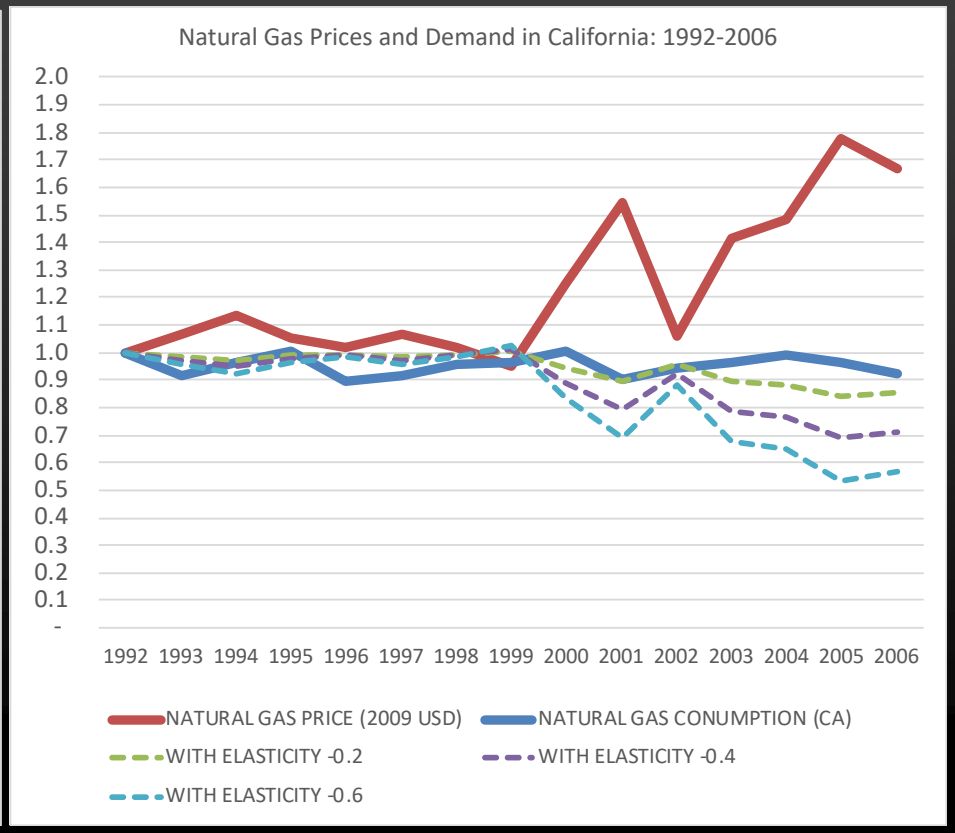


Figure 2. Gasoline consumption (left-hand figure) and natural gas consumption (right-hand figure), fuel prices and -0.2, -0.4 and -0.6 price elasticities from 1992 to 2006. The gap between actual consumption (dark blue lines) and price elasticities (dotted lines) represents the extent to which policy studies overestimate the effect of prices on demand.

Photo source: https://www.flickr.com/photos/87519500@N00/359526186 (creative commons license)

Addressing consumption-based GHG emissions in cities: A "CBEI" Guidebook

Derik Broekhoff

March 5, 2019

SEI Stockholm Environment Institute

The CBEI Guidebook

- One-year project supported by the Carbon Neutral Cities Alliance, with direction & support from Babe O'Sullivan
- Input and road-testing from:

Cities

- Portland
- San Francisco
- Vancouver
- Fort Collins
- Iowa City
- Stockholm
- Toronto

Organizations

- Oregon DEQ
- C40
- ICLEI
- Good Company

CNCA
CARBON NEUTRAL CITIES ALLIANCE

SEI Stockholm Environment Institute

Key Questions

1. What is a ***consumption-based*** greenhouse gas emissions inventory ("CBEI"), and what can it tell you?

2. How can cities use a CBEI to identify and prioritize consumption-based climate policies?

3. What are good strategies for setting targets and evaluating progress?

Guidebook Elements

CBEI basics

What is a CBEI?

Key CBEI insights

Estimating emissions

Creating a CBEI for your city

Choosing a CBEI estimation approach

CBEI examples

Developing a policy relevant CBEI

Creating strategies

Profile and prioritize emissions categories

Identify mitigation behaviors to address consumption

Prioritize which behaviors to target

Identify policy options

Assess policy options

Integrating and evaluating

Target setting approaches

Evaluating progress

Examples of targets and evaluation strategies

CBEI Basics: Concepts & Approaches

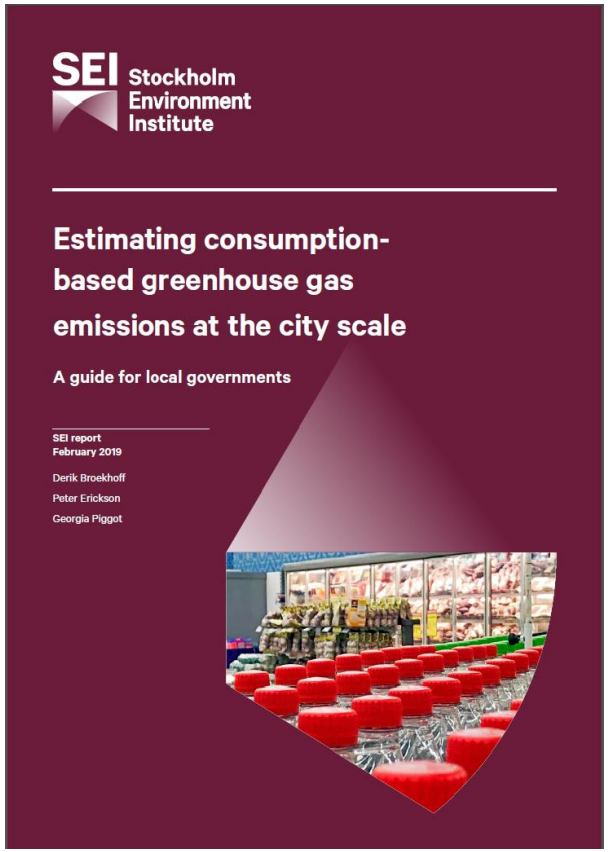
1. Creating a CBEI for your city
2. Choosing a CBEI estimation approach

Measuring Consumption

- Spending data
- Data on actual units consumed
- Data on mass or quantity disposed

Estimating Emissions

- Input-Output models
- Life-cycle analysis



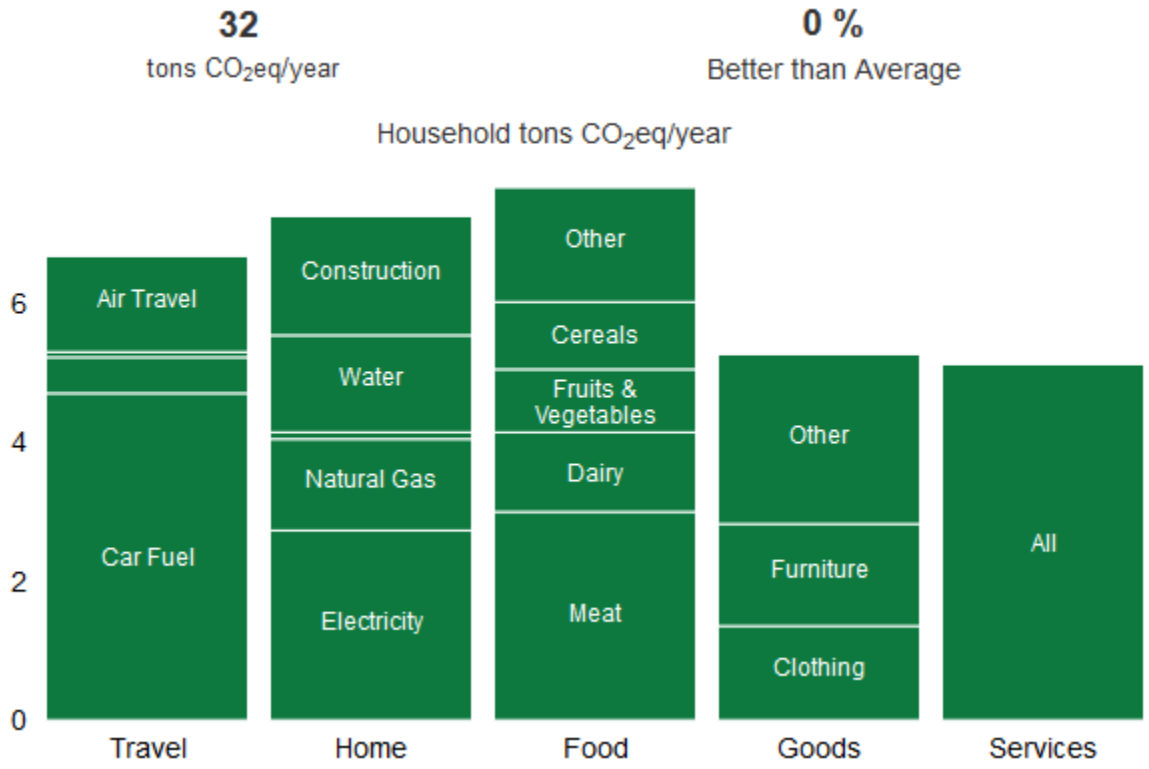
Developing a *policy relevant* CBEI

1. What categorization of emissions will be most useful for identifying and developing policy actions?
    - Some CBEIs aggregate emissions for types of consumption that are similar, but very different from a policy perspective (e.g. air travel vs. private automobiles under “travel”)
2. Who is doing the consuming?
    - Households
    - Local government
    - Business & industry

Creating Strategies

1. Profile and prioritize ***consumption categories***
2. ***Identify mitigation behaviors*** that can address consumption in different categories
3. ***Prioritize the mitigation behaviors*** to target with policy actions or other measures
4. Identify & assess policy options

Emissions profiling (from CBEI)



Prioritizing consumption categories

- Some possible criteria…
  - Per capita emissions (from CBEI)
  - Where do most of the emissions occur (in city or out)?
  - Emissions intensity (CO_2 tons per dollar spent)
  - Expected future trends
  - Typical consumer income level

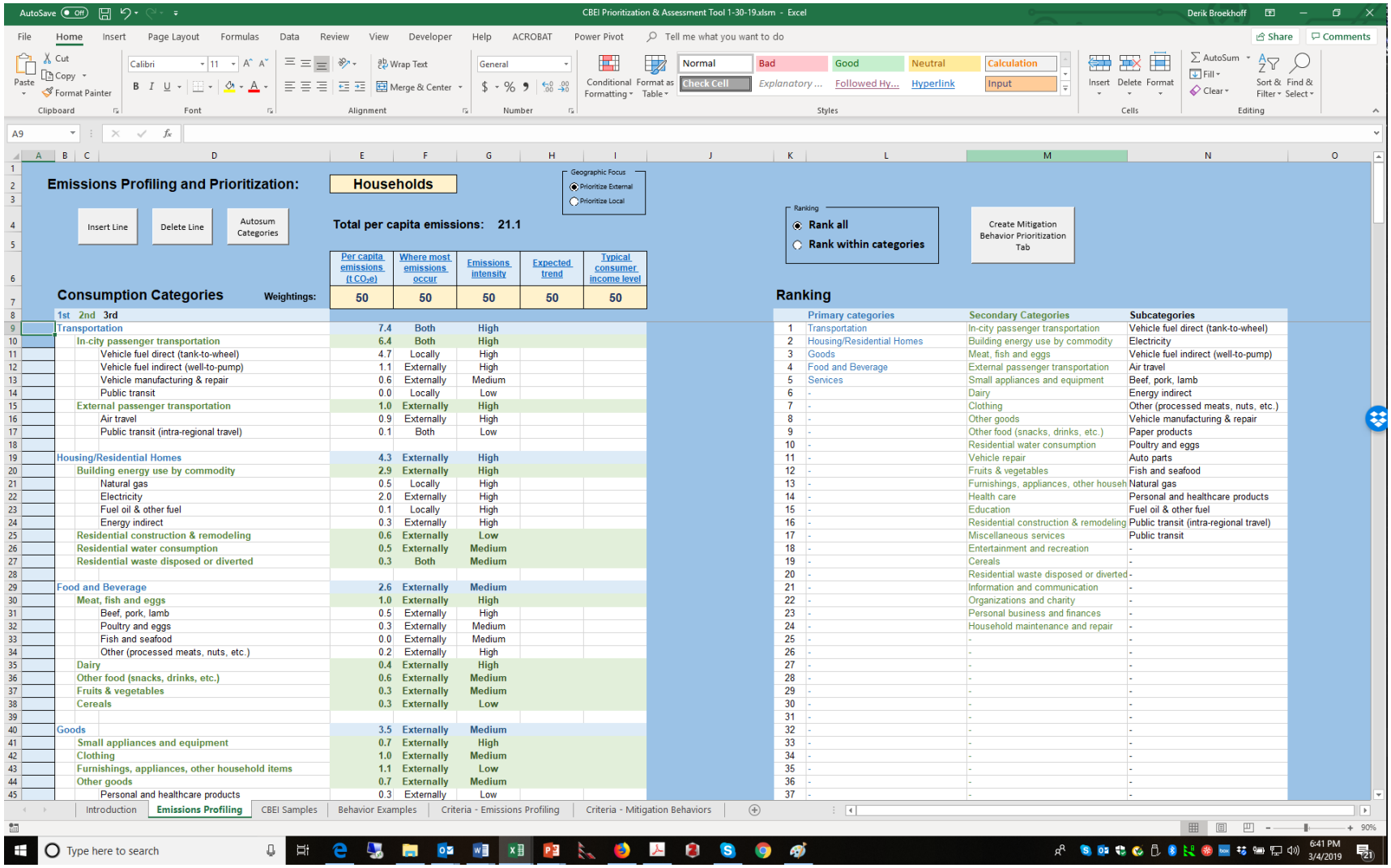
Identifying mitigation behaviors

Type of consumption	Targeted mitigation behaviors	Cross-cutting behaviors
Automobile travel	Switch to public transit Purchase fuel-efficient car Purchase electric car Walk or bike	Live closer to work, shopping, and amenities
Residential heating	Lower thermostat Purchase efficient HVAC system Switch to electric heating from natural gas	Choose smaller dwelling size
Electronic goods	Buy longer lasting, repairable electronics Share, rent, or lease equipment Recycle electronics	Shift consumption from goods to services (“experiences not things”)
Dairy products	Reduce dairy consumption Consume plant-based dairy alternatives	Eat no more (of all foods) than needed to maintain healthy body Reduce all food waste Compost food waste
Vehicle repair services	Regular vehicle maintenance Use alternate travel modes	Live closer to work, shopping, amenities

Prioritizing mitigation behaviors

- Possible criteria…
  - How much will it reduce emissions, for each person or household who does it?
  - What is the uptake potential (how many are likely to do it – and sustain it – with effective policies)?
  - What about “rebound” effects?
  - Can (local) governments do much to induce the behavior?

A CBEI Prioritization Tool



AutoSave Off — CBEI Prioritization & Assessment Tool 1-30-19.xlsm - Excel — Derik Broekhoff

File Home Insert Page Layout Formulas Data Review View Developer Help ACROBAT Power Pivot Tell me what you want to do — Share Comments

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Emissions Profiling and Prioritization: **Households**

Geographic Focus: Prioritize External / Prioritize Local

Insert Line | Delete Line | Autosum Categories

Total per capita emissions: 21.1

Ranking: Rank all / Rank within categories

Create Mitigation Behavior Prioritization Tab

Consumption Categories	Weightings:	Per capita emissions (t CO_2e)	Where most emissions occur	Emissions intensity	Expected trend	Typical consumer income level
		50	50	50	50	50
1st 2nd 3rd						
Transportation		7.4	Both	High		
In-city passenger transportation		6.4	Both	High		
Vehicle fuel direct (tank-to-wheel)		4.7	Locally	High		
Vehicle fuel indirect (well-to-pump)		1.1	Externally	High		
Vehicle manufacturing & repair		0.6	Externally	Medium		
Public transit		0.0	Locally	Low		
External passenger transportation		1.0	Externally	High		
Air travel		0.9	Externally	High		
Public transit (intra-regional travel)		0.1	Both	Low		
Housing/Residential Homes		4.3	Externally	High		
Building energy use by commodity		2.9	Externally	High		
Natural gas		0.5	Locally	High		
Electricity		2.0	Externally	High		
Fuel oil & other fuel		0.1	Locally	High		
Energy indirect		0.3	Externally	High		
Residential construction & remodeling		0.6	Externally	Low		
Residential water consumption		0.5	Externally	Medium		
Residential waste disposed or diverted		0.3	Both	Medium		
Food and Beverage		2.6	Externally	Medium		
Meat, fish and eggs		1.0	Externally	High		
Beef, pork, lamb		0.5	Externally	High		
Poultry and eggs		0.3	Externally	Medium		
Fish and seafood		0.0	Externally	Medium		
Other (processed meats, nuts, etc.)		0.2	Externally	High		
Dairy		0.4	Externally	High		
Other food (snacks, drinks, etc.)		0.6	Externally	Medium		
Fruits & vegetables		0.3	Externally	Medium		
Cereals		0.3	Externally	Low		
Goods		3.5	Externally	Medium		
Small appliances and equipment		0.7	Externally	High		
Clothing		1.0	Externally	Medium		
Furnishings, appliances, other household items		1.1	Externally	Low		
Other goods		0.7	Externally	Medium		
Personal and healthcare products		0.3	Externally	Low		

Ranking

	Primary categories	Secondary Categories	Subcategories
1	Transportation	In-city passenger transportation	Vehicle fuel direct (tank-to-wheel)
2	Housing/Residential Homes	Building energy use by commodity	Electricity
3	Goods	Meat, fish and eggs	Vehicle fuel indirect (well-to-pump)
4	Food and Beverage	External passenger transportation	Air travel
5	Services	Small appliances and equipment	Beef, pork, lamb
6	-	Dairy	Energy indirect
7	-	Clothing	Other (processed meats, nuts, etc.)
8	-	Other goods	Vehicle manufacturing & repair
9	-	Other food (snacks, drinks, etc.)	Paper products
10	-	Residential water consumption	Poultry and eggs
11	-	Vehicle repair	Auto parts
12	-	Fruits & vegetables	Fish and seafood
13	-	Furnishings, appliances, other househ	Natural gas
14	-	Health care	Personal and healthcare products
15	-	Education	Fuel oil & other fuel
16	-	Residential construction & remodeling	Public transit (intra-regional travel)
17	-	Miscellaneous services	Public transit
18	-	Entertainment and recreation	-
19	-	Cereals	-
20	-	Residential waste disposed or diverted	-
21	-	Information and communication	-
22	-	Organizations and charity	-
23	-	Personal business and finances	-
24	-	Household maintenance and repair	-
25	-	-	-
26	-	-	-
27	-	-	-
28	-	-	-
29	-	-	-
30	-	-	-
31	-	-	-
32	-	-	-
33	-	-	-
34	-	-	-
35	-	-	-
36	-	-	-
37	-	-	-

Introduction | Emissions Profiling | CBEI Samples | Behavior Examples | Criteria - Emissions Profiling | Criteria - Mitigation Behaviors

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Integrating and Evaluating

- Target setting & evaluating progress
  - **Gothenburg:** Reduce GHG footprint of residents by 75% by 2050, with interim targets to track progress, e.g. reduce volume of household waste per person by at least 30 percent by 2030.
  - **Vancouver:** Addressing consumption emissions through a broader goal of reducing its ecological footprint. Progress is tracked using economic data from the Canadian census. More frequently, the city collects data on citizen engagement in sustainable lifestyle programs and surveys residents about food consumption habits.

More Information

https://sustainableconsumption.usdn.org/climate/cbei-guidebook/overview