

UC IRVINE | ENVIRONMENTAL INJUSTICE | FALL 2019

BAKERSFIELD

SLOW DISASTER CASE STUDY | GROUP 1

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[ANTHRO 25A: Environmental Injustice](#)

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Fig 1: West Nord, *Bakersfield is located in California*, March 11th, 2009, Wikipedia accessed November 8th, 2019

1. What is the setting of this case? [Dominic Al-Shamari]

Bakersfield is a mid-sized city located in the southern end of the San Joaquin Valley and plays host to a highly dense and productive sector of agriculture. It is part of one of the biggest agricultural areas in the nation that stretches throughout the center of California, and as a result, it contains a large population of working people. As can be seen in Figure 2, the city sits directly on a major highway, and adjacent to another to the west, indicating a high throughput of traffic in the region. The city hosts a population of roughly 380 thousand people, with a median age of 31 and a median household income of \$57,000, which is considerably below the national average and has experienced a nearly 3.6% average decline a year (Data USA 2019). As a result, it has a poverty rate of just over 19% along with a median property value of \$240,000 (U.S. Census 2018). According to the EPA's EJ Screen, found in Figure 3 below, the city is in the upper percentiles compared to regional and state percentiles when comparing minority population (EPA 2018). The city is composed primarily of Hispanic Americans, which make up roughly 50% of the local population, the remaining population is roughly 30% White, 7% African American, or Asian. Of these people, roughly 92% have a source of

health coverage available to them, while 40% of those who have health coverage receive it as a result of employee coverage, throwing some leverage into the industry's court (BestPlaces 2016). While the region has been considered primarily conservative in recent decades as a result of its rural setting, recently the political climate has shifted the demographics in Bakersfield to a more left-leaning position. The larger Kern county, however, remains primarily conservative for electoral purposes. The geographic position of Bakersfield has it surrounded on all sides by high mountains, as it sits in the basin of the southern sector of the Central Valley, this has the effect of trapping smog up against the mountainsides, and with no natural escape from the basin, air pollution has been allowed to accumulate over the decades, and is considered one of the most polluted cities in the United States by several metrics (Walsh 2014). This pollution is further aggravated by the tendency for local farmers to burn their crops as a method of disposal, which has only exacerbated the situation with regards to air quality. The CalEnviro Screen of 2018, as seen in Figure 4, has the majority of the area in and surrounding Bakersfield in the upper percentiles of risk. Due to this extremely high and consistent level of elevated air pollution when compared to the rest of the nation, Bakersfield and by extension, the surrounding San Joaquin Valley experiences a significant instance rate of asthma among its population, alongside increased its risk for respiratory and cardiovascular disease.

EPA EJ SCREEN COMMUNITY PARAMETERS

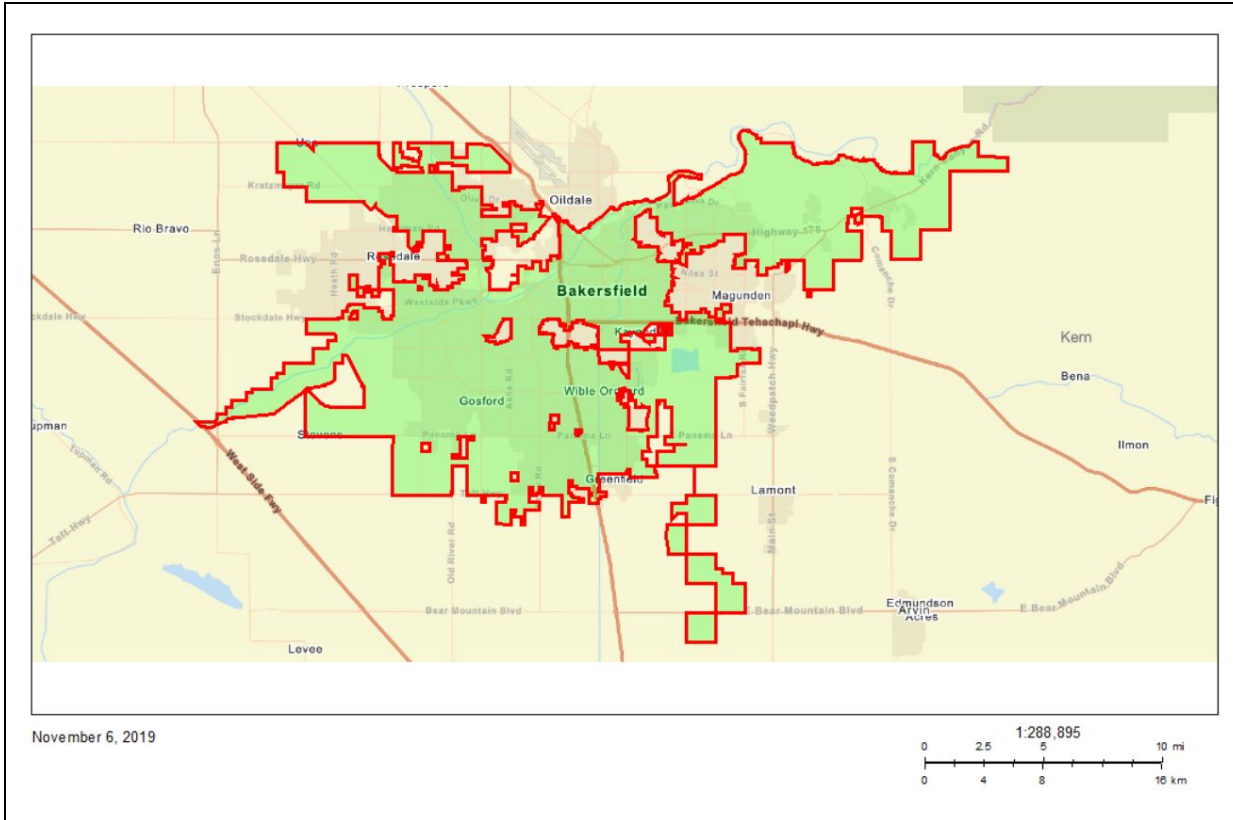


Fig 2: Selected area for the City of Bakersfield. EPA EJ Screen Report, *City of Bakersfield*, 2018. Retrieved November 6th, 2019. Screenshot taken by Dominic Al-Shamari.

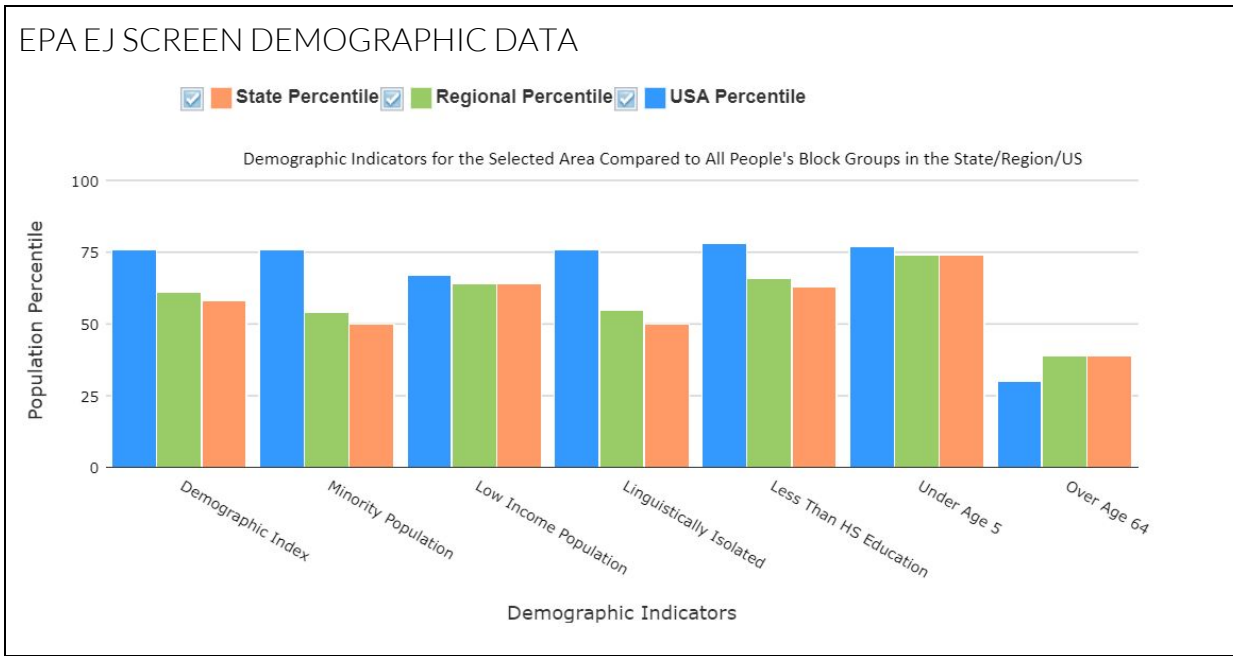
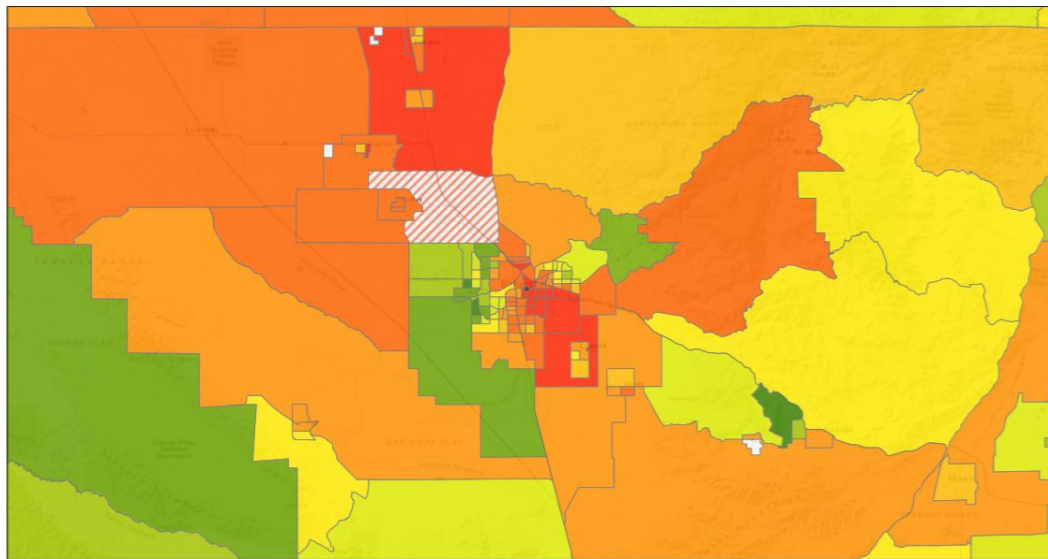


Fig 3: Demographic indicators for Bakersfield. EPA EJ Screen Report, *City of Bakersfield*,

2018. Retrieved November 6th, 2019. Screenshot taken by Dominic Al-Sharami.

CAL ENVIRO SCREEN

CalEnviroScreen 3.0 Results (June 2018 Update)



11/6/2019, 8:45:11 PM

CalEnviroScreen 3.0 Results (June 2018 Update)

1:577,791
0 5 10 20 mi
0 5 10 20 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeBCO, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), Swis OpenStreetMap contributors, and the GIS User Community, OEHHA

Fig 4: High scoring census tracts in Bakersfield, CalEnviro Screen 3.0, 2019. Retrieved November 6th, 2019. Screenshot taken by Dominic Al-Shamari.

2. What environmental threats contribute to slow disasters in this setting? What data is available to characterize these threats posed by slow disasters in the community? [Patrick Yang]

Due to the significant particle pollution concentration in Bakersfield, multiple environmental threats have arisen that are able to influence the health of the people living in the area. The geography of Bakersfield “creates a bowl that traps air pollution” (Walsh 2014), an effect that is further enhanced by the combined effort of “emissions from agriculture, industry, rail freight[,] and road traffic together creat[ing] one of the country’s worst concentrations of air pollution,” (Berg 2017, n.p.). From the unusually high concentration of particle pollution, locals could develop health problems and fatal organ diseases such as cardiovascular disease or asthma. A local news source in

Bakersfield states that “Californians [are put] at risk for premature death and other serious health effects such as asthma, COPD [(Chronic Obstructive Pulmonary Disease)], and lung cancer” (The Bakersfield Californian 2018, n.p.). The air pollution in the wider metro area, which has a population of approximately 875 thousand people, has caused “about 70,000 [people] are said to have asthma, 40,000 [people with] cardiovascular disease, and 27,000 [people with] chronic obstructive pulmonary disease” (Berg 2017, n.p.). Locals in this area run a huge risk with the potential health threats due to the remarkable air pollution from the various sources, decreasing the amount of pure air available to breathe. The exponential increase in air pollution will severely affect these citizens in both the short-term and long-term and will gradually cause grave damage to the environment. As displayed in Figures 5 and 6, the particulate matter 2.5 has a higher unhealthy percentile than the majority of the areas in the United States. Additionally, from Figures 5, 6, and 7, the amount of ozone in Bakersfield is greater than average with relatively moderate statistics that could become unhealthy at any point in the day. The evidence from these data tables contributes to our understanding of the significance of slow disasters in this area. Furthermore, the drinking water in the area is within dangerous areas with a 3.7 percentile from the California Healthy Places Index in Figure 7 describing that the “loss of valuable topsoil can mean increased use of expensive soil conditioners and fertilizers that can also contaminate water supplies if the chemicals are used improperly” (Wells 1988, n.p.). However, these conditioners and fertilizers on the built-up land and other agricultural areas as displayed in Figure 8 also contribute to the soil contamination of the area. An article from the LA Times states that “California agriculture could find that farmland conversion, erosion, salinity and irrigation shortages are so severe that its production of crops will decline rather than advance” (Wells 1988, n.p.). Another form of contamination in the area is the nitrate present in irrigation systems and fertilizers and have the potential to cause cancer. “The biggest sources [of nitrate] were synthetic fertilizer (54 percent) and animal manure (33 percent). Fertilizer application followed by irrigation drives excess nitrate down through the soil and into aquifers” (Meadows 2017). From these different forms of slow disaster pollutions, the primary perils lie in air pollution due to the transportation and industries near that area.

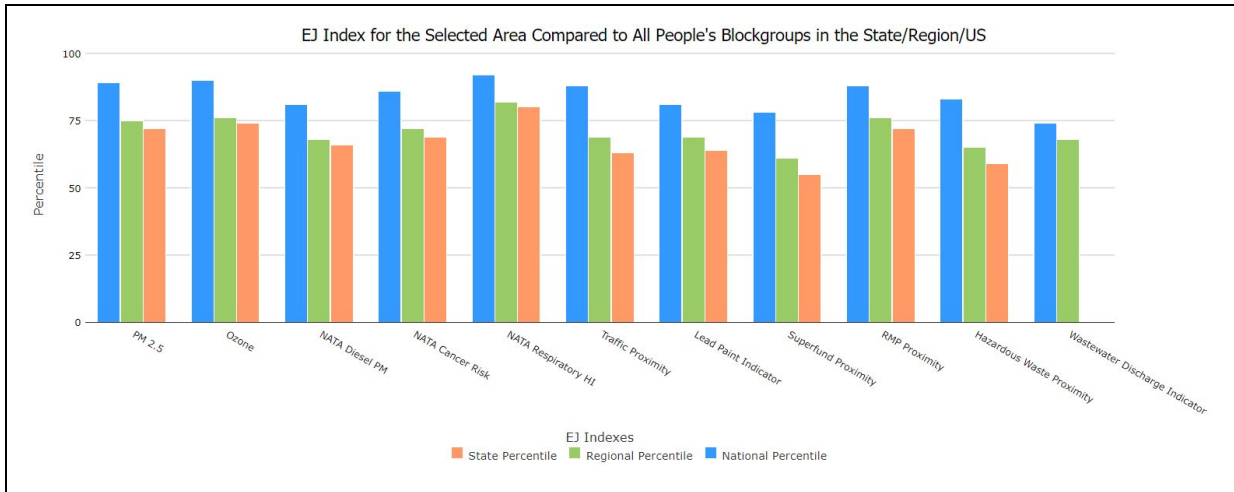


Fig 5: EJ Indexes for Bakersfield. EPA EJ Screen Report, *City of Bakersfield*, 2018. Retrieved October 23, 2019. Screenshot taken by Patrick Yang.

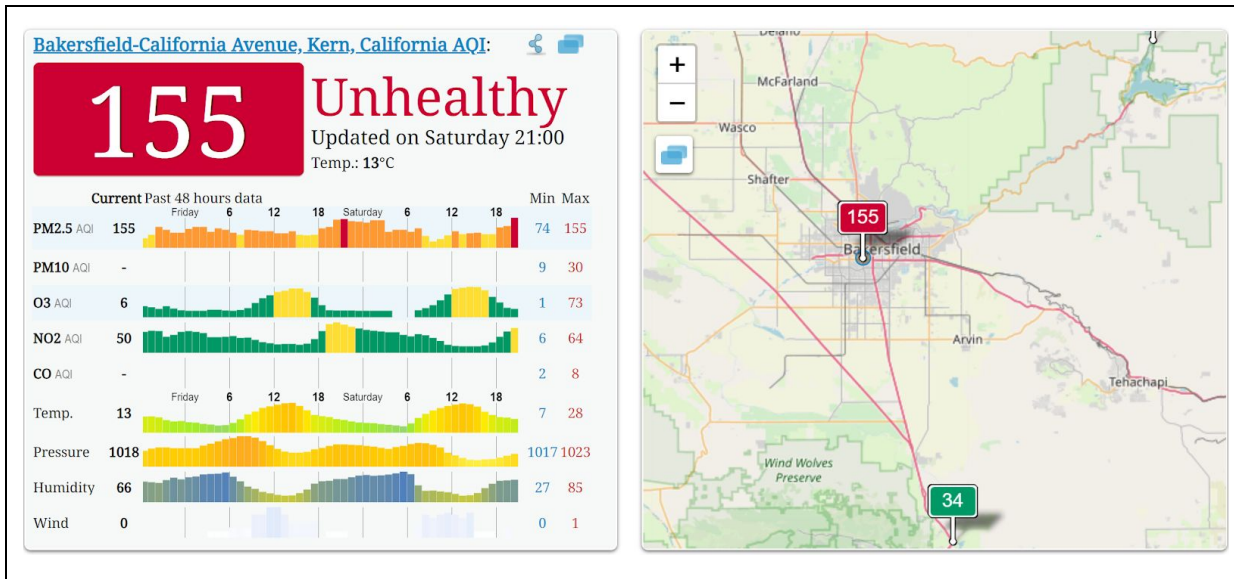


Fig 6: Chart and map exhibit the unhealthy atmosphere and particle pollution in the area of Bakersfield with a ranking of being unhealthy. World's Air Pollution: Real-time Air Quality Index, *City of Bakersfield*, 2019. Retrieved November 8th, 2019. Screenshot taken by Patrick Yang.

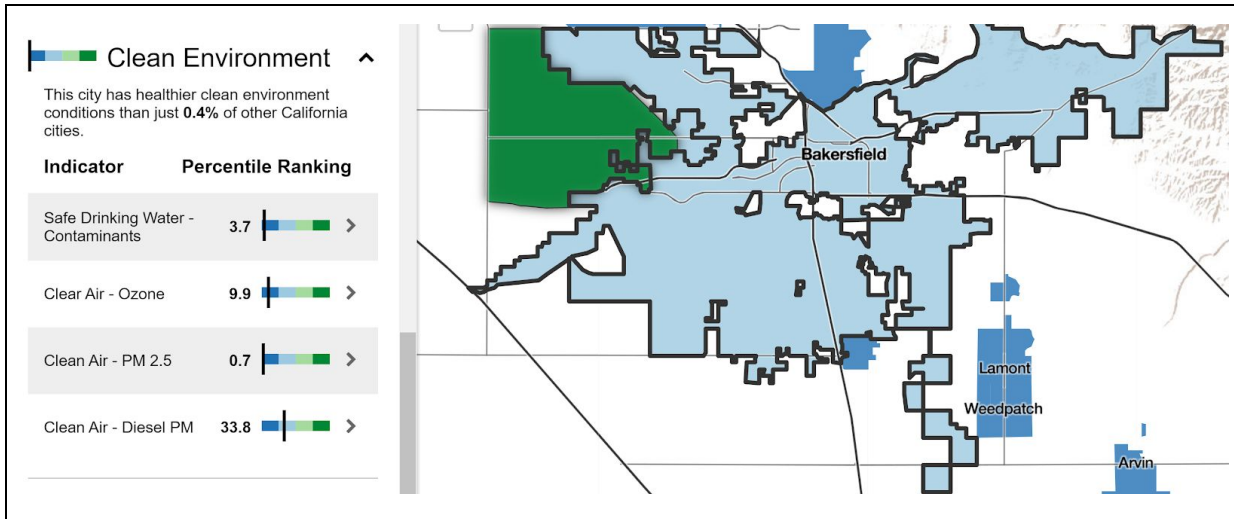


Fig 7: Focused on the clean environmental aspect of Bakersfield, the chart and map display the low percentile rankings for the city. The California Healthy Places Index, City of Bakersfield, 2018. Retrieved November 8th, 2019. Screenshot taken by Patrick Yang.

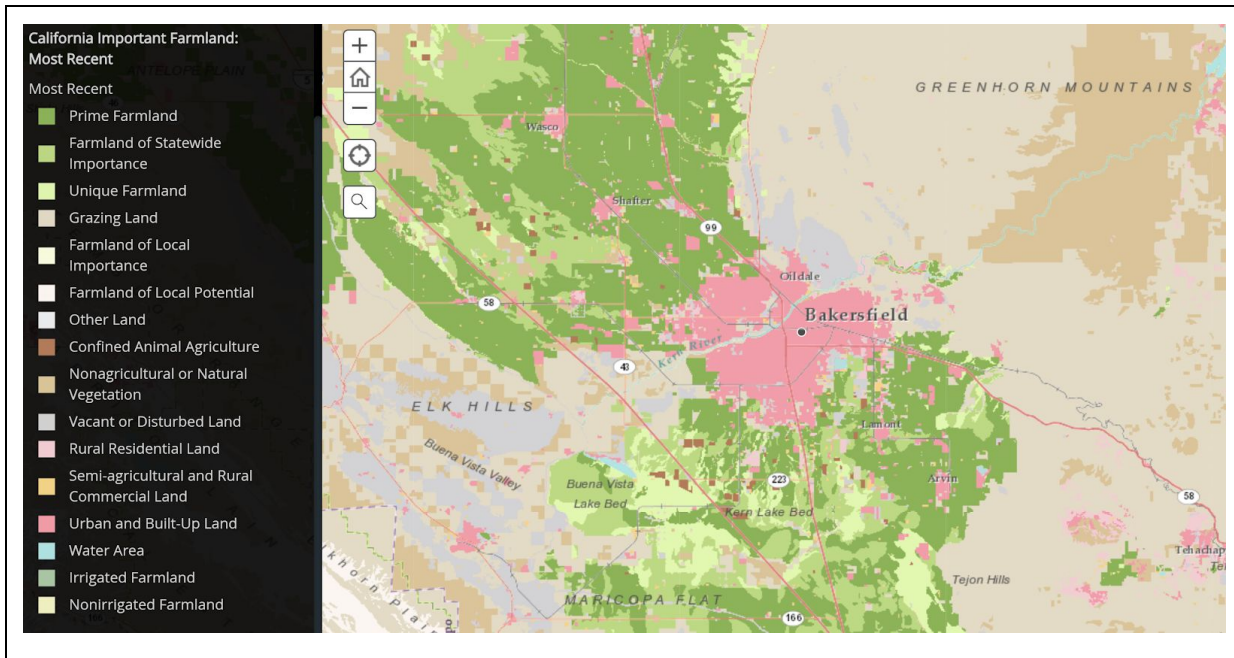


Fig 8: Map of the agricultural areas of Bakersfield including Urban and Built-Up Lands in the area. California Open Data Portal, City of Bakersfield, 2016. Retrieved November 9th, 2019. Screenshot taken by Patrick Yang.

3. What factors -- social, cultural, political, technological, ecological -- contribute to environmental health vulnerability and injustice in this setting? [Kushal Dave]

Several factors play a primary role in the combined vulnerability and injustice in Bakersfield, such as social support, transportation options, residential segregation, public safety, and social norms and attitudes through the likes of discrimination. For example, over fifty percent of the population in 2017 (see Figure 11) was Hispanic and the lack of support to a predominantly Hispanic community highlights the discrimination occurring, especially since other white-based communities have been known to receive government support (Garb 2017). Although these factors are important in understanding the vulnerability and injustice occurring in Bakersfield, there are three other factors that contribute greatly which take primarily political, ecological, and socioeconomic forms. From a political landscape, despite some progress in increasing regulation on corporate polluters, California is still in the sphere of influence of polluting companies and their political strings. Oil companies, in particular, have a grip on central California's legislature (Mishak 2017). In addition to this, Bakersfield has had to contend with environmental injustice brought about through the Trump administration's lack of support and rollback on air quality regulations, with particular attention to a weak Clean Air Act (Berg 2017). This lack of support exasperates the situation, but the crux of the contributing factors remains the poor geography of the region. The carbon dioxide and particulate pollution released through petroleum industry and local power plants (see Figure 10) is caught in the trough of the Central Valley, and with the Sierra Nevada mountain range to the east and south, the prevailing western winds fail to clear and disperse the accumulated pollution in the air above Kern County and Bakersfield. Along with making Bakersfield in the 90th-100th percentile in asthma rates and issues (see Figure 9) this issue is insurmountable, but it helps to highlight the socio-economic injustice factor as well. The only real solution to escape the pollution in Bakersfield is to leave, but the resources required to do this are beyond most people in Bakersfield. Data accumulated from 2015-2017 has shown the poverty rate of 17.7% in Kern County (see Figure 12) thus making it difficult to relocate to a different city. The richer people have long since moved away, but the effects of their consumption are felt unequally, as pollution congregates in the Central Valley, away from the higher value properties and communities on the coast. Out of sight and mind from those with real leverage for change, the issues of Bakersfield fall on distant ears, and can only echo off silent,

suffocating mountainsides.

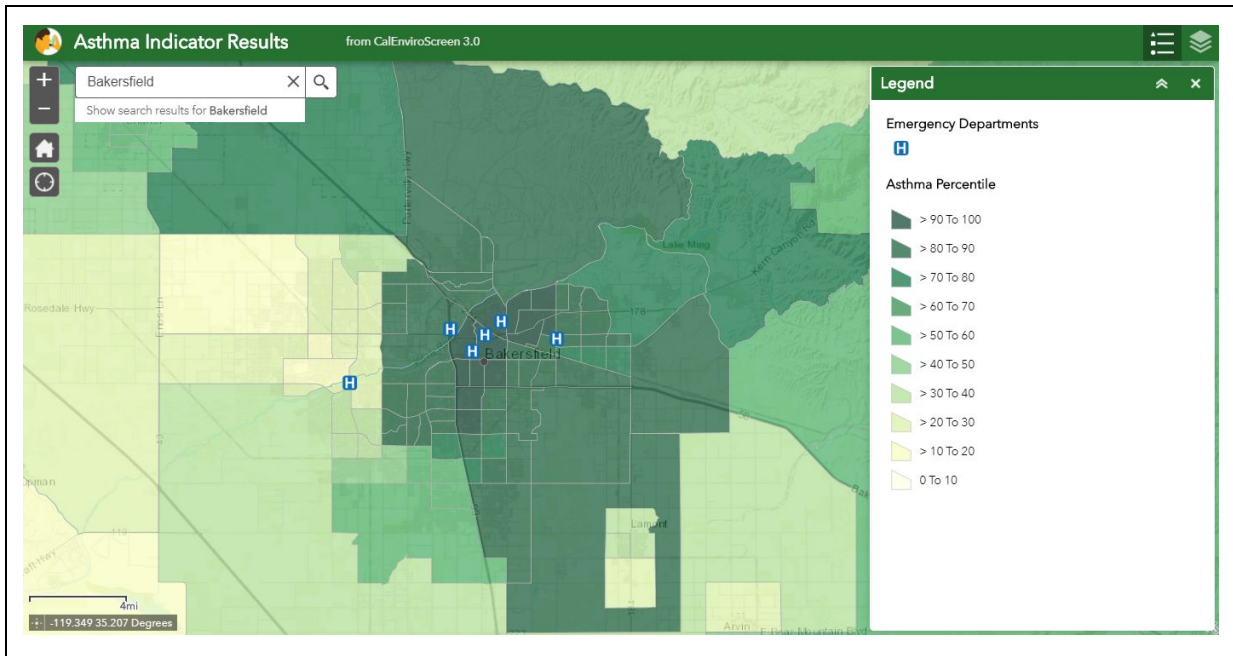


Fig 9: Map shows prevalence of asthma rates in Bakersfield. CalEnviroScreen3.0, City of Bakersfield, 2018. Retrieved November 8th, 2019. Screenshot taken by Kushal Dave.

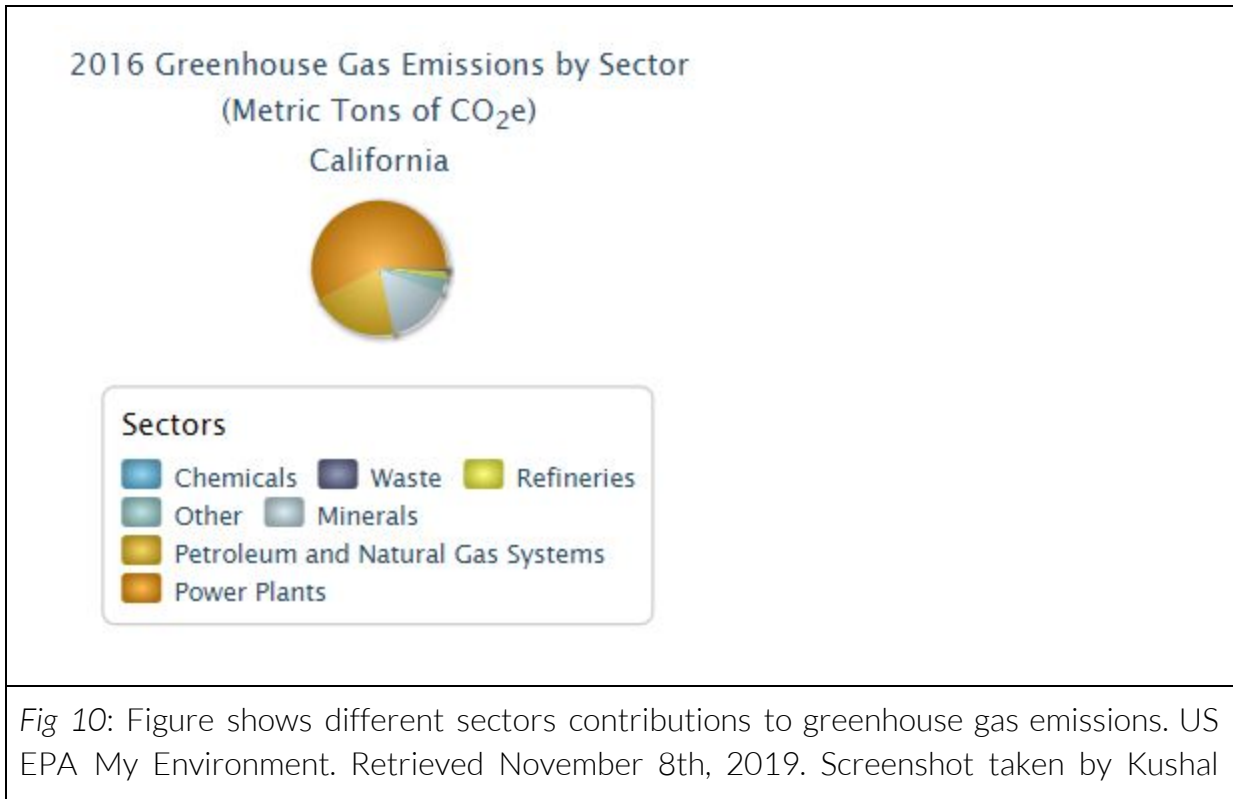


Fig 10: Figure shows different sectors contributions to greenhouse gas emissions. US EPA My Environment. Retrieved November 8th, 2019. Screenshot taken by Kushal

Dave.

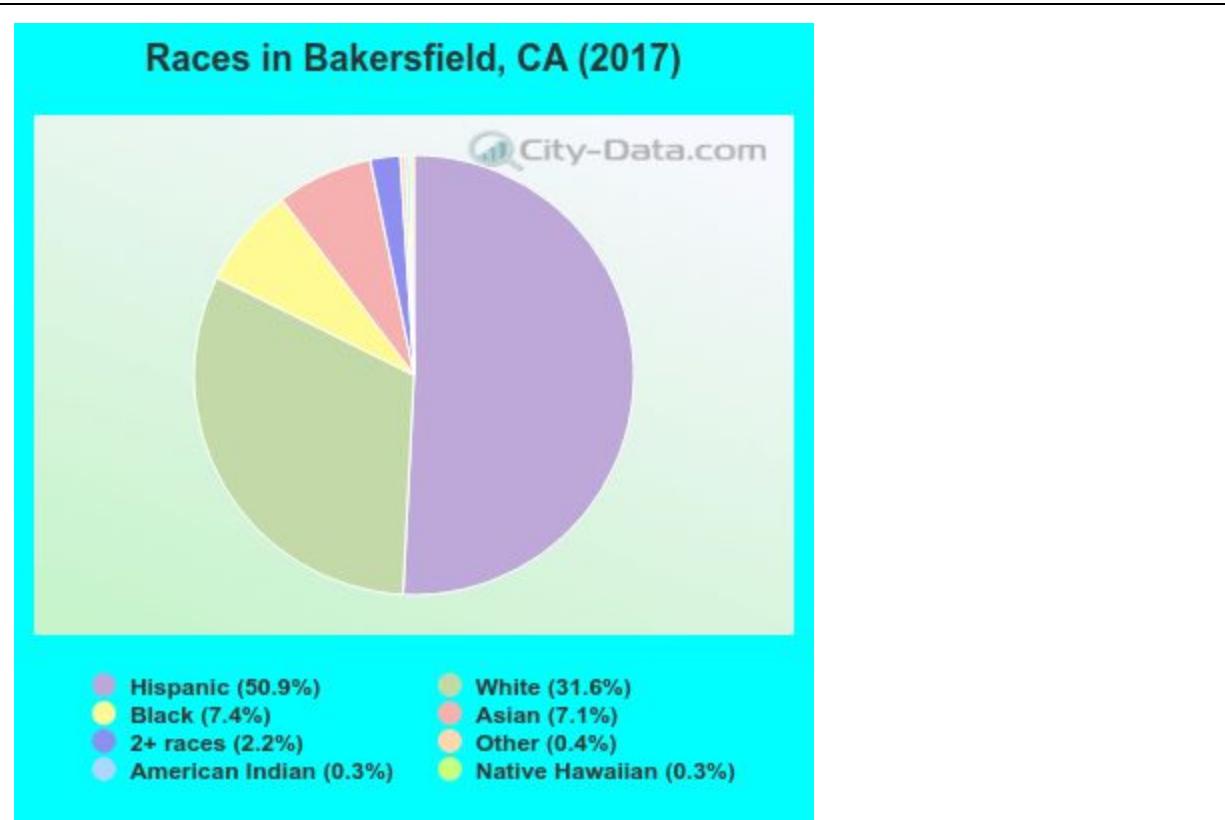


Fig 11: Chart shows makeup of different races in Bakersfield Population in 2017. City-Data. Retrieved November 8th, 2019. Screenshot taken by Kushal Dave.

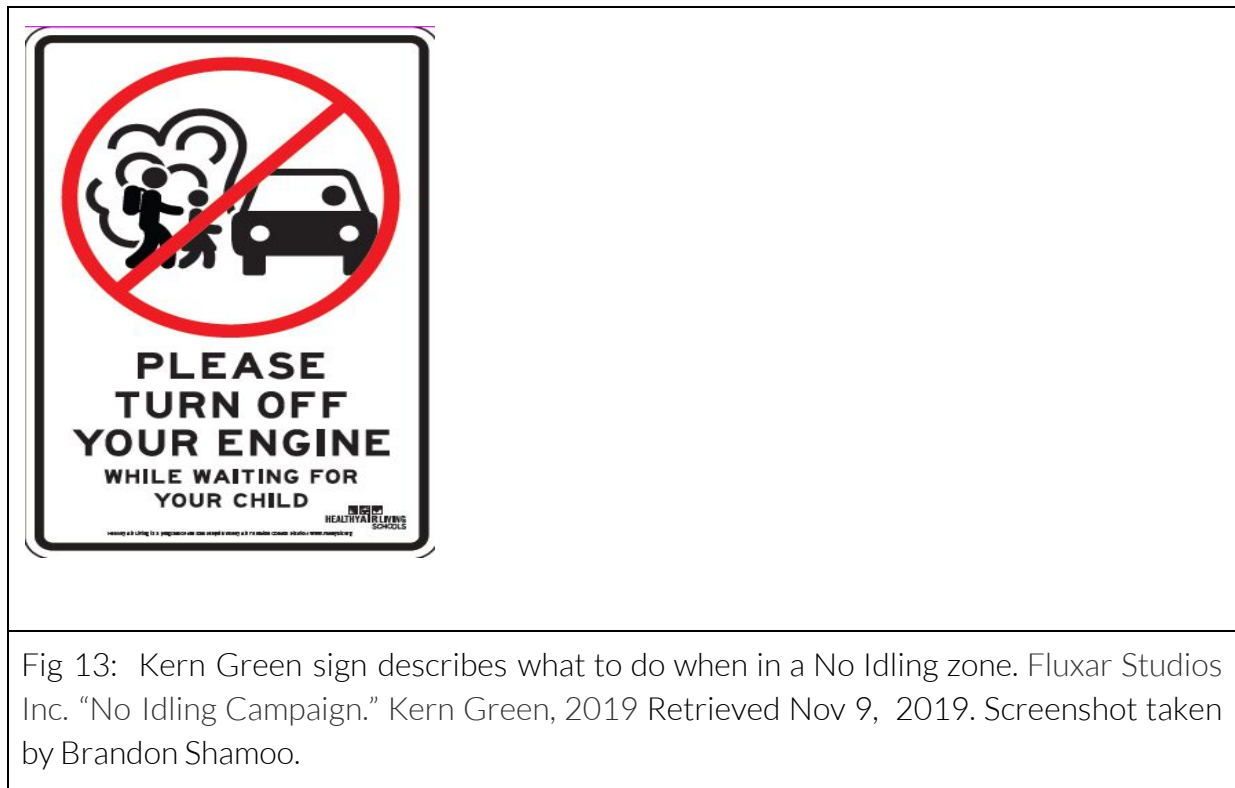
County	Poverty rate (%)	County	Poverty rate (%)	County	Poverty rate (%)
Alameda	15.4	Madera	17.5	San Luis Obispo	17.2
Alpine, Amador, Calaveras, Inyo, Mariposa, Mono, Tuolumne	13.4	Marin	17.9	San Mateo	16.5
Butte	18.6	Merced	16.8	Santa Barbara	22.0
Colusa, Glenn, Tehama, Trinity	17.9	Monterey, San Benito	17.9	Santa Clara	16.0
Contra Costa	14.3	Napa	15.5	Santa Cruz	21.7
Del Norte, Lassen, Modoc, Plumas, Siskiyou	15.6	Nevada, Sierra	18.6	Shasta	18.3
El Dorado	10.7	Orange	20.4	Solano	14.6
Fresno	18.0	Placer	12.5	Sonoma	15.8
Humboldt	18.9	Riverside	17.6	Stanislaus	14.2
Imperial	18.8	Sacramento	16.4	Sutter, Yuba	15.1
Kern	17.7	San Bernardino	17.2	Tulare	19.0
Kings	14.5	San Diego	19.3	Ventura	16.9
Lake, Mendocino	19.3	San Francisco	18.4	Yolo	19.9
Los Angeles	23.0	San Joaquin	15.6		

Fig 12: Chart shows poverty rates in various counties in California. Public Policy Institute of California. Retrieved November 8th, 2019. Screenshot taken by Kushal Dave.

4. Who are the stakeholders, what are their characteristics, and what are their perceptions of the problems? [Brandon Shamoo]

Some of the stakeholders involved in the slow disaster environmental crisis of Bakersfield include the Kern Oil and Refining Co., politicians, local residents, California Environmental Justice Alliance, Kern Green, and Kern Citizens for Energy. The Kern Oil Refinery is a local corporation based in Bakersfield where they produce gasoline and diesel fuel for California (Kern Oil & Refinery 2019). In general, a refinery's goal is to earn as much money as possible, but often their earning potential is limited due to the strict safety regulations required by the state. In the Kern Oil and Refining Co.'s case, the corporation feels that smaller refineries, like themselves, should not be required to monitor refinery emission levels as it severely diminishes their profit potential (Curry 2019). To help fix this situation with smaller refineries, a legislative bill was re-written by Democratic Bakersfield Assemblyman, Rudy Salas, to do just that in 2019 (Christopher 2019). In short, this bill allows for smaller refineries to be free from having to monitor their emission levels in the surrounding area (Christopher 2019). As mentioned prior, politicians also play a role within Bakersfield's environmental crisis. In the specific case of Assemblyman Salas, the Kern Oil and Refining Co. has gone on record to have financially supported Salas during his reelection campaign in 2018 (Christopher 2019). As for many politicians, one of Salas' main priorities was to be reelected for the next

term, and he was able to do just that with the support of the Kern refinery. To return the favor, Salas has come up with a bill that specifically supports the Kern refinery. Unfortunately for Salas and the Kern refinery, the bill was not passed due to unusual circumstances, but they are already pushing for the bill to be passed next year (Curry 2019). Arguably the most affected, the local residents of Lamont, a neighboring city to Bakersfield, have publicly spoken out about the situation. In an effort to improve their overall lifestyle, a group of these residents traveled up to Sacramento to discuss their problems with the toxic emissions produced by the Kern refinery (Cox 2019). Unfortunately, while this does bring attention to state officials about the problem, a small group of residents carries little to no political voice that can help fix the problem for good. A representative of the California Environmental Justice Alliance also commented about this situation saying that representatives tried to rush this bill through which would have cause suffering in many communities (Christopher 2019). The California Environmental Justice Alliance, or CEJA, is a non-local environmental activist group whose mission is to reach environmental justice through policy and support those who are most affected by environmental injustices (California Environmental Justice Alliance 2015). Unfortunately, none of these goals within CEJA's mission statement can be met with the passing of bills like the one with Salas and the Kern refinery. Kern Green is another local environmental justice organization whose goal is to educate local communities about environmental protection and to encourage local businesses to adopt green policies (Kern Green 2019). As seen below (see Figure 13), one of their solutions to improving air quality is to have no idling zones in school parking lots (Kern Green 2019). This will reduce unnecessary car emissions and help improve the air quality surrounding the school. Unfortunately for Kern Green, their biggest sponsor is Chevron who could easily pull their funding depending on what environmental problem Kern Green decides to help fix next.



5. What have different stakeholder groups done (or not done) in response to the problems in this case? [Collective Answer]

There have been responses to the situation in Bakersfield from a number of stakeholders, both local and national. The American Lung Association, for instance, has annually released their "State of the Air" report (see Figure 14) which for over a decade and presently has identified Bakersfield, CA as one of the worst in terms of air pollution by several metrics as the report reviews air quality throughout the United States. According to this report, Bakersfield has consistently, since 2006, maintained a position as the city in the United States with the worst risk from short-term particle pollution metric, and places near the top for annual particle pollution (American Lung Association 2019). The ALA's report has consistently brought scientific attention to both the air quality situation in Bakersfield, and other at-risk cities in the US. On the local level, three Central Valley officials in Bakersfield, Rey Leon, Jose Ornelas, and Eric Payne, have recently authored a petition calling for an end to oil and gas production within a 2,500 foot radius of local communities (Cox 2018). Alongside this, non-profit local groups such as Kern Green have continually promoted sustainability and environmental health. They have pushed community programs such as the No Idling Initiative, the Recycling to Zero Waste Programme, and the Community Garden Programme, within Kern county in order

to help stave off the pollution through encouraging community participation in reducing emissions and promoting awareness for respiratory and environmental health (Kern Green 2019).

RANKINGS											
People at Risk In 25 U.S. Cities Most Polluted by Short-Term Particle Pollution (24-hour PM _{2.5})											
2019 Rank ^a	Metropolitan Statistical Areas	Total Population ^b	Under 18 ^c	65 and Over ^c	Pediatric Asthma ^{d,e}	Adult Asthma ^{d,e}	COPD ^f	Lung Cancer ^g	CV Disease ^g	Diabetes ^{h,i}	Poverty ^{h,i}
1	Bakersfield, CA	893,119	259,120	95,307	16,083	49,617	26,076	373	35,790	60,013	182,948
2	Fresno-Madera-Hanford, CA	1,296,246	365,661	155,133	22,695	73,023	39,469	540	54,813	90,788	261,425
3	Fairbanks, AK	99,703	23,931	9,706	1,901	6,431	4,187	55	4,477	5,207	7,051
4	San Jose-San Francisco-Oakland, CA	9,658,361	2,098,636	1,400,989	130,254	598,339	340,714	4,015	480,965	793,588	942,299
5	Missoula, MT	117,441	22,463	17,656	1,926	8,760	5,358	61	6,195	6,528	16,351
6	Yakima, WA	250,193	74,414	33,654	5,440	18,628	9,904	133	13,019	15,674	44,726
7	Los Angeles-Long Beach, CA	18,788,800	4,317,234	2,511,924	267,954	1,142,240	636,210	7,806	890,929	1,479,796	2,582,162
8	Salt Lake City-Provo-Orem, UT	2,559,350	771,143	252,835	46,981	159,617	68,111	662	102,957	121,102	224,867
9	Seattle-Tacoma, WA	4,764,736	1,024,114	674,955	74,861	397,192	210,671	2,540	273,648	333,479	438,522
10	Pittsburgh-New Castle-Weirton, PA-OH-WV	2,623,639	499,580	515,760	44,395	214,890	151,013	1,699	229,913	235,133	292,380
11	Logan, UT-ID	138,002	42,374	13,331	2,664	8,545	3,552	39	5,233	6,074	19,171
12	Visalia, CA	464,493	143,726	51,669	8,921	25,149	13,466	193	18,628	30,984	110,299
13	Phoenix-Mesa, AZ	4,790,771	1,155,134	738,748	93,121	360,835	227,133	2,243	281,706	372,324	635,629
14	El Centro, CA	182,830	52,296	23,042	3,246	10,266	5,654	76	7,909	13,022	35,830
15	Spokane-Spokane Valley-Coeur d'Alene, WA-ID	708,519	158,514	118,839	11,819	56,016	31,682	373	43,622	51,551	92,465
15	Sacramento-Roseville, CA	2,598,377	598,140	399,007	37,124	158,830	92,789	1,079	132,172	216,432	330,612
17	Medford-Grants Pass, OR	303,831	61,967	68,735	3,580	26,255	14,284	150	22,166	25,603	45,917
17	Santa Maria-Santa Barbara, CA	448,150	99,713	66,887	6,189	27,419	15,374	186	21,688	35,228	60,921
19	Eugene-Springfield, OR	374,748	70,090	70,206	4,049	33,306	16,508	185	24,127	28,664	60,773
20	Salinas, CA	437,907	114,861	57,637	7,129	25,455	14,154	183	19,847	32,724	49,860
21	Anchorage, AK	400,888	100,962	42,686	8,022	25,620	16,979	218	19,230	22,425	39,431
22	Bend-Prineville, OR	209,998	42,822	41,936	2,474	18,196	9,501	104	14,264	16,943	20,994
23	Portland-Vancouver-Salem, OR-WA	3,201,058	705,750	477,266	42,953	271,786	131,850	1,605	181,273	223,680	372,765
23	Reno-Carson City-Fernley, NV	621,769	132,305	109,892	10,264	50,864	36,065	289	44,032	53,668	65,928
25	Bismarck, ND	127,766	29,752	19,989	1,936	8,362	5,045	70	7,852	9,170	9,360
25	Pocatello, ID	92,869	25,099	13,036	1,994	6,064	3,277	47	4,825	5,600	12,945

Fig 14: American Lung Association’s 2019 “State of the Air” report, which here shows Bakersfield’s ranking as number one in the nation for risk from short-term particulate pollution. Retrieved Nov 9, 2019. Screenshot taken by Dominic Al-Shamari.

6. How have big media outlets and environmental organizations covered environmental problems related to worse case scenarios in this setting? [Collective Answer]

The LA times covers an oil spill that recently occurred on the outskirts of Bakersfield this last summer. They covered local residents response, which was largely supportive of Chevron, despite the recent spill, citing that their spill was miniscule compared “with the

catastrophic Exxon Valdez oil spill... and BP's deep-sea spill...our little outbreak is nothing" (Sahagun 2019, n.p.).

A local online news source reported on the spill as well, but mainly acted as a *mouth-piece* for Chevron, quoting statements issued by Chevron that give the impression that the company has been steadfast in remediating the issue and cited that no environmental harm has occurred (Cox 2019). The influence the company had on the incident shows how much power these companies have and how easily they can escape punishment. Companies are using the media to portray dangerous incidents in a way that does not show them at fault.

I did a google search for environmental groups issuing statements, however, my search did not turn up any results for either national or environmental groups. The closest article that covers environmental groups response cites that they are "calling for increased scrutiny of California's oil and gas industry after learning that more than 50 million gallons of crude oil flowed out of the ground in an uncontrolled release..." (Goldberg 2019, n.p.).



Fig 15: Khan Irfan, California Gov. Gavin Newsom being briefed by Billy Lacobie, of Chevron and Cameron Cambell, of California department of conservation division of oil and gas, July 24th, 2019, Desert Sun accessed November 9th, 2019

7. What local actions would reduce environmental vulnerability and injustice related to fast disaster in this setting? [Collective Answer]

In addition to the pollution caused by oil and gas production in the oil fields, vehicles exhausts is also a main contributor to Bakersfield's air pollution. "The biggest pollution source right now that's holding us back is the nitrogen oxide emissions from mobile sources that make up 85% of the pollution" (Berg 2017, n.p.). Encouraging the use of public transportation and enforcing regulations on the amount of traffic can reduce the air pollution level (see Figure 16). Adapting the use of renewable energy is another method as reduces the need for fuel. Local government can regulate the amount of pollutants that the oil companies and industries by having them "obtain an environmental permit from the local authority, which sets out air quality standards under the Industrial Emissions Directive" (Law & Your Environment 2019, n.p.) to limit the amount of pollution they are allowed to emit.

Planting trees and vegetation can also help control the pollution level. It is cheaper and more efficient than technological solutions. A single tree can absorb approximately 50 pounds of pollutants in its bark and can convert the gases into clean air. Studies shows that "restoring vegetation to county-level average canopy cover reduced air pollution an average of 27 percent across the counties" (Arenschield 2019, n.p.).



Fig 16: Marcos Angie, *Photo Displaying Poor Air Quality and Traffic in California*, June 15th, 2017, The California State University accessed November 9th, 2019

8. What extra-local actions (at state, national or international levels) would reduce environmental vulnerability and injustice related to fast disaster in this setting and similar settings? [Collective Answer]

In Bakersfield, one of the biggest issues is its poor air quality. According to one report by the American Lung Association, Bakersfield ranked bottom three in three different categories for air quality (The Bakersfield Californian 2018). Bakersfield is located at the end of the valley (see Figure 17) which plays a role in the poor air quality (Berg 2011) and this factor cannot be controlled. However there are other major reasons causing air pollution such as emissions from agricultural industries and oil refineries (Berg 2017). The oil extracted from Kern County, which Bakersfield is part of, makes up 10% of the national oil production (Masunaga 2016) while also ranking first in agricultural production (Mayer 2017) illustrating the importance of these industries to the city. While important to the economy, these industries also cause several health hazards to the people residing in the city. From 2013-2016, one in every thirty-seven people living in Kern County died due to chronic lower respiratory disease which was twelve times higher than California's rate and fourteen times higher than the US's rate (Perez 2018). In order to protect the civilians living in these areas, three actions should be performed by the state and national government. First and most importantly, harsher oil and

agricultural regulations should be implemented. Companies must be held accountable and should not be allowed to get away with polluting the environment and endangering communities for their monetary gain. For these reasons, this should be the highest priority. Secondly, investigations should be conducted regularly by government officials to ensure companies are complying with the regulations. However, since geography also plays a role in the poor air quality in the area, the community must also play its part in helping clean the air. The third action the government should take is to educate people on ways to reduce pollution in the air along with supporting local groups that are attempting to combat the issue.



Fig 17: Map and Satellite Images of the San Joaquin Valley, October 11th, 2015, San Joaquin Valley Geography accessed November 8th, 2019

9. What kinds of data and research would be useful in efforts to characterize and address environmental threats (related to fast disaster, pollution and climate change) in this setting and similar settings? [Edgar Santana]

I believe studying groundwater data, especially data that correlates with oil and natural gas production, would be useful when characterizing and addressing any environmental threats that may stem from oilfield activity. For example, the American Association of Petroleum Geologists (AAPG) recently published a study stating that “[disposal] of produced waters in both surface ponds and injection wells have affected water salinity over near the oil fields” (Gillespie and Landon and Davis 2019, n.p.). High salinity groundwater can be harmful to agriculture, infrastructure, and the surrounding environment (EPA 2019).

Another useful set of data can come from the California Air Resources Board’s (CARB) Interagency Refinery Task Force (IRTF). The main goal of this group is to assess existing emergency air monitoring systems in order “better coordinate refinery safety and compliance efforts and improve preparedness for future incidents” (California Air Resources Board 2019, n.p.). The useful data can come from the IRTF’s Refinery Emergency Air Monitoring Assessment Reports in that they highlight gaps in existing emergency air monitoring and can point researchers in the right direction of potential hazards.

In addition to the previous data source, American Lung Association makes numerous reports on air quality and its effects on respiratory systems. The report that could be useful in this case is the American Lung Association’s “State of the Air” report. This report issues a letter-grade on ozone levels and particle pollution, and highlights particular groups that are at risk such as individuals under the age of 18, 65 and over, and pediatric asthma (American Lung Association 2019).

Another data source that can be useful in this case is studying the effects of oilfield activity on agriculture. California Water Boards, Central Valley District has data available on the chemicals and additives that are used by local oil and drilling companies that sell to agricultural companies as well as reports comparing crops irrigated with produced water and crops irrigated with traditional water sources (California Water Boards 2019).

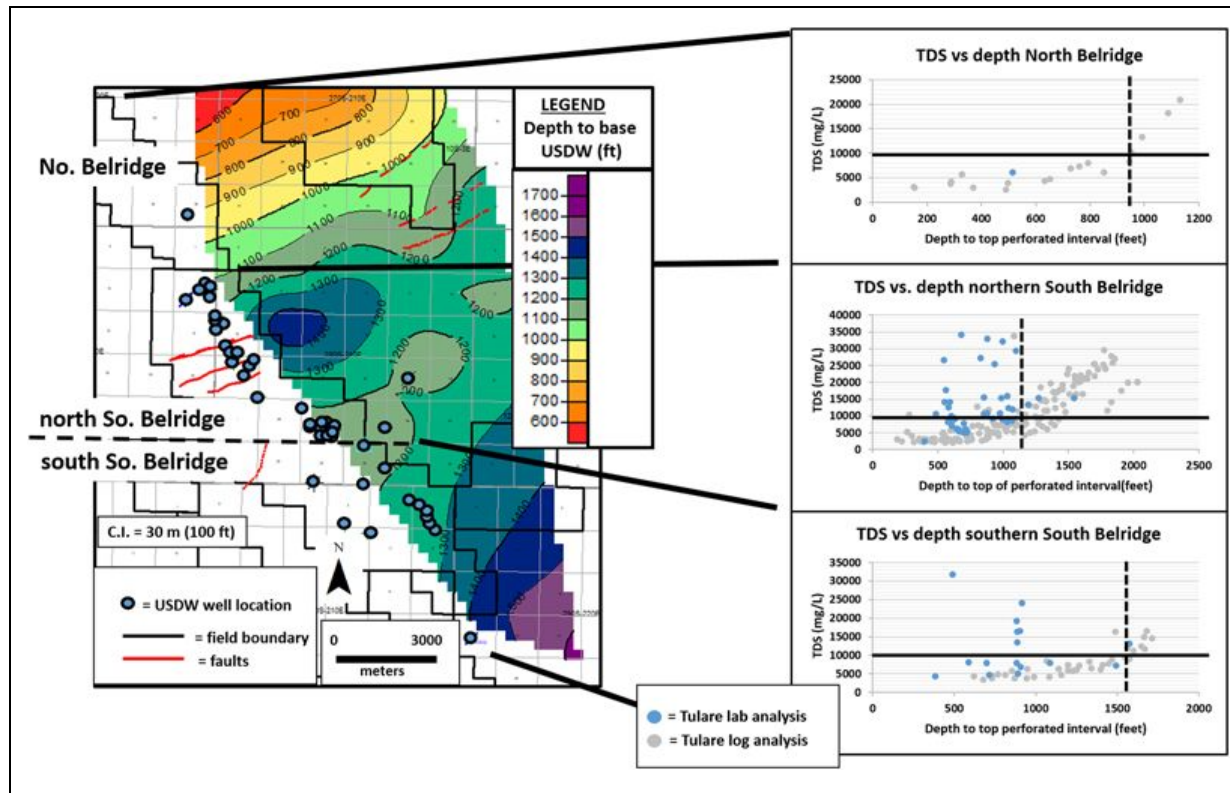


Fig 18: Example of type of useful data to collect: graph of total dissolved solids (TDS) versus depth of geochemical samples from the Tulare Formation in and near the North and South Belridge oil fields.

10. What, in your view, is ethically wrong or unjust in this case? [Christine Voong]

I believe there are many injustices regarding the continuation of oil and gas production with little concerns of the environmental health of the nearby communities. Bakersfield, California has one of the worst air pollution in the nation, resulting from the production of oil, exhaust from diesel vehicles, and agricultural burning, which escalates the air particle pollution in the region. These factors influence the health of communities and oil fields workers well-being, especially communities of color and low income as they are more likely to live in areas with higher levels of pollution due to their lack of privileges. Some health concerns include “premature death and other serious health effects such as asthma, COPD and lung cancer” (The Bakersfield Californian 2018, n.p.). The geological aspect of Bakersfield contributes to the high level of air pollution. Air pollution is denser than air, meaning it will remain close to ground level inconveniently exposing the communities to the smog. In addition, Bakersfield is surrounded by three mountain

ranges, which contain the pollution in the valley (see Figure 19). The “valley portion of Kern County is being especially impacted by wind and blowing dust” (The Bakersfield Californian 2019, n.p.). Winds can transfer air pollution from nearby communities into the valley, and with the mountain ranges acting as a barrier, the air particles will remain in Bakersfield.

Central Valley officials Rey Leon, Jose Ornelas, and Eric Payne are aware of the negative effects of oil and gas production were to continue without moderation. They formed a petition in obligation to reduce oil production and pollution emissions. Many elected officials signed the petition, however, efforts “to reach county supervisors representing Kern’s richest oil-producing regions were unsuccessful” (Cox 2018, n.p.). Kern County has one of the largest oil fields in California, providing much of the resources that the local economy relies on substantially. Reducing oil production would decrease sales revenue in the industry eradicate the number of jobs and consumers, which large patrons do not favor. Reducing oil and gas production may be difficult to operate at it concerns the corporate level. Oil and gas production do contribute to air pollution, but other more controllable factors include exhaustion from diesel instruments and agricultural burning. Researching and understanding the possible contributing factors of pollution can provide the government a base as to what regulations are necessary. Disclosing that information to the community allows the local organizations and communities to efficiently initiate countermeasures to air pollution.



Fig 19: Image shows the Tehachapi mountain range containing the air particle pollution within Kern County Valley.

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APPENDIX

CHOOSING A SLOW DISASTER COMMUNITY SKETCH		
Questions to Consider:	Community 1: Bakersfield	Community 2: Sacramento
<i>Does the community's Wikipedia page give any clues to worse case scenarios? Are there hazardous industries? (Look in the economy section)</i>	- Yes, there is a whole section on air pollution	- None, most of the top employers are state officials or health program employees
<i>Are there local environmental groups in this community? (Possible search term: environmental justice)</i>	Yes there are a few	Environmental Council of Sacramento
<i>What is the RMP proximity in EPA EJ Screen?</i>	USA: 88th percentile State: 72nd percentile Regional: 76th percentile	USA: 92nd percentile State: 81st percentile Regional: 83rd percentile
<i>Is the community listed in either of these resources? Who's in Danger? (starting on page 59) // California Fact Sheet</i>	Yes, listed in Who's in Danger?	Yes, listed in Who's in Danger?

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<i>According to the American Lung Association, is the community's state of air rating?</i>	Fail	Fail
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Appendix 1: Choosing a Community Sketch

COMMUNITY FAST FACTS SKETCH	
Slow Disaster Community:	
Conduct a "quick" Google search for fast facts about your community: What is the landscape? How densely populated? Main industries? Overall wealth of the region? Brief history? Find quick resources/articles about the community: Recent news? What are the environmental groups? Environmental News? Community vulnerabilities?	
Google Search	News Resources
<p>Main industries: agriculture and oil</p> <p>Unemployment rate: 5.5% (US average is 3.9%)</p> <p>Air quality 43; water quality 42</p> <p>Geography plays a major role in air pollution (surrounded by mountains and at the end of the valley so all the pollution settles there)</p> <p>Population: 380,000 (2017) Population density: 3,368 people per square mile</p>	<p>Kushal Dave</p> <p>https://www.bestplaces.net/economy/city/california/bakersfield</p> <p>https://www.bestplaces.net/health/city/california/bakersfield</p> <p>https://www.citylab.com/environment/2011/09/behind-pollution-californias-central-valley/207/</p> <p>https://datausa.io/profile/geo/bakersfield-ca/ http://www.city-data.com/city/Bakersfield-California.html</p>

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<p>Oil field discovery in 1899 introduced petroleum industry</p> <p>Most Common Industries: Health Care & Social Assistance, Retail Trade, and Educational Services</p> <p>Kern Green is a local environmental group</p> <p>Kern County is the "most polluted county in the [U.S.]"</p>	<p>https://www.britannica.com/place/Bakersfield</p> <p>https://datausa.io/profile/geo/bakersfield-ca/</p> <p>https://www.kerngreen.org/about</p> <p>https://calmatters.org/blogs/inside-california-capitol/2019/09/last-minute-switch-serves-california-oil-company-environmentalists-cry-foul/</p>
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Appendix 2: Community Fast Facts Sketch



Kushal Rajiv Dave <krdave@uci.edu>

Re: Form submission from: Risk Management Plan Rule Vulnerable Zone Indicator System form

1 message

rmprc <rmprc@epacdx.net>
To: EPA <krdave@uci.edu>

Thu, Oct 31, 2019 at 5:56 AM

U.S. Environmental Protection Agency

Chemical Emergency Preparedness and Prevention Office
RMP Vulnerable Zone Report

PLEASE DO NOT REPLY

You asked us if the address or location referenced below is likely to be in a vulnerable zone of a potential accidental release based on reports filed by a facility under the Environmental Protection Agency's Risk Management Program. Here is your reply:

You Submitted

Address:

11605 Regarese Drive
Bakersfield, CA 93311

Important Information on Latitude/Longitude:

Latitude is the distance of a facility north or south of the equator measured in degrees. Longitude is the distance of a facility east or west of the prime meridian measured in degrees.

The facility latitude and longitude values were obtained from EPA's Facility Registry and may reflect corrections to the latitude and longitude submitted by the facility.

Facility latitude and longitude used by VZIS may not duplicate the latitude and longitude used by the facility during the preparation of their Off-site Consequence Analysis. Some facilities may have used points that reflect the chemical storage area of their facility. EPA used the latitude/longitude points in EPA's Facility Registry to standardize VZIS operation.

RMP facility information used for this search was last updated in September 2019.

Appendix 3: EPA RMP Report Part 1

Facility latitude and longitude used by VZIS may not duplicate the latitude and longitude used by the facility during the preparation of their Off-site Consequence Analysis. Some facilities may have used points that reflect the chemical storage area of their facility. EPA used the latitude/longitude points in EPA's Facility Registry to standardize VZIS operation.

RMP facility information used for this search was last updated in September 2019.

Because websites use various methods and data sources to determine latitude/longitude values, values may differ among websites.

<u>Latitude:</u>	<u>Longitude:</u>
35.300152	-119.131786

Results:

The EPA's Vulnerable Zone Indicator System shows that the location you submitted is **likely to be** in at least one RMP facility's vulnerable zone.

tps://mail.google.com/mail/u/1?ik=44a3b96a05&view=pt&search=all&permthid=thread-f%3A1648913641130052442&siml=msg-f%3A16489136411... 1/2

1/9/2019 University of California, Irvine Mail - Re: Form submission from: Risk Management Plan Rule Vulnerable Zone Indicator System form

Local Emergency Planning Committees (LEPCs) are your community's chemical safety experts!

LEPCs develop and review your community's chemical emergency response plan and collect annual chemical inventory reports from facilities. Work with your LEPC to learn more about chemicals in your community! To find out which RMP facilities may affect the above location, you can:

Note: Due to formatting differences in some web based Internet E-mail accounts (such as Hotmail) you may not be able to access the hyper linked websites below by clicking on them directly. If you first experience problems with the hyperlinks when you click on them, try cutting and pasting the full hyperlink (URL) into the "address" field of your web browser and press "enter", which should take you directly to the website.

Contact your Local Emergency Planning Committee

(LEPC): <https://www.epa.gov/epcra/local-emergency-planning-committees>

Appendix 3: EPA RMP Report Part 2

View the Concerned Citizen page on EPA's Chemical Emergency Preparedness and Prevention Office website:
<https://www3.epa.gov/epahome/citizen.htm>

Read Chemicals In Your Community, a publication that tells you how to obtain helpful information that can help you build a snapshot of chemicals stored and released in your community: <https://www.epa.gov/epcra/chemicals-your-community>. A facility's vulnerable zone is based on one or more "off-site consequence analyses"(OCAs) submitted to EPA as part of their Risk Management Plan. To learn how you can access Off-Site Consequence Analyses (OCAs), visit: <https://www.epa.gov/rmp/federal-reading-rooms-risk-management-plans-rmp>

This is a PRIVATE message. If you are not the intended recipient, please delete without copying and kindly advise us by e-mail of the mistake in delivery. NOTE: Regardless of content, this e-mail shall not operate to bind CGI Federal, Inc. to any order or other contract unless pursuant to explicit written agreement or government initiative expressly permitting the use of e-mail for such purpose.

On October 30, 2019 at 11:51 PM EPA via EPA < no-reply@epa.gov > wrote:

Submitted on 10/30/2019 11:51PM
Submitted values are:

E-mail Address: krdave@uci.edu
Street Address: 11605 Regarese Drive
City: Bakersfield
State: California
Zip Code: 93311
Country:
Nearest Intersection:
Nearest Intersection 2:

RMP Reporting Center, CGI Federal Inc., [12601 Fair Lakes Circle, Fairfax, VA 22033](#)
P.O. Box 10162 Fairfax, VA 22038
Phone: (703) 227-7650
Fax: (703)227-4199
E-mail: RMPRC@epacdx.net

Appendix 3: EPA RMP Report Part 3

STAKEHOLDER SKETCH		
<p>In this sketch, list different kinds of social actors -- "stakeholders" in governance parlance -- and the forces that enable and disable them. Sometimes stakeholders will be distinguished by their class position, place of residence, ethnicity or expertise. In some cases, it is important to splice groups usually seen as one: recognizing the way gender and generation makes a difference, for example. List the stakeholders down the middle. In the left column, list catalysts -- things (money, honorable reputation, etc) that enable that group of people to get what they want. In the right column, list corruptions -- things that undermine their ability to get what they want (lack of money or status, youth, gender, poor organizational skills. In filling it all in, you create a quick map of power dynamics.</p>		
catalysts	"stakeholders"	corruptions
money	Oil companies	regulations
Income and job stability	workers	Lack of other employment, does not want to undermine the bosses
Upholding the clean air act that will monitor air pollution, supporting local group protesting air pollution	Outside activist (Climate change group 350.org)	Opposition from local groups such as the Kern Citizens for Energy
Income, lifestyle	Local residents in proximity to oil production operations	Little political voice compared to big oil
Business, good area to grow crops	Agricultural companies	Limited to area to farm

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re-election	Politicians	Other politicians, laws, lobbyists
Getting more schools to participate in the "no idling campaign"	Kern Green a group that works to make kern county more sustainable	Funded by chevron and other companies that could potentially pull funding.

Appendix 4: Stakeholders Sketch

“Many Forms of Injustice” Sketch		
Types of Environmental Injustice	Example of type of justice listed that you’ve learned about through the course and your research. Try to use course concepts (example: “health disparities”).	Data collection/research needed to respond to this type of environmental injustice .
1. DATA INJUSTICE: Do stakeholders have the data they need to understand and respond to environmental hazards in this setting?	Bhopal, India when American company did not inform sector in Bhopal about MIC hazards	Need to research the current literature provided to bakersfield communities regarding long term effects. Need updated protocols/equipment and the information like the American companies had
2. ECONOMIC INJUSTICE: Does poverty or uneven wealth exacerbate environmental hazards in this setting?	West Oakland, where there are poorer communities more likely to suffer vehicle air pollution	Need to research the distribution of property values and try to correlate with hazard indexes geographically.
3. EPISTEMIC JUSTICE: Are some ways of understanding environmental hazards and harms discounted or silenced?	Wilmington, California with oil refinery companies funding community and recreational buildings and activities	Research the amount of money and supplies the harmful companies are giving to each community to fund for recreational activities and events
4. GENDER JUSTICE: How do gender hierarchies shape both exposure to environmental hazards and capacity to address them?	Bhopal, India - men primarily were the ones who worked in the factories allowing them to be more exposed to the methyl isocyanate	Demographic research is required to ascertain any discrepancies in health effects between sexes, and try to correlate them to social or economic forces.
5. HEALTH JUSTICE: Are there health disparities or uneven access to health care in this setting?	Asthma levels are higher for children in Long Beach as compared to many other regions, demonstrating some form of health disparities in the community	Will need to cross reference property values geographically with health data as well as hospital and clinic availability. Access to affordable insurance is also a factor needing clarification.
6. INTERGENERATIONAL INJUSTICE: Will future generations be impacted by environmental hazards in this setting today?	Tyrone Hayes and atrazine effects on future generations	Examine implications of each chemical altering DNA and hindering intergenerational growth and development factors
7. MEDIA JUSTICE: Is there adequate news coverage of the environmental hazards in the setting? Does news convey the perspectives and vulnerabilities of all stakeholders?	Flint Michigan water crisis, little amount of people actually saw the Michigan Water Crisis	Look for news articles or any form (if any) coverage on the large media sources and compare them with the news coverage from small media. Contrast differences between different topics such as presidential elections as compared to a deadly toxic event.
8. PROCEDURAL JUSTICE: Have all stakeholders had fair access to government support and law to address environmental hazards in this setting?	Government officials reassuring that the water in Flint Michigan is safe for use	Analyze the factors going into government officials personal desires and data on the levels of toxicity as compared to the data released to public
9. RACIAL JUSTICE: Do environmental hazards in this setting disproportionately impact particular social groups, especially communities of color?	Fracking wells in Pennsylvania’s Marcellus Shale region	Data should be collected on which communities are affected and how to limit it by potentially changing the sites of fracking. Research should also be done to find a different approach instead of fracking
10. REPRODUCTIVE JUSTICE: Do environmental Do environmental hazards in this setting undermine rights to safely parent children?	Pregnant women are affected by air pollution and it can lead to low birth rates and premature births.	Research should be done to see the effects of air pollution on reproduction and find ways to give better treatment to withstand it if the hazards are not being mitigated

Appendix 5: Many Forms of Injustice Sketch

Patrick Yang is a first-year Chemical Engineering major at the University of California, Irvine. Attempting to discover or enhance alternative fuel sources, he is interested in researching sustainability and resolving the global climate change phenomenon. As he finishes his studies in Chemical Engineering, he intends to pursue a double major in Business Administration in pursuit of expansion in his comprehension of a field that revolves around the immediate world today as well as a combination of self-interest in the topic. Furthermore, in determination to deepen his understanding of the universe, Patrick plans to obtain his Doctorate degree in Chemical Engineering.



Kushal Dave is a fourth-year Biological Sciences major attending the University of California Irvine. He plans on attending medical school after graduating from his undergraduate schooling in order to become a medical doctor. Kushal wants to be in a field where he can interact with others and have a positive influence on their lives and found medicine can allow him to do both.



Edgar Santana is a fourth-year Civil Engineering major, specializing in Transportation Systems. His post-undergraduate ambitions include working for transportation agencies at the city, state, or federal level. He is particularly interested in areas of transportation research that involve “Connected Vehicle Technology” and Autonomous Vehicle Infrastructure.



Brandon Shamoo is a second-year Computer Science major at the University of California, Irvine. He is interested in artificial intelligence and environmental protection.



Christine Voong is a second year Business Economic major at the University of California Irvine. She plans to minor in Computer Science by her third year of university. Interested in the response to economic in the household level to market level in both national and international settings.



Dominic Al-Shamari is a third year Biomedical Engineering undergraduate at the University of California, Irvine. He plans to specialize in Brain-Computer Interfacing with a focus on the engineering challenges in the effort to link single neurons to electronic components. Dominic aims to grow his own research community into a successful private commercial laboratory, with a focus on bioengineering and biophysics applications. He currently devotes his efforts and time to the learning and advancement of BCI technology, and spreading awareness of humanity's responsibility to our Pale Blue Dot.

