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A Roadmap to Fossil-Free Homes:

Where Local Building Electrification Policies Would Have the Greatest Impact

A report by Stand.earth Research Group, SAFE Cities, and Lead Locally

September 2023

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Executive Summary

Since Berkeley, California passed the first municipal ordinance requiring new construction to be all-electric in 2019, building electrification policies have become one of the most popular, important, and in some cases controversial steps local governments can take to protect climate, public health, and safety. With support from local advocates, there is a growing movement of cities, counties, and now states across the U.S. – and increasingly worldwide as well – passing and pursuing building electrification policies. These policies help communities achieve their climate goals and also protect their health and safety as new evidence comes forward on the impact of appliances like gas stoves on children's health.

In response, the fossil fuel industry is executing a well-funded and expansive attack to undermine these policies – including inciting a culture war around gas stoves, driving preemptive state legislation that blocks local action, and manufacturing disinformation campaigns.

Amid all this, we wanted to cut through the noise and gain insight into some important questions: which counties and metropolitan areas have the highest potential emissions reductions by moving their new residential buildings off fossil fuels over the next decade? What are the opportunities and roadblocks in these locations? And how much impact could this combined action have on the United States' total emissions?

This report (a project by Stand.earth Research Group, SAFE Cities, and Lead Locally) explores the projected emissions impact of policies that limit gas hookups in new residential buildings at the county level across the country. **Our findings show that targeted building electrification measures in specific metropolitan areas can have a large impact on reducing emissions from the nation's future housing stock, and that most of the counties apprising these areas have a majority of residents who expect their local leaders to take more action on climate.**

Here are a few of our top findings:

1. **The impact of new construction going all-electric is significant:** Passing policies requiring electrification on all new residential construction nationally would eliminate almost 140 million metric tons of carbon dioxide (CO_2) between 2023 and 2030. That's the equivalent of stopping more than 156 billion pounds of coal from being burned or the equivalent of negating the emissions that 37.5 U.S. coal plants generate in a single year.

2. **Local action in strategic areas can make an outsized difference:** Due to the clustered nature of our cities and surrounding suburbs, a relatively small number of policies in specific regions would have an outsized impact on emission reductions. Remarkably, more than half (52%) of gas emissions from residential buildings constructed between 2023 and 2030 could be eliminated by passing policies in just 63 metropolitan areas and their surrounding counties. Narrowing further, twelve metropolitan areas will account for over 30% of estimated cumulative CO_2 emissions and new housing stock between 2023 to 2030. Finally, just 14 states contain over 70% of projected emissions from new construction between 2023-2030.

3. **Time is of the essence – for climate, health, safety, and budgets:** Every new building that is constructed with gas hook ups locks in cumulative fossil fuel emissions and health risks for years to come, until a costly retrofit can be done to make it all-electric.

4. **Residents in the counties we've identified want to see action from their local officials on climate.** In nearly all target counties, a majority of residents have prioritized climate change as an urgent issue and expressed a desire for their local elected officials to do more to address global warming.

5. **Cities and counties in states that have preempted local authority over gas must take action.** To date, nearly half of U.S. states have passed preemption laws which make it difficult or outright impossible for local jurisdictions to pass policies limiting gas hook ups in new construction. Concerningly, we found that many of the 63 metropolitan areas fall in preemption states, including 14 of the top 20. While lobbying of state governments by the gas industry severely curtails what communities can do to decarbonize their buildings, the projection of future emissions makes it clear that local policymakers in those states must still take action. In this report, we outline several alternative pathways that local governments in preemption states can explore to reduce emissions from their community's buildings – while ultimately aiming to roll back those preemption laws.

6. **Policies targeting new construction alone aren't sufficient.** It's clear that emissions from existing residential properties constitute a much larger share of building emissions than new construction. To adequately address this, we need to pass policies that help retrofit existing structures while also changing the way we build new housing. Money from the Inflation Reduction Act of 2022 will make this easier than it's ever been, and local governments have a vital role to play connecting homeowners, developers, landlords, and property managers with these funds.

Taken together, these findings outline a clear path forward for local elected officials and activists who want to take action to protect their communities and the climate from fossil fuel pollution in buildings. The journey to carbon-free buildings may be difficult – but smart, targeted, and creative actions at the local level can make our path significantly easier.

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Introduction

Building electrification has emerged as a clear priority for climate and health advocates as well as local government leaders across the United States. Dozens of cities and counties where SAFE Cities and Lead Locally are working with advocates and local government leaders have passed these policies as an impactful local tactic towards decarbonization.

Crucially, buildings account for a bulk of municipal greenhouse gas emissions – making up between 60 to 80% of emissions in many North American cities[1] – and must be a core focus for local and higher levels of government as we endeavor to move our communities towards clean, renewable energy. Beyond impacting the climate, devastating gas explosions are not uncommon[2], and recent research on gas stoves has shown that the appliances are responsible for 1 in 8 cases of asthma in children[3].

The first step toward getting out of this hole is to stop digging. It is imperative that newly constructed homes, offices, hospitals, and other buildings are not designed to be reliant on fossil fuels for their energy needs. Cities and counties can take a variety of measures to ensure new buildings are all electric – such as by preventing gas hookups in new development, incentivizing the use of electric appliances as well as heating and cooling systems, and establishing or strengthening building performance standards.

As cities and counties across the country increasingly take action towards building electrification, the fossil fuel industry continues to try to lock in as much infrastructure as possible. The industry is pulling no punches, trying everything from pressuring state legislatures to preempt local governments from taking action to waging a culture war to defend the market share of dangerous, antiquated gas stoves. The industry's disinformation campaigns and malicious attacks on the building electrification movement threaten the welfare of current and future generations, and we know every gas hook up installed today is one we'll have to replace to address climate change tomorrow.

While industry scare tactics and state preemption laws are a problem, they are not insurmountable obstacles for cities and counties in passing meaningful building electrification policies. Every local government – regardless of whether it's in a preemption state – has a role to play in the movement to transition buildings off fossil fuels. We set out to identify the areas with the largest potential for impact, and the best opportunities to pass new policy at the city or county level to advance the transition away from fossil fuels within the country's future housing stock.

This report compiles a list of the country's 114 top counties across 63 metropolitan areas that on their own are projected to emit more than half of future emissions from new residential construction. Targeting these areas would have the biggest impact on reducing greenhouse gas emissions by implementing building electrification measures on new residential construction.

To achieve this, we examined the counties that use the most gas in their residential housing based on their climate zone, state, and housing type, and those that plan to build the most over the next decade. Realizing that some of the largest concentrations of residential growth in the country is projected to happen in the suburbs over the next decade, we focused on county and metropolitan areas that have the greatest potential for emissions reductions through building electrification.

The result is a compilation of critical data and projections for the counties in the country where local building electrification measures – at either the city or county level – would have the greatest impact. We also included information on which counties and cities within these regions have already passed such measures, or are preempted from doing so by their state. However, it is important to note that there are strategies – such as incentives or building performance standards – which cities and counties in preemption states can take to accelerate building electrification.

We hope this report can help building electrification advocates and government officials more effectively advance their work at the local level, and provide a blueprint for the movement's progress toward fossil fuel free housing.

1. Keeping Track of Greenhouse Gas Emission Reduction Progress and Targets in 167 Cities Worldwide | Frontiers
2. Silent Threat: Gas explosions injured hundreds, killed dozens nationwide since 2010 | WBTV
3. Population Attributable Fraction of Gas Stoves and Childhood Asthma in the United States | PMC

Main Findings

Methods

We estimated the number of new housing units that will be built from 2023 to 2030 for each county in the U.S., and estimated the gas consumption adjusted by climate region, state, and housing type. We subsequently converted this to carbon dioxide (CO_2) to arrive at an estimate for end-use carbon emissions that could be avoided in the absence of gas connections in new residential construction. The methodology combines data and estimates from various government sources and non-government sources, including U.S. Census American Housing Survey (AHS), Building Permits Survey(BPS), EIA Residential Energy Consumption Survey (RECS), IECC climate zones 2003 (GIS), and Yale Climate Opinion maps for 2021. For a complete list of data sources, methods, and assumptions please see the Annex.

We combined county level data with climate zones, state, and housing type, to estimate natural gas use per household. Then, using the national average of all new builds with a gas connection in 2020 and 2021 (66%), we estimated gas use for new households by county (base year being 2020) to forecast cumulative new buildings and CO_2 intensity between 2023 and 2030. We used the estimated compound annual growth rate (CAGR) at the state level from the Building Permits Survey (BPS) by state for 2017 to 2021 for single and multi units. Using the forecasted numbers for each county, we ranked the top 100 most cumulative emissions intensive counties and cumulative new builds for 2023 to 2030, working out to a total of 114 counties.

Metropolitan areas

For the purpose of this report, we define metropolitan areas as a big city and its surrounding counties where it may be driving growth in residential construction. Some of these areas contain cities and counties that have already passed building electrification policies; this was not factored in our overall calculations, but is addressed in the “Past Action” section below.

Most estimated/projected emissions are coming from relatively few areas
We found that 114 counties covering 63 metropolitan areas are on track to emit 52% of future emissions between 2023 and 2030 in a business as usual (BAU) scenario from burning gas in new construction without any decarbonization policies in place. These metropolitan regions and neighboring counties will also account for over 55% of the new housing stock projected over this time.

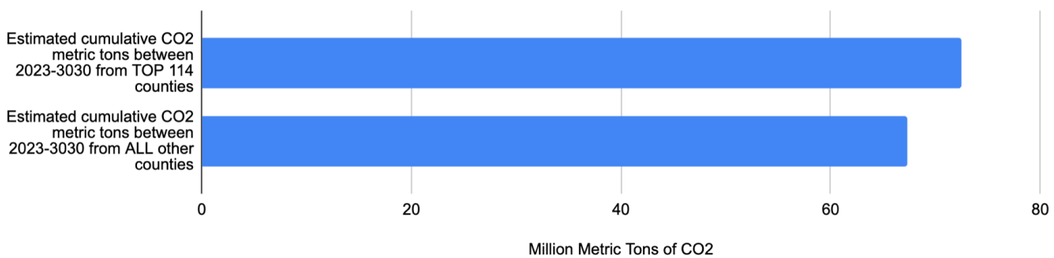

Figure 1. Bar graph showing the estimated cumulative million metric tons of carbon dioxide (CO_2) from new builds using gas between 2023-2030

These areas could avoid emissions equivalent to the annual emissions of 19.3 coal fired power plants
It is estimated that these top 63 metropolitan areas could account for over 10 million new units built between 2023 and 2030, emitting cumulatively over 72 million metric tons of CO_2 without any building electrification policies. That’s the same amount of emissions that would be generated annually by 19.3 coal fired power plants or equivalent to burning nearly 81 billion pounds of coal.

Just a dozen metropolitan areas account for nearly a third of estimated/projected emissions
Strikingly, twelve metropolitan areas will account for over 30% of estimated cumulative CO_2 emissions and new housing stock between 2023 to 2030. However, nine of these metropolitan areas are located in states that have passed laws preempting local jurisdiction from requiring new construction to be all-electric.

Table 1: The top 12 metropolitan areas for projected emissions from new gas using units have residents who want more local action on climate in states with and without preemption.

Metropolitan areas	Estimated cumulative CO_2 tons for all new units built 2023-30	Estimated total # new units built 2023-2030	Local officials should do more to address global warming (yes %)	Global warming is happening (yes %)	Preemption
Houston	5,845,850	960,118	58	70	yes
Phoenix	4,848,308	762,658	55	70	yes
Orlando	4,835,194	797,584	60	72	yes
Dallas-Ft. Worth	4,259,584	696,018	60	73	yes
Austin	3,627,822	623,639	61	77	yes
Salt Lake	3,381,781	338,442	53	69	yes
Denver-Aurora	2,649,240	257,624	58	73	
Tampa-St. Petersburg	2,426,739	387,127	60	73	yes
Cape Coral - Ft. Myers	2,348,999	382,020	58	68	yes
Nashville	2,084,240	286,583	59	67	yes
Philadelphia	1,980,059	262,028	62	76	
Minneapolis-St. Paul	1,710,667	189,073	60	78	

When looking only at states without preemption laws, the top dozen metropolitan areas make up nearly a quarter of projected emissions

When looking at only states without preemption laws about building electrification, the emission reductions from top 12 metropolitan areas are still large, accounting for 22% of all new estimated CO_2 emissions and building stock between 2023 and 2030. Perhaps unsurprisingly, a number of these places have already taken some sort of building electrification action, which is already reducing these projected emissions.

Table 2: The top 12 metropolitan areas not in preemption states account for over 22% of all new estimated CO_2 emissions and building stock between 2023 and 2030.

Metropolitan areas	Estimated cumulative CO_2 tons for all new units built 2023-30	Estimated total # new units built 2023-2030	Local officials should do more to address global warming (yes %)	Global warming is happening (yes %)
Denver-Aurora	2,649,240	257,624	58	73
Philadelphia	1,980,059	262,028	62	76
Minneapolis-St. Paul	1,710,667	189,073	60	78
Raleigh	1,568,385	204,131	60	72
Los Angeles - Anaheim	1,417,494	226,907	62	75
Seattle	1,239,175	193,348	61	81
Charlotte	1,052,213	140,799	66	77
Las Vegas	1,000,828	143,087	61	73
Riverside-San Bernardino	921,551	128,342	62	75
Colorado Springs	884,788	84,634	55	70
New York	832,131	103,771	69	79
Wilmington	790,471	117,056	55	69
Newark	600,226	78,888	70	83
Greenville	598,531	78,774	58	66
Sacramento	577,586	84,966	61	77
Madison	526,234	54,150	61	80
SF Bay Area	524,763	79,851	65	84
San Diego	490,063	79,809	59	76
Georgetown	411,269	50,603	58	71
Reno	400,997	45,554	58	76
Pittsburgh	386,038	44,496	62	76
Boston	378,818	41,235	63	79
Vancouver	373,057	53,596	57	72
Durham	368,308	50,330	67	79
Tacoma	355,951	52,529	58	74
Yonkers	354,204	38,366	65	82
Chicago	351,016	32,865	66	80
Charleston	346,299	54,982	62	75
Fort Collins	340,304	31,835	56	76
Omaha	337,635	33,331	57	72
Washington DC	318,782	43,318	70	83

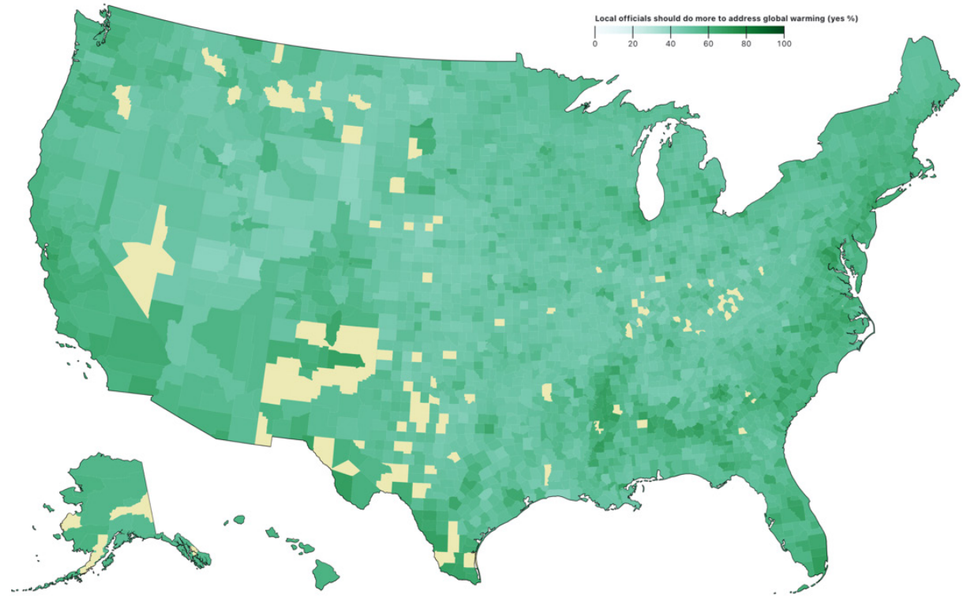

Figure 2. Map showing the percentage of people responding "yes" to a question asking whether "local officials should do more to address global warming". In over 70% of the counties a majority (50% or more) residents responded yes. Data are taken from the Yale Program on Climate Change Communication[4] and combined with county level data from BPS. yellow = data we dont have for counties from BPS.

In nearly all counties, a majority of residents want more local climate action

In all of these counties, a majority of residents (with an average of 73%) were aware that global warming is occurring. Even more importantly, a majority of residents (with an average of 59%) in 110 of 114 of those counties believe that their local elected officials should be doing more to address the climate crisis.

4. Yale Climate Opinion Maps 2021 | Yale Program on Climate Change Communication

State level

Fourteen states account for more than two-thirds of projected emissions
Just 14 states contain over 70% of projected emissions from new construction between 2023-2030 – the previous list as well as WA, SC, MN, and NJ. The 10 states with highest emissions profiles account for almost 60% of projected CO_2 emissions between 2023 and 2030. These are FL, TX, NC, PA, CA, CO, AZ, TN, UT and GA. These top 10 states also account for almost 65% of new housing stock projected to be completed between 2023 and 2030.

Some states, such as Washington and New York, have statewide policies coming online, and other states, such as California, have multiple local policies that are already reducing the emissions projected here.

Table 3: The top states ranked from highest cumulative estimated CO_2 emissions from using gas in new buildings built between 2023 and 2030

State	Estimated cumulative CO_2 tons for all new gas using units built 2023-30	Estimated total # new units built 2023-2030	Local officials should do more to address global warming (yes %)	Global warming is happening (yes %)	Preemption law passed
Florida	20,508,108	3,242,547	62	73	yes
Texas	18,779,538	3,431,417	60	72	yes
North Carolina	8,696,291	1,126,064	59	71	
Pennsylvania	8,169,262	928,883	58	70	
California	7,432,671	998,374	62	77	
Colorado	6,728,626	656,855	57	73	
Arizona	6,670,892	934,289	57	72	yes
Tennessee	5,495,258	740,211	57	66	yes
Utah	5,453,915	529,284	53	68	yes
Georgia	5,214,589	730,573	60	71	yes
Washington	4,723,806	581,775	59	75	
South Carolina	4,570,230	607,376	59	70	
Minnesota	4,344,130	438,993	56	72	
New Jersey	3,533,946	399,432	63	77	

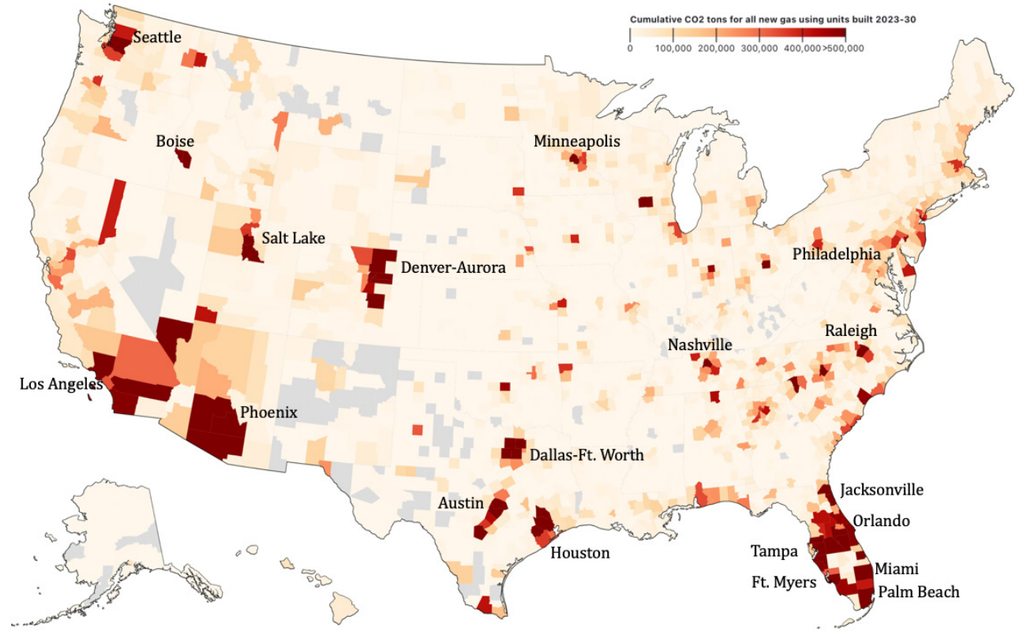

Figure 3: Map of the U.S. showing cumulative estimated CO_2 emissions from using gas in new buildings built between 2023 and 2030. Scale is from 0 to greater than 500,000 metric tons of CO_2. Some counties are missing data (gray) as they were not included in the BPS. BPS covered 96.4% (3029 out of 3143) counties across the US.

Past action

It's important to note that there are already a number of cities, counties, and states passing building electrification policies that will stop emissions. They are preventing the accumulation of years of locked-in carbon emissions and improving the health and safety of their communities. These jurisdictions started a national movement for building electrification and the models they've used should be replicated wherever possible.

To get a snapshot of the impact these existing policies have, we took a list of jurisdictions that passed policies that require new residential construction to be all-electric[5], and cross-referenced it with our list of the 63 metropolitan areas with the most projected emissions between 2023 and 2030. Because our data was at the county level and many of these building electrification policies were passed at the city level, we prorated the emissions reductions by population size of each respective city to its broader metropolitan area.

Current building electrification policies in the top 63 metropolitan areas account for a reduction of less than 4% from the top 114 counties, and overall less than 2% of total US emissions. However if we add in all the counties for NY with the reduction in that for top 114 passing BE, we see a reduction in overall US emissions from new builds 2023-2030 of over 3.5%.

This shows that we can't simply rely on the leadership of the places where building electrification started. It is essential to 1.) continue to grow the building electrification movement into the national mainstream, quickly passing policies as soon as possible in as many places as possible and 2.) ensure equitably electrifying existing buildings is a priority as well, especially in high density population centers with low projected building growth rates.

Table 4: Counties in key metropolitan areas impacted by current building electrification policies. Overall building electrification policies covering portions of these 8 metropolitan areas will constitute a 2% reduction of all U.S. emissions projected between 2023 and 2030

Metropolitan areas	County	State	Estimated cumulative CO_2 tons for all new gas using units built 2023-30	Estimated cumulative CO_2 tons for all new gas using units built 2023-30 based on BE
Chicago	Cook	Illinois	351,016	164,649
Los Angeles - Anaheim	Los Angeles	California	1,087,192	630,269
	Orange	California	330,302	298,415
New York	Kings	New York	447,519	0
	Queens	New York	384,612	0
Riverside	Riverside	California	616,766	536,424
Sacramento	Sacramento	California	344,481	230,395
San Diego	San Diego	California	490,063	478,929
SF Bay Area	Alameda	California	231,114	71,511
	Santa Clara	California	293,648	23,329
Washington DC	DC	DC	318,782	0
		TOTAL	4,895,495	2,433,922

5. Zero Emission Building Ordinances | BDC

Opportunities

We are going to need to decarbonize every sector of our economy to address climate change, and electrifying buildings must be a top priority for communities. Fortunately, in addition to the outsized impact that targeted actions in specific regions can have, there are a bevy of conditions that make building electrification easier than it has ever been.

People are ready for change

People are more eager for action on climate now than at any other point in history. As of 2021, 72% of adults believe climate change is occurring and critically 59% think local officials should be doing more to address the issue[6]. These numbers hold true across the counties we've identified as having the most potential for emissions reductions through building electrification measures.

Local elected officials should prioritize passing policies that address climate change, and one of the most efficient ways to do that is via building electrification.

Table 5: Top 20 metropolitan areas and polling on whether residents believe local officials should take more action on climate and believe in global warming

Metropolitan areas	Estimated cumulative CO_2 tons for all new units built 2023-30	Estimated total # new units built 2023-2030	Local officials should do more to address global warming (yes %)	Global warming is happening (yes %)	Preemption state?
Houston	5,845,850	960,118	58	70	yes
Phoenix	4,848,308	762,658	55	70	yes
Orlando	4,835,194	797,584	60	72	yes
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Denver - Aurora	2,649,240	257,624	58	73	
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Nashville	2,084,240	286,583	59	67	yes
Philadelphia	1,980,059	262,028	62	76	
Minneapolis - St. Paul	1,710,667	189,073	60	78	
Raleigh	1,568,385	204,131	60	72	
Jacksonville	1,489,649	241,333	58	70	yes
Los Angeles - Anaheim	1,417,494	226,907	62	75	
Boise	1,395,061	134,262	52	66	yes
Miami	1,287,497	241,927	68	78	yes
Palm Beach	1,259,767	206,874	63	76	yes
Seattle	1,239,175	193,348	61	81	
San Antonio	1,209,176	204,639	58	73	yes

The technology is here

For a long time, methods of electric heating – particularly for space heating and stoves – simply weren't on par with what gas could offer.

That's no longer true.

For heating our homes, heat pumps can work in temperatures as low as -13 degrees Fahrenheit (-24 degrees Celsius)[7], and even colder countries like Norway, Sweden, and Finland are turning to heat pumps to stay warm[8]. When it comes to cooking our food, induction stoves are ready for deployment. Not only are they nearly three times as efficient as gas stoves[9] when it comes to transferring heat, but they also boil water in less than a third[10] of the time it takes their gas counterparts.

Most importantly, as the grid and our communities are increasingly powered by renewable energy, these benefits will only multiply.

Follow the money

In the summer of 2022, the federal government passed the Inflation Reduction Act (IRA)[11]. Amongst other sweeping changes, this massive piece of legislation contains provisions that provide large sums of money to local governments that want to accelerate the electrification of buildings in their community. Of particular note was Section 50131, regarding **"Technical Assistance for the Adoption of Building Energy Codes[12]."** This section authorized $1 billion via grants for local governments to help them design and implement building electrification policies (or, for those in preemption states, building performance standards or energy codes).

It's worth noting that there are also plenty of funds that will soon be available via the IRA for residents and governments to use toward electrifying existing buildings as well.

For a full breakdown of the ways the IRA can help those who want to transition, we recommend the following resource from C40: Climate action and the Inflation Reduction Act: A guide for local government leaders.

Local action leads to state action

We're seeing evidence of local action leading to state action across the country. First, the Washington State Building Code Council updated its building code to require electric heating in commercial, large multi-family, and residential construction[13]. Next, California decided to prohibit the sale of new gas furnaces and water heaters after 2030[14]. Then, in 2023, New York passed a law requiring that most new construction buildings[15] be all-electric statewide.

What do all of these states have in common? Prior to taking this action, multiple local governments in each state passed or began pursuing robust building electrification policies.

The first place to take on building electrification was Berkeley, California in 2019[16], and since then, more than 100 jurisdictions have passed similar policies[17] – and plenty more are considering doing so. Many of those places are in California, Washington, and New York.

Building electrification began as a bottom-up movement, and now that movement is set to attain even greater heights as more jurisdictions from a wider variety of states –with cities from Colorado[18] to Maryland[19] to Illinois[20] jumping on board.

6. Yale Climate Opinion Maps 2021
7. Cold Climate Air Source Heat Pump Final Report | Center for Energy and Environment
8. Guest post: How heat pump sales are starting to take off around the world | Carbon Brief
9. 2021-2022 Residential Induction Cooking Tops | ENERGY STAR
10. Induction cooktop vs. gas stove: Which boils water faster? | The Cooldown
11. Text - H.R.5376 - 117th Congress (2021-2022): Inflation Reduction Act of 2022
12. Technical Assistance for the Adoption of Building Energy Codes
13. Washington state to require electric heating in building code update | S&P Global Market Intelligence
14. California plans to phase out new gas heaters by 2030 | NPR
15. New York passes first statewide ban on gas in new buildings | Canary Media
16. Berkeley first city in California to ban natural gas in new buildings | Berkeley Side
17. Zero Emission Building Ordinances | BDC
18. Crested Butte "buying into community values" with plan to become first Colorado municipality to go all-electric | The Colorado Sun
19. Howard County Council Passes Legislation for All-Electric Buildings | Baltimore Sun
20. New Construction in Oak Park Will Now Be All-Electric | MEEA

Roadblocks

Within our research, we encountered several roadblocks to progress on building electrification at the local level. While none are insurmountable, they are significant barriers to policy that should be considered in advocacy.

Preemption states contain many cities and counties with high projected emissions

Our report shows that over 35% of emissions from new builds will come from counties that are within preemption states. These state policies are barriers to local enactment of mandatory building electrification, but local authority could be reinstated by the states in the future. Some local governments in preemption states have found success anyway, by using legislative approaches including voluntary incentives and education. Cities and counties in preemption states are encouraged to get creative with the tactics they use to promote building electrification in consultation with their city manager or legal counsel.

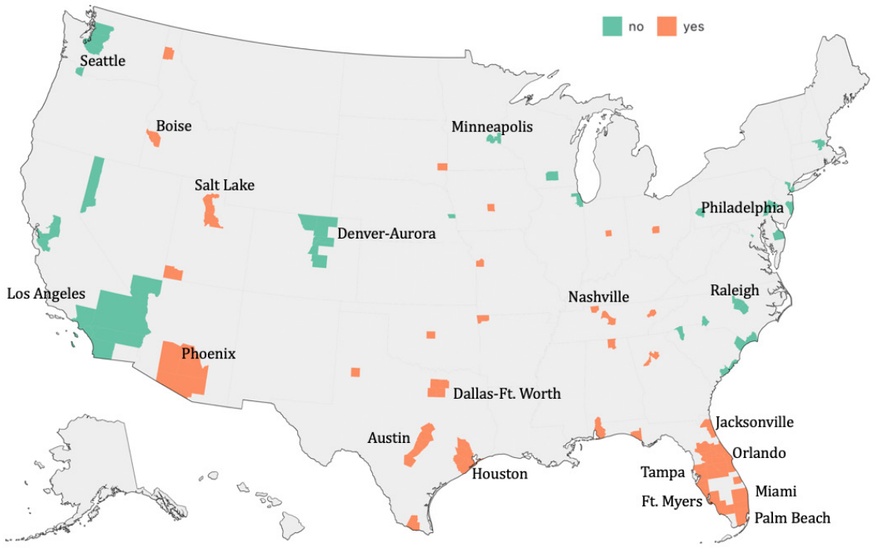

Figure 4. Map showing the top 114 counties for most projected cumulative emissions from using gas in new builds between 2023-2030 which fall within a pre-emption state or not. Orange = preemption state, and green = not preemption state.

Beyond requiring new buildings to be all-electric, city governments can explore a list of policy options including:

- promoting community, industry, and trades awareness of the financial and health benefits to electric appliances;
- providing a broad array of municipal financial incentives such as grants or low-interest loans to homeowners, property managers, landlords, and developers for going electric
- electrifying city and county-owned buildings;
- working with regional air quality regulators; and
- exploring policies that encourage electrification via building efficiency or other standards that don't violate existing preemptions laws.

Kansas City, MO has taken exemplary action despite being in a preemption state. Here's what they have to say in their Climate Protection and Resiliency Plan[21]:

"B-4.2: Build community awareness of heat-Inhousehold equipment. Create an education campaign to help build community awareness of air- and ground-source heat pumps encouraging building owners who are replacing end of life gas systems to choose all electric options instead. Since space and water heating equipment typically has a useful life of 10-20 years, units being replaced now may not be replaced again before the City's carbon neutral goal in 2040. This campaign should include education of home and business owners on the benefits and costs of choosing a heat pump over conventional heating and cooling equipment as well as training professionals who sell and service the equipment. In addition to heat pumps, develop education and resources focused on other household equipment such as induction cooking, heat-pump dryers and water heaters, water-sense labeled clothes washers and dishwashers, ENERGY STAR® refrigerators, and LED lighting."

"B-4.3: Provide financial assistance and incentives to support community-wide building electrification. Explore incentive, grant, private capital, climate sales tax, and other opportunities to issue low-interest loans, rebates, and incentives to building owners, landlords, property managers, homeowners, and businesses to help them electrify their buildings with modern, efficient appliances."

Existing buildings

A high percentage of projected building emissions remain from existing buildings and must be addressed. The projected cumulative emissions from all new buildings between 2023 and 2030 is not even equivalent to the emissions from existing residential buildings using gas in 2020 – meaning we have a lot of ground to cover to reduce the emissions of our current housing stock.

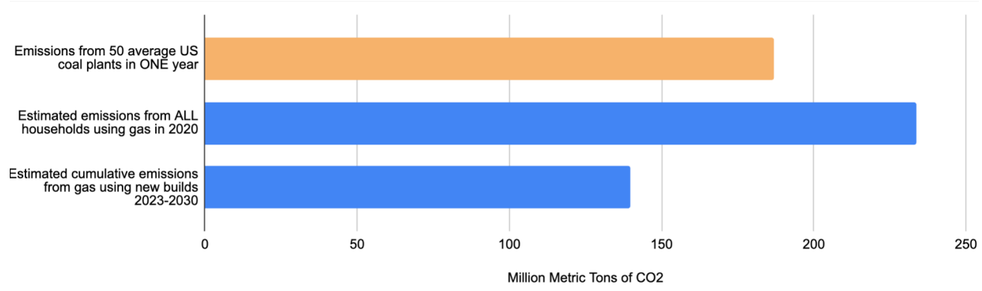

Figure 5. Bar graph showing comparison of emissions of 50 average sized coal plants in the US for one year, gas emissions from existing gas using households in 2020, and cumulative estimated/projected emissions from new builds using gas 2023-2030.

While this report only covers where building electrification measures could have the highest impact by lowering estimated/projected emissions from new residential development – the new emissions we don't want to lock in – it's imperative to also pass local and state legislation that helps incentivize retrofits of commercial and existing buildings.

Gas industry tactics to prevent electrification

The gas industry views local building electrification policies as “an existential threat[22]” and “death by 1,000 cuts[23]”, and stopped at nothing to prevent them from passing.

The industry has often employed dirty tricks ranging from spamming residents with unsolicited emails and robo texts[24], to impersonating concerned residents on the Nextdoor app[25], and even to threatening to bus in hundreds of out-of-towners with “no social distancing in place[26]” to disrupt city business during COVID.

And when those means haven’t proven successful, the industry has turned to influencing the courts. Using the restaurant industry as a front[27], fossil fuel companies have spent millions of dollars in a lawsuit attempting to subvert Berkeley’s gas hookup ban . After courts initially ruled in favor of Berkeley, a three-judge panel of the Ninth Circuit Court of Appeals[28] invalidated the city’s ordinance, ruling that it preempted federal law. While this case threatens some existing and proposed municipal building electrification policies in that federal court district (primarily in the Pacific Northwest and West Coast), the ruling isn’t final. The Biden administration filed an amicus brief[29] in June 2023 disputing the court’s interpretation, and Berkeley requested a review of the decision by the full Ninth Circuit. Regardless of the outcome of the court case, cities and counties can still pass legislation with different approaches that don’t conflict with the Ninth Circuit decision.

Local leaders working on these policies need to be prepared for the potential of stiff opposition from the gas industry. Fortunately, local governments and advocates are determined to enact these critical policies for climate and health and are developing, sharing, and successfully implementing new approaches for building electrification.

21. Kansas City Climate Protection & Resiliency Plan
22. Newly Revealed Emails Show Utilities Are Desperate to Avoid Gas Bans | Gizmodo
23. Berkeley gas hook-up ban appears likely to spread to other California cities: WSPA head | S&P Global
24. SoCal Gas Denies Knowledge of Texts Sent Out to Santa Barbara Residents | Newspress
25. How the Fossil Fuel Industry Convinced Americans to Love Gas Stoves | Mother Jones
26. How to stop a climate vote? Threaten a 'no social distancing' protest | Los Angeles Times
27. Did SoCalGas back the case against Berkeley’s gas ban? | The Sacramento Bee
28. Ninth Circuit Holds Berkeley’s Gas Ban Preempted by U.S. Energy Policy & Conservation Act | Climate Law Blog
29. Biden Administration Amicus Brief in California Restaurant Association v. City of Berkeley

Conclusion

Ultimately, this study paints a picture that is equal parts hopeful and concerning.

On the one hand, even if we prevented all 140 million tons of potential emissions from new residential construction from 2023 through 2030, that's only a fraction of what our buildings are contributing to the climate crisis. To truly mitigate our building emission problems, we're going to need to address the construction of new commercial properties and electrify existing buildings as well.

However, as stated earlier, the first step to getting out of a hole is to stop digging. And make no mistake – every new building that goes up today with gas hookups is another building that will have to undergo a costly retrofit in the coming decades if we want to avoid the worst of the climate crisis.

Targeted actions in relatively few areas could have dramatic impacts on emissions from buildings. This report lists the counties and metropolitan areas that are projected to contribute the most to climate change from new residential development if at their current growth rate they did nothing to change how they build. You'll notice in most of these places, a majority of residents are concerned about climate change and want their local elected officials to take more action to address this critical problem. People want their local governments to take action on this issue, and there are many ways for local elected officials to do so.

Our report also notes which of these counties (or cities within them) already have building electrification policies on the books – or are in states where they are preempted from doing so. If you're in a state without preemption laws in place, the obvious place to start is with a policy that requires new construction to be all-electric. But even if your state preempts your city government from outright requiring all-electric buildings, there are steps local governments can take to make a dent in this monumental problem.

Beyond policies that limit what kind of hook ups new buildings can have, there are policies that can incentivize more efficient[30] (and, spoiler, electricity is far more efficient than gas)[31] and all-electric construction[32]. There are policies that work to help low-income people switch out their gas appliance[33]. There are policies that encourage residents to switch to electric systems when replacing old appliances[34]. And thanks to the Inflation Reduction Act, there are billions of dollars in grants and loans available to help local leaders move toward decarbonized communities.

This report identifies locations where new buildings will cause an outsized amount of emissions through the end of the decade. With this information in hand, we hope advocates can more effectively target their work at the local level – and contribute to the ever-growing proof of concept for the movement towards housing that no longer relies on fossil fuels. Now, it's up to us to get that number as close to zero as possible, in as little time as possible, using every possible policy mechanism available to us.

30. Special Tax Rate for Energy Efficient Buildings | Charlottesville, VA
31. Electric heat pumps use much less energy than furnaces, and can cool houses too – here's how they work | The Conversation
32. Kansas City Climate Protection & Resiliency Plan | Sept 2022
33. Healthy Homes and Residential Electrification Amendment Act
34. Energize Denver Bill | Oct 2021

About

Stand.earth Research Group

Stand.earth Research Group (SRG) obtains crucial information to help build campaigns on critical issues. We specialize in chain of custody research, identifying and tracking raw materials as they move through complex supply chains. We trace environmental destruction and human rights violations to help hold corporate actors accountable and, ultimately, change corporate practices.

SAFE Cities

SAFE Cities is a growing movement of neighbors, local groups, and government leaders working at the local level to phase out fossil fuels and fast-track clean energy solutions to ensure a just energy transition. We are building connections between local efforts to limit fossil fuels and supporting the efforts of community leaders to adopt SAFE policies that phase out fossil fuels and fast track clean, more efficient energy solutions for all.

Lead Locally

Lead Locally helps elect state and local climate candidates to run and win in critical elections across the country for climate in order to move our communities off fossil fuels towards a just, renewable economy. They work to support down ballot climate candidates and local partners through research, fundraising, voter outreach, and candidate training.

Annex

Data and Methodology

Data Sources

- ➔ U.S. Census American Housing Survey (AHS)[35]

- ➔ U.S. Census Building Permits Survey (BPS)[36]
  U.S. Census data raw data files by county for 2020 is the survey of all new build permits covering 90% of U.S. counties. The Monthly Building Permits Survey is conducted for about 8,400 permit-issuing places. These 8,400 permit-issuing places each issue an average of at least 6 permits per year and represent about 99% of the annual total of new residential housing units authorized. The remaining 11,600 permit-issuing places have their activity imputed each month. Annually all 20,000 permit-issuing places are surveyed. All places issuing building permits for privately-owned residential structures. Over 98 percent of all privately-owned residential buildings constructed are in permit-issuing places.

- ➔ EIA Residential Energy Consumption Survey (RECS) on fuel used and end uses for 2020[37]
  List of tables used for Housing Characteristics
  - Table HC1.1 by Housing unit type
  - Table HC1.3 by Year of construction
  - Table HC 1.6 by Climate region

  List of tables used for Consumption and Expenditures (C&E)
  - CE2.1 Fuel consumption in the U.S. - volume estimates (in CcF) which have been used here from page 3 and 4 for natural gas per household using the fuel in 2020

- ➔ IECC climate zones 2003 (GIS) layer[38]
  This contains the 2003 climate zone classification. We do not use the 2021 new classification as our base year is taken as 2020 which was still under the old climate zones. Information can also be found at the Guide to Determining Climate Zone by County: Data Files | Building America Solution Center. The IECC climate zone map | Building America Solution Center can also be accessed here.

- ➔ Greenhouse Gas Equivalencies Calculator | U.S. EPA
  We used the U.S. EPA Conversion of natural gas use to carbon dioxide emissions factors and used the average carbon dioxide coefficient of natural gas is 0.0550 kg CO_2 per cubic foot.

- ➔ Yale Climate Opinion Maps 2021 to assess citizen interest in climate change issues. We looked at two questions: “Percent of adults who think global warming is happening” and “Percent of adults who think that their local officials should do more to address global warming”.

- ➔ Information on preemption states obtained from the following source: Half of U.S. states are on pace to prohibit local gas bans (S&P Global Market Intelligence)

- ➔ U.S. Census data on city and county populations[39] to estimate the change in estimated emissions due to building electrification policies.

- ➔ Policy data from Building Decarbonization Coalition’s Zero Emission Building Ordinances. We have considered only those states, counties and cities which have a policy in place for all new residential construction, needing all electric requirements covering single and multi family homes. The CO_2 changes have been estimated based on the population of the city as per the U.S. 2020 April 1 Census (linked above).

- ➔ Residential energy use emissions from the U.S. Energy-Related Carbon Dioxide Emissions, 2021. We have only accounted for emissions from burning gas and not any other sources.

Assumptions and limitations

Following are a list of assumptions that were made in the analysis of the data:

1. Survey estimates from U.S. government sites and other third party sources (listed under data sources) for gas use, new builds, and other metrics are assumed to be correct.
2. All multi (2+) units have similar statistics for energy use thus including energy use for single units and 2+ units.
3. Energy use data from the EIA by climate zone and division are applied to all gas using households in that county.
4. We have used a national average of new builds based on the AHS 2020-2021 numbers to be 66%. We were unable to get more granular due to constraints of time and availability of such data.
5. Base year for all calculations is 2020 as it is the latest available across data source types. We have then projected it out to 2030.
6. Metropolitan areas are taken as those with a population 200,000+ for the most part. Suburbs and cities close to a major city are classified as that city region. Where necessary we have listed all counties covered under these areas.
7. For estimated cumulative CO_2 emissions it is assumed that all buildings for that year are completed at the beginning of the year. Thus, emissions for buildings completed in 2030 will be counted for one year, while those completed in 2023 will be counted for eight years. Changing the assumption on completion of units did not impact the order of top counties or metropolitan cities, nor overall percentages. It only impacts absolute numbers.

35. American Housing Survey (AHS)
36. Building Permits Survey
37. 2020 Residential Energy Consumption Survey (RECS)
38. Antonopoulos, C., T. Gilbride, E. Margiotta, and C. Kaltreider. 2022. Guide to Determining Climate Zone by County: Building America and IECC 2021 Updates. PNNL-33270. Richland, WA: Pacific Northwest National Laboratory. https://doi.org/10.2172/1893981
39. U.S. Census Bureau QuickFacts: United States, www.census.gov/quickfacts

Methodology

1. County level estimates from BPS raw data files

2. Convert this into single unit (attached and detached) and multi units (2+ units)

3. Combine county estimate with IECC climate zones for each county

4. Estimate county level natural gas use per household (HH) in CcF (100 cubic feet)
    a. Get this by climate zone, by division and by unit type from RECS consumption data for 2020
    b. For each county and unit type estimate the average of all three in (a.)
    c. Get an estimate of average gas per HH in CcF for 2020 by county

5. Estimate what percentage of new builds will have a gas hookup at a national level
    a. Use AHS data on new builds by year of completion for new units at national level to get what percentage of single and multi units has gas use - overall works to about 65% of all units completed in 2020-2021 has gas hookup. We use this going forward.

6. Use the BPS county level data for new builds in 2020 and multiply by number estimated in (4.) with the percentage of new builds in 2020 that had gas hookup to get gas use for new builds in 2020 by county.

7. Use EPA GHG conversion (1 CcF gas = approximately 5.5 kg CO_2) to get county by county emissions for 2020 new builds.

8. Forecasting:
    a. Estimate CAGR at the state level using BPS permits by state for 2017-2021 for single and multi units
    b. Apply this CAGR to each county within that state for single and multi units
    c. Use this CAGR with base year 2020 to forecast building permits issued for years 2021 onwards out to 2030 (can be any date we choose)

9. Using this forecasted estimate by county for each year going forward we can estimate emissions (based on CcF use by new gas using HH)

10. Use this number to rank the top 100 most emissions intensive counties for 2020 and then cumulative for 2023 to 2030.

11. Create scenarios to estimate emissions reductions from not allowing gas hookups in new buildings
    a. BAU: current emissions scenario using ~66% gas
    b. Ideal scenario: 100% buildings do not have gas hookup

12. Building Electrification policies have been passed in some counties, states and cities. For this we looked at those where some policy regarding new construction has been passed and it is assumed that going forward there will be no gas hookups in these new builds for these localities. Where this is passed at state or county level - the estimated cumulative emissions for 2023 to 2030 have been taken as zero for the counties. Where this has been passed at the city level - we have taken the proportion of emissions to be zero as the same proportion of city population to county population for the 2020 U.S. census. For example: the city of Los Angeles has 3.9 million people while the county of Los Angeles has 10 million making the city housing 39% of the county population. Thus, the estimated emissions for Los Angeles county between 2023 to 2030 of 243,861 metric tons of CO_2 has been adjusted to be 148,919 metric tons of CO_2.

All Results

Metropolitan areas

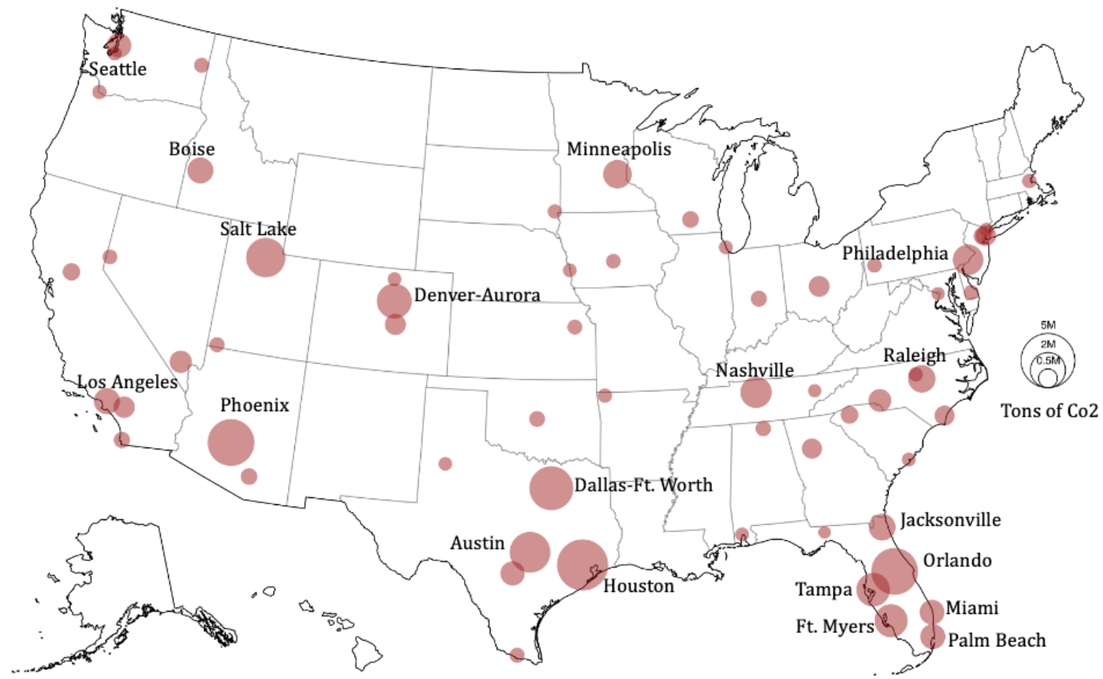

Figure A1: Map showing the cumulative emissions from new gas using units built between 2023 and 2030 for the top 63 metropolitan areas, with the top 20 labeled. The size of the bubble indicates the level of emissions.

Table A1: Top 63 metropolitan areas and the associated 114 counties for estimated cumulative CO_2 emissions from using gas in new buildings between 2023 and 2030.

Metropolitan Area	County	State	Estimated cumulative CO_2 tons for all new gas using units built 2023-30	Estimated total # new units built 2023-2030	Local officials should do more to address global warming (yes %)	Global warming is happening (yes %)	Pre-emption state
Atlanta	Fulton	Georgia	378,691	49,213	67	80	yes
	Gwinnett	Georgia	426,811	52,220	63	69	yes
Austin	Bell	Texas	274,405	43,596	60	75	yes
	Hays	Texas	436,499	69,083	61	77	yes
	Travis	Texas	2,102,914	380,271	64	82	yes
	Williamson	Texas	814,004	130,689	59	72	yes
Bentonville	Benton	Arkansas	374,655	49,509	53	68	yes
Boise	Ada	Idaho	893,984	86,053	54	72	yes
	Canyon	Idaho	501,076	48,210	50	61	yes
Boston	Middlesex	Massachusetts	378,818	41,235	63	79	
Cape Coral - Ft. Myers	Charlotte	Florida	312,205	49,763	56	67	yes
	Collier	Florida	465,347	75,892	58	69	yes
	Lee	Florida	1,083,305	181,085	59	67	yes
	Sarasota	Florida	488,142	75,281	58	71	yes
Charleston	Charleston	South Carolina	346,299	54,982	62	75	
Charlotte	Mecklenburg	North Carolina	1,052,213	140,799	66	77	
Chicago	Cook	Illinois	351,016	32,865	66	80	
Colorado Springs	El Paso	Colorado	884,788	84,634	55	70	
Columbus	Franklin	Ohio	863,329	89,205	63	80	yes
Dallas - Ft. Worth	Collin	Texas	1,318,123	207,515	59	75	yes
	Dallas	Texas	861,690	149,079	65	77	yes
	Denton	Texas	857,584	139,905	57	71	yes
	Tarrant	Texas	1,222,186	199,520	59	69	yes
Denver - Aurora	Adams	Colorado	519,973	49,981	61	77	
	Arapahoe	Colorado	533,028	51,085	59	73	
	Denver	Colorado	601,013	62,789	64	82	
	Douglas	Colorado	445,317	41,827	55	72	
	Weld	Colorado	549,909	51,942	52	63	
Des Moines	Polk	Iowa	390,604	35,749	58	70	yes
Durham	Durham	North Carolina	368,308	50,330	67	79	
Fort Collins	Larimer	Colorado	340,304	31,835	56	76	
Georgetown	Sussex	Delaware	411,269	50,603	58	71	
Greenville	Greenville	South Carolina	598,531	78,774	58	66	
Houston	Brazoria	Texas	361,478	54,663	56	68	yes
	Fort Bend	Texas	1,241,232	197,682	62	75	yes
	Galveston	Texas	295,442	45,980	56	67	yes
	Harris	Texas	3,032,103	518,451	64	73	yes
	Montgomery	Texas	915,595	143,342	53	69	yes
Huntsville	Madison	Alabama	438,516	53,687	57	66	yes
Indianapolis	Hamilton	Indiana	479,968	46,721	55	70	yes
Jacksonville	Duval	Florida	921,450	154,973	62	72	yes
	St. Johns	Florida	568,199	86,360	54	68	yes
Knoxville	Knox	Tennessee	311,670	41,676	56	67	yes
Las Vegas	Clark	Nevada	1,000,828	143,087	61	73	
Los Angeles - Anaheim	Los Angeles	California	1,087,192	176,125	64	76	
	Orange	California	330,302	50,782	60	74	
Lubbock	Lubbock	Texas	326,729	54,018	56	67	yes
Madison	Dane	Wisconsin	526,234	54,150	61	80	
McAllen	Hidalgo	Texas	419,500	68,648	66	79	yes
Miami	Broward	Florida	409,141	75,128	67	77	yes
	Miami-Dade	Florida	878,356	166,799	69	78	yes
Minneapolis - St. Paul	Hennepin	Minnesota	985,467	109,321	62	80	
	Ramsey	Minnesota	361,247	41,617	62	80	
	Washington	Minnesota	363,953	38,136	56	73	
Mobile	Baldwin	Alabama	341,956	49,522	51	60	yes
Nashville	Davidson	Tennessee	1,288,071	186,465	64	70	yes
	Montgomery	Tennessee	398,822	50,857	58	68	yes
	Rutherford	Tennessee	397,347	49,261	56	63	yes
New York	Kings	New York	447,519	55,834	69	76	
	Queens	New York	384,612	47,937	69	83	
Newark	Hudson	New Jersey	600,226	78,888	70	83	
Ocala	Marion	Florida	426,838	64,931	58	70	yes
Oklahoma City	Oklahoma	Oklahoma	465,824	58,239	58	70	yes
Omaha	Douglas	Nebraska	337,635	33,331	57	72	

Orlando	Brevard	Florida	489,667	80,405	57	72	yes
	Lake	Florida	427,600	66,560	59	72	yes
	Orange	Florida	1,166,441	206,925	66	70	yes
	Osceola	Florida	628,895	99,221	67	77	yes
	Polk	Florida	1,001,455	161,047	60	72	yes
	Seminole	Florida	254,213	42,959	61	72	yes
	Sumter	Florida	391,911	62,743	55	69	yes
	Volusia	Florida	475,012	77,724	58	72	yes
Palm Beach	Palm Beach	Florida	745,235	127,233	64	78	yes
	St. Lucie	Florida	514,532	79,641	61	73	yes
Philadelphia	Chester	Pennsylvania	390,926	50,537	61	77	
	Montgomery	Pennsylvania	327,803	42,648	63	79	
	Ocean	New Jersey	374,843	41,147	54	66	
	Philadelphia	Pennsylvania	886,487	127,696	70	81	
Phoenix	Maricopa	Arizona	4,158,700	662,634	56	70	yes
	Pinal	Arizona	689,608	100,024	55	70	yes
Pittsburgh	Allegheny	Pennsylvania	386,038	44,496	62	76	
Raleigh	Johnston	North Carolina	357,736	43,854	56	68	
	Wake	North Carolina	1,210,649	160,277	64	77	
Reno	Washoe	Nevada	400,997	45,554	58	76	
Riverside-San Bernardino	Riverside	California	616,766	85,126	61	74	
	San Bernardino	California	304,786	43,216	63	77	
Sacramento	Sacramento	California	344,481	51,987	61	79	
	San Joaquin	California	233,105	32,979	61	75	
Salt Lake	Davis	Utah	368,401	35,903	49	66	yes
	Salt Lake	Utah	1,441,344	150,044	58	76	yes
	Utah	Utah	1,208,279	116,741	51	65	yes
	Weber	Utah	363,758	35,755	52	70	yes
San Antonio	Bexar	Texas	839,698	145,768	65	81	yes
	Comal	Texas	369,478	58,871	52	65	yes
San Diego	San Diego	California	490,063	79,809	59	76	
Seattle	King	Washington	833,380	131,663	62	84	
	Snohomish	Washington	405,795	61,685	60	79	
SF Bay Area	Alameda	California	231,114	34,714	67	86	
	Santa Clara	California	293,648	45,137	64	83	
Sioux Falls	Minnehaha	South Dakota	370,774	39,098	55	73	yes
Spokane	Kootenai	Idaho	413,163	41,592	48	64	yes
St. George	Washington	Utah	418,060	49,227	49	62	yes

Tacoma	Pierce	Washington	355,951	52,529	58	74	
Tallahassee	Bay	Florida	274,215	48,287	53	69	yes
Tampa-St. Petersburg	Hillsborough	Florida	1,284,843	210,250	64	75	yes
	Manatee	Florida	542,904	85,715	58	71	yes
	Pasco	Florida	598,991	91,162	58	74	yes
Topeka	Jackson	Missouri	405,547	45,096	60	74	yes
Tucson	Pima	Arizona	525,302	78,418	60	80	yes
Vancouver	Clark	Washington	373,057	53,596	57	72	
Washington DC	DC	DC	318,782	43,318	70	83	
Wilmington	Brunswick	North Carolina	316,488	47,327	55	69	
	Horry	South Carolina	473,984	69,729	55	68	
Yonkers	Bergen	New Jersey	354,204	38,366	65	82	
Total of top 114 counties	**72,438,901**		**10,358,562**	**60**	**73**		
U.S. all County TOTAL	**139,731,920**		**18,442,351**				

State level data

Table A2: List of all states and sorted by descending order of estimated cumulative CO_2 emissions.,

Note: Some states, such as Washington and New York, have statewide policies coming online, and other states, such as California, have multiple local policies that are already reducing the emissions projected here.

State	Estimated cumulative CO_2 tons for all new gas using units built 2023-30	Local officials should do more to address global warming (yes %)	Global warming is happening (yes %)	Preemption law passed	Estimated total # new units built 2023-2030
Florida	20,508,108	62	73	yes	3,242,547
Texas	18,779,538	60	72	yes	3,431,417
North Carolina	8,696,291	59	71		1,126,064
Pennsylvania	8,169,262	58	70		928,883
California	7,432,671	62	77		998,374
Colorado	6,728,626	57	73		656,855
Arizona	6,670,892	57	72	yes	934,289
Tennessee	5,495,258	57	66	yes	740,211
Utah	5,453,915	53	68	yes	529,284
Georgia	5,214,589	60	71	yes	730,573
Washington	4,723,806	59	75		581,775
South Carolina	4,570,230	59	70		607,376
Minnesota	4,344,130	56	72		438,993
New Jersey	3,533,946	63	77		399,432
Indiana	3,441,721	53	65	yes	343,677
New York	3,381,195	64	79		328,146
Ohio	3,349,805	56	68	yes	318,948
Virginia	3,028,117	61	74		374,279
Wisconsin	2,923,044	54	69		274,061
Idaho	2,918,417	54	68	yes	283,352
Alabama	1,905,331	55	63	yes	279,490
Michigan	1,846,380	58	70		158,726
Nevada	1,809,396	59	72		229,110
Massachusetts	1,773,461	61	77		180,129
Missouri	1,650,087	55	68	yes	197,085
Oregon	1,585,506	59	74		193,487
Maryland	1,426,245	65	78		171,223
Louisiana	1,315,478	54	65	yes	198,205
Illinois	1,267,371	60	74		121,497
Iowa	1,170,372	54	68	yes	107,232
Oklahoma	1,113,551	54	64	yes	162,427
Arkansas	990,076	55	66	yes	154,754
Nebraska	988,793	52	67		106,186
South Dakota	907,283	54	68	yes	97,819
Kentucky	876,719	52	62	yes	142,169
New Mexico	807,480	59	72		109,268
Maine	794,942	56	70		82,913
Delaware	725,921	61	73		90,409
Montana	646,678	52	67	yes	90,592
Kansas	616,147	54	68	yes	81,526
New Hampshire	533,610	56	71	yes	54,937
Mississippi	416,844	57	67	yes	68,715
Connecticut	381,556	60	75		38,147
Wyoming	327,398	45	58	yes	31,850
West Virginia	307,339	47	57	yes	41,759
North Dakota	268,639	47	60	yes	30,569
Vermont	247,956	58	74		25,514
District of Columbia	215,186	70	83		29,241
Hawaii	164,485	59	72		23,417
Rhode Island	136,649	58	73		13,751
Alaska	100,604	55	70		12,532