

Environmental justice and air pollution: are we monitoring the right pollutants? Case study in Phoenix, AZ

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Abstract

Past environmental justice (EJ) research concludes that exposure to environmental hazards is greater in minority communities than in majority communities. Most EJ studies that suggest disproportionate environmental hazards exposure in predominantly minority communities are based upon United States Environmental Protection Agency's Toxic Release Inventory (USEPA TRI) data, which does not take into account multitudes of Small Quantity Generators (SQGs) whose combined capacity for emissions is more than what a TRI facility emits. Furthermore TRI facility emissions are contained and constrained by emission capture devices such as after burners, bag house filters, etc and permit conditions while Small Quantity Generators (SQGs) have no such legal requirements. This study looks into the air contaminants that are being monitored as a part of the regulatory requirement to what is actually being emitted. In the Maricopa County Monitoring District, the air contaminants monitored are typically the National Ambient Air Quality Standards (NAAQS) - criteria pollutants; however what is being emitted by the different entities are a lot more than just the NAAQS criteria pollutants. At the present time what is being monitored is inadequate and incomplete, moreover the myriad of chemicals emitted unfettered has individual and synergistic community-wide health effects that is currently un-monitored and unknown. This research paper is important in two fundamental ways, one, it places emphasis on the problem of environmental justice in the context of society of today. Second, it explores the possibility of setting standards in such a way that an individual community can decide how much contaminant emissions (air) they are willing to accept in terms of chemicals and quantities.

Keywords: air pollution, pollution monitoring, air contaminants.



1 Introduction

Maricopa County, Arizona, has had air quality concerns for the past fifteen years or more. Rapid growth, climatic conditions and pro-business political powers have been the fundamental causes for the failing of the National Ambient Air Quality Standards (NAAQS). The County has seen unprecedented growth for several years which brought about air pollution from auto emissions from the new residents.

The pro-business climate and the legislature willingness to handout tax credits for small businesses is been one of the many reasons for businesses moving operations to the County, and to the metro phoenix area. In the past 10 years, the County has either failed to meet the National Standards or passed the standards by a very small margin.

2 National air quality

The nation's air quality standard setting and its implementation was assigned to the Environmental Protection Agency (EPA). Many states have their own standards that reflect EPA's standards, and in the case of Maricopa County, the implementation for the Metro-Phoenix area is achieved through the County Air Pollution office.

The Clean Air Act, which was last amended in 1990, requires EPA to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. The Clean Air Act established two types of national air quality standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

The EPA Office of Air Quality Planning and Standards (OAQPS) has set National Ambient Air Quality Standards for six principal pollutants, which are called "criteria" pollutants. They are listed below. Units of measure for the standards are parts per million (ppm) by volume, milligrams per cubic meter of air (mg/m^3), and micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$).

2.1 Maricopa County air quality

Maricopa County is one of the nation's fastest growing county in terms of population. It has been one of the fastest growing counties for the past several years and continues to do so. The county which was established in February, 1871 is approximately 9226 Sq Miles and has a population of approximately 3.2 Million residents. It is the 4th populous county in the US. There are 27 cities within the County and about 20 of them belong to the 'Metro-Phoenix' area.

The Air Quality department of the County is resident within the 'Health Services Group', and is responsible for emissions inventory, permits, monitoring and enforcement.



Table 1: National Ambient Air Quality Standards (NAAQS).

Pollutant	Primary Stds.	Averaging Times	Secondary Stds.
Carbon Monoxide	9 ppm (10 mg/m ³)	8-hour ¹	None
	35 ppm (40 mg/m ³)	1-hour ¹	None
Lead	1.5 µg/m ³	Quarterly Average	Same as Primary
Nitrogen Dioxide	0.053 ppm (100 µg/m ³)	Annual (Arithmetic Mean)	Same as Primary
Particulate Matter (PM ₁₀)	50 µg/m ³	Annual ² (Arith. Mean)	Same as Primary
	150 µg/m ³	24-hour ¹	
Particulate Matter (PM _{2.5})	15.0 µg/m ³	Annual ³ (Arith. Mean)	Same as Primary
	65 µg/m ³	24-hour ⁴	
Ozone	0.08 ppm	8-hour ⁵	Same as Primary
Sulphur Oxides	0.03 ppm	Annual (Arith. Mean)	-----
	0.14 ppm	24-hour ¹	-----
	-----	3-hour ¹	0.5 ppm (1300 µg/m ³)

¹Not to be exceeded more than once per year.

²To attain this standard, the 3-year average of the weighted annual mean PM₁₀ concentration at each monitor within an area must not exceed 50 µg/m³.

³To attain this standard, the 3-year average of the weighted annual mean PM_{2.5} concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m³.

⁴To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 µg/m³.

⁵To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

2.2 Non attainment

There were several exceedances for Ozone limits during the years 1981 – 1991, and as a result of this non attainment significant portion of the county (by population and geography was) was classified as a ‘non-attainment’ area for both ozone and carbon monoxide.



Table 2: Emissions breakdown.

Category	VOC tons/yr	VOC tons/day	NO _x tons/yr	NO _x tons/day	CO tons/yr	CO tons/day
External and Internal Combustion Sources	2,392.58	1.45	7,615.72	20.61	4,203.38	5.53
Industrial Processes	614.94	2.33	0.00	0.00	0.00	0.00
Solvent Utilization	22,595.56	65.02	0.00	0.00	0.00	0.00
Storage and Transport	5,781.43	17.02	0.00	0.00	0.00	0.00
Waste Disposal	146.20	4.30	96.33	2.01	1,253.02	40.38
Miscellaneous	282.24	0.89	12.67	0.01	411.04	0.51
Area Source Totals:	31,812.95	91.01	7,724.72	22.63	5,867.44	46.42

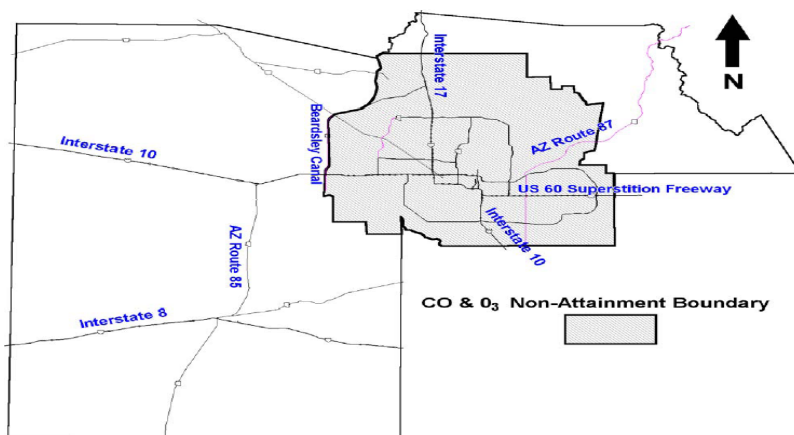


Figure 1: Non attainment map.

The air quality department as a part of the requirement of the Clean Air Act Amendments of 1990, collects emissions information, in the following categories, 1) Stationary Point; 2) Area; 3) Non-road Mobile; 4) On road Mobile; and 5) Biogenic sources. Collectively all five sources are estimated to contribute 336.94 tons of VOC, 292.70 tons of NO_x, and 1,254.84 tons of CO per ozone season day. (1999 emissions data)

3 Case study outline

This case study inquires the possibility that air quality in a community is not only the national ambient air quality standards criteria pollutants but also the various emissions large and small from the commercial entities in the community.

4 Research questions

The current policy of assessing the air quality of a community/neighbourhood with the NAAQS criteria pollutants is not only incomplete, but also inadequate to understand and quantify the exposure potential for a given community.

To test this hypothesis further, two zip codes (85007, 85009) were selected randomly, and these two areas are in the 'non-attainment' area within Maricopa County. Each of this area is considered in the following sections.

Table 3: Census info by race.

Category	Maricopa County	Arizona State
White persons, percent, 2000 (a)	77.40%	75.50%
Black or African American persons, percent, 2000 (a)	3.70%	3.10%
American Indian and Alaska Native persons, percent, 2000 (a)	1.80%	5.00%
Asian persons, percent, 2000 (a)	2.20%	1.80%
Native Hawaiian and Other Pacific Islander, percent, 2000 (a)	0.10%	0.10%
Persons reporting some other race, percent, 2000 (a)	11.90%	11.60%
Persons reporting two or more races, percent, 2000	2.90%	2.90%
White persons, not of Hispanic/Latino origin, percent, 2000	66.20%	63.80%
Persons of Hispanic or Latino origin, percent, 2000 (b)	24.80%	25.30%

5 Maricopa County background information

The study area randomly chosen is the area represented by the zip code, 85007. This area is within the 'non-attainment' zone for the County Air Quality.



Information from the 2000 census indicates the following breakdown of the different races within the State and Maricopa County:

6 Case study I

The area under consideration is zip 85007. In this zip code, there are 93 operations that have emissions. Majority of these operations are not Large Quantity Generators (LQG) of hazardous waste, but mostly Small Quantity Generators (SQG) and Conditionally Exempt Small Quantity Generators (CESQG).

Under the Resource Conservation Recovery Act (RCRA) regulations the LQGs have more stringent requirements than SQGs or CESQGs and as such only LQGs are required to have emission control devices. EPA database lists only 5 entities in its 'emitter' category, implying that emissions from these entities have an impact on the air quality.

However the rest of the emitters in this zip code emit significant chemicals, but not in big enough quantities to come under the purview of emission control regulations. In this case some of the entities include, painting operations, small manufacturing, machine-shops, and commercial bakeries amongst the others.

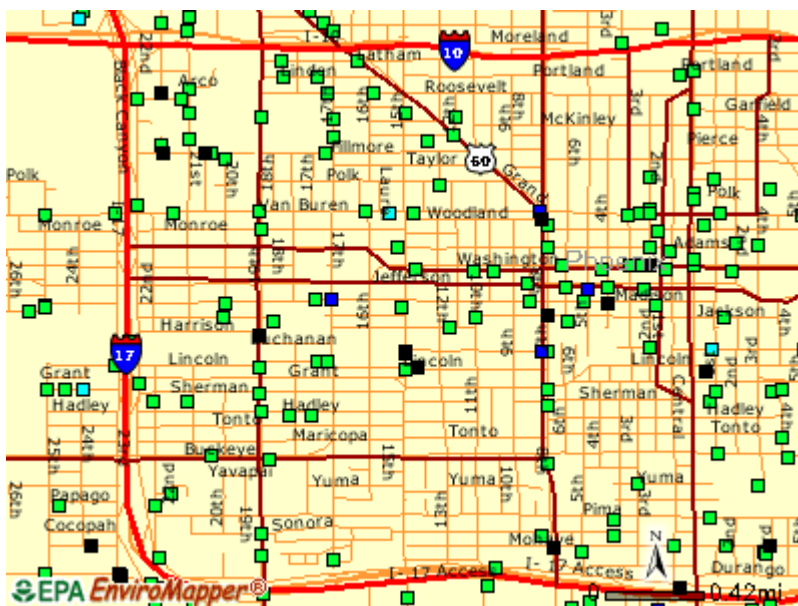


Figure 2: Emissions info for zip 85007.

Arizona Departmental of Environmental Quality (ADEQ) Resource Conservation and Recovery Act (RCRA) list indicates that some of the emissions from these entities include, VOCs, Styrene, MEK, MIBK, Toluene and other chemicals that are listed in the EPA's Hazardous Air Pollutants (HAPs) list.

Maricopa County Air Pollution office requires an annual emissions inventory from most of these entities, however there is no monitoring done within the community to understand the potential exposure to these contaminants.

This implies that for the most part the emissions from SQGs or CESQGs are either unrecognized or considered insignificant and are not considered in the overall air quality of the community.

The United States Environmental Protection Agency (USEPA), database for emissions shows the following for zip code 85007. (USEPA 'where you live' query for 85007, Feb 12, 2006.)

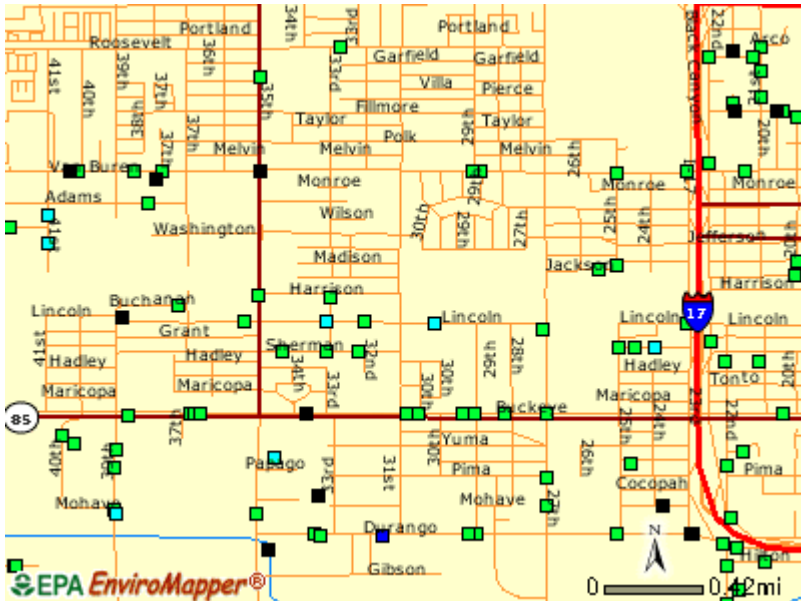


Figure 3: Emissions info for Zip 85009.

7 Case study II

Zip code 85009 was randomly chosen for this case study. This area is within the current non-attainment zone in the Metro-Phoenix area. There are 282 operations that have emissions. These include CESQGs, SQGs, and LQGs.

EPA database lists 23 operations that contribute towards the air quality in this area, however there are approximately 250 of these operations have some emissions, and they include VOCs, Methylene Chloride, Toluene, Isopropyl Alcohol etc. These entities report to Maricopa County for their annual emissions inventory and the amount of emissions range from a few 100 lbs to several tons. A majority of these operations have an air permit that allows emissions up to 10 tons for VOCs and 1 ton or less for listed HAPs. The USEPA database for emissions shows the following for zip code 85009. (USEPA 'where you live' query for 85009, Feb 12, 2006.)



8 Results

The entities that contribute to the overall air quality in these study area include Large and Small quantity generators of hazardous waste, and others that emit only a small quantity of the listed air pollutants. At the present time only the NAAQS criteria pollutant are monitored. There is no program to monitor any other pollutant even when they are part of the HAPs list. Findings from this case study shows that these emissions are not monitored and are not considered when evaluating the air quality of the community. A good majority of this unconsidered emission are chemical listed under Toxic Substances Control Act (TSCA) and have significant health impacts, particularly in the elderly and young children population.

9 Conclusion

The current system of monitoring only the NAAQS criteria pollutants for air quality consideration is not only incomplete but also inadequate to understand and quantify the true air quality of a community. When emission from all these small quantity emitters are aggregated, the quantities become significant and as such it has a detrimental impact on the air quality and at this time the significance or the impact is not understood.

10 Questions for further research

What is the total emission within a community?

The total emission in a community can be calculated from the County emissions inventory, and when considered along with emissions from traffic, it would give an overall quality of air in the community.

What is the potential impact of these unconsidered emissions on the health of the citizens of the community? Asthma rates, cancer rates and other health issues within the community could be considered for understanding this.

Note: This paper would be revised when Maricopa County Emissions inventory records for 2003 & 2004 become publicly available.

References

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