

Tackling Air Pollution and Climate Change Through

Energy and Buildings

Final Report



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Team Mission Statement

Through commitment to collaboration, systems, and our shared passion, we aim to be a driving force of change for the people of Stockton — and the many cities like it — by working to help identify and reduce pollutant emissions, turn the city to more renewable resources, and provide an overall higher standard of living to those living in Stockton.

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Introduction

Marginalized communities within the U.S. disproportionately suffer from the effects of environmental health risks. The city of Stockton, California is no exception to this reality, which is often referred to as “The Climate Gap” which causes these communities to suffer more during extreme weather events, pay a greater proportion of their income on basic necessities, and be exposed to worse air pollution than other Americans[1]. A proposed solution has come in the form of Assembly Bill 617, created to minimize the health effects of communities most exposed to air pollution. The AB 617 boundary in Stockton covers sixteen square miles of land with a population of approximately 132,000. Within the AB 617 area, there are numerous sources of pollutants including: dust swept away from the agricultural industry, reliance on a non-renewable based electric grid, poor indoor air quality, NOx from local industries, truck traffic, etc. As a result of these pollutants, this community is adversely affected by many health issues and pollution indicators, including asthma, cardiovascular disease, low birth weight, etc[2]. Additionally, Stockton ranks in the top 5% of the most disadvantaged communities in California[3].

We will be focusing on energy and buildings within this boundary and how changing this infrastructure and the culture around it can help reduce these negative health impacts for the Stockton community. Directly improving conditions inside and around the buildings in Stockton will lead to improved health conditions as 87% of our lives are spent indoors[3][4]. As a result, switching Stockton to more renewable energy, increasing knowledge and accessibility to energy savings programs, improving energy efficiency and weatherization, limiting open burning, reducing the impacts and sources of poor indoor air quality, and providing incentives to the community in all of these areas to facilitate implementation would be viable solutions to address these issues. Within energy and buildings, like many other systems, many of these concepts work together cohesively, and one action in one sector is able to create a positive feedback loop that will make another facet of this transition in a different sector easier. For instance: a switch to renewable energy in Stockton will decrease emissions of carbon and Short Lived Climate Pollutants (SLCPs) generated by fossil fuel electricity; through weatherization, a house can be repaired to face current weather conditions which optimizes energy efficiency which then in turn improves indoor air quality and reduces adverse health effects. These changes will actively contribute to lowering the impacts of poor air quality in Stockton as well as reduce the financial burden of high electric bills on the residents[3]. This works directly in weatherization and higher energy efficiency efforts which will help not only in these ways but to also reduce the amount of energy needed in the first place.

Our design solution focuses on four main areas: generating Stockton’s electricity through cleaner sources, lowering electricity bills for lower-income residents, ending

open wood burning, and improving indoor air quality. It addresses the current state of Stockton, our proposed solutions, followed by the design of how we would like to achieve the preferred state. In addition, we hope that the solutions that we are proposing will be able to be applied to Stockton and global communities alike.

Our Vision for 2025 and Beyond

The values emphasized in our vision for 2025 are as follows: access to clean energy should be a right, Stockton residents should have energy independence and methods to lower their utility bills, and above all, the public health of all Stockton residents is of utmost importance. By 2025, we plan for at least 60% of Stockton's residential energy to be provided by rooftop and community-shared solar (compared to California's goal of 60% renewable energy by 2030)[5]. All multifamily unit homes, such as apartments, will have access to solar through systems installed on rooftops or through community solar systems installed in open areas.

Furthermore, low-income residents will have their homes weatherized, or protected against the elements, through aspects such as insulation, improving ventilation, and sealing cracks and gaps. Through weatherizing homes, they will become energy efficient and residents will be able to reduce their cost on electric utilities and gain energy independence. Stockton will also be an established member of a Community Choice Aggregation (CCA). Being a part of a CCA allows local governments to provide power from alternative suppliers while working with the existing utility provider for transmission and distribution. This gives residents the option to get their power from cleaner energy sources, influence a more rapid shift to renewables, increase jobs in the green sector, and lower utility bills.

Similarly by 2025, Stockton will phase out energy from biomass from the DTE site in Stockton which currently burns biomass fuel and sells its power to PGE[3]. Phasing out biomass burning at this site would lower emission rates of CO₂, CO, PM 2.5, black carbon, methane, NO_x, and SO₂. In addition, by 2025, there will be no agricultural burning and farmers and agricultural workers will still be financially supported. They will have options to discard agricultural waste through programs such as the Alternative to Agricultural Burning, the Healthy Soils Program, and the Environmental Quality Incentives Program. In addition, we plan to see a decrease in residential open burning in terms of a heating/cooking source through increased education, outreach, hazardous waste facilities, and providing housing opportunities for the homeless and reintegration strategies.

Finally, indoor air quality will be improved from development in weatherization efforts and indoor air filters installed in all commercial and school buildings as well as homes near highways and other high traffic areas. Success will be measured by an increase in public health through a decrease in asthma rates, heart disease, and

respiratory/lung infections, as well as a decrease in pollutant emission, and energy independence from fluctuating prices set by power companies and lowered utility bills.

Key Areas of Concern

The City of Stockton is considered one of the top 5% disadvantaged communities in California in terms of environmental health and equity[3].

Open burning by farmers and residents has impacted the City of Stockton and poses risks to the environment and public health of Stockton's community. Although there are regulations in place to decrease agricultural burning, due to postponements, time and cost constraints, as well as droughts, agricultural burning still makes up a large portion of PM 2.5 emissions[3]. In addition, residents continue to burn wastes due to a poor hazardous waste management system and a lack of other alternatives[25].

In addition to the environmental impacts on the residents of Stockton, PG&E increased electricity and gas monthly bills by 4.6% in 2021. PG&E's official reason for these increases is the resultant improvement in safety and reliability against extreme weather impacts in California. As valid as this reason may be, it adds an additional financial burden on low-income residents, who are forced to spend more out of their (often minimum wage) earnings. This is an illustrative example of the downsides of monopolies and centralized electric providers[6].

Options are severely limited for the low-income communities of Stockton. Due to lack of widespread incentive programs, solar is not common as it is seen as unaffordable. This prevents households from making informed decisions that could ultimately lead to improved financial wellbeing.

Apart from barriers to going solar and improving their financial state, Stockton citizens also suffer the consequences of heightened PM2.5 and NOx exposure, among other harmful pollutants. There are multiple factors causing increased air pollution, including but not limited to: idling cars near schools, smoke from wildfires, and insufficient ventilation inside buildings. Higher pollution levels lead to increased respiratory problems among the population, among other negative health effects.

CERP measures IAQ.1 and SC.1 are designed to improve indoor air quality in homes and schools through air filtration systems and weatherization in the Stockton AB617 zone but the measures would not cover all homes and schools. The inability to provide all residents with improved air quality hinders health equity to Stockton AB617 residents.

Data Visualization and Analysis

As we begin to look into our four different sections, we start by looking at Figure 1. The highlighted sections show the key areas that affect the energy and buildings sector within Stockton. This figure shows that open burning (including cooking and fireplaces) combined with residential fuel combustion makes up approximately 47% of all of the PM 2.5 emissions. As we cover the 4 different aspects of energy and buildings, we will continue to consider how much emissions this sector emits and create appropriate solution designs to lower not only PM 2.5 emissions but also other SLCPs.

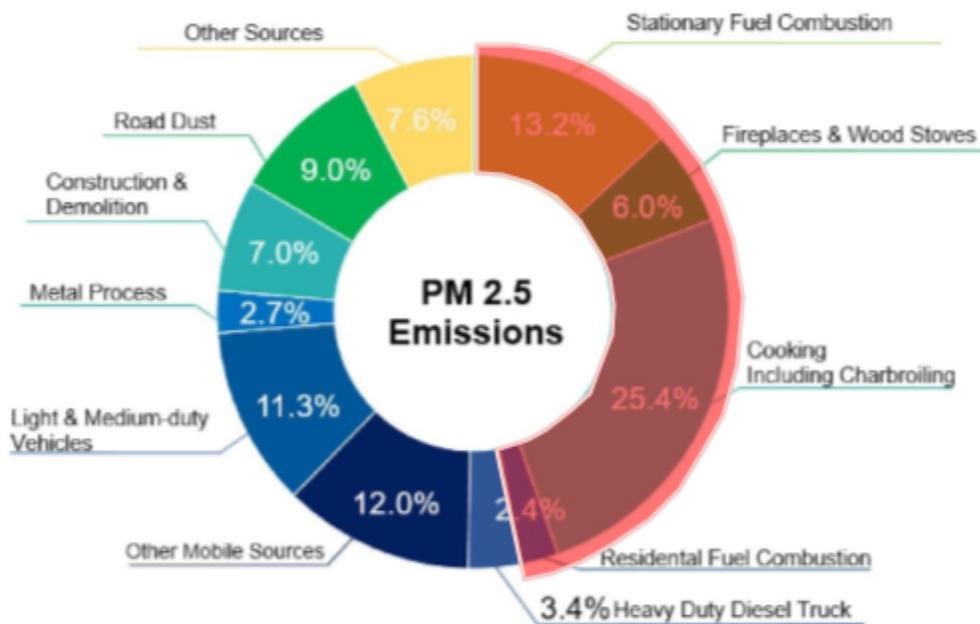


Figure 1. Sources of PM 2.5 emissions in Stockton. The red highlighted section represents the sectors contributing to PM 2.5 emissions from energy and buildings.

http://community.valleyair.org/media/2409/draft-stockton-cerp_030621.pdf

Open Burning

Open burning is defined as “burning any matter, including, but not limited to, litter, refuse, garbage, leaves, paper or other combustible material outside of an appliance meeting building codes and regulations”[12]. Open burning and its PM 2.5 pollutants come from many different sectors including stationary fuel combustion (especially with

the DTE plant), fireplace and wood stoves, cooking, and residential fuel combustion. Another large source of open burning in Stockton comes from agricultural burning to remove vegetative materials from agricultural operations, such as grass and weeds, dead trees, vineyard removal, and acreage removal[13]. These together make up at least 47% of all PM 2.5 emissions as well as approximately 23% of NOx emissions.

Figure 2 shows the systems map of this issue. The main aspects that directly affect open burning for both sectors is with regulations and incentives. As explained later in this section, there are several rules and regulations that limit the types of material that can be burned and the time of year burning is allowed. However, as these rules are sometimes not followed or are postponed, this issue still exists. Another important factor is the residents' advocacy, either for more incentives for existing programs or for regulations as in holding the agricultural sector accountable, more follow up actions, and enforcement strategies. Through incentives and regulations, open burning will decrease which leads to a decrease in air pollution and an increase in Stockton's public health with decreased asthma rates, pulmonary infections, and eye/ears/throat/nose irritations. As the residents begin to see these changes with their air quality and health, we hope that they will push for more changes within open burning, which restarts the loop.

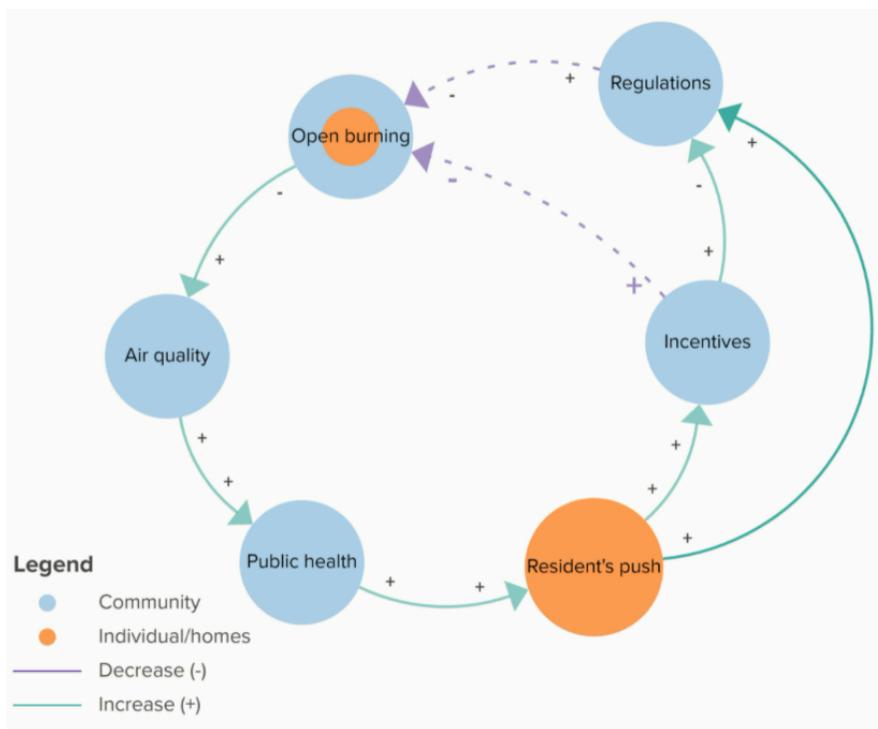


Figure 2: Systems map of open burning within Stockton <https://kumu.io/michellejkim99/hw3#untitled-map>

Taking a closer look at residential open wood burning, either for heating or cooking, it contributes 5.4 tons per year of PM 2.5 towards area sources of emissions in the community of Stockton, representing 4.3% of the total PM 2.5 inventory[3]. In

addition, residents illegally burn wood in open areas and other materials, such as hazardous wastes and trash, causing one of the largest sources of particulate pollution[3]. As seen in Figure 3, the nearest hazardous waste disposal site, the San Joaquin County Household Hazardous Waste Facility, is outside of the AB 617 boundary. This location has several benefits such as accepting most items for free, having a reuse room for residents to take allowable products dropped off by other residents free of charge, and having resources that lists out other locations to dispose of certain materials. However, there are other materials, such as bleach, asbestos, and automotive fluids, that can only be properly disposed of at this site[25]. In addition, this facility is only open from 9 am to 3 p.m. Thursday through Sunday, which limits accessibility to those working during those time frames, and those without cars.

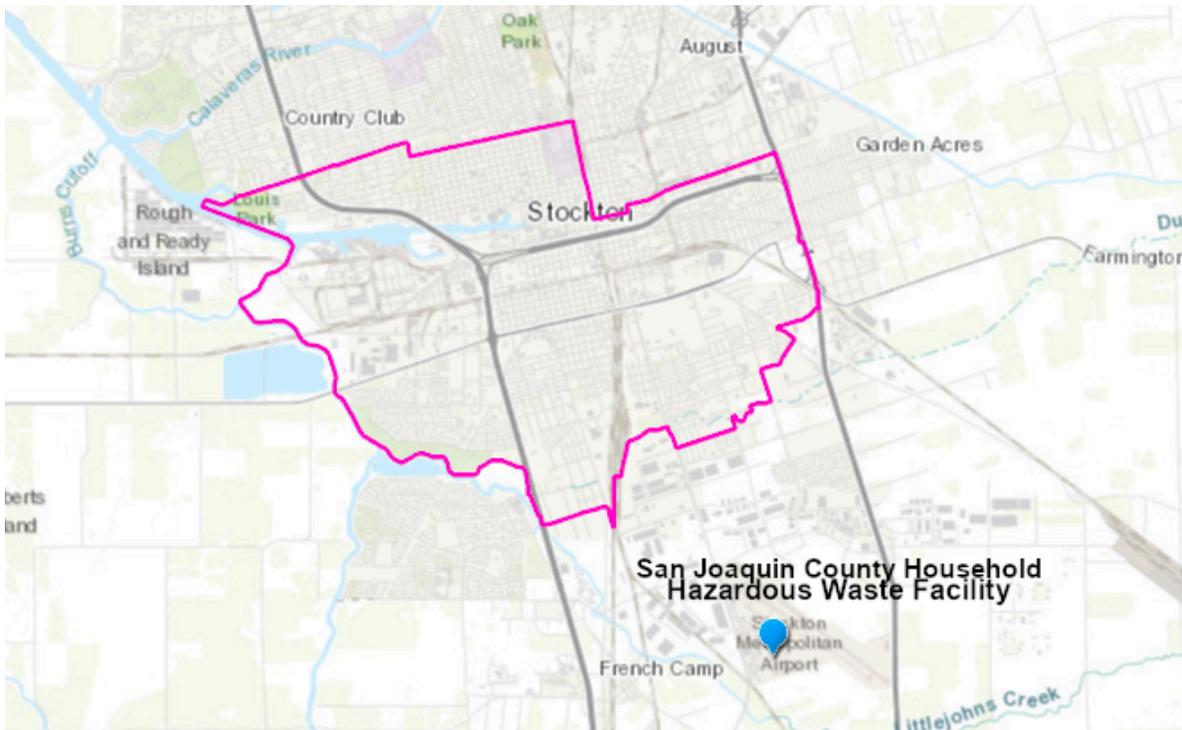


Figure 3: Stockton's AB 617 Border with the San Joaquin County Household Hazardous Waste Facility location. <https://cal.maps.arcgis.com/home/webmap/print.html>

Wood burning through fireplaces and stoves is especially high during the winter season as more people burn wood for heat. This leads to larger issues as winter air quality deteriorates. These levels of residential open burning lead to high levels of PM 2.5 in neighborhoods, especially low-income, people of color, and minority neighborhoods in Stockton. In addition, the CSC has identified areas of concern where illegal waste burning occurs in residential areas and homeless encampments[2].

For agricultural burning, looking at Figure 4, we see that in 2017, San Joaquin

Valley had the highest percentage of all of California of PM 2.5 open agricultural burning emissions[13]. Although agricultural burning is currently seen as necessary by both farmers and CARB to remove unwanted crops and is an effective methods to control unwanted pests and diseases, it also releases significant amounts of PM 2.5 to nearby residential areas. San Joaquin Valley currently has certain periods allowing agricultural burning based on air quality levels and has steadily increased its prohibitions on crop burning to 90% from the beginning of implementing Rule 1403 in 1992. However it is still not enough to mitigate the high levels of pollution still being released through agricultural burning.[9] It is also important to realize that open burning also results in incomplete combustion leading to high levels of black carbon (another SLCP) as well as NOx, VOCs, and other toxins to human health such as carbon monoxide. In seasons when agricultural burning is not allowed, farmers typically give their dead vegetative materials to the DTE plant to utilize as biomass fuel. Although cleaner than burning its predecessor, coal, burning biomass still emits harmful pollutants.

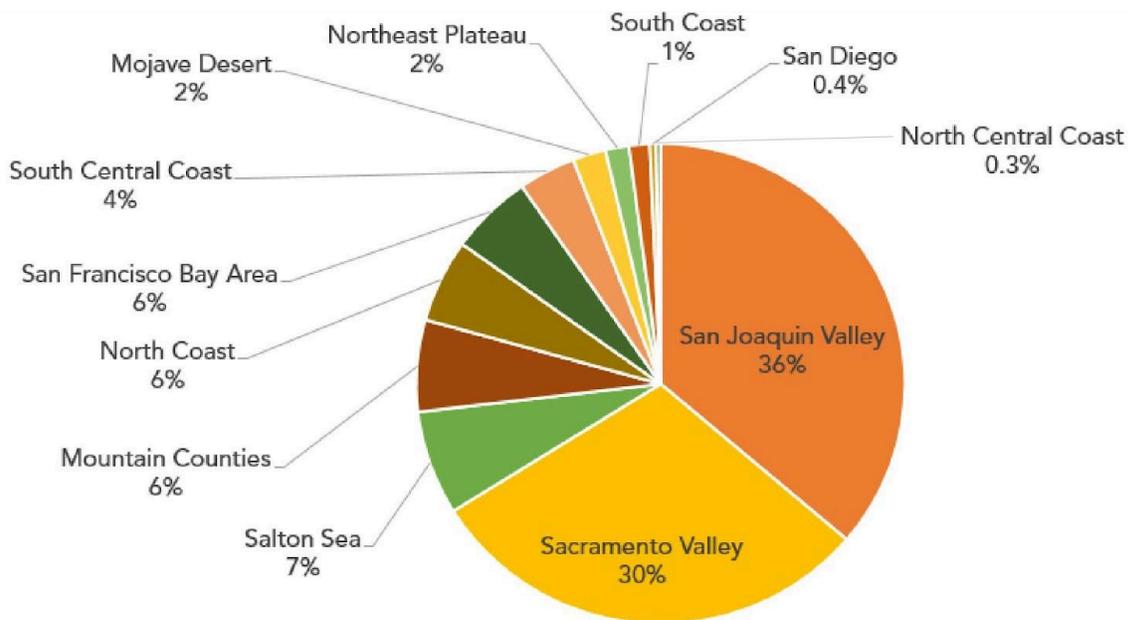


Figure 4. Open agricultural burning emissions (PM 2.5) in California 2017

https://ww2.arb.ca.gov/sites/default/files/2021-02/Staff_Recommendations_SJV_Ag_Burn.pdf

On the other hand, the City of Stockton, in conjunction with the San Joaquin Valley Air District and CARB, have produced several strategies to mitigate and curb the effects of open burning.

1. **The Ordinance Restrictive Open Burning**, enacted in 2005, states that without a permit, residents of Stockton are not allowed to open burn. In addition, it prohibits specific materials to burn[12].
2. **District Rule 4901** and the associated program **Check Before You Burn (CBYB)**

notify residents of specific seasons and times when open burning is allowed based on the outdoor weather and air quality, especially in the winter season as more people tend to burn in the winter for heat. It also created the **Burn Cleaner Incentive Program** which incentivizes residents to replace uncertified, old, solid fuel-burning equipment with EPA certified natural gas or electric stoves[9]. This program has so far replaced and installed 77 cleaner devices with \$230,500 from grants from the Community Air Grants and has reduced 18.09 tons of PM, NO_x, VOC emissions[3].

In terms of agricultural burning, there are several rules and programs in place to mitigate and eventually discontinue agricultural burning.

1. **District Rule 4103** was established in 1992 and has been amended multiple times to address the changing air quality and needs of agricultural practices. It was one of the first rules to begin regulating open air burning and mitigate the effects on the community[13].
2. In 2003, **Senate Bill 705** was adopted and required permits to burn certain categories of agricultural waste and established best management practices. Although another aspect of SB 705 was to phase out agricultural burning by 2005-2010, it also stated that if the District determined a need for postponing certain burning prohibitions based on certain criteria and CARB concurs, the ban on open burning would be postponed. As shown in Figure 5, we see the trends of agricultural burning in San Joaquin Valley from 2000 through 2020. Through implementation of Rule 4103, which bans certain materials from being burned, there is a decrease in agricultural burning until a drought starts from 2011 and from 2014, when there is a sharp increase. In this time frame, SB 705 was postponed several times[13].

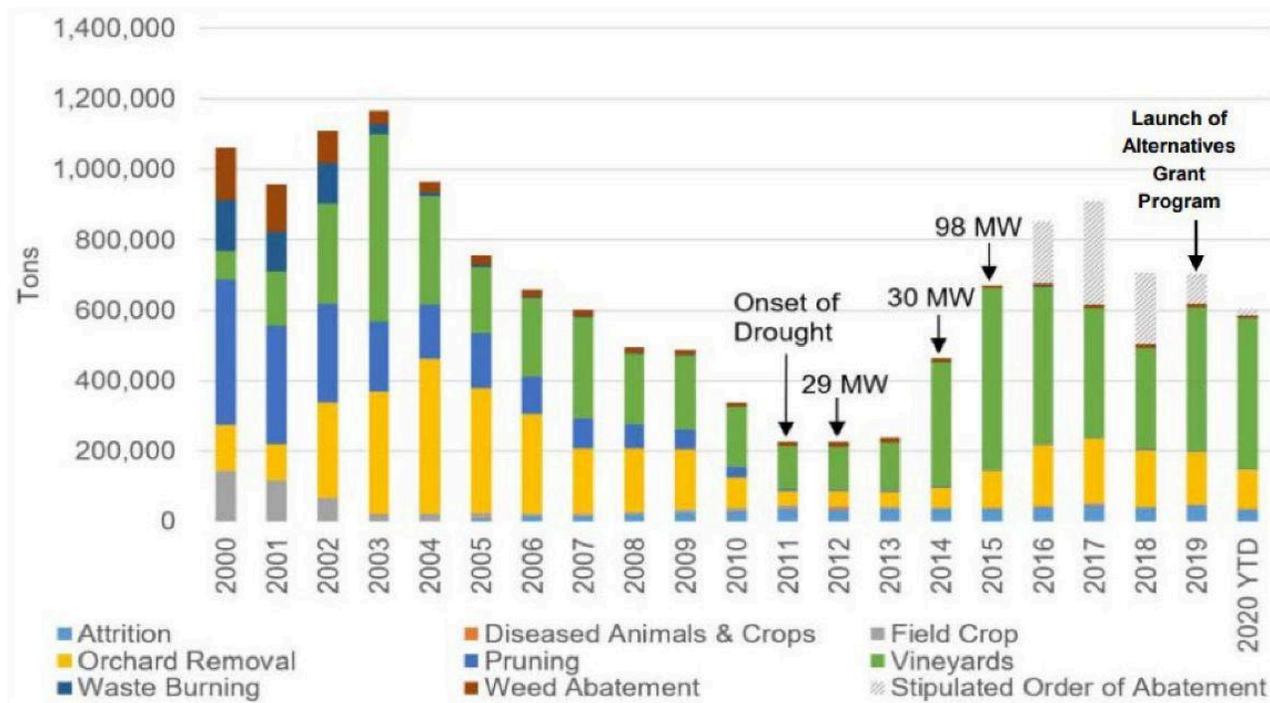


Figure 5: Stockton’s AB 617 Border with the San Joaquin County Household Hazardous Waste Facility location. <https://cal.maps.arcgis.com/home/webmap/print.html>

3. Finally, there are **alternatives to agricultural burning** in the San Joaquin Valley such as the Alternative to Agricultural Open Burning Incentive Pilot Program which began in 2018 as well as the Healthy Soils Program and the Environmental Quality Incentives Program (EQIP)[14]. These programs chip, shred, mulch, or compost agricultural material to use in soil incorporation or for other agricultural uses such as animal feed and promote best management practices on soil and conservation actions. Through these existing programs, the San Joaquin Air District hopes to follow the trend outlined in Figure 6.

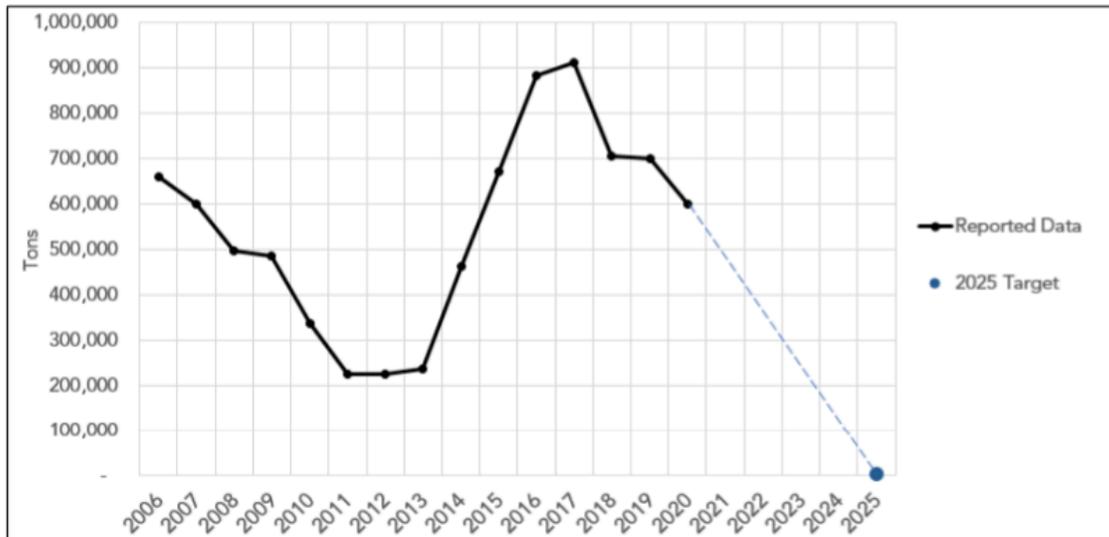


Figure 6. San Joaquin Valley open agricultural burning trend and 2025 target goal
https://ww2.arb.ca.gov/sites/default/files/2021-02/Staff_Recommendations_SJV_Ag_Burn.pdf

Through this project we plan to focus more on the alternatives to agriculture burning, especially in increasing incentives for farmers to participate in programs such as the emerging pilot program and established programs. For residential burning, we will address improving waste disposal systems, providing electric heating systems powered by solar energy, and creating housing shelters and reintegration programs.

Solar Power

Currently in Stockton, there are 1,200 existing solar installations. To put this into perspective, there are 81,100 solar viable rooftops in Stockton, according to Project Sunroof. This means that 97% of the buildings in Stockton are solar-viable as visualized in Figure 7.

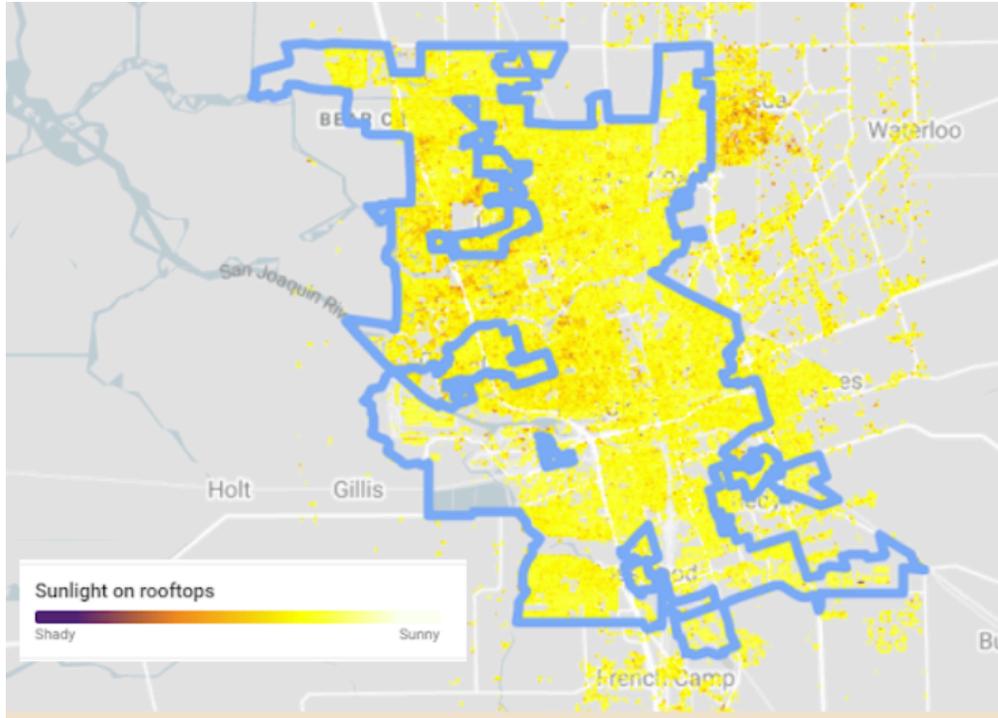


Figure 7: This figure shows a gradient of potential locations of solar on rooftops in Stockton, California--sunny meaning receiving the most amount of sunlight and shady meaning being more blocked in some way as to not be receiving decent sunlight. This estimate was based on rooftops receiving at least 75% of the maximum annual sunlight in the county which is at a threshold of 1,225 kWh/kW for Stockton. Source: Project Sunroof data explorer (November 2018) [15].

This means there is an equivalent to 2.9 million MWh/year available in solar energy - enough to avoid 802 thousand metric tons of CO₂ emissions. Along with this, there will be overall health benefits from switching to solar power including reduced NO_x, SO₂, and PM_{2.5}. This will inevitably result in fewer premature deaths due to these reduced emissions, as well as a decrease in the associated health costs. Figure 6 shows results from a recent study of the eastern United States which found that by replacing electricity generation with 17% solar photovoltaic (PV) electricity generation would result in an estimated decrease of premature deaths by 1,424 deaths due to an average PM_{2.5} concentration decrease of 4.7% as well as a 20% NO_x and 15% SO₂ emissions decrease[8].

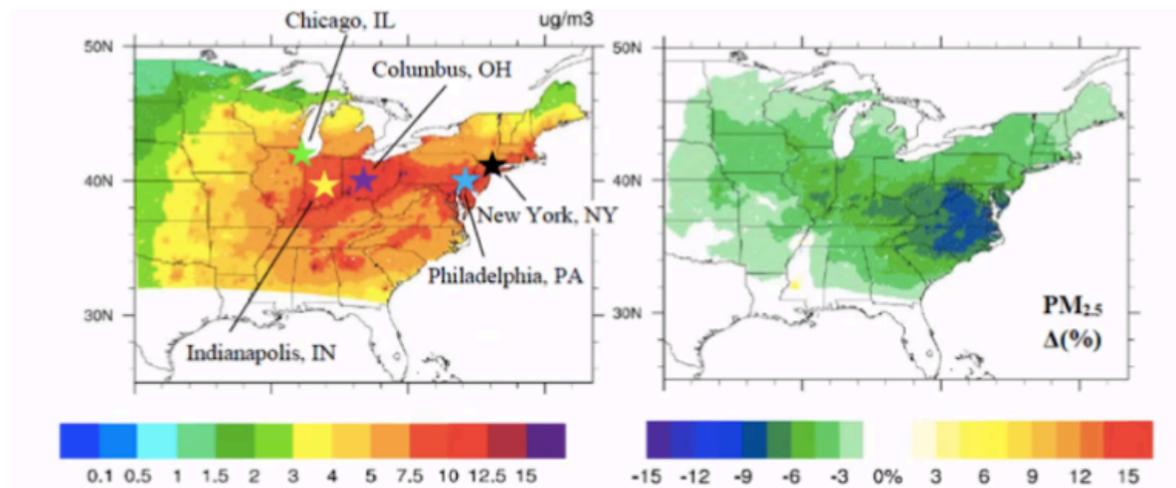


Figure 8: This figure shows a model of summer $PM_{2.5}$ concentrations throughout the Eastern United States comparing the ‘business as usual’ current electric generation grid mix(left) as opposed to replacing 17% of the electric grid with solar PV electric generation(right) [8].

In addition to the overall health benefits, there are multiple financial incentives that would result from residents and businesses in Stockton switching to solar energy. Firstly, it would lower electric bills for anyone switching to solar power. This does bring the problem of the initial costs of implementing and installing solar panels to the forefront. However, there are federal solar tax credits that are already in place that could potentially make solar and the initial financial burden that comes with it more affordable and accessible for Stockton residents. These tax credits apply to both the commercial and residential sectors. Additionally, the tax credits include not only the expenses for the solar PV panels/cells themselves, but also the expenses associated with contractor labor including the preparation, assembly, and permitting fees, as well as the inspections costs[6][11]. Additionally, on-bill financing is available through Stockton’s utility provider: Pacific Gas & Electric (PG&E). PG&E provides on-bill financing to those who invest in clean energy upgrades through their utility. This allows the utility to incur the cost of the clean energy upgrade, which is then repaid on the utility bill. On-bill repayment options require the customer to repay the investment through a charge on their monthly utility bill as well, but with this option, the upfront capital is provided by a third party, not the utility[45][16]. Another path for residents to be able to switch to cleaner energy while lessening the economic burden of the switch.

Overall, the health benefits and financial incentives should allow for a lot of potential room for residents and businesses alike to be able to adopt solar if they are able. We reached out to GRID Alternatives, a nonprofit that brings solar to marginalized communities, to see if they would be willing to help with this effort or if they already have an implementation plan for Stockton--this is discussed further within our

implementation plan. We have a lot of data showing the ideal locations for implementing solar in Stockton, shown previously in Figure 7 as well as Figure 9, so hopefully we can work with GRID Alternatives or an organization similar to it and be able to bridge the gap in solar implementation between effectiveness and efficiency in getting their opinion on which locations--such as schools, corporations, parking lots, apartment complexes etc.--would be best for switching to solar.

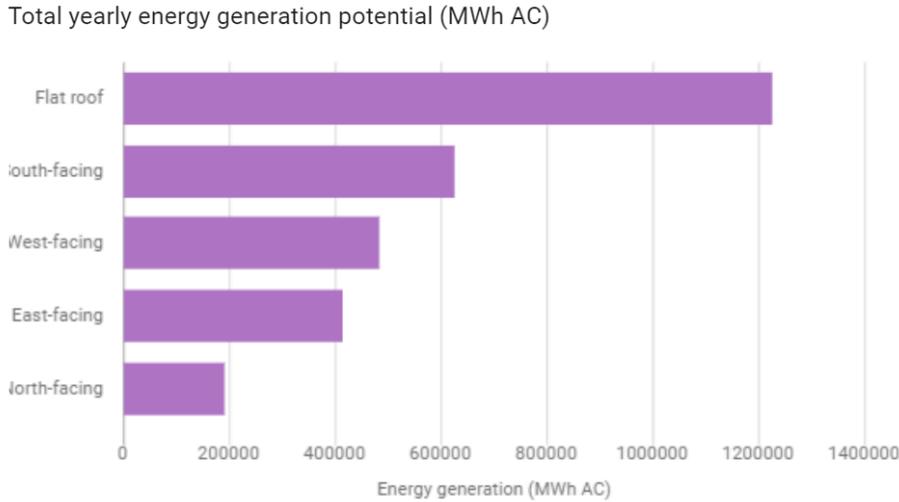


Figure 9: This figure shows the most effective roof types for implementing solar in Stockton. Source: Project Sunroof data explorer (November 2018) [15].

Energy Efficiency & Weatherization

Weatherization is the practice of increasing energy efficiency of homes while ensuring residents' health and safety. A large number of homes constructed in the United States have been built without careful consideration of how to efficiently control temperatures inside houses, causing their houses to not properly retain conditioned air that is generated by the house's cooling and heating systems. Weatherization is the answer to reducing the amount of energy homes use and improving home insulation. Improving home insulation reduces outside pollutants and ultimately improves indoor air quality which is part of the CERP's incentive measure IAQ.1.

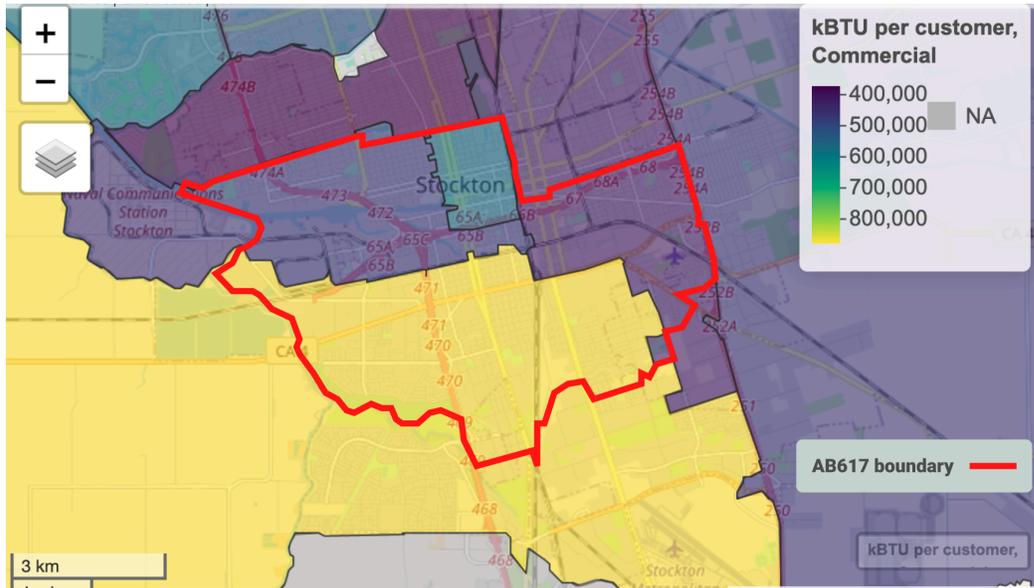


Figure 10: This figure shows Stockton’s commercial kBTU per sqft of residential building area, per zip code.

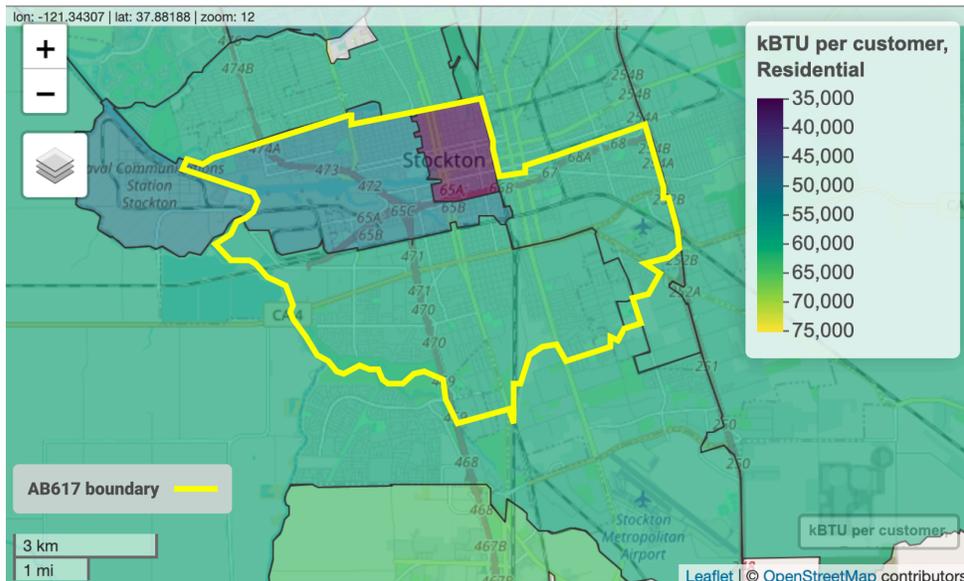


Figure 11 : This figure shows Stockton residential kBTU per sqft of residential building area, per zip code.

Figures 10 and 11 display the Energy Usage Intensity (EUI) in terms of kBTU/sqft /year for commercial and residential buildings, which helps us identify how much energy is consumed on average in the city of Stockton.

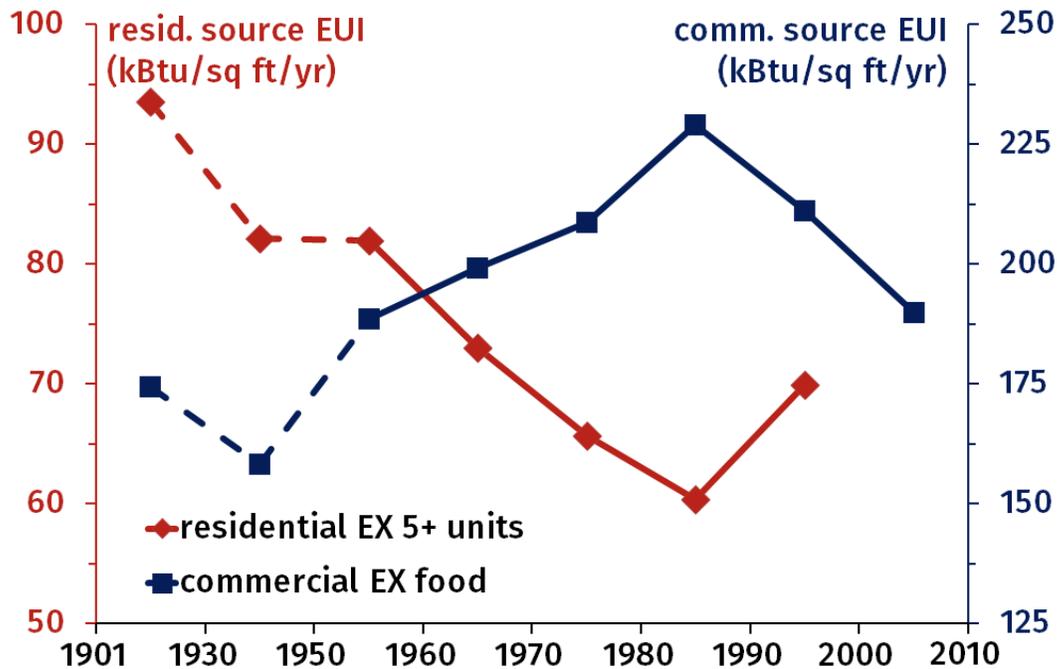


Figure 12: This figure shows the average source energy use intensity of residential (red, left axis) and commercial (blue, right) buildings in the US.

Stockton's EUI is below average in the residential sector and significantly higher for commercial use. This helps us identify what policies and resources the City of Stockton has to implement to prioritize commercial over residential buildings.

Why is EUI increasing? And how can households and commercial sites mitigate it?

As a result of reduced population concentration per household, the average energy consumption per household is declining.[17] However, the caveat here is that while the per household consumption is apparently falling, the consumption per household member (i.e., a single human being) is increasing.

The energy usage in commercial settings is also increasing. Unlike individual households, commercial energy use and, ultimately, its adverse ecological effects are an even bigger cause for alarm as seen in Figure 12. At most commercial sites today, lighting is the dominant factor when it comes to energy consumption; heating and cooling (ventilation broadly speaking) are also major sources of the excess energy consumption problem[18].

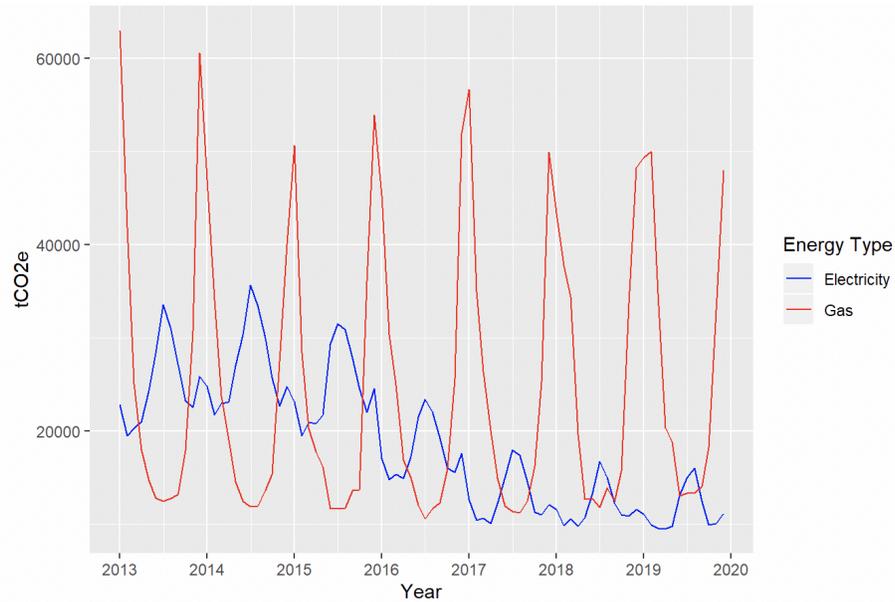


Figure 13: This figure shows the TCO2 emissions by energy type (Electricity and gas) in the City of Stockton [20]

Finally, as Figure 13 implies, there are predictable gas consumption peaks for households, associated with spikes in energy consumption towards household heating during the winter season. We can also observe that the electricity peaks (due to AC usage in the summer months) are significantly lower — 33,000 tCO2e compared to 63,000 tCO2e. Gas based heating produces more tCO2 compared to tCO2 emitted by electric heaters— which suggests that a major energy efficiency and weatherization effort would be heating electrification.. This would serve as a stepping stone in Stockton's path towards decarbonization and energy consumption reduction in the 5-10 years to come.

Indoor Air Pollution

Stockton's poor air quality cannot be escaped by entering buildings. Considering the socioeconomic status of at-risk neighborhoods and the age of buildings, it is safe to assume that most buildings in Stockton are not weatherized. Without a safe breathing space, adverse health effects from poor indoor air quality, especially asthma, are commonplace. Stockton has a minimum 83% percentile asthma rate relative to California as seen in Figure 14[21] which can be attributed to Stockton's poor indoor air quality. Pollution sources, like the freeways that run through the AB617 zone, make buildings an unsafe breathing space.

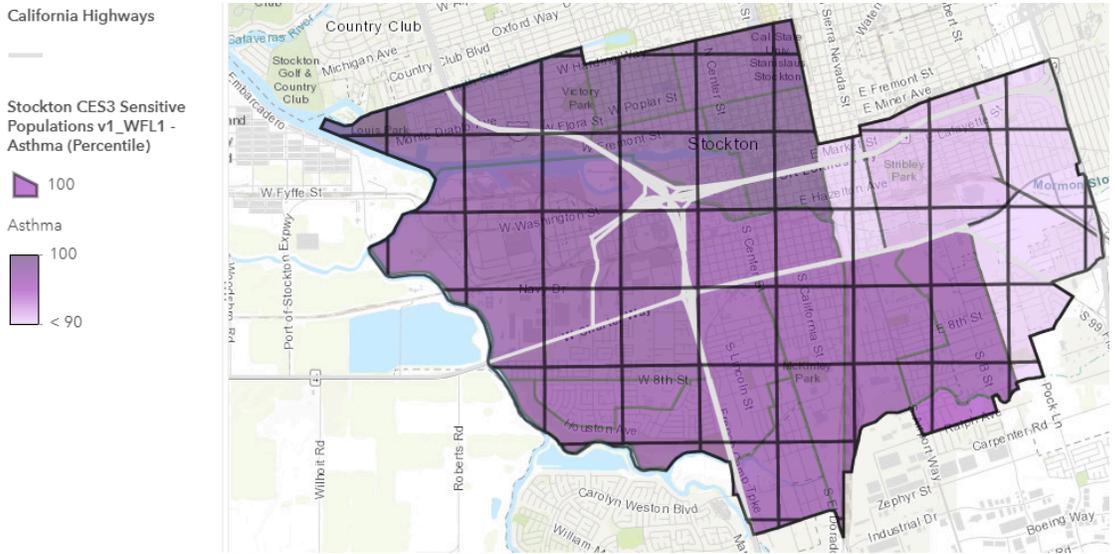


Figure 14: Stockton AB617 area map with asthma percentile in purple relative to California. Highlighted are highways that run throughout Stockton. Data from CalEnviroScreen3.0

Asthma is worsened by the SLCPs, PM_{2.5} and carbon emissions that plague Stockton. Mechanical air filters would be the best method to combat these irritants considering other types of filters like electrostatic and ionization filters can create ozone.

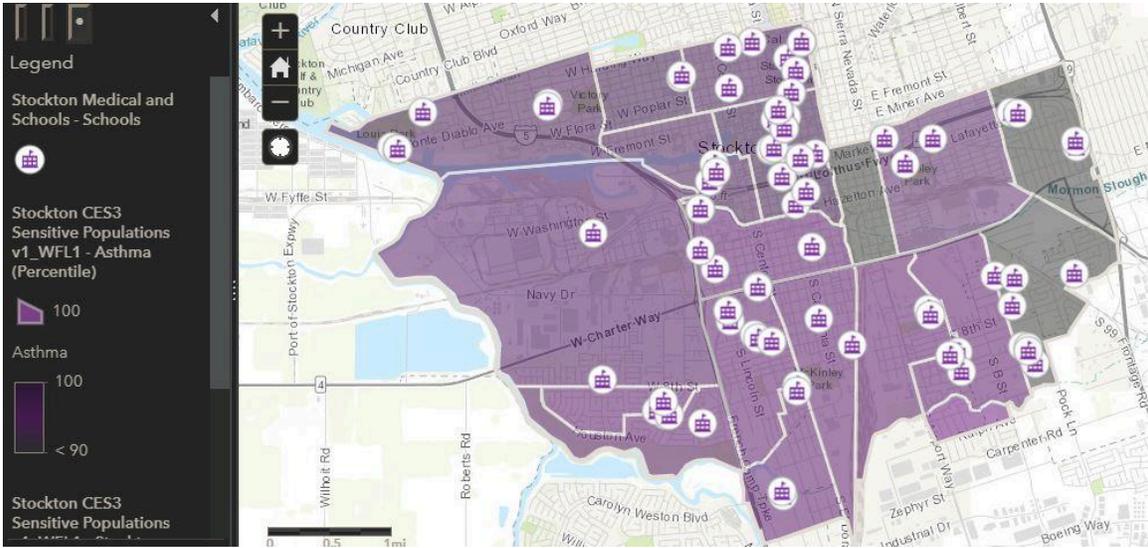


Figure 15: Schools in the Stockton AB617 area. Most schools are in areas where the asthma rate is incredibly high

Schools are some of the highest priority buildings in improving indoor air quality. Making school a safe breathing environment in Stockton AB617 is imperative to improve the general health of its future residents. As seen in Figure 15, keeping children safe in

schools is critical as asthma develops in children at around age five[22]. Children often stay at school to participate in other programs past the school day therefore, targeting indoor air quality at schools would directly impact the spaces where children stay for a good portion of the day.

Design Plan for Stockton 2025

Open Burning Design Process

By looking at Figure 16, we see the main issues that impact both residential and agricultural burning. Through our design process, we begin to look at each of these causes, look at existing designs, and create improvements and new ideas to address the issue of open burning.



Figure 16. Causes of agricultural and residential burning and primary causes.
<https://embed.kumu.io/be37043d8d26b5edf44a5dcba1428fe2>

To understand residential open burning, we first looked at other AB 617 communities such as West Oakland which also has a large residential burning issue. The AB 617 West Oakland community appears to be approaching this issue the same way Stockton currently is, which is through education and outreach on the harmful effects and current rules on open burning[23]. On one hand, we believe education is extremely important. If access to these education sessions is increased by making them more frequent, different times throughout the day, different areas, multilingual, and especially welcoming homeless people that may burn for warmth, we hope to see more people know what not to burn and when not to burn as well. However, education can only go so far.

For example, burning waste is currently illegal yet some people still do it, perhaps because they did not know it was illegal or did not have any other available choices. We can only hope that educating residents would change their current behaviors and decrease residential burning. Therefore, we also looked at and created designs to solve the root cause of open burning beginning with burning wastes.

Waste management

Stockton is currently serviced by two private companies, Waste Management (WM) and Republic Services for residential waste collection[23]. Both of these companies collaborate with StocktonRecycles to provide recycling guides, reminders and tips, and information for Stockton residents, businesses, and schools. In addition to educating residents on the harmful effects of open burning, we propose to add education on waste management reduction and reinforce proper waste disposal techniques, existing measures to recycle hazardous wastes, and current enforcements. There are brochures and flyers that have all of this information, so we hope through increased circulation, improved results with waste disposal and reduction will be seen[24].

In addition, we propose to improve current waste management practices provided by the City of Stockton, through measures such as creating more recycling zones for residents to take their hazardous wastes to. As mentioned in the previous section, there is only one hazardous waste disposal site located outside of the AB 617 community. This site is currently funded through the County Service Area (CSA) special district budgets and used approximately \$1.3 million dollars for construction costs. The household hazardous waste project (CSA #53) had a projected fund balance of \$1.89 million as of July 1, 2020, so one solution design would be to create multiple hazardous collection sites within the Stockton AB 617 borders that would be closer to residents and more accessible to all using the excess budget available[26]. The wastes collected at these sites would be taken to the San Joaquin County Waste Facility on a weekly or bi-weekly basis. As these sites could be built in conjunction with existing recycling zones built near grocery stores, offices, and rehabilitation centers, construction time and costs could also be reduced.

Incentive programs

To address wood burning stove and heating systems, we propose to expand the Burn Cleaner Wood Stove Change Out program by first replacing all wood burning/uncertified stoves and heating devices in Stockton with electric technology and later moving towards replacing natural gas stoves and heating devices in addition to the 77 they have already replaced. Furthermore, any new homes or fireplace remodeling projects should only be allowed to install electric stoves and heating devices. This program incentivizes residents to replace their stoves with varying amounts depending on location and income of the household. It receives funding through proceeds made from

California's Cap-and-Trade program which are deposited into the Greenhouse Gas Reduction Funds and then utilized by California Climate Investments[2]. So far, this program has received \$3 million in the 2018-19 budget[28]. However, as cap and trade auction revenues are volatile and have varying amounts of revenue generated per year, an increase in grant writing programs and generating additional funding from different sources independent of California's cap and trade program such as EPA grants and other private foundations may create a more reliable and diversified source of funding for these programs.

Homelessness

Finally, for the cases of those without homes that burn for warmth, Stockton has begun to implement initiatives to address homelessness.

- In December 2020, The San Joaquin County Board voted to allocate \$2.8 million from California's Homeless Housing Assistance Program (HHAP) to four projects within the county. In addition, Stockton received \$6.4 million from this program to create shipping container shelters and provide funding to the Stockton Shelter for the Homeless (SSH), the Central Valley Low Income Housing Corporation (CVLIHC), and other programs that provide housing, rent support, and job/employment opportunities to the homeless[33].
- In September 2020, Governor Newsom announced that Stockton received \$4.3 million in Homekey awards funding which works to purchase housing such as hotels and vacant apartments and convert them into permanent, long-term housing for people experiencing or at risk of experiencing homelessness[33].

These programs have so many more benefits to support those without homes, however for the scope of this project, we will focus on the aspect that they will also decrease open burning from Stockton residents as they move into homes and do not need to open burn for warmth.

On the other hand, for agricultural burning, in regards to SB 705, we want Stockton residents to push for deletion of the subsection in SB 705 and for no further postponements to Rule 4103. Through this action, we want the residents to hold the agricultural sector accountable to follow burn prohibitions. In addition, there are all of these alternative programs available, that shred, chip, and create mulch out of crops and use them in soil incorporation. We propose to increase participation, get more funding, and diversify funding from other sources (the healthy soil there are already several existing alternative programs available such as the mentioned Alternative Agricultural Burning as well as the Healthy Soils Program and the Environmental Quality Incentives Program[14]. Shown in Figure 17, through an emission reduction analysis for a typical 100 acre project, we see a large difference in emissions from open burning agricultural material in contrast to recycling, composting, and utilization in soil incorporation.

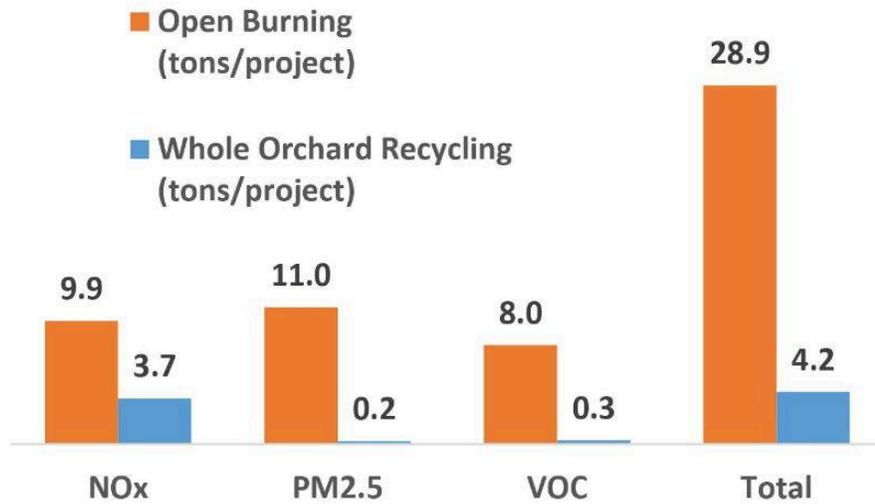


Figure 17: Emission reduction analysis performed on a typical 100 acre area.
<https://www.valleyair.org/BurnPrograms/open-burn-report-progress/documents/2020-ag-burning-staff-report/2020-Ag-Burn-Report.pdf>

The results of this study show that these programs are an extremely viable option to decrease emissions from agriculture burning. Thus, as a next step, we propose to increase participation by diversifying and receiving more funding from other sources. Currently, the San Joaquin District has provided \$13.5 million from various grants towards the Alternative to Agricultural Burning Pilot Program and estimates around \$15 million per year will be needed to sustain it at a rate removing 25,000 acres per year until the need for incentives is deemed unnecessary[23]. The Healthy Soil Program primarily receives funding from cap and trade funds from the Greenhouse Gas Reduction Funds, receiving \$41 million since the start of the program. However in the 2020-2021 fiscal year, it did not receive any funding due to COVID-19 and subsequent economic downturns[23]. In addition, EQIP is also funded through a similar manner as the Healthy Soils Program: through an annual competitive process that may lead to uncertainty whether it would be funded in a given year[23]. Thus, in order for these programs to remain effective and to support the transition out of open burning, sufficient and reliable sources of funding are required. Similar to the Burn Cleaner Program proposed solution, these funds should come from diverse sources such as multiple levels of government, different environmental agencies, and community sponsorships in order to anticipate any unforeseen circumstances.

As we move forward, we plan to look at a cost-benefit analysis for these alternative programs in comparison to using agricultural biomass as a source of biofuel for the DTE site in Stockton to see if these alternative programs are a more viable option

in terms of financial costs. The table below outlines and summarizes the proposed solutions for open burning.

Issue	Solution Design	Approach
Residents burning hazardous wastes	Increase education on waste management techniques	Education
Residents burning hazardous wastes	Create collection zones within the AB 617 border	Incentives
Outdated wood burning stoves	Increase CBYB and Burn Cleaner Program and other incentive programs, diversity funding	Incentives
Homeless sector burning for warmth	Utilize incentives given for temporary/permanent housing,	Incentives
Agricultural sector does not follow Rule 4103	Residents hold agricultural sector accountable, push for deletion of SB 705	Regulations
Agricultural sector continues to have high rates of burning	Increase participation in alternative programs, increase and diversify funding	Incentives

Solar Design Process

Based on the enormous health, financial, and environmental benefits, the preferred state of Stockton includes a significant switch of the electric grid to include more solar energy. The AB 617 community must consider where they are getting their solar from and from which levels of government and regulation.

Our first solution involves a more direct implementation plan. This would be in the form of completely changing the infrastructure within Stockton in residences, businesses, and public buildings to install solar panels throughout the community.

Proposed Solution 1:

There are a few ways that we could go about doing a project like this. First off, GRID Alternatives, a non-profit organization that installs solar panels for clients and communities throughout the country, has done similar projects for low income communities throughout the San Joaquin Valley. They provide “developing community solar projects that maximize the benefits for low-income and underserved communities, while integrating workforce development and other local economic opportunities” and

they additionally, “partner with governments at all levels to develop community solar programs and projects that benefit the highest need community members”[27]. This would give opportunities for not only community groups within Stockton, but also varying levels of government, options to be able to implement solar on a large scale to people in Stockton.

To see if this was feasible, we contacted GRID alternatives to see if they have any plans to do any further work within Stockton’s AB 617 community. When talking to their representative, they explained that they have already installed 22 solar structures in Stockton specifically. One of the key things learned from this call was that they give free installation to any qualifying low-income household. However, the funding that they get is from State Bill 535 (SB 535) which provides funding from the Greenhouse Gas Fund to disadvantaged communities. When talking to the GRID Alternatives representative, they said that some of the biggest issues in implementation to communities like Stockton comes from the fact that throughout California they get over 12,000 applications a year for this program but only about 1,000 get approved. This is due to the applicants either not being in the SB 535 boundary, not having suitable rooftops, or not being homeowners. However, as we saw previously through Project Sunroof, 97% of rooftops in Stockton are solar viable, and additionally, according to the 2020 US Census, 48.8% of homes in Stockton are owned-which means that if home owners are open to implementing solar, this could be [5]. Lastly, when looking at the CalEnviroScreen data, SB 535 completely covers the AB 617 community, as seen in Figure 18. Therefore, all of the reasons that implementation through GRID Alternatives is not successful can be overcome within the Stockton AB 617 community.

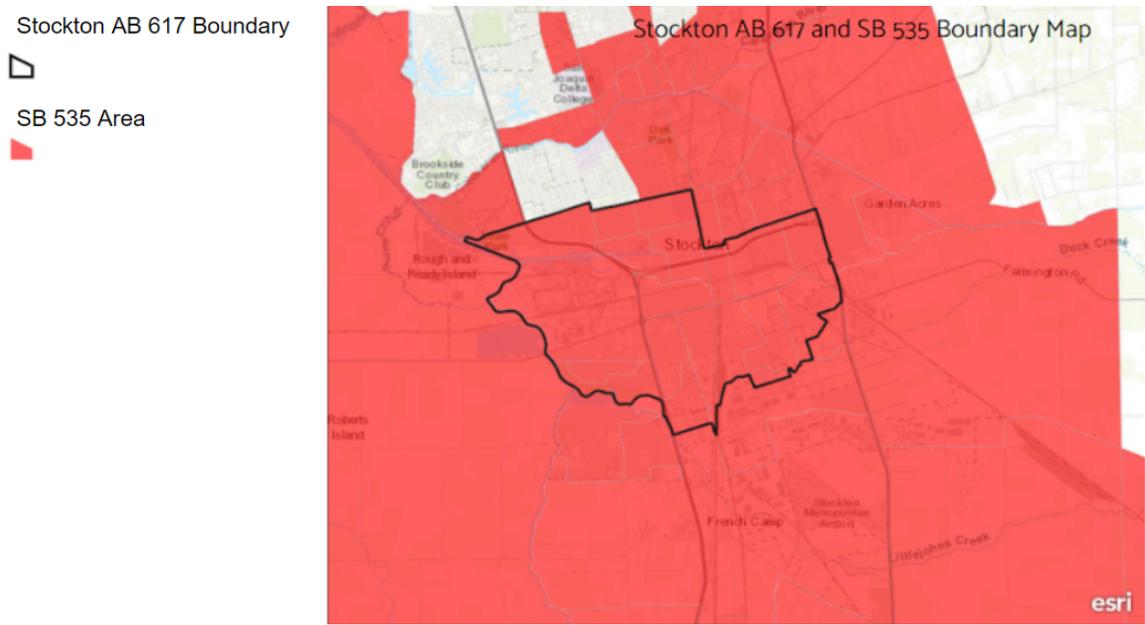


Figure 18: This figure shows the SB 535 designated area in red, in addition to the Stockton AB 617 boundary outlined in black. As we can see, these two both overlap completely, meaning the AB 617 community of Stockton is completely within the SB 535 designation.

Another way that this could be achieved is through community solar. Community solar is shared solar, namely for those who do not have the proper infrastructure to implement solar on their own homes. This means residents could own a piece of a local solar facility that helps to power their community and in turn could get credit for that energy offset for their own electric bill. Not only would this contribute to the same benefits in switching the electric grid, but these community members can have more of a sense of ownership and stake in their community. To look for potential spots in Stockton for these ‘community solar gardens’ Figure 19 shows a zoning map within Stockton. This can also be helpful to see in general where solar could be installed--public facilities, aggregated residential space, commercial and industrial zones--all that could potentially house solar on their rooftops.

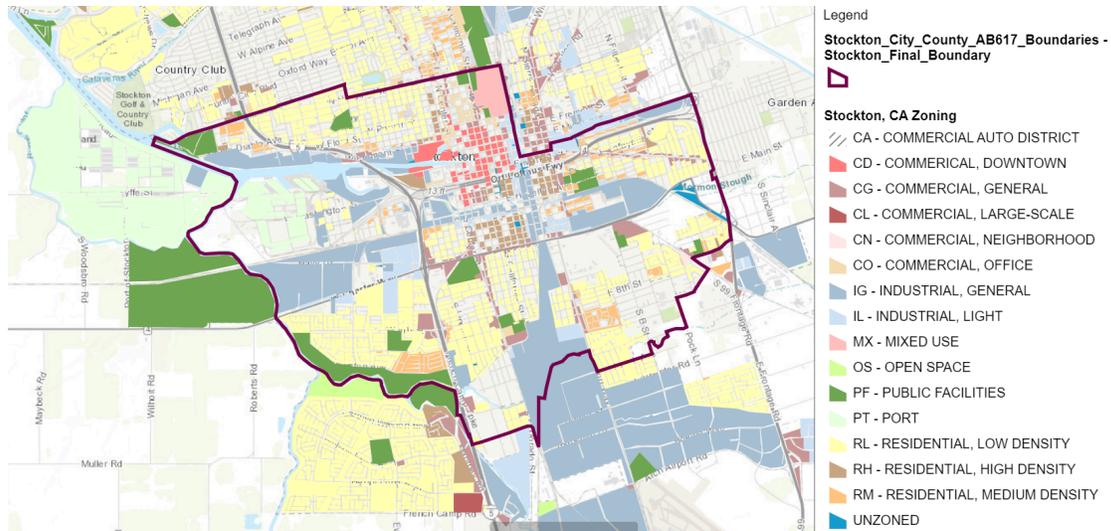


Figure 19: Stockton’s zoning section within the AB 617 boundary.

<https://cal.maps.arcgis.com/home/item.html?id=bf587e45c523404db7b0d6774fdac040>

The benefits of this plan include being able to provide a large change in the electric grid, in a relatively short amount of time, for the people of Stockton. GRID Alternatives provides free solar installation for any qualifying low-income household. This gives a lot of independence for individual families and households who might want to make the switch to solar but cannot afford the buy-in costs to it. Additionally, they would then be able to have much lower electricity bills which is a great financial benefit. Also, putting solar panels on one's household or participating in community solar are both great ways to feel a greater sense of ownership and a larger stake in a community--putting in infrastructure to build a town.

The cons of this plan include the initial cost for some and for the city of Stockton, as well as the great amount of organization that this would require. Although--a non-profit like GRID Alternatives would be helpful with this as they have done similarly in SB 535 communities in places like Fresno, CA and therefore have the infrastructure and organization to replicate this to a city like Stockton. GRID Alternatives works with the current utility companies in the area that implement solar, for example PG&E, to have a seamless transition in changing the electric grid. Nevertheless, to be able to do this or to create community solar, planning is required beforehand to determine where would be the best place to implement the solutions, who in the community is interested and able, as well as educating the community as to why this would be beneficial to them. Additionally, solar power needs minimal but continuous maintenance throughout its lifetime which may be difficult to find support for to upkeep the infrastructure as well as finding a sustainable solution for the inevitable waste at the end of the lifetime.

Proposed Solution 2:

Our second solution would be more policy and regulation based. One aspect of this would be for Stockton to join a CCA, as well as requiring solar on all new installations--not just homes.

In terms of implementation, Stockton is already moving forward in the CCA process as their city council just voted to pursue community choice energy [29][28]. They approved a motion for a study to be done on the City of Stockton, and if this path continues in this way, they can follow the steps of the 21 other communities in California that have joined CCA's. The CCA process has a very robust system and it would not only provide an alternative power generation source for Stockton, but it would also provide plenty of economic opportunities for the residents in the form of jobs to build the infrastructure entailed in the CCA. On the legislative side of things, the City of Stockton could implement a solar mandate on all new buildings. There currently is a statewide California solar mandate; however, this is not very strict. They require solar to be installed on all new homes up to three stories tall and can reduce the required solar installation by up to 40% depending on the energy efficiency of the home built [4][29]. However, what if Stockton created a mandate for all buildings, including businesses and public buildings? This could likely provide a lot of room for growth in solar throughout the city and would create a foundation of this energy for any new building being built--and similar things have been done before. For instance, in January 2020, the City of Berkeley became the first city in the United States to pass an 'All Electric Building Ordinance' meaning that no gas hook-ups can be installed on new houses, apartments, and commercial buildings [16]. All Electric in Berkeley is just one example of city-led efforts to reduce emissions and produce cleaner energy in a local community. The hope is that ordinances like this will not only benefit the surrounding community, but also become an inspiration point for other cities, states, countries to do the same.

There are many benefits to joining a CCA, including that the community of Stockton residents would be able to decide for themselves where they want to source their energy from. Additionally, since CCAs are already structured and have been done in similar communities in California before, this would be a smoother transition to be able to start converting their electric grid. They are due to decide to continue pursuing this plan within the next few months[30][18]. Additionally, much like community solar, choosing sources of energy as a community within a CCA also provides the sense of ownership in a community that is crucial for growth to occur from the roots--the people. Making legislative change in the form of faster permitting processes and requiring solar to be considered on all new installations additionally would be really beneficial for the future of Stockton and would recreate a strong foundation for the city to grow from.

The cons to this plan include timing. Stockton's initial council vote to allow for the study for the CCA to occur happened in 2016--these processes move very slowly. This can be said for almost any legislation or policy work to be created at all levels of government--it takes a while. Additionally, a CCA gives the power to the community to decide where they want their electricity from--this does not however, mean that they will necessarily choose a greener option. A solution to both of these problems is through education and empowerment of the residents of Stockton. By highlighting the vast benefits of joining a CCA, this could ignite the residents to push for not only quick movement of this process, but also to choose an overall cleaner energy source. This has to be done, however, in a way that promotes equity throughout the community and highlights these efforts with community members who have less accessibility to resources or community organizing. Overall, if this is the best chance for Stockton to change their electric grid and move on to a path of more renewable energy, the timing may be worth it for the lives of the current and future generations of families and community members living in Stockton.

Weatherization/Efficiency Design Process

The preferred state in terms of energy and weatherization is to have programs and policies to increase the energy efficiency in Stockton buildings by an average of 20% energy savings in a decade like the The Better Buildings Challenge - Milwaukee (BBC-MKE) program[29]. Utilizing technologies like Energy Star Portfolio Manager software to standardize all public buildings and provide financial and technical assistance for the commercial and residential private sector, in addition to the following benefits after implementation:

- Visualize Stockton's buildings' energy use
- Compare public and private buildings to similar buildings
- Track energy usage to help identify abnormalities
- Allow City of Stockton to recognize your building for energy reduction accomplishments

Implementing this initiative starts with establishing an efficiency target of at least 20% for all buildings over the next decade as a participating building, then offering incentives and financing options for upfront funding on energy efficiency improvements. In addition to providing technical assistance to help owners of buildings identify energy efficient equipment and train any necessary support workforce.

Some of the challenges that we might face in deploying such technology would be getting buy-in from the public and private sector. Following the steps of the City of Milwaukee on this initiative can be very useful, since the City of Milwaukee has implemented a similar strategy with an original \$750,000 grant benefiting over 133 buildings[31][5]. The City of Milwaukee benefited greatly from the 133 participant buildings because it simply helped benchmark the buildings and have the information they need to:

- Identify underperforming buildings to target for efficiency improvements
- Identify best practices from efficient buildings
- Set investment priorities
- Verify savings and prevent snapback
- Share and report performance
- Earn recognition
- Benchmark more than energy
- Implement a comprehensive management program

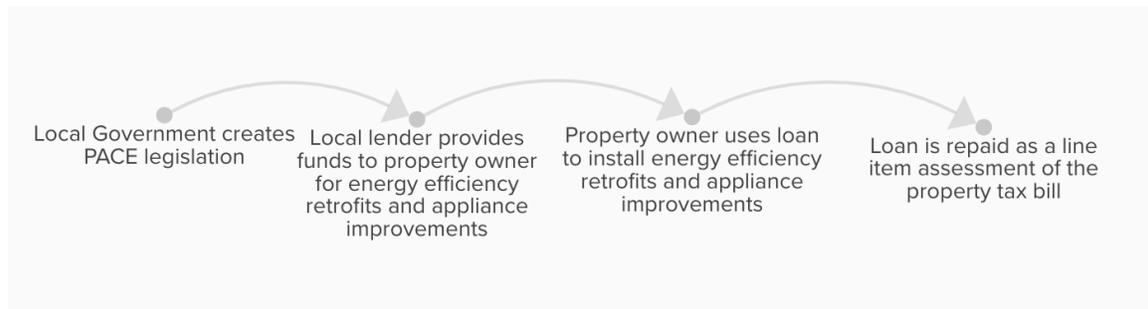


Figure 20: Stockton's PACE program design system for Energy efficiency equipment retrofits and appliance improvements <https://embed.kumu.io/6b69aecad897355c92e7d1496fe2b200#pace>

Another solution to increase the adoption of energy efficient systems is enabling property-assessed clean energy (PACE) financing for energy efficiency retrofits and appliance improvements. The way PACE programs work is by unlocking financing options through San Joaquin County PACE Program partners:

1. Alliance NRG
2. CaliforniaFIRST
3. Clean Fund Commercial PACE Capital
4. Dividend Soar
5. FortiFi
6. HERO
7. PACE Funding Group
8. Petros PACE Finance

9. Ygrene Works

San Joaquin County PACE program partners will initiate the proper funds for property owners to upgrade their buildings and start saving money. As an example, a company called Becker and Becker which has a property at 777 Main street in downtown Hartford, Connecticut utilized the PACE programs and Greenworks (a Connecticut PACE financing partner) to fund \$1 million worth of weatherization and energy efficiency upgrades to the property. The building has been operating with significantly reduced energy demand, saving \$316,927 in their first year[34].

Finally, property owners in Stockton spend the loans on energy renovation projects for their buildings and pay the loan through property tax reassessment.

Some ways of reducing the energy costs associated with running a commercial enterprise [19], which can be implemented in the upcoming 5-10 years, include the following:

1. Investing in programmable thermostats in order to better monitor and, most importantly, act on energy consumption
2. Utilising air compressors to only draw as much electricity as is required, as a function of the load
3. Implementing heat recovery systems, which enables a site to recover 50-90% of heat, normally lost due to HVAC inefficiencies

As far as options for reducing household consumption are concerned, there are also the following remedies available (and financially viable for household owners to consider) [7]:

1. Making slight but marked adjustments to day-to-day schedule and consumption patterns, such as turning off redundant lights and being more mindful when it comes to heater usage in the winter and AC demand in the summer
2. Replacing incandescent lights with LEDs or CFLs in order to reduce long term excessive energy consumption
3. Weatherizing one's home by sealing weather leaks (e.g., vents, windows, doors)
4. Much like in the commercial setting above, purchasing a programmable thermostat (also known as a smart thermostat) can also go a long way as far as reducing unnecessary energy consumption

The PACE program adopted by San Joaquin County PACE program finances projects 2, 3, and 4.

Indoor Air Pollution Design Process

The Stockton AB 617 community needs air filters in all homes and schools in order to provide a safe breathing environment for its residents. Air filters remove many asthma irritants and pollutants that plague Stockton residents. The Stockton AB 617 community requests that all air filters installed by CERP measures be mechanical air filters. Other filters like electric filters produce ozone which is a lung irritant.

The CERP has Measure SC.1 in place to improve indoor air quality in schools with air filtration system installation. SC.1 will provide \$2.64 million in incentive funding to schools to help install and maintain air filtration systems. With SC.1's budget, the CERP estimates that 33 schools in the AB617 boundary will have funding for air filtration systems. There are 35 schools in the community (32 public and 3 private) and 50 daycare centers, so additional funding is needed to assist all of these facilities.

CERP has Measure IAQ.1 in place to improve indoor air quality in homes near air pollution sources. IAQ.1 will provide \$1 million in an incentive funding program for air filter installation in homes. CERP states that the average installation costs for a home is \$500 which amounts to 2000 air filtration units installed in Stockton AB 617. Stockton's AB 617 132,000 residents cannot be fully covered by only 2000 installation units but the homes not covered by IAQ.1 can have their homes' indoor air quality improved through other means. The Weatherization Assistance Program can cover some of the homes not able to be helped by IAQ.1 if the household is at or below 200% of the poverty income guidelines are considered eligible for weatherization services or if they receive Supplemental Security Income or Aid to Families with Dependent Children[22]. Old houses and houses owned by many low-income and at-risk groups are not weatherized. Aside from weatherization, this is the main con to IAQ.1 as not all homes can have air filters installed with both the incentive funding and assistance programs. Some residents will not be covered by IAQ.1 or will not have knowledge of weatherization assistance programs.

To circumvent the expensive cost of purchasing mechanical air filtration units, DIY filters provide an immediate and inexpensive solution to Stockton's indoor air quality issues. DIY air filters can be made with a standalone fan and a HEPA filter attached to the fan. These filters can be made for as little as \$50 and multiple can be made per household. These filters can cover the households in the Stockton AB 617 as well as providing some extra filtration for schools. We propose CERP measure O.1 for indoor air quality outreach should be expanded to include workshops on how to make these filters as well as how often they should be replaced. Using low-cost box filter options will help extend the impact of measure O.1 well beyond the 2000 units (at \$500 each) currently budgeted for in the CERP.

In order for CERP incentive funding and assistance programs to be fully effective, outreach on indoor air quality must be done. The CERP has Measure O.1 which aims to

create community outreach on indoor air quality education and weatherization and incentive programs through websites, apps, and workshops. In-person outreach will be achieved through four in-person meetings that are organized and held by community leaders in Stockton's AB 617 zone. The online aspects aim to increase downloads of the Valley Air App and awareness of the myRAAN website which are online tools that update real time information on air quality and educate users on the importance of indoor air quality. These outreach initiatives are needed as CERP measures for air filters are incentive programs, not direct funding. Not all Stockton AB 617 residents will know about these programs or will have the knowledge about the importance of indoor air quality. The same can be said about assistance programs. There are cons to O.1 however. In-person workshops are not available to everyone as not everyone has easy access to transportation to the workshops. On the other side of outreach, the internet aspect of the outreach is not accessible by everyone as not all residents have internet access. Aside from its cons, O.1 is imperative for CERP's air filter measures to be fully effective.

Evaluation Criteria:

For our evaluation criteria, we created a list of our actions, goals, the stakeholders involved, and the measurable product that it would produce. We rated these based on a time scale. The plans that are labeled in green are projects that we believe could be implemented within the next 1-4 years. Those in yellow could be in 5-8 years and those in red 8+ years. In terms of both climate disaster as well as the lives and health of the people of the Stockton AB 617 community, time is critical, which is why we chose this as our unit of measure.

Action	Goal	Stakeholders Involved	Measurable Product
Incentivize programs that are alternatives to farmers burning	Reduced levels of crop burning	Farmers, CARB, San Joaquin Air District Valley	Reduced levels of burning, less smoke, PM 2.5, black carbon, CO
Expand education on waste management and cleaner fuel types and emissions	Education on current waste management practices,	Stockton Waste Management (WM), Residents	Less overall waste and reduced levels of PM2.5
Installing air filters into homes and schools	Reducing asthma irritants and improve indoor air quality	Schools and home owners	Gradual decrease in asthma rates, reduction in PM _{2.5} , NOx, and ozone in buildings
Replace wood burning stove/heating pumps with electric ones	Cleaner burning stoves/heat pumps will reduce emissions from older stoves	Residents, CARB, San Joaquin Air Valley District	Indoor air pollution reduced, less PM 2.5, black carbon, CO in neighborhoods
Installing solar panels as an alternative energy source throughout Stockton	Reduced emissions from energy generation as well as lowered electric bills and more sense of ownership in placing a sustainable long-lasting product	Schools and other public buildings, individual home/business owners, corporations	Reduced levels of PM _{2.5} being measured throughout the AB 617 boundary, as well as a reduction in the average electric bill cost for residents and businesses that made the switch.
Community outreach on indoor air quality and weatherization and incentive programs	Increase enrollment into weatherization and incentive programs	Residents	Full use of CERP's IAQ1 and SC1 budget as well as enrollment into the Weatherization Assistance Program and LIHEAP Weatherization
Utilize the software Energy Star PortfolioManager to standardize all public buildings	Track and share energy consumption data to develop and plan energy efficiency-based buildings	Property owner, city of Stockton, Energy Star	Reduce energy usage in participant buildings by 20%
Improve recycling/waste management	Reduced levels of residential waste burned	Residents, Stockton Waste Management (WM)	Less trash burned ->more trash collected, reduced levels of PM 2.5, black carbon, CO
Create housing shelters and reintegration programs	Reduced levels of waste burned for warmth (and so much more other benefits outsides of E&B)	Residents without homes, Stockton government	Less open burning, reduced levels of PM 2.5, black carbon, CO
Enable property-assessed clean energy financing	Building and retrofitting more energy efficient properties	Property owner, city of Stockton, finance partners (ex Dividend)	Energy usage reduction in properties financed by program; Number of energy efficiency systems installed

Implementation Plan

In Figure 21, we have outlined our implementation plan for the various designs we discussed above.

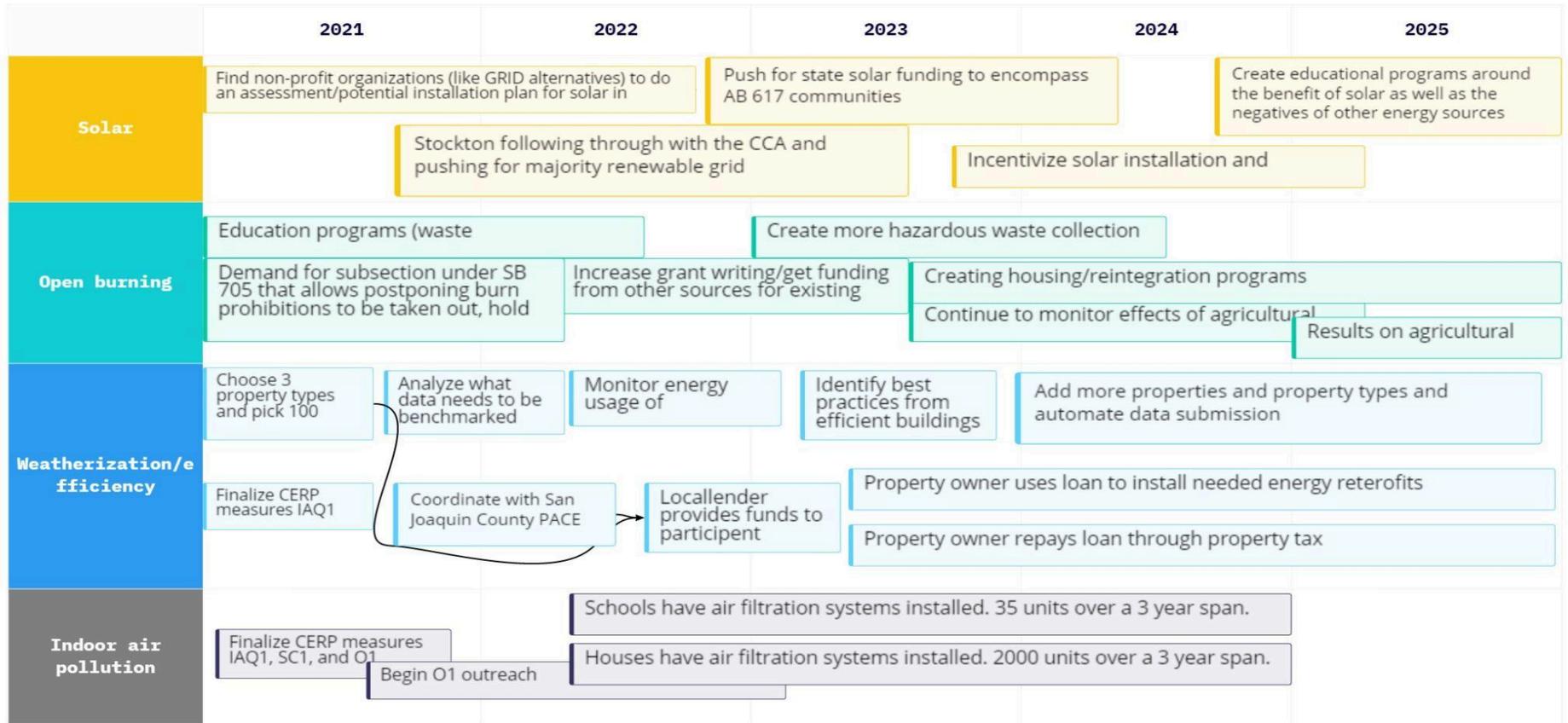


Fig. 21: Implementation plan of the proposed solutions https://miro.com/app/board/o9J_lIz4XnQ=/

Open Burning

For open burning issues, as Stockton already has a plan in the CERP to begin educating residents on the harmful effects of wood burning, in 2021 SJVAPCD can also integrate education on waste management and reduction. In addition, demanding for the section in SB 705 that allows postponement on burn prohibitions will take around a year as CSC members, agricultural workers, and the San Joaquin Air Valley District must all agree and then CARB must also concur. By 2022, Stockton should look towards expanding and increasing its incentive programs through an increase in grant writing and diversifying funding sources. In addition, they should continue to closely monitor air quality and emissions especially in the agricultural sectors to see if the alternative programs are functioning well. Additionally, by 2022, the hazardous waste collection sites within the AB 617 border should be created and operational. These sites could be built in existing trash collection sites, so construction time may be shortened. As there are currently several funds for homeless shelters and reintegration programs, by 2023, the shelters and several programs should be established. However, results in open burning from the residential sector may take some time to be seen. However, by 2025, we will begin to see results, especially in the agriculture sector as we see the trend decreasing already starting from 2018 as seen in Figure 6.

Indoor Air Quality and Weatherization

For indoor air quality strategies, the implementation plan begins before 2020 with the ongoing outreach on indoor air quality education. Measure O.1 can begin its expanded outreach program. By 2022, CERP measures SC.1 and IAQ.1 will help with installing air filters in schools and begin weatherization efforts including air filter installation in homes. The implementation of SC.1 and IAQ.1 would finish in 2024. By 2025, all Stockton homes and schools should have updated HVAC systems or DIY filters in homes.

After finalizing CERP measures IAQ1 we need to simultaneously start searching for 3 property types (ex: education, food sales & service, and entertainment/public assembly) for the pilot and pick 100 properties to participate in the deployment of the Energy Star PortfolioManager software pilot. We can then analyze the data that is needed to benchmark Stockton's buildings against other buildings in Stockton and the US and give it a score of 0-100, where 50 is considered median efficiency. We then monitor the energy usage of participant buildings, where local lenders provide funds to participant property owners. Between 2023 and 2025, we will be adding more properties and property types and automate data submission after identifying best practices from efficient buildings. This will help us prioritize resources and efforts to increase the overall energy efficiency of buildings in the City of Stockton.

Solar Energy

In terms of solar implementation, this starts with finding a non-profit organization like GRID Alternatives that would be able to do an assessment followed by an implementation plan for introducing solar on a large scale to Stockton. To keep as many of the options for solar open as possible, throughout this time we would continue to push for Stockton to join a CCA. This process could be streamlined by having the solar assessment and implementation plan already finished. In 2023 we would push for state funding for solar to encompass AB 617 communities, much like what has been done for SB 535, so that more funding can go towards AB 617 as a whole, and especially communities other than Stockton that do not coincide with the SB 535 area. With all of this front work done to be able to create a logistical path for solar, we would start looking to encourage solar and community solar incentives to encourage people to invest in solar in 2024. This would go hand in hand with our vision for 2025 of creating educational programs, workshops, and a community committee to encourage solar as well as speak to the benefits of renewable energy as well as the downsides of other sources of energy. This would benefit not only the effort to have people invest in solar, but also in the case of the CCA, to choose renewable energy for their electric grid.

Strategies to Share Beyond Stockton

Several of our designs can be implemented beyond the Stockton AB 617 community, either for other AB 617 communities within California or even beyond California and utilized globally. For example, several of our solution designs rely on the funding AB 617 receives. As most of its funds come from California's Cap-and-Trade program, by diversifying the funding source, several other programs under the California Climate Investments can become more independent of fluctuating funds. In addition, the AB 617 West Oakland community also has a large open burning issue, especially coming from the homeless sector, so they could also utilize the plan for funding and creating homeless shelters and programs to reduce burning on top of their current re-education strategy.

On the other hand, for our solar strategies, the data gathered for Stockton, made it apparent that implementing solar throughout not only many other cities, but nation-wide, is on the minds of many communities and policy-makers alike. Much like how we want this implementation plan to be applicable to cities like that of Stockton's AB 617 community, we also hope that similarly marginalized and disproportionately polluted communities can give more light on how to approach widespread implementation in Stockton. This would include extending funding for programs like SB 535 to similarly affected areas like AB 617 communities. In our case, Southwest Stockton was already enveloped in the SB 535 area, but other AB 617 communities are not included in this SB 535 funding, meaning they are not eligible for funding from solar programs like GRID Alternatives.

Overall, we hope that our implementation plan can be used not only for similar communities, but can be transformed to be used on both a global scale and different time scales--we're hoping that the plan that we have created can be applicable for generations to come.

Acknowledgments

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