Air Quality, Pollution Monitoring, and Action

This section reviews the well-documented negative impacts of pollution on local health as well as the sources of these emissions. Our analysis focuses on Fontana and warehousing-related air pollution.. Although warehouses do not directly contribute heavy amounts of pollution, activity at these sites attracts mobile sources of pollution. The California Air Resources Board notes that heavy-duty trucks are responsible for more than 50 percent of nitrogen oxides and fine particle pollution from all mobile sources in the state. (Lambert 2021). These impacts are both local and regional, with studies indicating that in addition to known adverse environmental and health impacts, air pollution from warehousing activity exacerbates social disparity in the Southern California region. Notably, warehouses facilities “are approved in communities already experiencing pollution burdens from toxic facilities,” encroach on sensitive land uses like schools, and “are more likely to be located in neighborhoods with lower median income and higher levels of poverty.” (Torres et al. 2021)

Due to the lack of available data, we recommend pursuing monitoring as a means of documenting pollution. However, without removing the sources of air pollution from the area, its negative impacts will persist. Additionally, we want to acknowledge that there are immense climate change impacts associated with the pollutants discussed in this section. Because we are focusing on the local impacts, we have determined discussing climate change is outside the scope of this report.

Sources of Emission

Mobile Sources

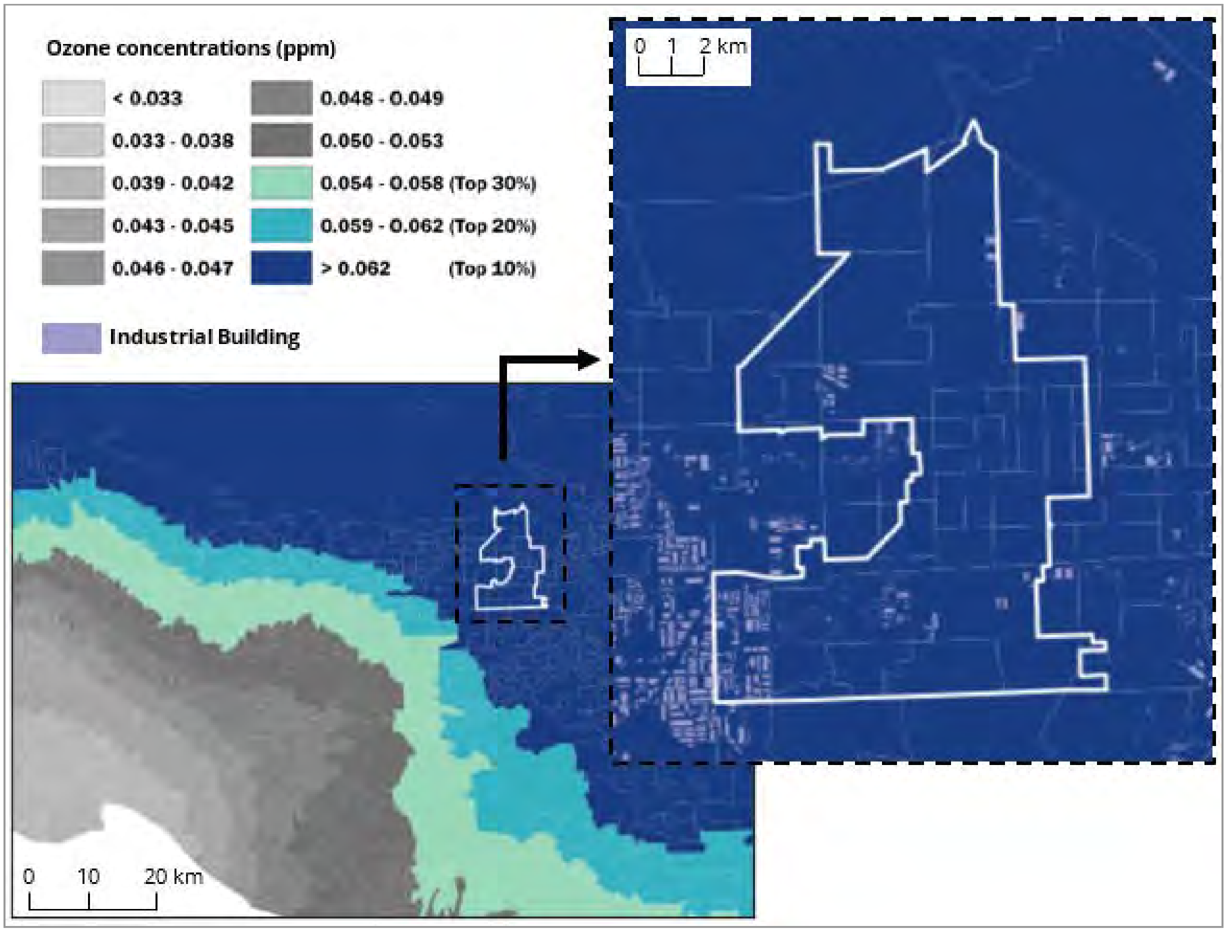
Mobile sources of emissions (e.g. cars, trucks, etc.) are the largest sources of air pollution in the United States. The transportation sector represents 29% of all greenhouse gas (GHG) emissions, a quarter of which come from medium-heavy and heavy-heavy trucks (US EPA 2015). Weight ranges for various truck classifications are defined in Figure 5.01. Vehicle emissions include greenhouse gases like CO_2 and CO, smog-forming ozone (O_3), nitrogen oxide (NO_X), and fine particulate matter (PM 2.5 and PM 10). Even in small concentrations, these pollutants can have detrimental impacts on one’s health.

Figure 5.01: Truck Classification Table

Light-Heavy (4.25 - 7 tons)	
Medium-Heavy (7 - 16.5 tons)	
Heavy-Heavy (over 16.5 tons)	

Source: US EPA 2015. Icons sourced from Flaticon.

Figure 5.02: Average Daily Maximum 9-Hour Ozone Concentrations (2017-2019)



Source: Author generated with data from: August et al. 2021; *2016 Land Use Information for San Bernardino County* n.d.; *2016 Land Use Information for Riverside County* n.d.; *Microsoft/USBuildingFootprints* [2018] 2021.

Ozone is one air pollutant that is prevalent in the Southern California region. Numerous studies display how acute ozone exposure is associated with damage to lung tissue, lung disease, and respiratory symptoms (e.g., asthma) (Last, Pinkerton, and Schelegle 2017;

Malig et al. 2016; Moore et al. 2008). The health impacts of ozone are heightened in afternoons and during warmer months when emissions stay at ground-level for prolonged periods of time. Ozone is the primary component of smog, and although California has taken significant steps to reduce its ozone concentration, there is still an abundance of pollution in Fontana. Figure 5.02 displays the average daily concentrations of ozone in the region. Fontana and the Inland Empire contain the top 10% of most polluted tracts in the state.

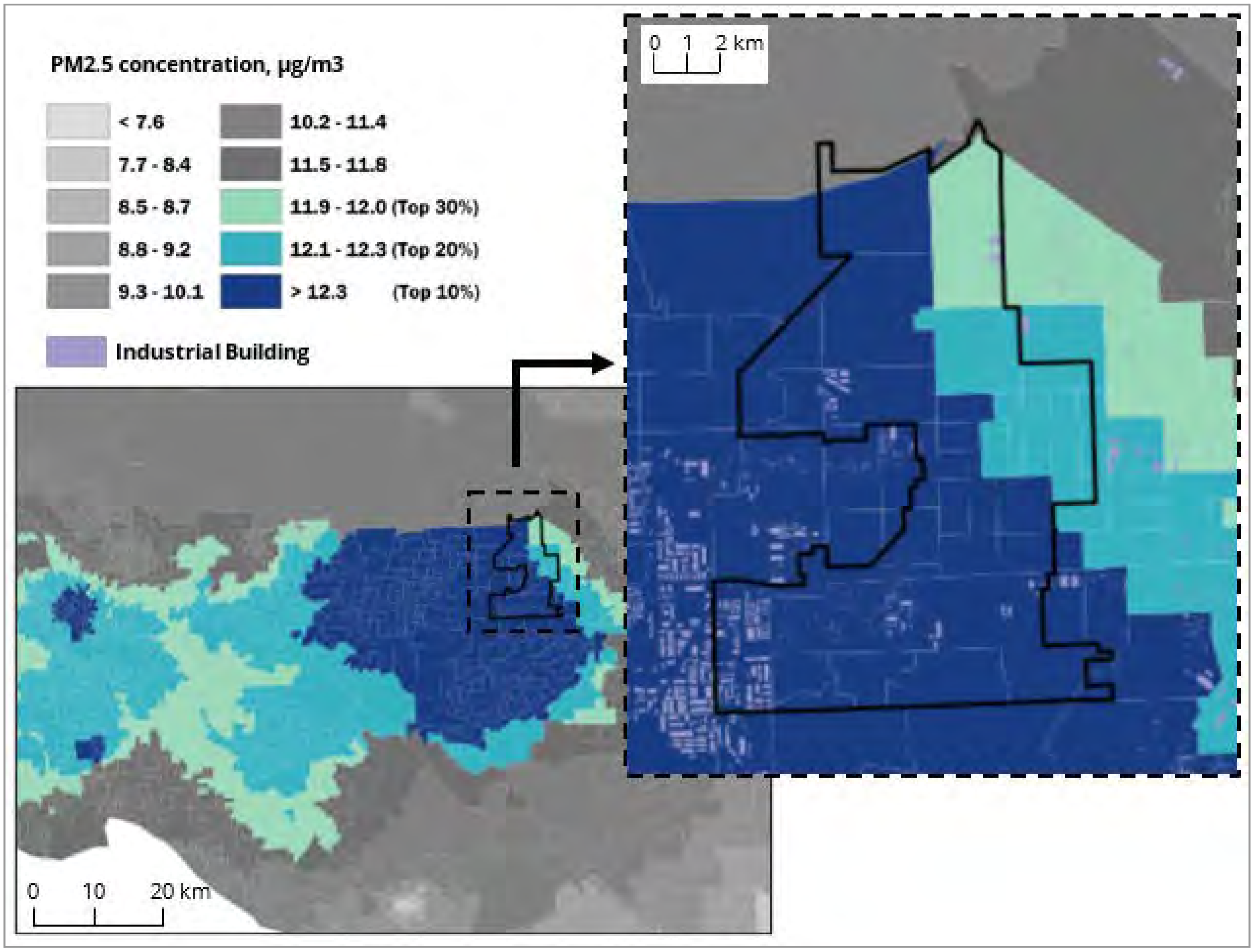
Another significant impact on health is particulate matter (PM). Fine, inhalable particulate matter (PM2.5[1]) has been directly linked to decreased lung function, aggravated asthma, and irregular heartbeats (US EPA and OAR 2016; "Common Air Pollutants | California Air Resources Board" n.d.). Smaller particles can enter a person's bloodstream and have been shown to increase hospitalization for cardiovascular disease, respiratory disease, and can even cause premature death (Crouse et al. 2012; Wu et al. 2020). PM2.5 comes from cars and trucks, with heavy-duty diesel trucks emitting very hazardous exhaust. Diesel PM has been found to contain carcinogens like benzene and formaldehyde (Krivoshto et al. 2008). Although recent technological innovations have reduced diesel emissions the particles released are often ultrafine and will continue to be harmful until entirely eliminated.

Other activities that emit PM2.5 involve combustion, such as industrial facilities and forest fires. In Southern California, where the risk and severity of fires has increased in recent years, the density of particulate matter can exacerbate existing emissions from mobile sources.

Fontana is overly exposed to PM2.5. Figure 5.03 displays how particulate matter sits within the basin surrounding Fontana. The geographic location, combined with the reliance on cars and trucks for transportation, make efforts to mitigate and minimize PM2.5 emissions a top priority. Populations such as children, the elderly, and those with respiratory or cardiovascular conditions who are more susceptible to the adverse effects of PM2.5 should be taken into account when developing strategies for reduced emissions.

[1] PM2.5 are particles less than 2.5 micrometers in diameter - nearly 30 times smaller than the width of one hair

Figure 5.03: Annual Mean PM2.5 Concentration (2015-2017)



Source: Author generated with data from: August et al. 2021; *2016 Land Use Information for San Bernardino County* n.d.; *2016 Land Use Information for Riverside County* n.d.; *Microsoft/USBuildingFootprints* [2018] 2021.

Warehouses and Distribution Centers

Static sources, such as buildings, are another significant contributor to air pollution. Direct emissions from fossil fuels and electricity consumption (both on-site and off-site) are responsible for approximately 25% of California's GHG emissions. The majority of emissions from buildings comes from electricity usage, which, despite advancements, is not operating on an entirely clean grid and will require significant investment to manage fluctuations in demand (Simon 2021). To benchmark the climate impact of different buildings in the city, we identified building footprint by land use and used their total area (in square feet) to estimate electricity consumption (in kWh) and CO_2 emissions (in metric tons). Building footprints were identified from a dataset developed by Microsoft using machine learning to draw building outlines from satellite imagery. These footprints were overlaid on land use maps developed by the Southern California Association of Governments to identify the land use code per building.

Figure 5.04 displays these estimates of energy usage and carbon emissions at warehouses, single-family residential units, and commercial buildings in Fontana. These buildings are three of the largest types of development in the city with regards to area. Despite their large footprint, warehouses and distribution centers are considerably energy efficient. When considering tons of CO_2 emitted per square foot, warehouses emit CO_2 at a lower rate of intensity than single-family residential and commercial buildings.[2]

Figure 5.04: Estimated Electricity Usage and Emissions for Selected Building Types

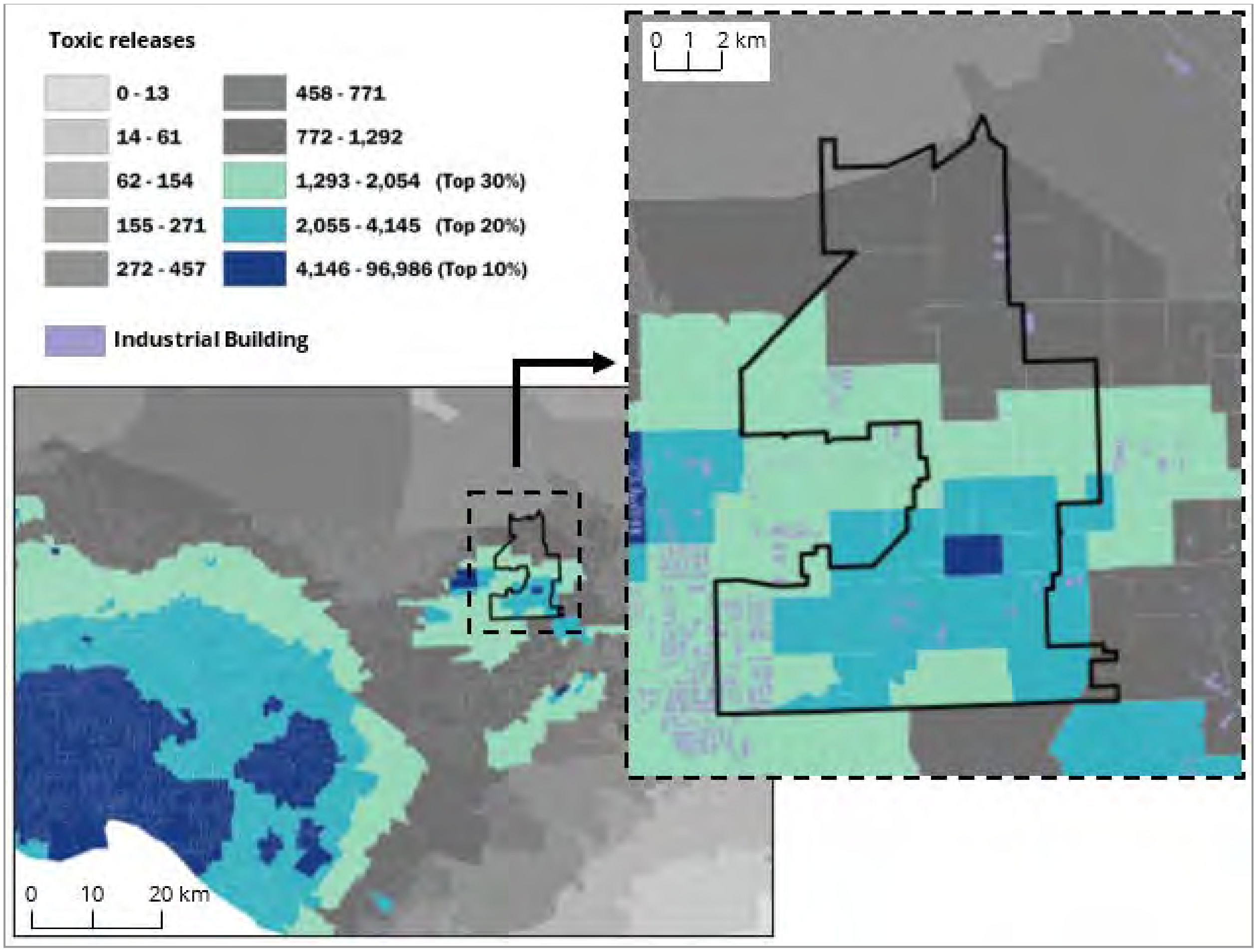
Building Type	Estimated Units	Estimated Area (sq. ft)	Energy Usage (MWh/year)	CO_2 Emissions (tons/year)	CO_2 Emissions Intensity (tons/sq. ft)
Single-Family Residential	39,709	122,780,100	4,249,628	873,587	0.007
Commercial	615	7,761,200	272,951	56,110	0.007
Warehouse / Distribution Center	98	23,497,400	364,210	74,869	0.003

Source: Author generated, with data from: (Energy Star 2021; Energy Information Administration 2016; *Microsoft/USBuildingFootprints* [2018] 2021; *2016 Land Use Information for San Bernardino County* n.d.).

One study shows that increased automation can further decrease energy consumption per warehouse (Lewczuk, Kłodawski, and Gepner 2021). However, the reductions in emissions are small for the cost of implementation. Additionally, warehouses operate on small profit margins and are often unable to take large financial risks, such as those present in early adoption of automated facilities ("The Future of Warehouse Work: Technological Change in the U.S. Logistics Industry" n.d.).

[2] Note that the estimates for warehouse energy intensity and emissions in Figure 5.04 are likely lower than in reality. The data could not distinguish between warehouse types, so assumed all were standard distribution centers. However, refrigerated facilities are significantly more energy intensive compared to non-refrigerated facilities (requiring 4x the electricity per square foot). Development standards for refrigerated facilities should be higher and more stringent to account for these much higher costs.

Figure 5.05: Toxicity-Weighted Concentrations of Modeled Chemical Releases to Air from Facilities (2017-2019)

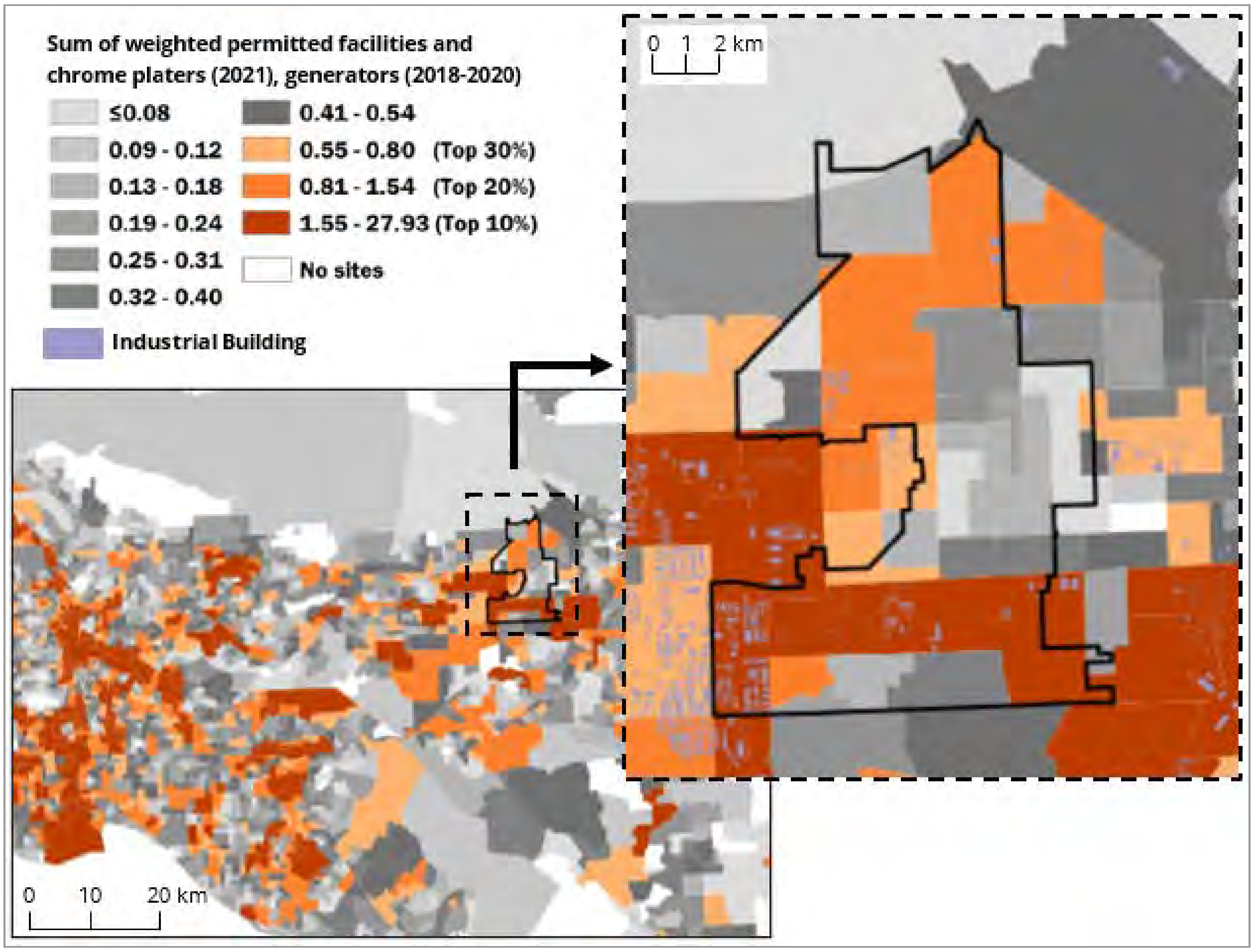


Source: Author generated with data from: August et al. 2021; *2016 Land Use Information for San Bernardino County* n.d.; *2016 Land Use Information for Riverside County* n.d.; *Microsoft/USBuildingFootprints* [2018] 2021.

A concern in Fontana is that there are already locations with high toxicity concentrations and hazardous waste generation. As seen in Figures 5.05 and 5.06 these locations are correlated with the location of industrial buildings. They are also the locations with higher proportions of people of color and low income households within the City (Figures 2.08 and 2.09), furthering concerns found in studies that indicate how there are racial and ethnic disparities in exposure to these toxins (Zwickl, Ash, and Boyce 2014). All sources of pollution should be addressed, however an equitable response involves prioritizing these communities that have been (and are) disproportionately impacted.

Warehouses and distribution centers are often sited in locations with other industrial land uses. There is concern of release of toxic chemicals at these locations, both in the air and in the ground. Although difficult to track, several studies indicate that living and working near toxic-releasing industries increases the risk of cancer and increases infant mortality rates (Morello-Frosch et al. 2002; McCarthy et al. 2009).

Figure 5.06: Hazardous Waste Generators (2018-2020) and Facilities (2021)



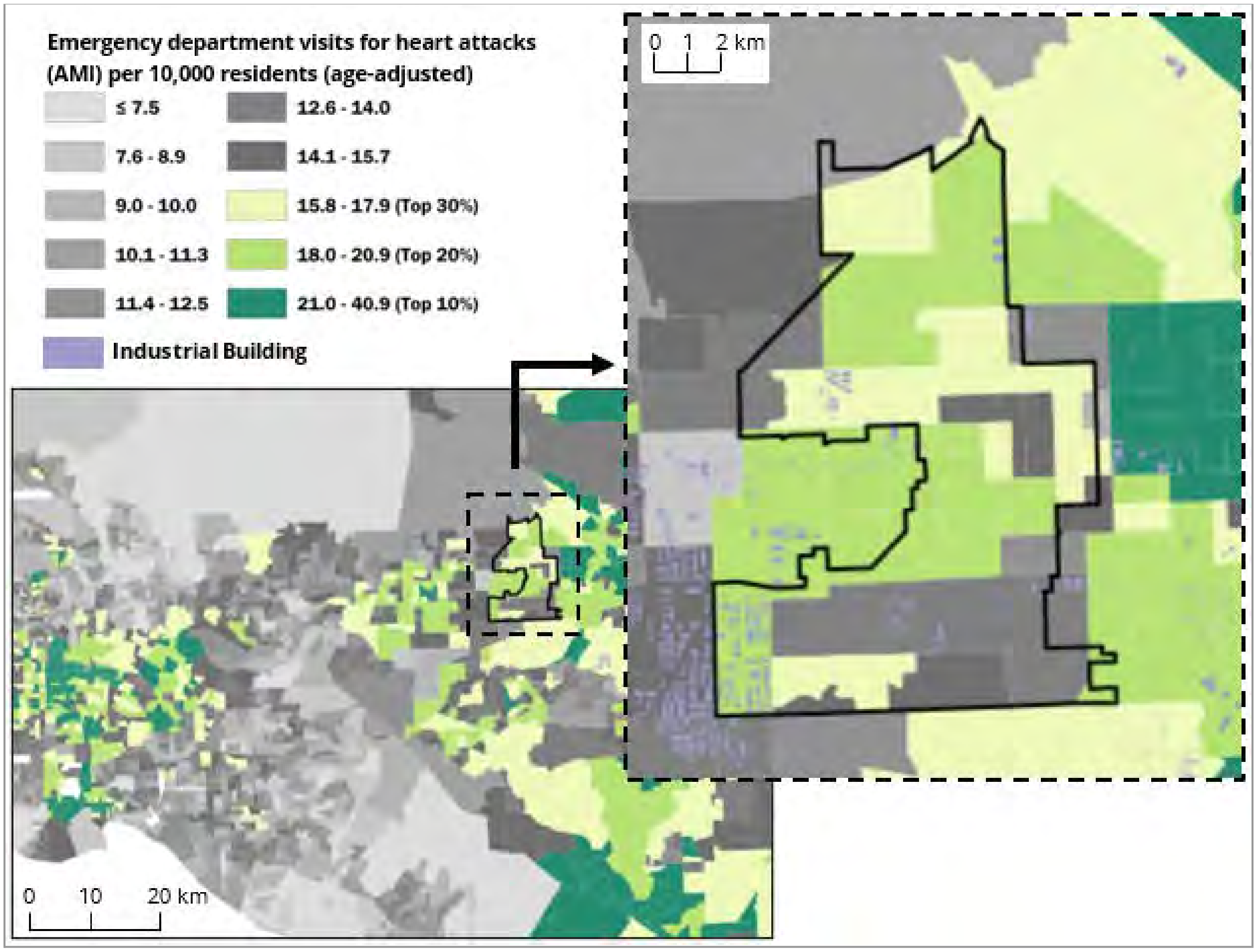
Source: Author generated with data from: August et al. 2021; *2016 Land Use Information for San Bernardino County* n.d.; *2016 Land Use Information for Riverside County* n.d.; *Microsoft/USBuildingFootprints* [2018] 2021.

Future studies are needed to fully understand the air pollution impact of warehouses. These facilities are so new that many emissions- and health-related datasets that rely on older indicators (ranging in age from three to ten years) do not fully capture their presence. It is likely that true pollution exposure is higher than estimated (Bonta 2021).

Health Impacts of Emissions

As mentioned above, even low levels of air pollution have been linked to higher rates of hospitalizations. Figure 5.07 displays the spatially- and age-adjusted emergency department visits within Fontana and the Greater Los Angeles region for heart attacks.

Figure 5.07: Cardiovascular Disease



Source: Author generated with data from: August et al. 2021; *2016 Land Use Information for San Bernardino County* n.d.; *2016 Land Use Information for Riverside County* n.d.; *Microsoft/USBuildingFootprints* [2018] 2021.

Central Fontana and unincorporated Kaiser have higher incidence rates of heart attacks than parts of north Fontana and most of south Fontana. When compared to the wider region, the cardiovascular incidence rates are near those of Los Angeles. Despite potential inconsistencies in reporting rates (it is unclear who goes to the hospital for heart attacks and how it is reported) we find this data compelling because Central Fontana and unincorporated Kaiser have a higher proportion of poor or Hispanic households in the region (Figures 2.08 and 2.09). These communities bear a greater pollution burden, and, as mentioned above, should be prioritized when planning equitable approaches to pollution mitigation and reduction.

Recommendations

Recommendation 5.1: Invest in air pollution monitoring and sensors

An important aspect of tracking these changes and providing guidance for future policy will be the addition of more air quality monitoring stations throughout the Fontana area. The South Coast Air Quality Management District (SCAQMD) currently only operates one air pollution monitor in the entire city. SCAQMD and others such as CalEnviroScreen have developed models to obtain fine-grained (spatially and temporally) measurements of air quality, but for the City of Fontana to do their own measurements in this manner would require investment. Increasing the number of locations where air quality measurements (including but not limited to PM 2.5, PM 10, NO2, O3, and CO) are being taken will help track the progress of electrification. These monitoring stations will provide insight into areas that are seeing more or less benefits, and, more generally, provide more data the city can use to shape policy around trucking to most benefit the people who live there.

A cost-effective approach to increased monitoring is to invest in outdoor, stand-alone sensors, such as those sold by PurpleAir. A recent study by SCAQMD found that PurpleAir PA-II particulate matter sensors were "very reliable" and highly correlated to the corresponding measurements collected using a substantially more expensive particle instrument ("PurpleAir PA-II" 2017). Each unit costs approximately $250. Each unit reported PM1.0, PM2.5, and PM10.0 mass concentration within 20-second intervals, which the researchers found to result in low variability.

Although these less expensive monitors do not capture all GHGs like NO2 and O3, they can be an extremely useful resource for city-wide monitoring of air quality. The sensors simply require a 100-240V AC power supply to operate, and therefore could be installed at nearly every light pole in the city. We recommend first locating sensors at locations with populations that are more sensitive to worsening air quality. This includes educational centers, senior centers, and residential neighborhoods with high rates of cardiovascular or respiratory diseases.

It is essential to not place monitors directly adjacent to freeways. The interest is in measuring how particulate matter congregates in residential and work environments, not just on the road. Additionally, although two major freeways, the I-10 and I-15, cut through the City of Fontana and are located near warehouses and other industrial buildings, these roads are not under City jurisdiction. The freeways are a major source of pollution, but the

City can still mitigate the impacts of air pollution on its residents by understanding how emissions from mobile sources are distributed.

Recommendation 5.2: Incorporate air pollution monitoring into community engagement initiatives

Monitoring the levels of particulate matter will inform not only the City about how to address pollution but also its residents. A benefit, for example, of placing stand-alone sensors at educational centers, such as elementary, middle, and high schools, could include incorporating air quality information and data analysis into the curricula and club activities, allowing students to learn about the importance of good air quality. Monitoring provides an opportunity to teach Fontana's youth about environmental science, environmental justice, and air pollution.

Recommendation 5.3: Require air pollution monitoring at logistics industry facilities

To ensure ongoing air monitoring, we recommend Fontana require all logistics industry facilities to install and maintain monitoring technology on their grounds. This would require installing both indoor and outdoor sensors to measure particulate matter emissions on their premises. In addition to working with existing facilities to install sensors, the city should require it of all new facilities through the permitting process. This can be considered akin to the other development impact fees for sewage, for example.

Recommendation 5.4: Apply for funding and additional support of air monitoring

Given the low cost of stand-alone sensors, the Fontana Chamber of Commerce has already expressed interest in financially supporting a first round of air quality monitor purchase and placement. The City, however, should also seek additional sources of funding to track and measure emissions.

An example is the Community Air Protection Program (CAPP), established by CARB in association with AB 617, which supports community organizations in limiting their community's exposure to air pollution. Communities awarded through the program create emissions reduction plans, educate around air quality standards and best practices, implement and support air quality monitoring, and more.[3] For example, the Center for Community Action and Environmental Justice successfully applied to have an inclusive, community-centered planning process with the community of Westside San Bernardino to create an air quality and climate resilience plan in 2019.

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[3] To learn more about the Community Air Protection Program, including application timelines and previous awardees, visit this webpage: https://ww2.arb.ca.gov/capp

CAPP projects have strong community involvement requirements. Implementing a CAPP project in Fontana would provide support for an extended engagement process and is an opportunity for community-led planning. City staff and officials could use this process to better understand the needs of residents harmed by warehousing and associated pollution.

Because this program has existed for several years, CAPP implementation in Fontana can learn from the challenges of previous projects. It is imperative for the efficacy of the project and the health of Fontana residents that such a project result in permanent, enforceable emissions reductions prioritized (Mohan et al. 2021).

Applicants to the grant program cannot be municipalities, but we recommend that Fontana use this program as a means of working with a local non-profit invested in the air quality of the region. We also recommend that the City of Fontana encourage and support a local non-profit in applying for a Community Air Grant in 2022. By combining financial support from the Chamber with CARB funding, the City of Fontana and partners could purchase air quality monitors as well as design an extended community-involved program to maintain monitors and improve air quality.

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