

2012 Community Greenhouse Gas Emissions Report

Executive Summary
Prepared for



City of Phoenix
March 2017

Executive Summary

Climate change is one of the most pressing global issues today, as human development continues to cause increases in greenhouse gas (GHG) emissions. Cities have become the focus for climate change mitigation, both because cities are a major source of greenhouse gases and because of their ability to implement real solutions to climate change. Municipal sustainability goals promote both sustainable development and climate change adaptation to bolster our community resilience. As the sixth largest city in the United States, Phoenix has the potential to emerge as a leader in the climate change arena and set an example for other cities.

In 2008, Phoenix City Council embraced this challenge and adopted a goal to reduce GHG emissions from city operations to five percent below 2005 levels by 2015. After conducting two municipal scale greenhouse gas inventories, according to the Local Government Operations Protocol of the International Council for Local Environmental Initiatives (ICLEI), the city revised this goal to 15 percent below the 2005 levels by 2015. According to the results of the 2015 GHG inventory Update, the city of Phoenix met its goals and reduced emissions by 15.6 percent. While that success only addressed municipal operations, Phoenix has now completed its first community-scale GHG emissions inventory using the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC or GPC Protocol), a worldwide standard for inventorying city-induced GHG emissions developed by the World Resources Institute, C40 Cities Climate Leadership Group, and ICLEI¹. The GPC is also the standard supported by the Global Covenant of Mayors for Climate and Energy, of which Phoenix is a member.

The findings summarized in this Phoenix community-wide inventory report consists of all direct and indirect emissions from Phoenix categorized into three main sectors: stationary energy, transportation and waste. Stationary energy sources include natural gas consumption for heating as well as electricity use. Transportation includes vehicles, rail and aircraft landings and take-offs within city boundary. Waste is solid waste and wastewater emissions. Industrial Processes and Product Use and Agriculture, Forestry and Other Land Uses sectors were not reported due to data limitations and low relevance. The sources surveyed in this inventory are those sources generally

¹ Greenhouse Gas Protocol. (n.d.). GHG Protocol for Cities | Greenhouse Gas Protocol. Retrieved from <http://www.ghgprotocol.org/city-accounting>.

addressed by other comparable communities such as Portland, Austin, Houston and Las Vegas.

Major Findings

In 2012 total GHG emissions in Phoenix were 16,148,539 MT CO₂e, shown by sector in Figure 1.

A BASIC level community-scale GHG emissions inventory was conducted for the City of Phoenix, which included the stationary energy, transportation and waste sectors. Of the GHG emissions sectors, transportation was the largest source of GHG emissions, followed by stationary energy and then waste.

GHG Emissions by Sector
(MT CO₂e)

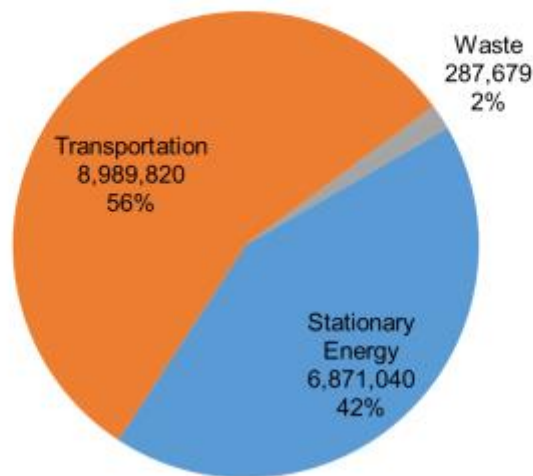


Figure 1: Breakdown of City of Phoenix Community-Scale GHG Emissions by Sector

The following pages illustrated a detailed breakdown for each of these sectors along with comparison to other cities by sector.

Stationary Energy

Total GHG emissions from stationary energy sources, electricity consumption and natural gas combustion were 6,871,040 MT CO₂e. Stationary energy sources include residential, commercial and manufacturing buildings, energy industries and agriculture. For Phoenix, residential buildings were the largest emission source, followed by commercial buildings and finally manufacturing industries, as shown in Figure 2.

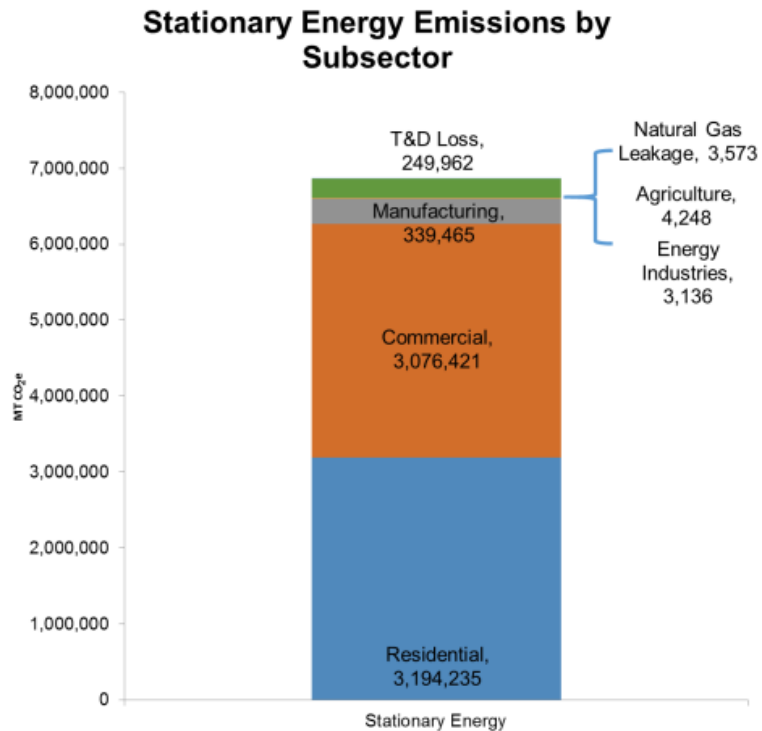


Figure 2: GHG Emissions from Stationary Energy Sources

Transportation

GHG emissions from transportation totaled 8,989,820 MT CO₂e. This category includes on-road transport, railways, water transportation, aviation and off-road transport. The highest emissions were from on-road transportation with 5,688,102 MT CO₂e as shown in Figure 3.

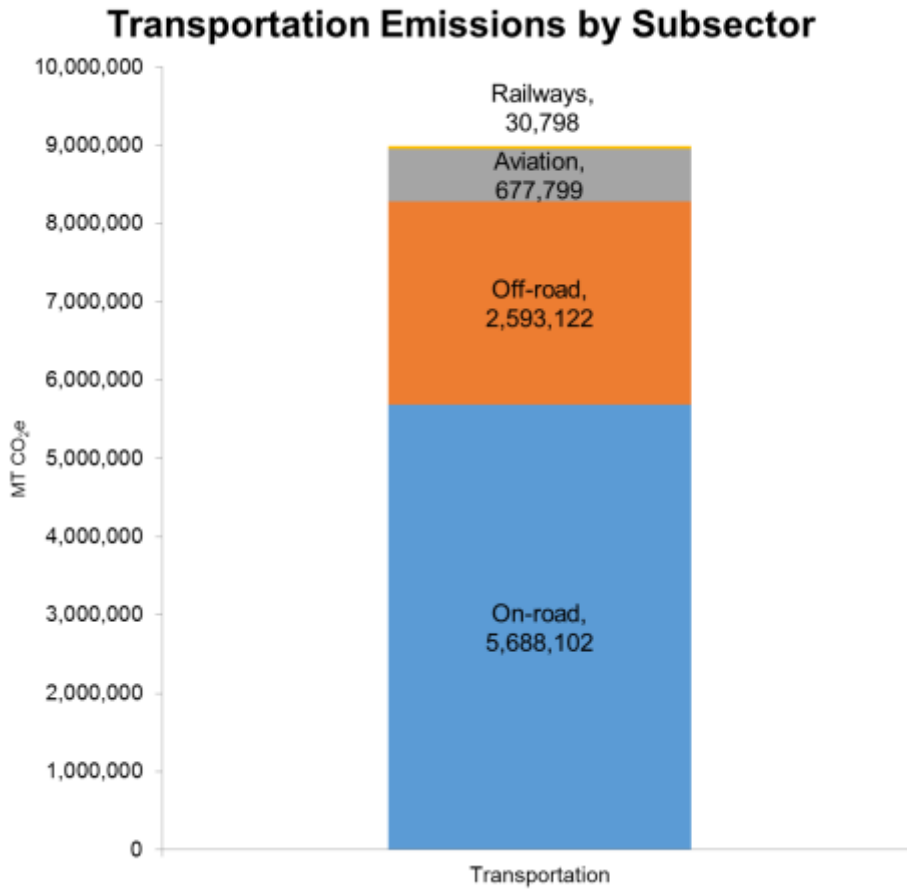


Figure 3: GHG Emissions from Transportation Sources

Waste

GHG emissions in the waste sector totaled 287,679 MT CO₂e and are a result of the disposal of solid waste, the biological treatment of waste, including composting, and wastewater generated inside and outside of the city, as shown in Figure 4.

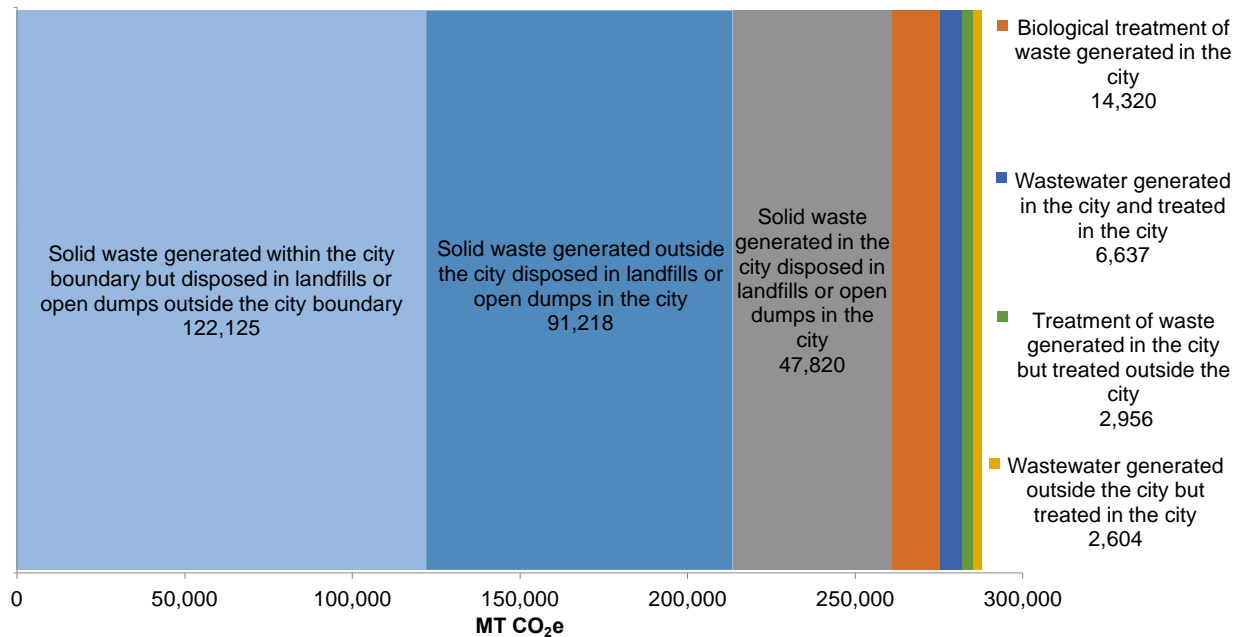


Figure 4: GHG Emissions from Waste Sources

Comparison of City of Phoenix 2012 Community-Scale GHG Emissions to Municipal Operations GHG Emissions

Overall, the city of Phoenix municipal operations accounted for approximately 3.9% of its community-scale GHG emissions, as compared in Figure 5. Operations comprises approximately 1.8% of scope 1 community emissions and approximately 7.3% of scope 2 community emissions. Scope 3 emissions were higher in the municipal operations GHG emissions inventory because these emissions were accounted as scope 1 emissions in the community-scale GHG emissions inventory, in accordance with GPC Protocol.

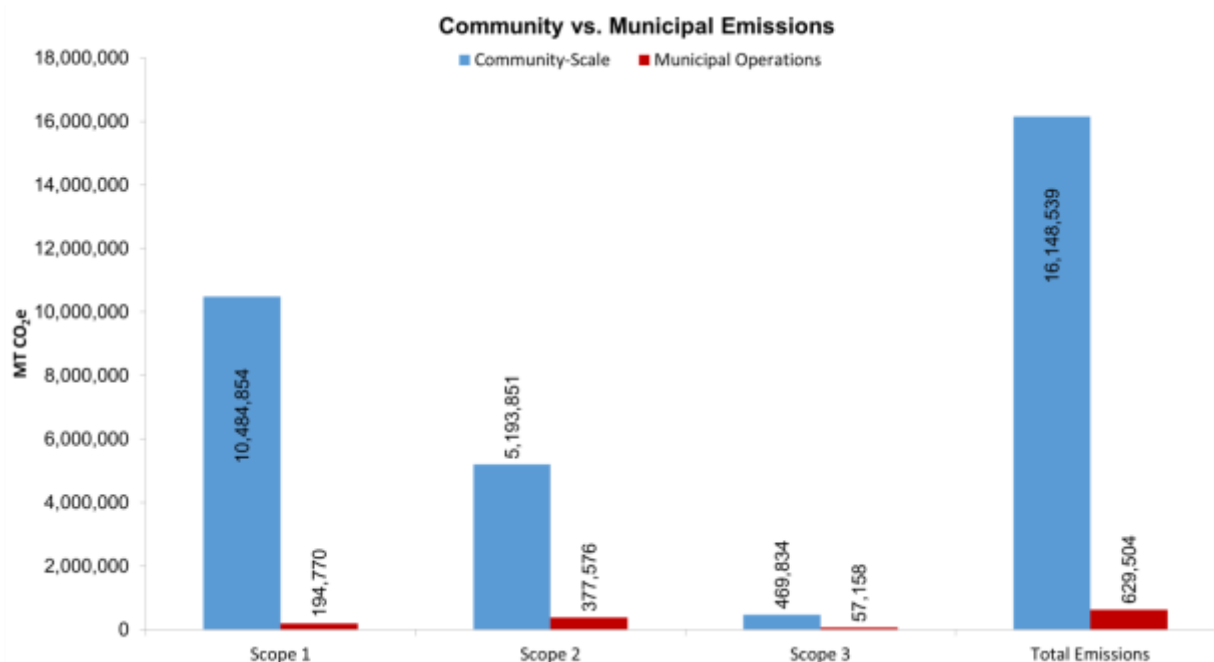


Figure 5. A Comparison of 2012 City of Phoenix 2012 Community-Scale GHG Emissions to Municipal Operations GHG Emissions²

² City of Phoenix. (2013) 2012 Greenhouse Gas Emissions Inventory for Government Operations. Report Prepared by ASU Global Sustainability Solutions Services. Retrieved from <https://www.phoenix.gov/Documents/106457.pdf>.

Comparison to Other Cities

Overall

Phoenix emitted 11.0 MT CO_{2e} per person, which ranks Phoenix higher than cities like Seattle, but lower than Houston, Portland and Las Vegas, as shown in Figure 6. This data was normalized to Phoenix’s inventory by only comparing stationary energy, transportation and waste emissions between cities. Factors that are important to consider when making comparisons are varying levels of population, areal size of the city, climate, gross domestic product, renewable energy mix, transportation fuel mixes and the type of inventory conducted.

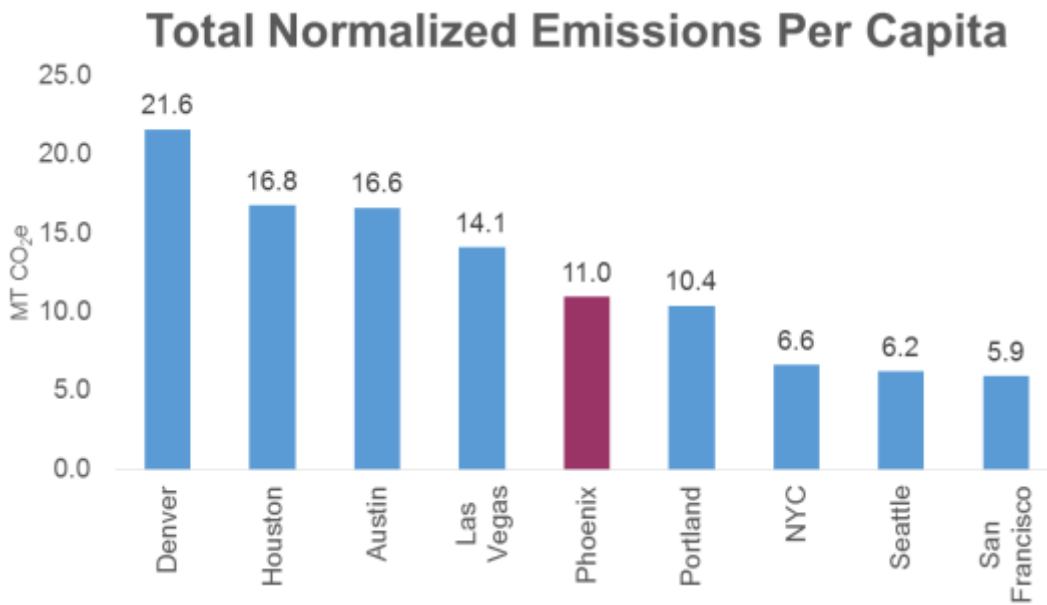


Figure 6: A comparison of the per-capita GHG emissions from City of Phoenix to other major U.S. cities.

Disclaimer: While attempts were made to normalize the level of emissions to better compare recent GHG inventories across various U.S. cities, some inventories are not easily comparable due to the use of a customized inventory methodology.

Stationary Energy

For the stationary energy emissions per capita, Phoenix ranks lower than Denver, Houston, Las Vegas, Austin, and NYC, as shown in Figure 7. This could be due to the cleaner energy supply from purchased grid electricity. Another factor could be that there is a portion of the year when Phoenix buildings do not need to be heated or cooled, and cooling is less energy intensive than heating buildings³.

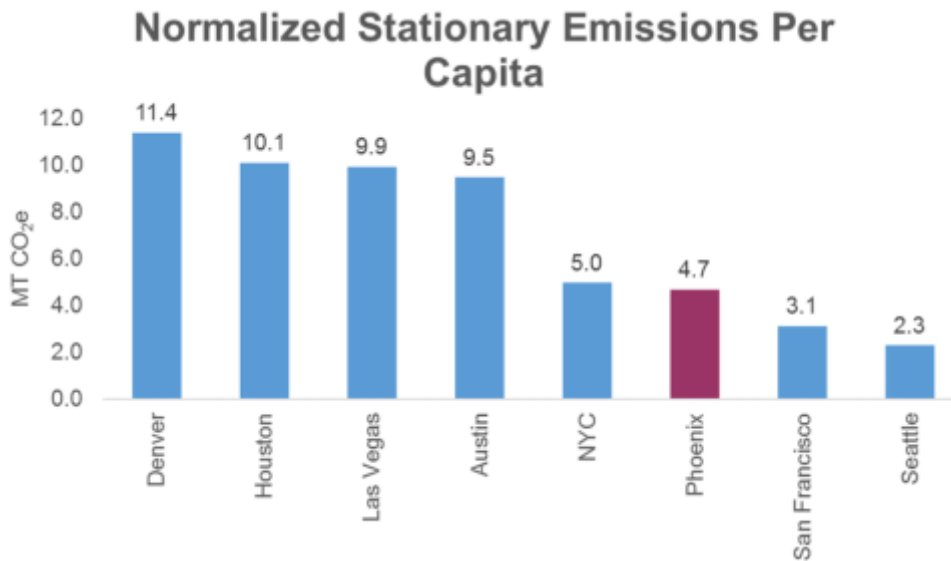


Figure 7: A comparison of the per-capita GHG emissions from Phoenix's stationary energy emissions to other U.S. cities

³ Sivak, M. (2013). Air conditioning versus heating: climate control is more energy demanding in Minneapolis than in Miami. *Environmental Research Letters*, 8(1), doi: 10.1088/1748-9326/8/1/014050.

Transportation

Phoenix ranked relatively high in its transportation emissions, with only Denver and Austin having higher emissions intensity, as shown in Figure 8. Cities known for their public transportation, such as Seattle and NYC, ranked much lower than Phoenix. This sector is where the city could improve the most to lower emissions.

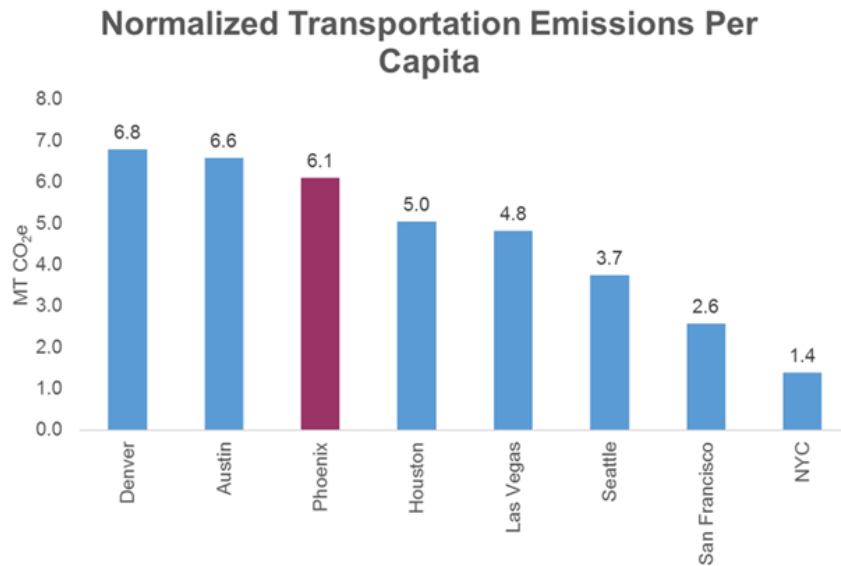


Figure 8: A comparison of the per-capita GHG emissions from Phoenix's transportation emissions to other U.S. cities

Waste

Phoenix only ranked higher than Seattle for its waste emissions per capita, as shown in Figure 9. This could be due to the highly efficient methane collection systems in Phoenix landfills, as well as the limited agricultural waste being produced in the city.

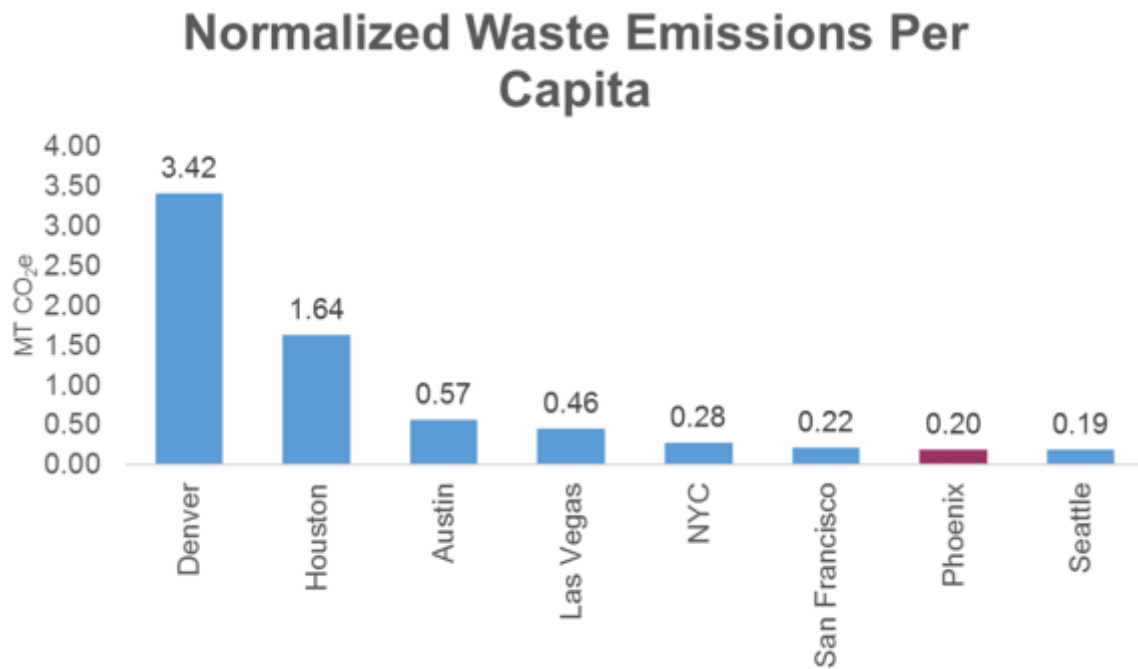


Figure 9: A comparison of the per-capita GHG emissions from Phoenix's waste emissions to other U.S. cities

Emissions by Scope

As shown in Figure 10:

Scope 1 GHG emissions: 10,484,854 MT CO₂e.

- These are direct GHG emissions from on-site fuel combustion, mobile fuel combustion, or fugitive emissions from waste disposal and treatment within the boundaries of Phoenix.

Scope 2 GHG emissions: 5,193,851 MT CO₂e

- These are indirect GHG emissions from energy generated outside Phoenix but consumed within the city, such as electricity, including electricity for transportation.

Scope 3 GHG emissions: 469,834 MT CO₂e

These are indirect GHG emissions not within the city of Phoenix boundary, such as waste generated within the city but disposed of outside the city boundary.

GHG Emission by Scope
(MT CO₂e)

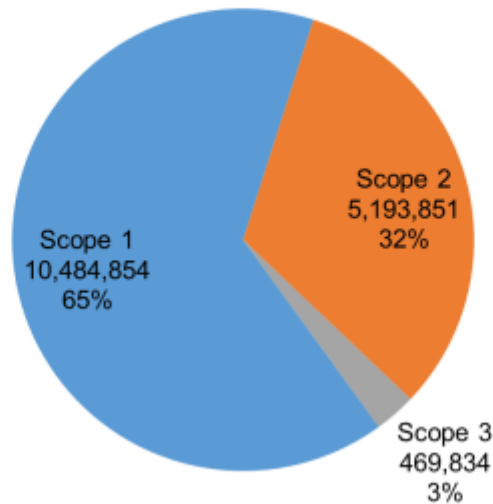


Figure 10. City of Phoenix Community-Scale GHG Emissions by Scope.

On a per capita basis, the city of Phoenix emitted 11.0 MT CO₂e per person, which ranks Phoenix higher than cities like Seattle, but lower than Houston, Austin, and Las Vegas. This data was normalized to Phoenix's inventory by only comparing stationary energy, transportation and waste emissions between cities. Factors that are important to consider when making comparisons are varying levels of population, areal size of the city, climate, gross domestic product, renewable energy mix, transportation fuel mixes and the type of inventory conducted.

Review and Recommendations

In review, the 2012 community GHG inventory showed us that:

- Phoenix is one of the first US cities using the GPC protocol for methodology.
- Reporting methods between cities are still very different, and this makes comparing city to city difficult. Until more cities apply the GPC, normalization is necessary to accurately make comparisons.
- Total per capita emissions were 11.0 MT CO₂e for Phoenix
- The transportation sector is the largest source of emissions for Phoenix

To further the implications of these findings and Phoenix's commitment to climate leadership, the following actions are recommended:

1. The city of Phoenix should create a Community Climate Action Plan that will set goals and reduction targets community-wide moving forward. This will allow Phoenix to challenge itself again to meet reduction targets and create effective policy to do so.
2. A community scale inventory allows the citizens of Phoenix to more directly engage with the emissions sources being reported. However, several emissions are still not accounted for on a community scale, due to the inability to isolate certain types of data to just within the Phoenix boundary. Phoenix should also consider a consumption-based or regional GHG inventory for future GHG studies. A consumption-based inventory will provide the consequences in emissions from the products citizens buy and consume. A regional inventory will provide more guidance to policy-makers toward those emissions sources that cannot be addressed within a single municipal boundary, such as vehicular traffic.
3. Finally, Phoenix has already taken several steps to measure, set reductions and implement policies to reduce GHG inventories. Therefore, Phoenix should continue to showcase its commitment to the Global Covenant of Mayors for Climate and Energy, to increase the city's visibility in its response to climate change.

Acknowledgements

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