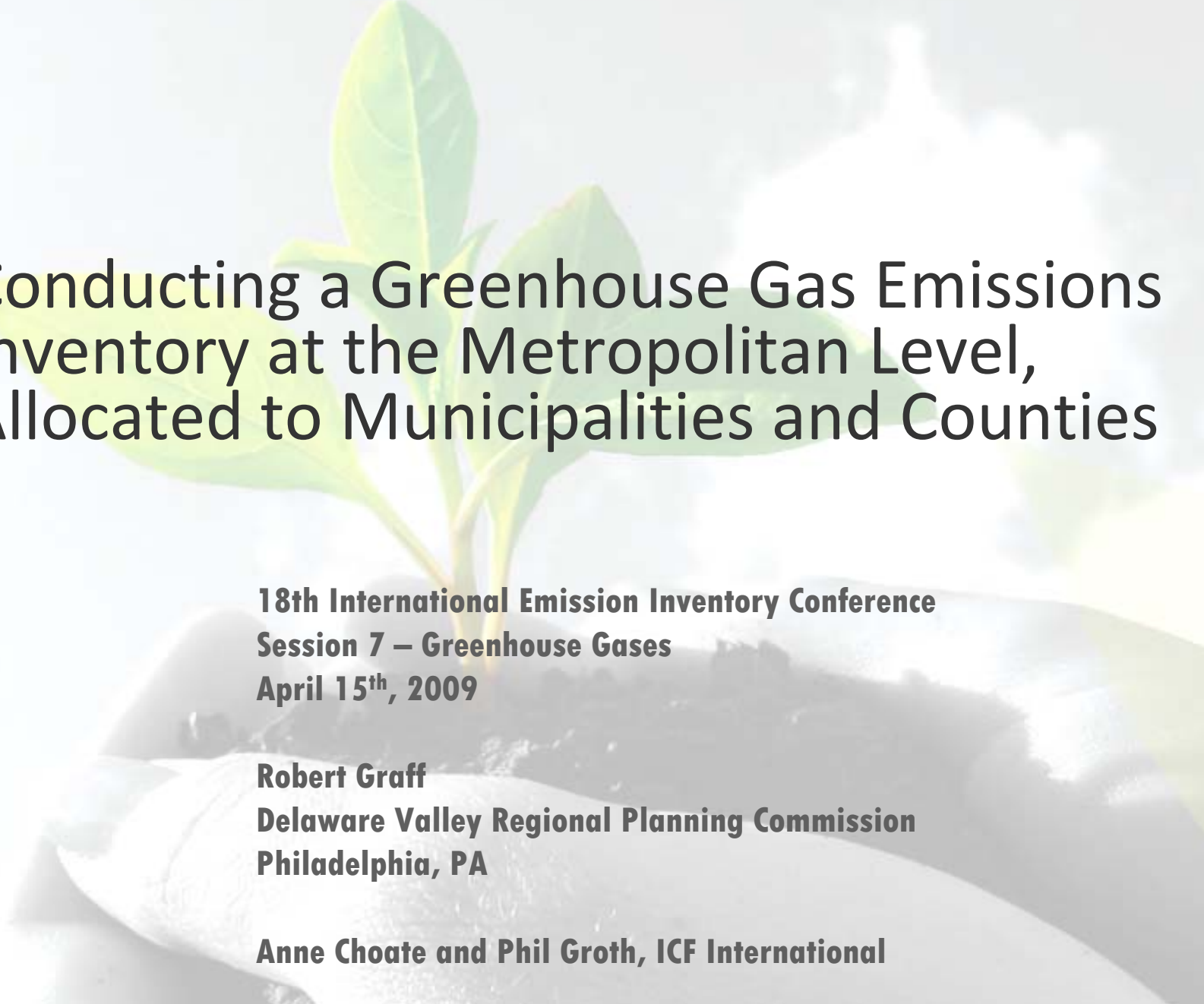




Conducting a Greenhouse Gas Emissions Inventory at the Metropolitan Level, Allocated to Municipalities and Counties

**18th International Emission Inventory Conference
Session 7 – Greenhouse Gases
April 15th, 2009**

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Anne Choate and Phil Groth, ICF International

Background

- DVRPC is the Metropolitan Planning Organization for Greater Philadelphia (9 counties, 353 municipalities, 5.5 million people)
- Significant state, county, and municipal activity on climate change
- Desire to reduce confusion, foster more efficient use of limited resources
- Opportunity for DVRPC to provide leadership, support, and coordination
- Interest from national organizations in partnering
- In January 2008, DVRPC Board created a new Climate Change Initiatives program area, starting July 1

GHG Emissions Inventory Process

- Kicked off in May 2008
- Inventory Advisory Group formed – close to 100 people: municipal, county, state, regional, national, federal, citizens, businesses
 - Total of four meetings
 - Very engaged participants
 - Managing expectations on both sides
- ICF International served as consultant
 - Anne Choate
 - Phillip Groth

Categories Included

- Energy use—mobile and stationary
- Waste disposal—solid waste and wastewater
- Agriculture—livestock and soils
- Industrial processes (non-energy)
- Fugitive emissions from fuel systems
- Land use, land use change, forestry

- Does not include emissions embedded in goods and services or activities from outside the region

Sources of Information

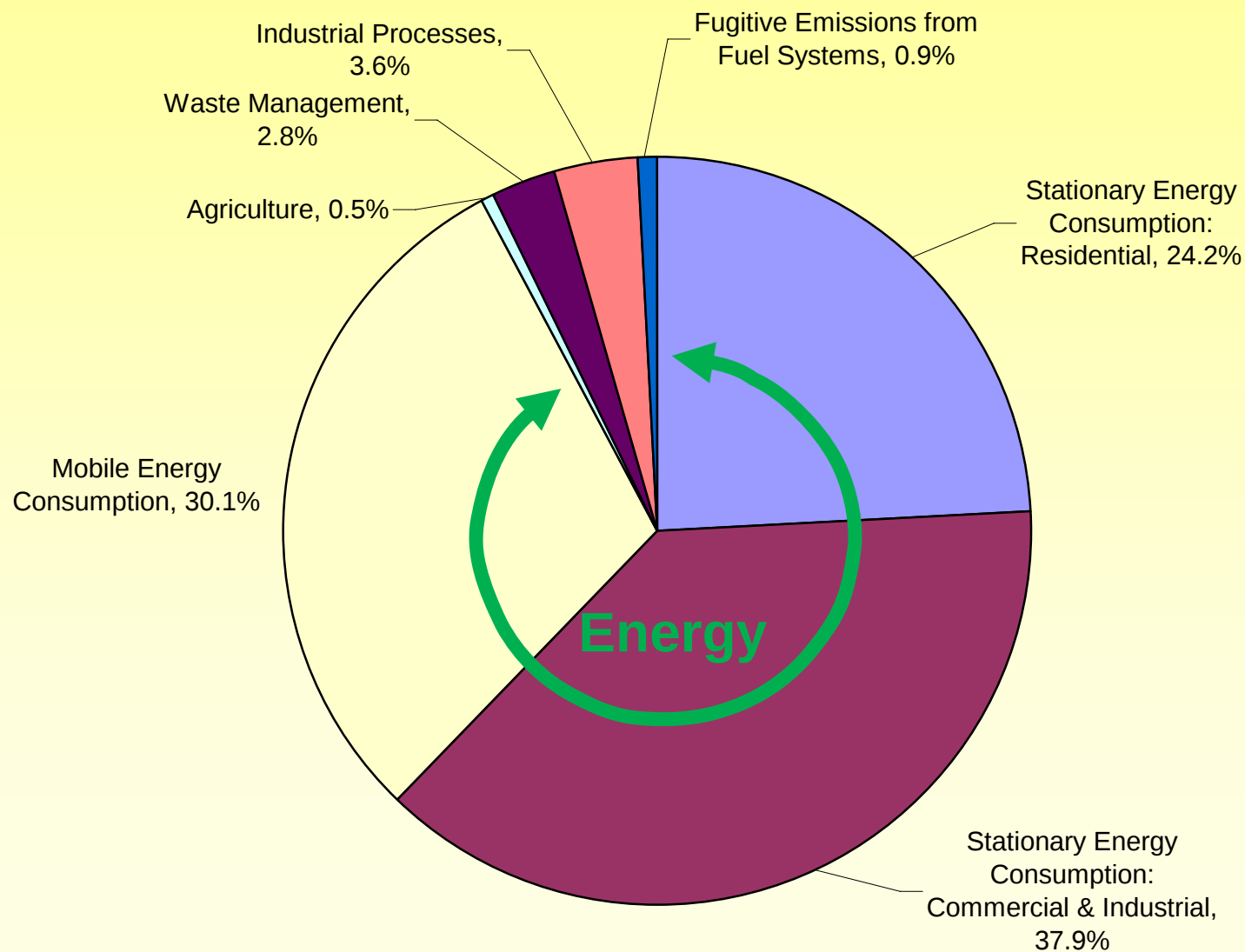
- Electricity and natural gas from utilities
- Other fuels from state-level inventories
 - Allocated in a variety of ways
- On-road vehicles: DVRPC model
- Transit: SEPTA, PATCO, NJT
- Land use change: DVRPC land use data
- Fugitive emissions: based on natural gas usage and refining capacity
- Waste disposal: state averages

2005 DVRPC Emissions Summary

Emissions Source Category	Emissions (MMTCO₂E)	Percent of Total
Stationary Energy Consumption—Residential	21.9	24.2%
Stationary Energy Consumption—Commercial & Industrial	34.2	37.9%
Mobile Energy Consumption	27.1	30.1%
Agriculture	0.5	0.5%
Waste Management	2.6	2.8%
Industrial Processes	3.2	3.6%
Fugitive Emissions from Fuel Systems	0.8	0.9%
Gross Emissions	90.3	100%
Land Use, Land Use Change, and Forestry	0.2	
Net Emissions	90.4	

Regional total is 1.26% of national 2005 total of 7260 MMTCO₂Eq
16.5 MMTCO₂Eq per capita vs. 24.5 MMTCO₂Eq nationally

2005 DVRPC Emissions by Sector



Electricity and Natural Gas

- Received from over a dozen utilities
 - Billing or consumption data
 - customer class
 - ZIP (70% of E, 60% of G) or municipality
 - holes
- Electricity: eGRID (PJM Interconnection)
 - Vampire power, transmission loss, CH₄ and N₂O
- Natural Gas: EPA
 - Leakage to “Fugitive Emissions”

Other Stationary Fuel Use

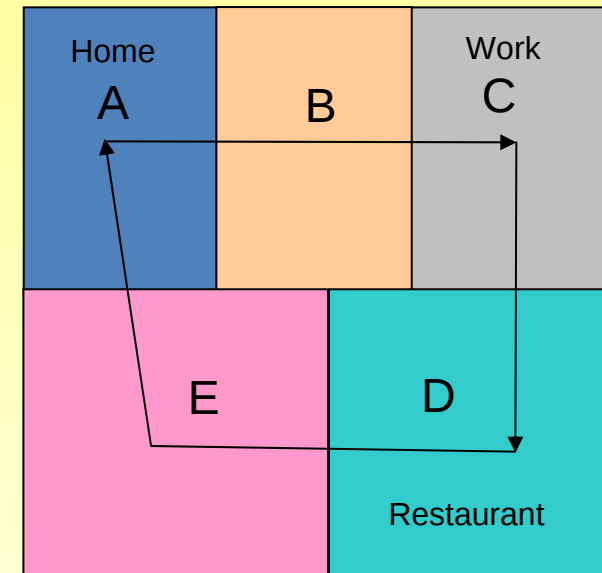
- State totals (EIA) by sector
 - Residential
 - To county by 2005 ACS
 - To MCD using 2000 Census
 - Commercial/Industrial
 - Used residential method for fuel oil, LPG, coal
 - Used employment for other fuels
 - Industrial fuels not allocated to MCD

Mobile Energy

- On-road vehicles:
 - Total: DVRPC travel demand model
 - Allocation: Following slides
- Aviation:
 - Regional allocation based on one-half portion of national flight miles to/from PHL (1.8%).
 - Not allocated below region
- Freight rail:
 - Based on region's share of national rail tonnage
 - Not allocated below region
- Marine, off-road, public transit, intercity rail, through highway

How do you allocate VMT?

- A driver leaves home in municipality A for work in municipality C. This trip passes through municipality B. After work the driver travels to a restaurant in municipality D, then returns to home in municipality A, passing through municipality E.



Trip:	Trip Summary	Miles traveled in Municipality				
		A	B	C	D	E
Home to work	A→B→C	2	3	5		
Work to restaurant	C→D			4	3	
Restaurant to home	D→E→A	3			3	5

Four Ways to Allocate

VMT Basis	VMT by Municipality					Total
	A	B	C	D	E	
Boundary based	5	3	9	6	5	28
Origin based	10		7	11		28
Destination based	11		10	7		28
Origin-destination split	10.5		8.5	9		28

- Used origin-destination split
- Methodology widely applicable
- Through highway and airport trips not allocated

Leaving only . . .

- Waste disposal—solid waste and wastewater
- Agriculture—livestock and soils
- Industrial processes (non-energy)
- Fugitive emissions from fuel systems
- Land use, land use change, forestry

Allocation to Counties and MCDs

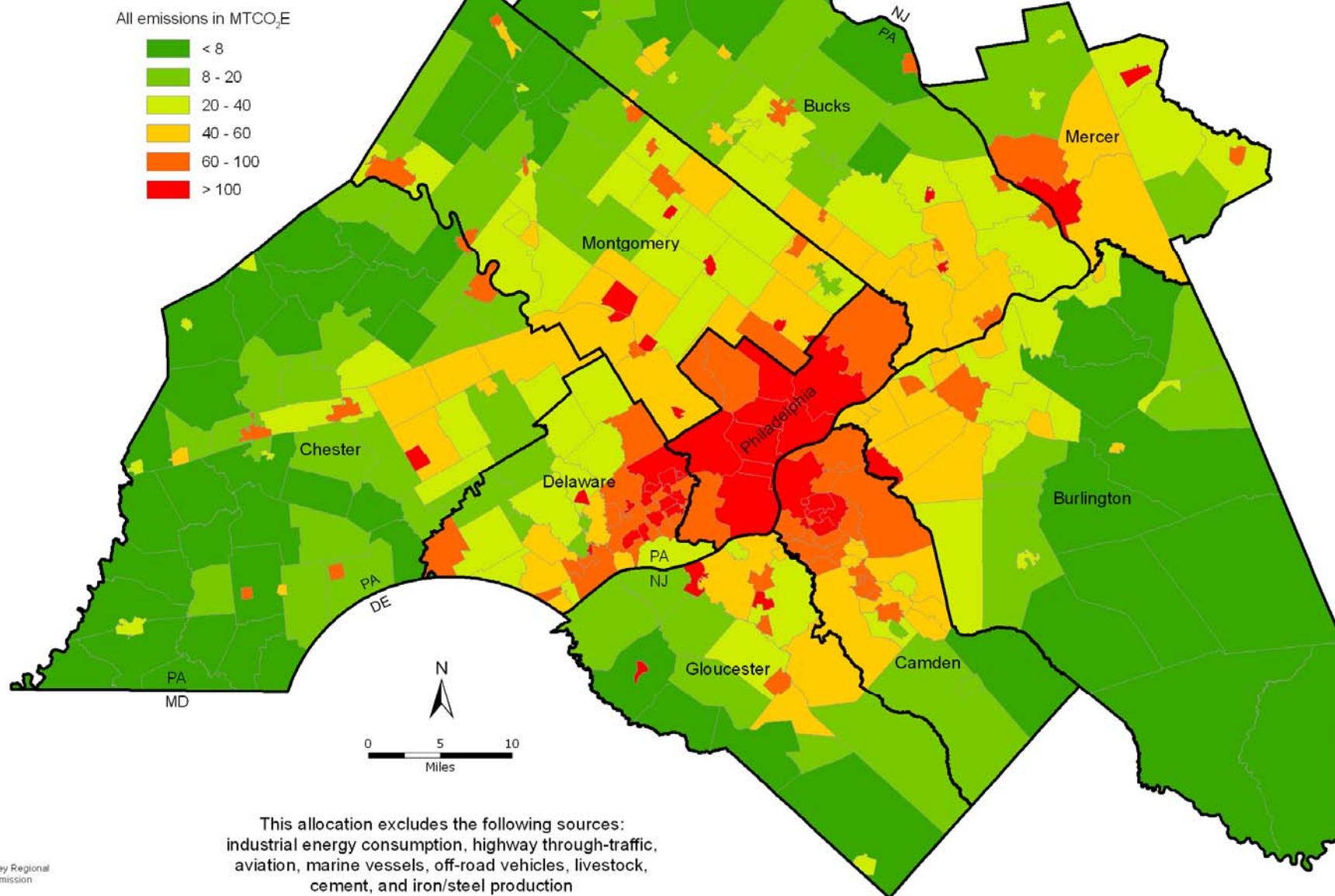
- Regional Totals Allocated to Counties and MCDs
- 90 percent of total to counties
- 84 percent of total to municipalities
- High confidence in over 90 of allocated emissions
- Should provide a good head start for local and county efforts

Allocation summary (partial)

Emissions Source Category	2005 Emissions (MMTCO ₂ E)	Allocated		Confidence in Allocation		
		County	MCD	Good	Better	Best
Stationary Energy— Residential						
Fuel Type						
Natural Gas	6.65	x	x			x
Coal	0.0033	x	x			x
Distillate Fuel Oil	2.33	x	x			x
Kerosene	0.16	x	x			x
LPG	0.23	x	x			x
Purchased Electricity	12.49	x	x			x
Stationary Energy— Commercial						
Fuel Type						
Natural Gas	5.61	x	x			x
Coal	0.04	x	x		x	
Distillate	0.87	x	x		x	
Kerosene	0.07	x	x		x	
LPG	0.05	x	x		x	
Residual Fuel	0.11	x	x	x		
Motor Gasoline	0.01	x	x	x		
Purchased Electricity	9.84	x	x			x
Stationary Energy— Industrial						
Fuel Type						
Natural Gas	1.97	x	some MCDs			x
Coal	0.20	x		x		
Distillate	0.87	x		x		
Kerosene	0.11	x		x		
LPG	0.12	x		x		
Residual Fuel	0.35					
Petroleum Coke	1.53					
Other Fuels	0.98					
Purchased Electricity	11.45	x	some MCDs			x
Mobile Energy						
Highway (ex. thru & airport traffic)	20.00	x	x			x
Public transit (buses and rail)	0.34	x	x			x

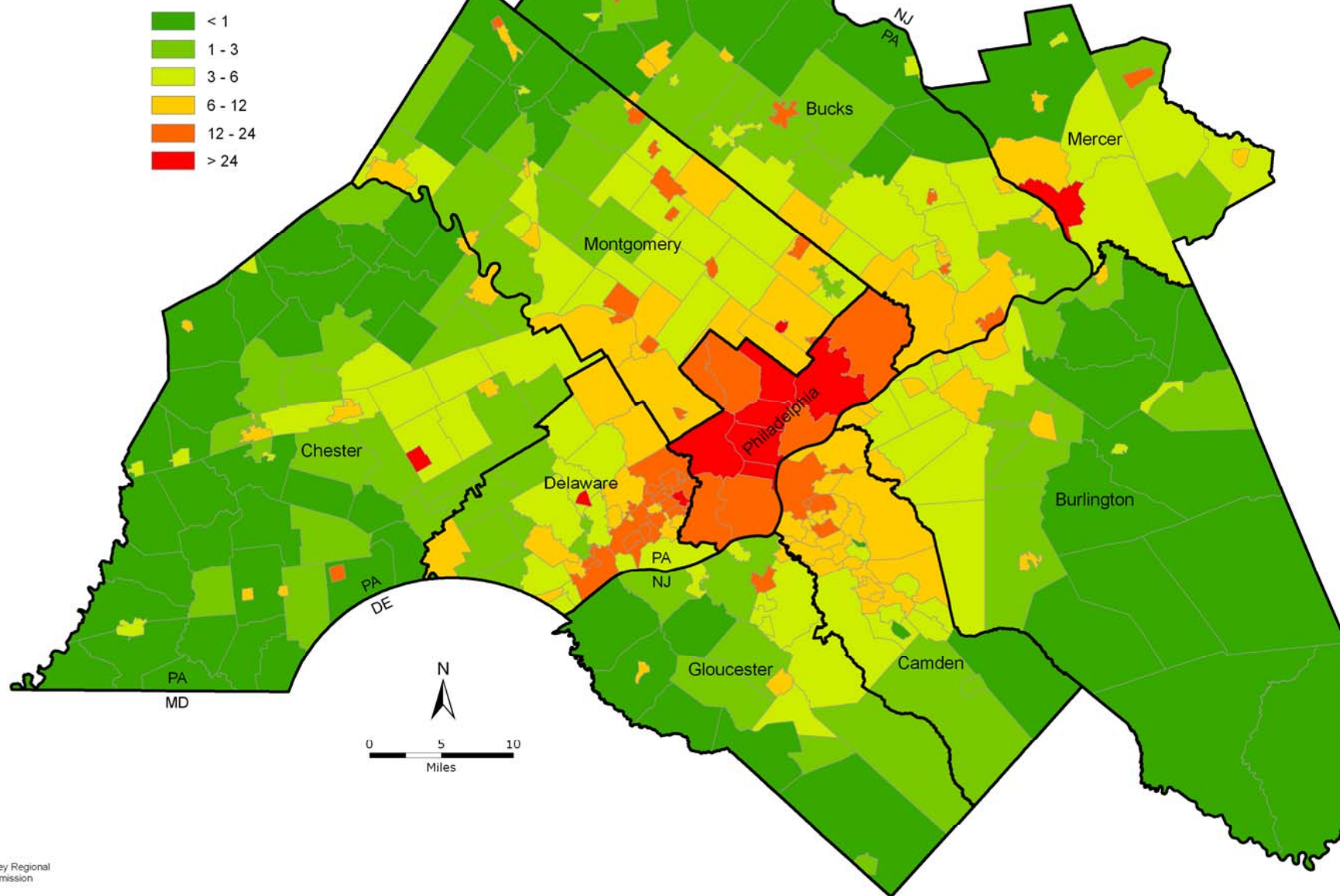
DVRPC Greenhouse Gas Emissions Inventory Allocation:

Emissions Per Acre
by Municipality (2005)



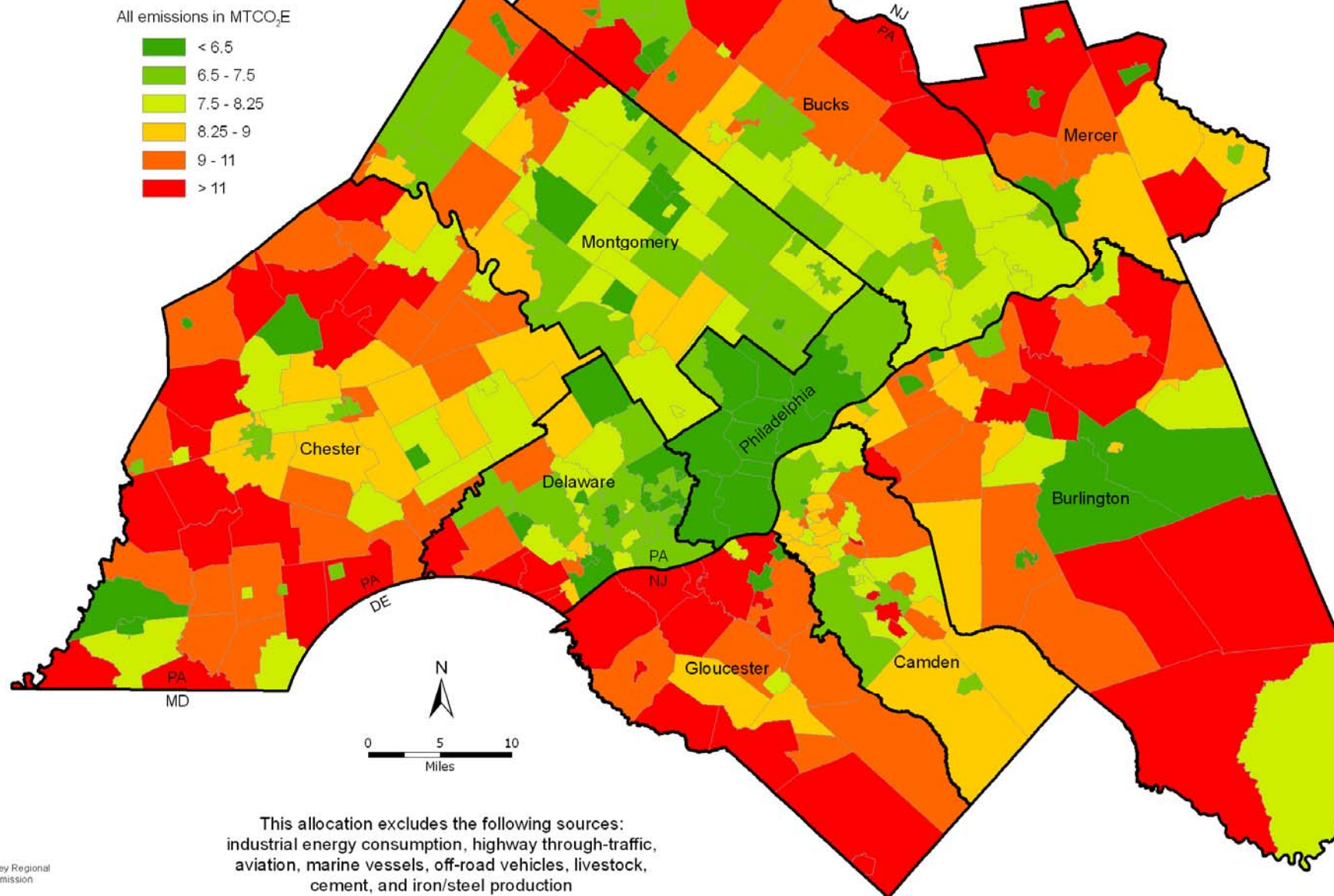
DVRPC Greenhouse Gas Emissions Inventory Allocation:

Population & Employment Per Acre
by Municipality (2005)



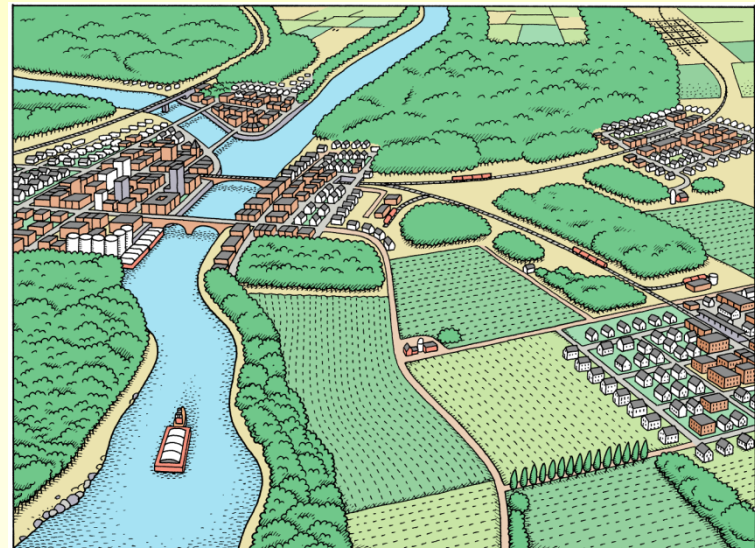
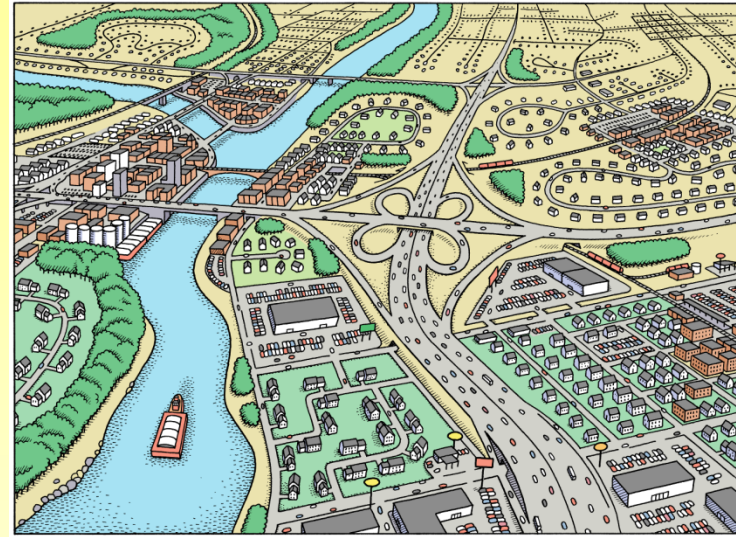
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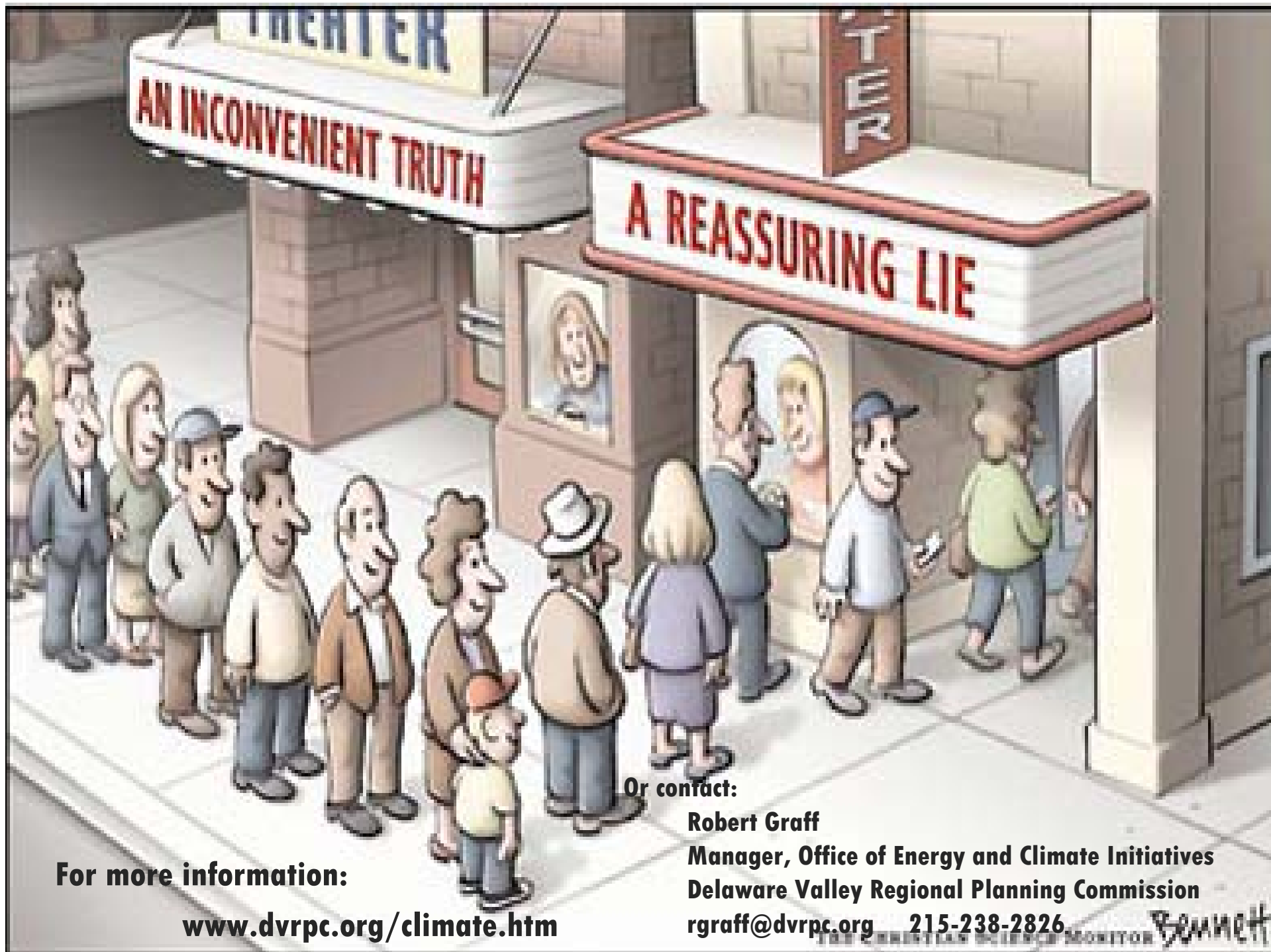
Emissions Per Population & Employment
by Municipality (2005)



Implications

- Energy use
- Household budgets
- Viability of place
- Land use planning
- Politics





For more information:

www.dvrpc.org/climate.htm

Or contact:

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