



Preliminary Health Impact Assessment

Literature review into the impact of energy efficiency and solar paneling in the Greater New Orleans area

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I. Background for HIA

Introduction and Purpose

This is preliminary research for a potential HIA that would be conducted with a larger team, more resources, and over a greater span of time than my tenure as an intern. This document is intended to consolidate ideas and provide a preliminary literature review for the team that will ultimately conduct the full HIA on the potential health risks and benefits of installing solar panels and energy efficiency measures on homes and businesses in New Orleans. This document and its estimates are based off of population data from the New Orleans area, and data of the impact renewables may have is based on data taken from similar HIAs conducted around the United States and the world. The full HIA team will most likely have to cull a greater number of studies in the health and energy sectors, as well as conduct interviews with New Orleanians, which I was not able to do with limited resources and manpower.

An HIA to assess the impact that renewable energy resources would potentially have on the Greater New Orleans area is necessary as the threat of climate change increases and the renewables industry grows larger around the country. In the US, there was a 19% increase in renewable energy commitments, totaling \$44.1 billion in 2015 ¹. Jobs in the renewable energy sector are outpacing coal jobs, and the U.S. Energy Information Administration (EIA) has reported that coal is soon expected to fall to its lowest level in nearly 40 years ². New Orleans is no exception. The mayor, Mitch Landrieu, released a Climate Action plan in July of 2017 that outlines a plan for the city to produce 100% low-carbon power, install 255 megawatts of solar, and increase energy savings at an annual rate of 3.3% by 2030. New Orleans' water-soaked locale and its subsidence makes the city particularly vulnerable to climate change, making this plan crucial if the city is to adapt and survive a changing climate.

The Greater New Orleans area relies on the services provided by the region's largest utility, Entergy Corporation, for electricity. After the closure of the Michoud Power Plant in New Orleans East following Hurricane Katrina, the company now asserts that a replacement is required to keep up with the city's energy needs. Entergy has filed a proposal for two gas-fired power plants, one of which that would be placed on the old Michoud site pending City Council approval. The Alliance for Affordable Energy and Health Department of New Orleans jointly released an HIA aimed at illuminating the potential health effects of building a gas-fired power plant in 2016. This HIA contrasts to the previous in that it aims to predict health impacts of energy efficiency measures and solar paneling in the Greater New Orleans area in order to provide evidence surrounding alternative energy sources to the City Council in order for its members to make a fully informed decision.

According to the guidelines set forth by the WHO, "[An] HIA is a practical approach used to judge the potential health effects of a policy, program or project on a population, particularly on vulnerable or disadvantaged groups" ³. Using the Climate Action plan as a base, the team will examine the potential health risks and benefits of implementing the city's goals with respect to solar paneling and energy efficiency upgrades on homes and businesses.

Primary research questions for this project are:

1. What are the direct and indirect health impacts on indoor/outdoor air pollution with the implementation of energy efficiency/solar paneling measures outlined in the Climate Action plan?
2. What are direct and indirect health impacts from reducing indoor noise pollution with energy efficiency?
3. What are the direct and indirect health impacts of reducing energy bills with energy efficiency/solar paneling?
4. What are direct and indirect health risks of installing energy efficiency measures/solar paneling and what are actions that can be taken to avoid them?

This document will explore why these key questions are should be vigorously answered in this proposed HIA.

Policy Context

In the New Orleans Mayor's Office proposed Climate Action plan, there were specific measures set for solar and energy efficiency. The goal is to add 255 megawatts of solar energy by the year 2030 and to expand the Energy Smart program from Entergy Corporation, among other goals relating to transportation, waste disposal, and energy ⁴. This HIA would function to fill a research gap of the impact renewables would have on the health of the residents of the city if these proposed plans are implemented. It will give some insight into preventable health problems from traditional energy sources, as well as provide information for city officials to make informed decisions about the impact their Climate Action plan will have on resident's health.

II. Regional Viability

Solar

The Southern Louisiana region is one full of potential for renewable energies, especially solar. A National Renewable Energy Laboratory (NREL) report outlining small rooftop capability for New Orleans found there is a potential for 1,277 megawatts of solar energy to be produced ⁴. New Orleans receives, on average, 18,000 kJ of solar radiation per square meter, making it one of the top counties in the country for average daily sunshine ⁵. Currently, there are there are about 7,000 solar units currently installed on properties in New Orleans ⁴. Project Sunroof, a tool offered by Google to estimate solar viability across the US, affirms 91% (about 121,000) of the buildings in the city of New Orleans have access to enough sunlight, illustrated in Figure 1 ⁶. According to the Project Sunroof data, if all buildings were equipped with solar and operating at full capacity, it could prevent 1.8 million metric tons of CO₂ emissions from being released. This is equivalent to 371,000 passenger cars being removed from the road for a year or 45 million tree seedlings being grown for 10 years ⁶. This is a rough estimate of Google's flagship solar

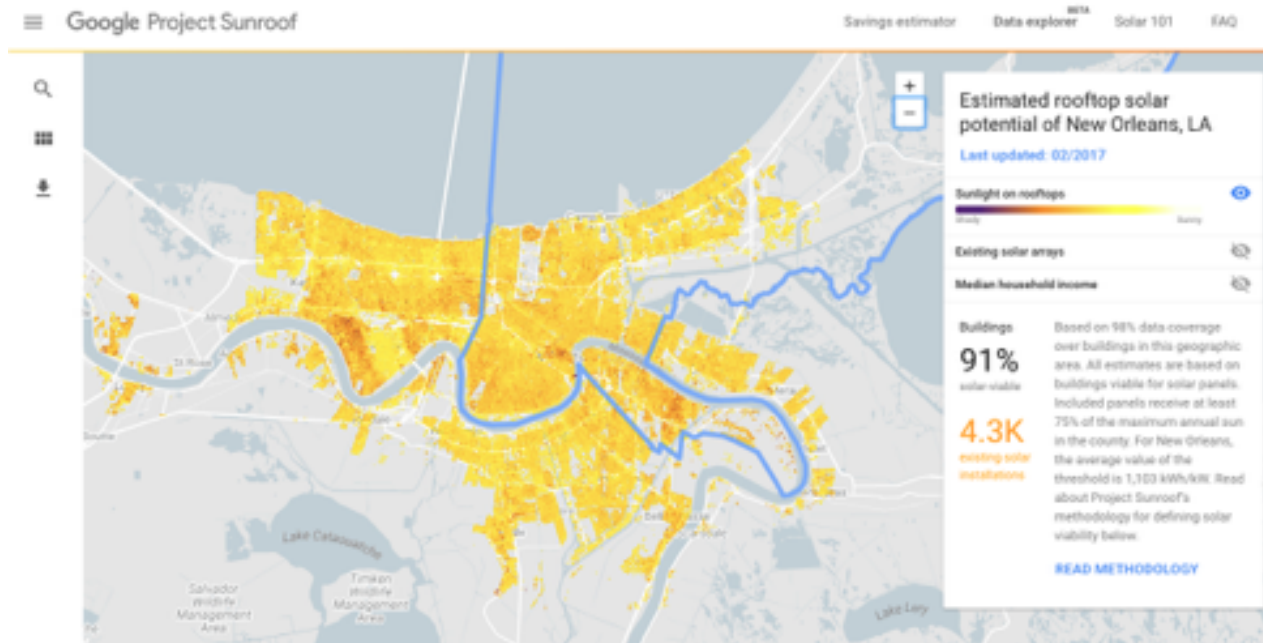


Figure 1. Imaging of solar potential in New Orleans illustrated by Project Sunroof from Google

program, but it serves to illustrate that a large installation of solar would undoubtedly have some impact on the environment of the citizens of New Orleans, including their health.

Energy Efficiency

Energy efficiency measure should be feasible to install in many homes across New Orleans. The types of home upgrades and rebates that are available via the Energy Smart program include:

1. Weatherization
 1. Weatherization is unique for each home's needs and includes:
 1. Insulation
 2. Reducing air filtration and pressure imbalances
 3. Sealing and repairing ducts
 4. Tuning and repairing A/C units.
 2. Weatherization conscious of health and safety of inhabitants includes (from guidelines released by the U.S. Dept. of Energy):
 1. Checking appliances and heating systems for combustion safety
 2. Carbon monoxide and gas leaks
 3. Mold control and checks on moisture damage
 4. Electric panel and wiring safety
 5. Tune-ups for unsafe heating and cooling systems
 6. Installing smoke and carbon monoxide detectors
2. A/C tune ups

3. Energy Star rated central A/C rebates
4. Energy Star rated window A/C rebates
5. Refrigerator rebates
6. Heat pump water heater rebates
7. Pool pump rebates

These programs are available to all homeowners and businesses that are Entergy customers. There is no information as to the extent that Entergy has already implemented this program, and whether their upgrades include safety measures outlined by the Department of Energy. On the surface it appears the program is accessible to the greater New Orleans population, but it is unknown who is taking advantage of it, how many New Orleanians are aware of its existence, and whether or not the most disadvantaged populations are participating. The HIA team should look into how feasible it is for these rebates and energy efficiency upgrades to reach the greater population of New Orleans, and assemble data on who is benefitting from these programs the most.

III. Neighborhood Demographics

Orleans Parish is broken down into thirteen neighborhoods that may be further divided into 73 separate neighborhoods. The larger 13 ones are called Lakeview, Mid-City, Uptown/Carrollton, Central City/Garden District, French Quarter/CBD, Bywater, Gentilly, Lower Ninth Ward, Algiers, New Aurora/English Turn, Viavant/Venetian Isles, New Orleans East, and Village De l'Est. There are large disparities that exist across these neighborhoods including race, blight, crime, income, and exposure to damaging chemicals include vehicular pollution and household lead. Figure 2 shows individual neighborhoods percentile of those living at or below the poverty line compared to national averages. The impacts of these disparities are not to be underestimated; in the 70112 zip code (containing the Tulane/Gravier, Iberville, and Treme neighborhoods) has an average life expectancy of 54.5, compared to 80 years in the 70124 zip code (Lakeshore, Lake Vista, Lakeview, West End, Lakewood, and Navarre neighborhoods)⁷.

A complete look at the makeup of New Orleans is not accurate unless it also considers the intersection of race concerning disparities in economics and health. According to a 2013 report by the Health Department of New Orleans, the median income for whites in the city is \$57,031 compared to \$30,167 for African Americans. African American children under 18 are 3.5 times more likely to be uninsured versus white children, and African American adults ages 18-64 are almost twice as likely to be uninsured compared to their white counterparts. Overall, African Americans in New Orleans are 1.37 times more likely to die than whites. Finally, when surveyed on how well their health needs were being met, New Orleanians who were earning above and below 200% of the Federal Poverty Line reported greater dissatisfaction than New Orleanians that were insured or uninsured, suggesting that the disparities by income are possibly felt considerably more than those by race⁷. This research highlights that poorer, African American population in New Orleans are more disadvantaged, and this must be considered when implementing renewable energies, or these more vulnerable populations will be shut out from programs that potentially positively benefit their health and economic standing.

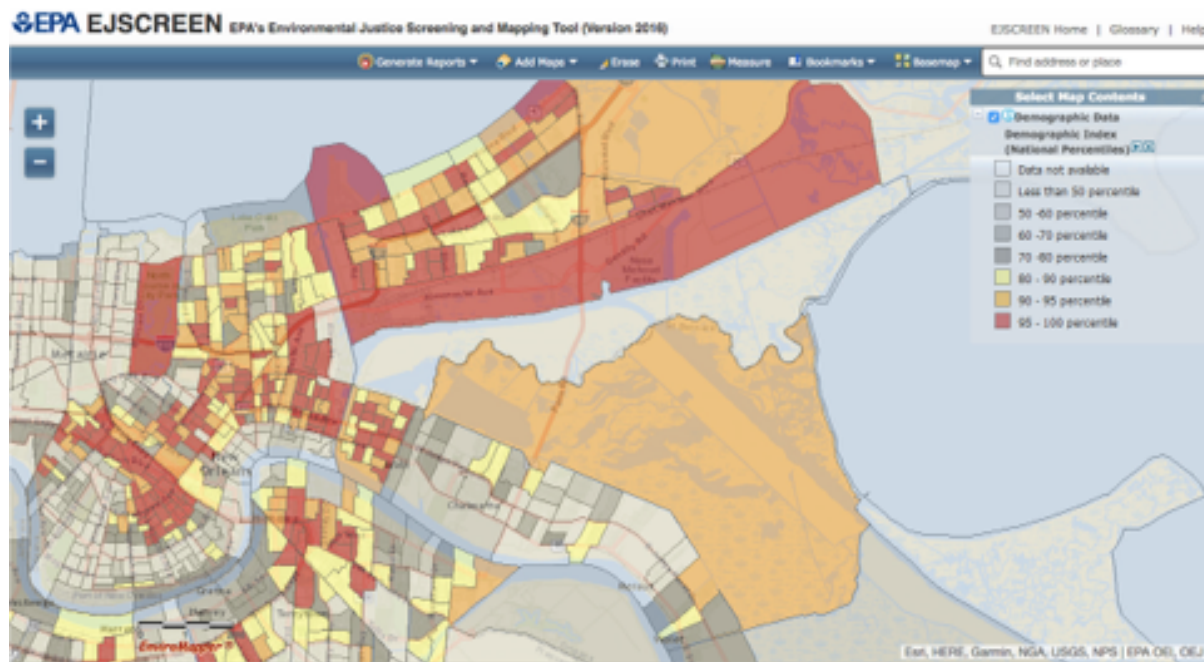


Figure 2. Map of percentiles of inhabitants living at or below poverty level compared to national averages. EPA EJSCREEN.

For the city as a whole to benefit from renewable technologies, they must be accessible to all New Orleanians

It is difficult to ascertain a median price for a solar panel array in Louisiana, but according to national averages it costs about \$11,060 to install a 5 kW system, after a 30% federal rebate⁸. According to Project Sunroof, the median roof has the potential for an 11 kW system, which is \$22,100 after the 30% rebate. This cost is clearly past the affordability for many residents of the city, shutting their accessibility to solar panels that would help reduce home energy costs, reduce pollution, and increase property value.

Upgrading energy efficiency in homes requires an investment that is likely out of reach for impoverished New Orleanians. A study in Massachusetts estimated the cost to come between \$1,100-\$9,300, depending on the specifics in the home⁹. Homeowners in the Northeast face very different efficiency goals to those in the South, so it is necessary to find estimates based on the New Orleans area. This is very likely out of the affordability of residents below the poverty line, and the current EnergySmart programs from Entergy are likely not sufficient to cover the costs of upgrading homes. Factors such as these should be considered when presenting recommendations at the conclusion of the HIA, so as not to exclude the most impoverished members of the city.

Each neighborhood in New Orleans faces unique challenges caused by their histories and surrounding developments. Presence of highways, lead paint, and poverty intersect to have varied impacts on resident's health, and their multitude of effects should be kept in mind when this HIA is conducted.

IV. Assessment Variables & Preliminary Findings

Based on past HIAs done on the same (or similar) proposals, there are several factors worth exploring when conducting their research. After reviewing multiple studies these factors have been chosen for their wide-reaching impacts on the health of the population, both currently and under changes proposed in the Climate Action plan. Indicated along with the variable is the intervention—solar energy and energy efficiency (EE) measures—that is most closely related to it, and findings from previous studies and HIAs.

Indoor Air Quality (IAQ)—EE & solar

Indoor air quality is an essential aspect of healthy living, as we spend most of our time indoors, whether at home, school, or work. The quality of air may be affected by a number of different contaminants from a multitude of sources, including mold, pets, presence/quality of HVAC system, presence of dangerous building materials (asbestos, lead), and proximity to outdoor pollutants (waste disposal sites, major transportation routes, or energy generation) among others. The WHO cites substantial links between household air pollution and acute lower respiratory tract infections, chronic obstructive pulmonary disease, lung cancer, cardiovascular disease, and cataract ¹⁰.

Indoor air quality may be affected by a myriad of factors that are present in homes; ventilation, air exchange, the quality of outdoor air, humidity, and the presence of window A/C, central A/C, or a dehumidifier may all be confounding variables when conducting a study on the health risks of poor indoor air quality. According to the U.S. EPA, “When buildings and homes are modified to decrease energy use, changes can occur in ventilation, infiltration (air leakage), and pressurization, creating air flow changes that can impact indoor pollutant levels” ¹¹. Because this HIA is concerned with researching the effects of energy efficiency measures (which include sealing indoor spaces off more effectively from the outside environment) and solar (which would overall reduce the levels of air pollution), these are critical variable worth investigating. The HIA should aim to review literature concerning these factors and interview homeowners with their experiences concerning:

1. Ventilation/air exchange
2. Humidity and home dehumidifiers
3. HVAC and window A/C systems

Homes in areas surrounded with many solar panels could be tested for differences in air quality, but it is still more important to look at this through the view of energy efficiency, as this will likely manipulate indoor air quality the most.

Outdoor Air Quality (OAQ)—Solar & EE

High outdoor air quality is essential if a city is to mitigate the effects of pollution on its population. Pollution in cities may reach unsafe levels because of the massive concentration of vehicles and people living together in small spaces, with the WHO asserting that 92% of the world’s population lives in areas where their air quality guidelines are not met ¹². A major

contributor to outdoor pollution levels is energy generation, and limiting outdoor pollution has been linked to decrease the burden of diseases such as asthma, stroke, heart disease, and lung cancer¹². A study found that 21 people die prematurely of air pollution-related diseases in New Orleans per year, while a WHO report cites the deaths of 3 million per year worldwide^{12, 13}. The WHO plainly states in their air quality guide that improvements in energy efficiency is one method to reduce “key sources of urban outdoor air pollution,” and that the short- and long-term respiratory health of a population would be improved by lowering air pollution in general¹².

There is evidence that cost benefits may be achieved by alleviating outdoor pollutants for the population. A study by researchers in Europe, called the Aphekom Project, found that reducing SO₂ in 20 European cities postponed 2212 deaths and saved €191.6 million in annual mortality benefits after regulating sulphur dioxide emissions in cars¹⁴. SO₂ is produced in the burning of fossil fuels (coal and oil), meaning they are produced both with transportation and with the coal-burning power plants providing the city with electricity¹². Therefore, it is important the researchers look into outdoor air pollution’s effects in terms of both solar installations, energy efficiency upgrades, and the costs that could be saved with their implementation.

Noise Pollution—EE

Noise pollution is concentrated more specifically to areas with popular, bustling areas, like the French Quarter, or to neighborhoods where large amounts of road traffic are present. The I-10, I-610, Route 90, and Route 61 are all major roadways that cut directly through the city of New Orleans, mostly through lower-income neighborhoods. This exposes the residents to consequences of a near-constant stream of running cars, including both air and noise pollution, as evidenced by the map provided by the Bureau of Transportation Statistics shown below in Figure 3¹⁵. The horns of ships and unloading of cargo from the wharf along the Mississippi River are additional around-the-clock sources of noise.

Health risks of noise pollution include annoyance, sleep disruptions resulting in daytime sleepiness, hypertension, cardiovascular disease including high blood pressure, myocardial infarction, and stroke, and impaired cognitive functioning in children¹⁶. This issue is one that affects neighborhoods unequally, with positioning next to major road and waterways being the greatest determinant of the levels of noise pollution. By sealing openings to the outside world, energy efficiency works to also seal out ambient noise, creating an opportunity to reduce another health burden on lower-income families that live closest to major transportation

corridors in the city ¹⁷. The angle of noise pollution reduction should therefore be adopted in this HIA to make it as comprehensive as possible.

Energy Bills—EE & solar

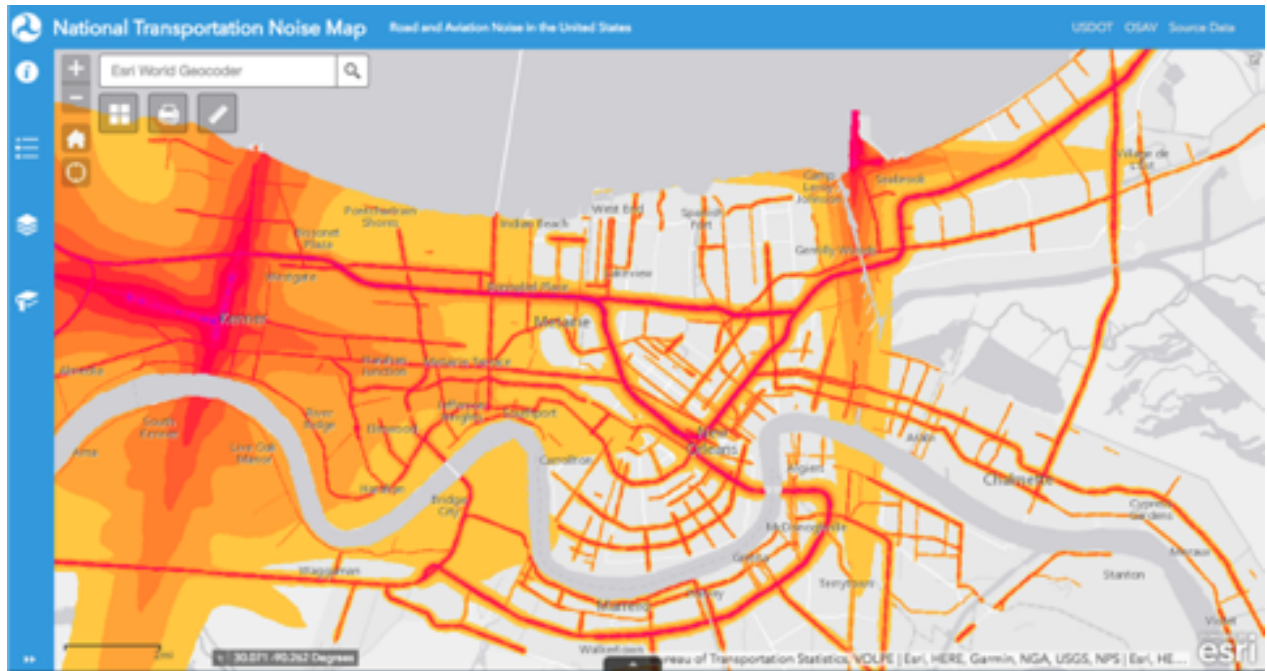


Figure 3. Noise map due to transportation from Dept. of Transportation.

While the energy costs in Louisiana are lower compared to national averages, the burden of energy bills upon households are more acutely felt in low-income homes, of which 30% of New Orleans qualifies as. A report from the American Council for an Energy Efficient Economy (ACEEE) outlines that the energy burden on lower income households is two times greater than median-income households, and three times as great when compared to high-income households ¹⁸. New Orleans ranked #2 out of 48 major cities as having one of the highest energy burdens upon lower-income households. The study found that low-income families pay more per square foot for energy than the average household due to inefficiencies present in their homes. An separate HIA concerning a proposed gas plant calculated the housing costs as a percentage of income in the table below in Figure 4 ¹⁹.

As the table shows, a large percentage of homeowners and renters in New Orleans East

Table 4: Housing costs as percent of income

Neighborhood	% of owner-occupied households paying 30% or more of income on housing	% of renter-occupied households paying 30% or more of income on housing
Viavant**	0	65
Village de L'Est	26	59
Read Blvd East	32	73
Read Blvd West	42	73
West Lake Forest	30	74
Little Woods	35	73
Plum Orchard	38	68
Pines Village	29	87
All Orleans Parish	33	61
U.S.	28	52

Source: The Data Center analysis of data from U.S. Census 2000 Summary File 3 (SF3) and 2010-2014 American Community Survey
 **Viavant has a small population size, and therefore data in this table may be skewed

Figure 4. Housing costs as a percentage of income broken down by neighborhoods in New Orleans East. Courtesy of Louisiana Dept of Public Health and Alliance for Affordable Energy (2016).

dedicate a significant portion of their income towards simply keeping a roof over their heads. This straining of assets causes families to forgo spending on other necessities, like food and healthcare, which can negatively impact health. Physical and mental health may become strained from long periods of stress from insecure financial standing. Solar and energy efficiency both stand to aid bills for lower-income households, after the cost of installation, making it unattainable to many of the households that would benefit from it the most. The HIA team should consider conducting interviews with residents and gathering data on residential energy bills of those with solar panels and those without, and seeing how this could positively impact mental and physical health of residents.

Lead Exposure—EE, potentially solar

Lead is a problem that continues to persist in the city of New Orleans, affecting neighborhoods both affluent and underserved. According to this map of percentages of houses built pre-1960, indicating the presence of lead paint, low income and high income neighborhoods alike struggle with an abundance of lead paint in the home environment.

This is potentially a large risk factor in homes, especially during home modifications like weatherization. The US Department of Energy has released guidelines for Lead Safe Weatherization focused on containment and decreasing generation of lead dust and chips during weatherization²⁰. The report is available online, widely enough available for contractors

to access it and implement it. It is currently unknown if these practices are used widely across New Orleans during weatherization. This is a factor worth consideration from the HIA team, as lead exposure during weatherization is a legitimate risk, especially for households with small children.

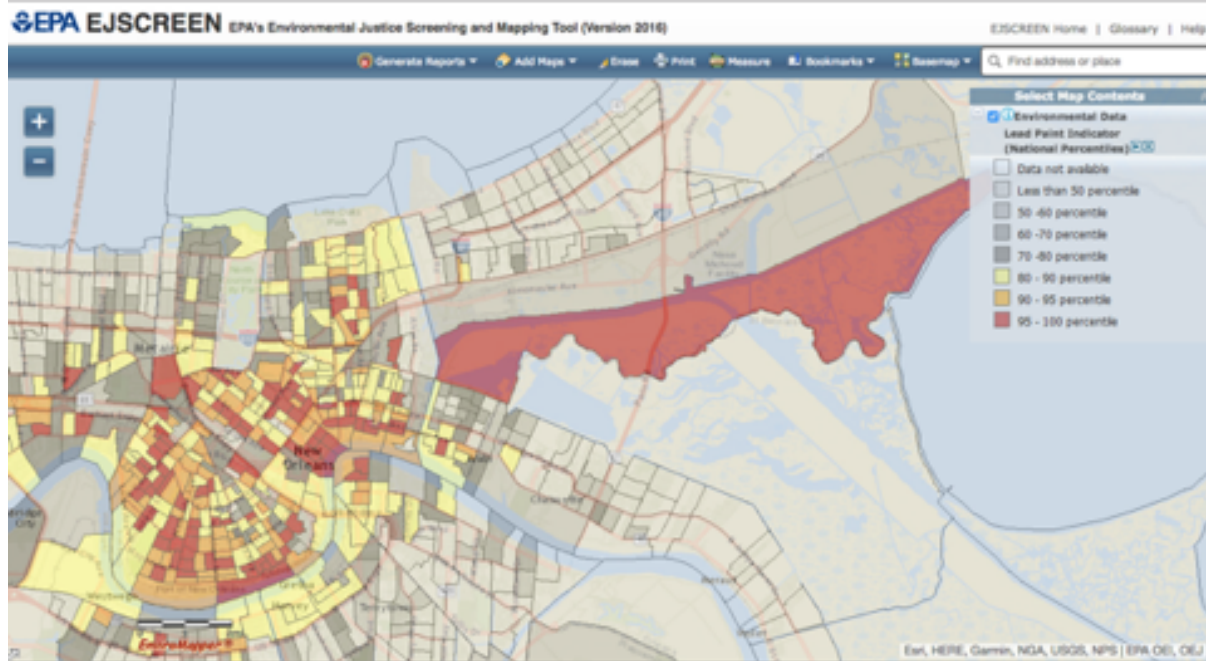


Figure 5. Map of potential lead exposure compared to national levels in US. EPA EJSCREEN 2017.

V. Conclusion and Recommendations

This proposed HIA could provide a wealth of knowledge surrounding renewables that is specific to the city of New Orleans. Its aim is to guide city leaders into making the best energy choices for their constituents based on the most favorable outcome economically, environmentally, and to the people's collective health. Solar paneling and energy efficiency are both alterations that bring about broad consequences, with many outcomes overlapping on the same environmental factor, such as indoor air quality. This adds to the complexity of the HIA, but also to its importance, as this demonstrates the many intersections between our energy generation, and physical and mental health.

The Climate Action Plan released by the mayor's office lays the groundworks for renewable energy projects in New Orleans, while this HIA may fully elucidate its benefits and risks, ultimately pushing the city closer to progressive change. Recommendations for the HIA team below are based on what information I could not obtain through internet research alone:

1. Interview residents of different neighborhoods to:
 1. Gauge how much they know about the EnergySmart program, and reasons why they may or may not have enrolled in it.

2. Examine interest in solar roofing installation and reasons why residents have or have not gotten it.
2. Taking measurements of indoor and outdoor air in homes and businesses around the city in order to compare pollution.
3. Checking if/what lead abatement guidelines are in place for energy efficiency measures in the city.
4. Checking hospital records to determine if residents of different neighborhoods are disproportionately affected by certain diseases, and explore how this may intersect with energy efficiency and pollution.
5. Finding more sources to back up findings that energy efficiency measures and solar energy measures positively benefit health.

There appears to be a wealth of data that supports the hypothesis that energy efficiency and solar paneling are beneficial for an urban population's health, but this HIA would be especially helpful in zeroing in the benefits for New Orleans, a locale that is increasingly threatened by global warming. Our health risks and needs change constantly, and humans continually strive for greener futures, and this proposed HIA would weigh risks and benefits that inform the transition of the city into a progressive, sustainable future.

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