2023

# The Stateless Agent: A Multidisciplinary Analysis of Transboundary Air Pollution in the El Paso-Ciudad Juárez Region of the U.S.-Mexico Border

Elizabeth Hernandez

Claremont McKenna College

# The Stateless Agent: A Multidisciplinary Analysis of Transboundary Air Pollution in the El Paso-Ciudad Juárez Region of the U.S.-Mexico Border

Submitted to
Professor Susan Phillips
and
Professor Tamara Venit-Shelton

By
Elizabeth Hernandez

For
Senior Thesis
Spring 2023
April 24th, 2023

**Acknowledgements**

Quiero agradecer a mis papás Javier Hernandez e Irma Meza ya que yo tuve el privilegio de obtener una educación universitaria gracias a todo su esfuerzo y sacrificio. Esta tesis representa la culminación de dicha educación universitaria. Gracias por sus llamadas motivacionales y todas esas veces que me dijeron que le echara ganas y me pusiera las pilas. En sus propias palabras, “Si las cosas se hicieran tan fácil, cualquiera las haría.” Siempre me han enseñado a estar orgullosa de quien soy y de donde vengo. Esta tesis representa mi orgullo de ser fronteriza y mi preocupación por las cuestiones ambientales de mi hogar. Esta tesis también está dedicada a mis amistades y vecinos, ¡orgullosamente fronteriza!

## Abstract

The El Paso-Ciudad Juárez (EPJ) region has a history of nonattainment for ozone and particulate matter. Given transboundary air pollution in the EPJ region is not confined to the U.S.-Mexico border, it is important to implement a transnational response that accounts for the health and safety of everyone, including marginalized communities in EPJ. This thesis assesses the state of air quality and transboundary air pollution in the EPJ region through a multidisciplinary perspective that focuses on issues of data monitoring, environmental governance, and transnational environmental justice. Analysis of the quantity and placement of ambient monitoring stations reveals EPJ residents near major pollution sources are underrepresented in the air monitoring network. Cross-border governmental collaboration efforts are found to be at stake in the dispute to blame Ciudad Juarez for El Paso's ozone nonattainment status. Community organizations in El Paso were found to address air pollution concerns, yet the lack of community organizations in Ciudad Juarez doing such work calls for the opportunity to implement a transnational network addressing transboundary air pollution concerns. Results of this multidisciplinary research suggest a transnational response that increases ambient monitoring stations near major pollution sources, addresses air pollution reduction rather than blame, and fosters a transnational network, will improve the wellbeing of marginalized border communities disproportionately impacted by air pollution in the EPJ region. Located along the U.S.-Mexico border, Latine communities and Latine environments in El Paso-Ciudad Juárez have long been rendered marginal by the government institutions in place.


Keywords: transboundary air pollution, U.S.-Mexico border, ambient monitoring stations, ozone nonattainment, transnational environmental justice, El Paso-Ciudad Juárez

# Table of Contents

> *We are nested between two mountain ranges. One is on the Texas side of the border; the other is on the Chihuahua side. Both can be readily seen from either side. They are nature's way of telling us that while we may argue over politics and economics, they will be there well after we and our concerns are gone, just as they were here when the first settlers arrived.*
>
> *- Moises Bujanda, El Editor Permian Basin, 1994*

## Introduction

The sister cities of El Paso, TX and Ciudad Juarez, Chihuahua comprise an international border like no other. With a combined population greater than 2.5 million people,[1] a significant number of residents, including my family and I, cross this segment of the U.S. - Mexico border on a regular basis. Whether it be crossing the border to Ciudad Juarez for affordable healthcare options and delicious restaurant food or returning to El Paso for leisure shopping and work, my routine for the past twenty years consisted of crossing to Ciudad Juarez on Friday afternoons and returning to El Paso on Sunday evenings. Crossing the border comes with its rules of thumb, as fellow *fronterizos*[2] seek to avoid the long wait times to cross the border, characteristic of weekday afternoons when individuals return home, weekday mornings when individuals go to work and school, and weekend evenings when those that spent their weekend on one side of the border return to their respective home.

My parents tell of a pre-9/11 time where border wait times were not as extended as they are today. However, in my post-9/11 world, long border wait times became the norm as you waited for the U.S Customs and Border Protection (CBP) officer to interrogate you on where you were headed, why you were in Ciudad Juarez, and what items you were bringing with you. These

1. "El Paso, United States Population (2023)," Populationstat, 2023, https://populationstat.com/united-states/el-paso.

2. People who live along the U.S.-Mexico border also known as borderlanders

extended wait times can go for as long as three hours sitting inside a vehicle or standing in the pedestrian line on a congested international bridge permeated by a blanket of smoggy air. Today, this blanket of smoggy air appears at the various border ports of entry (POE), or international bridges, every time border wait times are long enough to summon a considerable line of vehicles and commercial trucks.


Figure 1. Line to cross the Paso Del Norte International Bridge from Ciudad Juarez to El Paso. (*Puente Libre.mx*, November 7, 2021,http://puentelibre.mx/noticia/asi_sera_la_linea_para_cruzar_a_el_paso_por_el_santa_fe_ciudad_juarez/.)

The air quality of the El Paso-Ciudad Juarez (EPJ) border region faces serious challenges. According to a 2020 National Air Quality Report by Mexico's Instituto Nacional de Ecología y Cambio Climático (INECC),[3] the city of Ciudad Juarez ranked 16th for the worst ozone pollution in Mexico.[4] The high concentration of ozone pollution closely correlated with El Paso ranking 12th for the worst ozone pollution in U.S. metropolitan areas, according to a 2022 American Lung Association report.[5] However, air pollution in the El Paso-Juarez border does not constitute a

3. National Institute on Ecology and Climate Change

4. Instituto Nacional de Ecología y Cambio Climático, *Informe Nacional de la Calidad del Aire 2020*, (Ciudad de México: INECC, 2022).

5. "El Paso-Las Cruces, TX-NM," State of the Air, American Lung Association, 2023, https://www.lung.org/research/sota/city-rankings/msas/el-paso-las-cruces-tx-nm#ozone.

recent problem. The border region reports air quality problems as far back as the early 1990s,[6] showcasing a consistent trend of poor air quality levels in the EPJ border.

Although binational efforts to address air pollution in the U.S.-Mexico border increased, such as the implementation of the EPA's Border 2020 program, air pollution still remains a problem within Ciudad Juárez and El Paso. Drawing on the EPJ's consistent failure to achieve safe air quality levels, I will analyze the past and present historical and socio-political elements that have influenced air quality along the EPJ border region. Although most of the scholarship on air pollution in the U.S. - Mexico border only focuses on the U.S. side of the border, I will focus my analysis on the communities along both sides of the border. The proximity of these border communities to air pollution from international border ports of entry (POE) and industries sited along the border constitutes a case of environmental injustice in which Latine communities are rendered marginal.

These same border communities that wish to cross the POE on a constant basis must show their legal documentation upon entry to the United States. The transboundary air pollution or transboundary flow of pollutants between the United States and Mexico border,[7] however, must not show any legal documentation upon entry to either country. The U.S. Department of State defines a stateless person as someone who does not enjoy citizenship in any country.[8] I apply this definition to describe the transboundary air pollution along the U.S.-Mexico border and coin the term "stateless agent". Transboundary air pollution in the U.S.-Mexico border is a stateless agent

6. "El Paso: Current Attainment Status," Texas Commission on Environmental Quality, December 12, 2022, https://www.tceq.texas.gov/airquality/sip/elp/elp-status.

7. "Transboundary Air Pollution," U.S. Environmental Protection Agency, 2023, https://www.epa.gov/international-cooperation/transboundary-air-pollution.

8. "Statelessness," U.S. Department of State, 2023, https://www.state.gov/other-policy-issues/statelessness/.

that, in a border where Latine bodies are heavily policed, flows freely between both countries, unbound to a specific nationality. Given air pollution does not confine itself to man-made borders, it remains important to implement a transnational response that accounts for the health and safety of everyone, including marginalized communities. It remains important to analyze the nature of the stateless agent along the EPJ region of the U.S.-Mexico border in order to develop a transnational response that accounts for the health and safety of EPJ communities.

## Background

Located at the intersection between the western portion of the state of Texas, the northern part of the Mexican state of Chihuahua, and the southern part of the state of New Mexico, the border cities of El Paso and Ciudad Juarez are home to a combined population of more than 2.5 million people.[9] With its own population greater than 1.5 million people, Ciudad Juarez is a predominantly Mexican city where 2.16% of the population finds itself in extreme poverty and 21.5% of the population finds itself in moderate poverty. Other notable countries of origin for Juarez residents include the United States, Cuba, and Argentina.[10] On the northern side of the U.S.-Mexico border, the city of El Paso has a population greater than 970,000 people of which at least 81.6% identify as Hispanic or Latino. Moreover, 18.3% of El Paso's population finds itself in poverty, a percentage higher than the national average.[11] Overall, the EPJ region represents a predominantly Latino binational workforce situated along the U.S.-Mexico border. The EPJ's increasing population growth and economic emphasis on the manufacturing sector combine as anthropogenic influences on the air quality of the area.

Biogenic influences on the air quality of the EPJ region derive from the region's unique topology. El Paso and Ciudad Juarez share a common airshed, the El Paso-Juarez airshed (EPJA). The EPJA is one of the world's largest international airsheds, spanning a geographical area over

9. "Ciudad Juárez, Mexico Population (2023)," Populationstat, 2023, https://populationstat.com/mexico/ciudad-juarez; "El Paso, United States Population (2023)," Populationstat, 2023, https://populationstat.com/united-states/el-paso.

10. "Population And Housing," Data Mexico, Gobierno De México, 2023, https://datamexico.org/en/profile/geo/juarez-8037#population-and-housing.

11. "QuickFacts El Paso city, Texas; United States," United States Census Bureau, 2023, https://www.census.gov/quickfacts/fact/table/elpasocitytexas,US/PST045221.

648 km².[12] Because of this shared airshed, air pollutants flow freely between both El Paso and Ciudad Juarez. Moreover, elevation changes in the terrain throughout EPJ create a valley that traps air pollutants in specific sectors of the border region. Surrounded by mountain ranges from El Paso, New Mexico, and Ciudad Juarez, the downtown El Paso region and surrounding areas are located in this valley where ozone and particulate matter (PM) are trapped.[13] The trapped air masses limit the dispersal of pollutants, such as ozone and PM, contributing to high ozone and PM concentrations in EPJ.[14] Moreover, it remains important to note that historically, higher ozone concentrations occur during the summer and higher $PM_{10}$ concentrations occur during the winter in the EPJA.[15]

Ozone is an air pollutant of major concern in the EPJ region because of the frequent high ozone concentrations in the region.[16] Ozone derives from the reaction between nitrogen oxides ($NO_x$), whose emissions predominantly come from mobile sources, and volatile organic compounds (VOCs), whose emissions predominantly come from local residential and industrial sources.[17] Moreover, other meteorological factors influence the formation and depletion of ozone, such as temperature, wind speed, atmospheric pressure, and humidity.[18] High temperatures, calm winds, and high solar radiation constitute favorable conditions for the high production of ozone

12. Nakul N. Karle et al., "Multi-Scale Atmospheric Emissions, Circulation and Meteorological Drivers of Ozone Episodes in El Paso-Juarez Airshed," *Atmosphere* 12, no. 1575 (2021): 2, https://doi.org/10.3390/atmos12121575.

13. Karle et al., "Multi-Scale Atmospheric Emissions," 12.

14. See note 13 above.

15. Nakul N. Karle et al., "Investigation of the Successive Ozone Episodes in the El Paso-Juarez Region in the Summer of 2017," *Atmosphere* 11, no. 532 (2020): 2, https://doi:10.3390/atmos11050532.

16. Karle et al., "Multi-Scale Atmospheric Emissions," 1.

17. Karle et al., "Multi-Scale Atmospheric Emissions," 6.

18. Karle et al., "Multi-Scale Atmospheric Emissions," 9.

whereas stronger winds disperse the pollutants necessary for ozone formation.[19] Historical analysis of more than twenty years of air pollutant data shows that the month of June tends to have higher ozone concentrations in the EPJA.[20] A series of anthropogenic and biogenic factors influence the air quality status of the EPJ region and they must all be taken into account to holistically analyze the nature of transboundary air pollution in El Paso and Ciudad Juarez.

19. Karle et al., "Investigation Successive Ozone Episodes," 20.

20. Karle et al., "Investigation Successive Ozone Episodes," 21.

## Methodology

To analyze the nature of transboundary air pollution, the stateless agent, along the EPJ region of the U.S-Mexico border, I utilize a series of primary and secondary sources to contextualize my research. I begin by providing an overview of the scholarly literature on air pollution as it pertains to the U.S.-Mexico border and the EPJ border region. I discuss early efforts from scholars to address and raise awareness of air pollution issues in EPJ and how these efforts interact with international treaties and other areas of scholarship. Drawing from the disciplines of environmental science, economics, public health, sociology, international relations, borderlands studies, and environmental justice, I provide an overview of the pollutant sources in EPJ and how relevant stakeholders have aimed to address air pollution in EPJ. In each chapter, I implement a theoretical and applied approach where I put primary and secondary sources into conversation to develop part of a transnational response that accounts for the health and safety of border communities in EPJ.

In Chapter 1, I analyze the data collection and data monitoring systems that inform policy decisions on air pollution in EPJ. I look at web maps from the Texas Commission on Environmental Quality (TCEQ) portal and the Sistema Nacional de Información de la Calidad del Aire (SINAICA)[21] portal to analyze the placement of ambient monitoring stations in EPJ and the pollutants measured by these stations. I then utilize air data from the EPA Air Quality System database and the SINAICA portal to generate tile plots on ozone concentrations in EPJ. The tile plots are used qualitatively and quantitatively to analyze intra-urban spatial variability in ozone levels in EPJ. Building upon spatial architect Stephen Mueller's work on mapping blind spots in

21. National System for Air Quality Information (For Mexico)

the U.S.-Mexico border,[22] I geocode the coordinates of ambient monitoring stations and major pollutants in EPJ to generate an ArcGIS map on ambient monitoring stations and their proximity to major pollutant sources. The ArcGIS map is used to identify monitoring blind spots within the EPJ border. I also utilize academic journals and news articles discussing ambient monitoring stations in EPJ to further contextualize my research in the current state of data monitoring sites along the region.

In Chapter 2, I analyze past environmental governance efforts between the United States and Mexico or Texas and Chihuahua to address air quality in the EPJ region. I look at a variety of primary sources, such as the Border 2025 framework and the EPA Region 6 Action Plan for Border 2025, to outline binational strategies for air pollution reduction. Moreover, I assess the effectiveness of binational governmental institutions in meeting the goals and objectives of their binational strategies. Correspondence exchanges between the EPA and TCEQ supplemented with documents from the Federal Register and information from the TCEQ website are used to analyze the current dispute over El Paso's ozone attainment status. I also utilize academic journals to further develop an analysis on TCEQ's argument in the attainment status dispute.

In Chapter 3, I focus on community efforts to address air pollution along both sides of the border. Drawing from the literature on environmental justice and borderlands studies, I discuss how EPJ communities are disproportionately burdened by air pollution. Moreover, I utilize sociologist Joe Bandy's concept of transnational environmental justice to discuss examples of past transnational environmental justice networks in the EPJ region.[23] Testimonials from nonprofit

22. Stephen Mueller, "Mapping Blindspots in Urban Atmospheric Pollution Assessment in the U.S.-Mexico Borderland." *ARCC/EAAE 2022 Conference: Resilient Cities [Conference Proceedings]* (2022): 5, Researchgate.net.

23. Joe Bandy, "Reterritorializing Borders: Transnational Environmental Justice Movements on the U.S./Mexico Border," *Race, Gender & Class* 5, no. 1 (1997): 91, http://www.jstor.org/stable/41674850.

border organizations, such as Familias Unidas del Chamizal, are put into context to understand the correlation between air pollution and residents' health. The correlation between these factors is utilized to discuss a case of environmental injustice in the border communities of the EPJ region. The work of community organizations, like Juarez Limpio A.C. and Sunrise El Paso, addressing environmental issues on both sides of the border is analyzed to make the case for a transnational network on air pollution concerns.

## Literature Review

Many scholars have dealt with the issue of air pollution on the U.S.-Mexico border broadly and with a focus on the El Paso and Ciudad Juarez region. Most of the literature on urban air pollution along the U.S.- Mexico border comes from the disciplines of environmental science, economics, public health, sociology, international relations, borderlands studies, and environmental justice and deals with issues of proper placement of air monitoring sites, provisions of bilateral trade, pollutant exposure for border communities, global environmental justice, and environmental governance. In the following sections, I will put the scholars dealing with these issues into conversation to provide context on what sectors are responsible for polluting and what other sectors are doing to address this air pollution.

### *Air Pollution From the Industrial and International Trade Sector*

Professor of Civil Engineering Howard G. Applegate emerged in the literature as one of the earliest scholars to address transboundary air pollution along the U.S.-Mexico border. In his 1979 book *Environmental Problems of the Borderlands*, Applegate described air pollution as "one of the most complex environmental problems along the border".[24] Applegate discussed the growth of the industry sector as the main point-source polluter and listed sulfur oxides and particulates as the two greatest pollutants within the borderlands in the 1970s.[25]

24. Howard G. Applegate, *Environmental Problems of the Borderlands* (The University of Texas at El Paso: Texas Western Press, 1979), 18.

25. Applegate, *Environmental Problems of Borderlands*, 20.

*The Maquiladora Industry*

The growth of the industry sector along the U.S.-Mexico border can be attributed to the rise of the *maquiladora*[26] industry. During World War II and the postwar era of the 1940s, the U.S. relied on migrant Mexican labor to replace American farm workers needed in the war effort. In 1951, the U.S., in cooperation with Mexico, implemented the Bracero program to allow entry to Mexican citizens as seasonal agricultural workers.[27] However, the termination of the Bracero program in 1964, left a high unemployment rate among the northern Mexican population. In an attempt to address the high unemployment rate, the Mexican government implemented the Border Industrialization Program (BIP) in 1967 which allowed the location of foreign manufacturers in industrial parks along the Mexican side of the border.[28] The objectives of the BIP included industrializing the border while employing the Mexican population along the northern border cities. This industrialization program led to a massive increase in maquiladoras along the U.S.-Mexico border during the 1960s.

Scholars have studied the health effects of air pollution from maquiladoras on border communities. Air pollution from maquiladoras has a series of health effects on border communities, such as higher indices of respiratory disease and premature mortality.[29] In their study of maquiladoras in Ciudad Juarez, economists Allen Blackman and David Evans, and policy analyst Michael Batz found that PM 10 emissions from maquiladoras have significant impacts on human health. Nonetheless, unpaved roads, vehicles, and brick kilns are listed as the leading

26. Assembly plant in Mexico that produces a variety of products for export

27. Scott M. Schwartz, "The Border Industrialization Program of Mexico." *Southwest Journal of Business and Economics* 4, no. 4 (Summer, 1987): 2, ProQuest.

28. See note 27 above.

29. Allen Blackman, Michael Batz, and David Evans, "Maquiladoras, Air Pollution, and Human Health in Ciudad Juarez and El Paso," *Resources For The Future* (2004): 2, AgEcon Search.

sources of PM 10 emissions in contrast to maquiladoras.[30] Although maquiladoras are not believed to be the leading air pollutant in the case of El Paso and Ciudad Juarez, air pollution from maquiladoras is still significant within its industrial sector.[31] Since the establishment of the maquiladora industry in the border, particulate matter and ozone emerged as air pollutants of concern within the U.S.-Mexico border.

Particulate matter emissions from maquiladoras can also depend on a variety of variables, such as industry type. In a study modeling industrial air pollutant emissions in the Mexican border city of Tijuana, geographers Anne Obee, Ernst Griffin, and Richard Wright explored different characteristics of maquiladoras in the area. Although maquiladoras are generally known as assembly plants, their study revealed that maquiladoras performing processing activities tend to pollute more than those assembling.[32] Moreover, the technology available at each maquiladora plays a role in their particulate emissions as older processing technologies tend to pollute more than newer ones.[33] The maquiladora industry plays a role in contributing to air pollution from the industrial sector, however, bilateral air pollution from trade and commerce along the U.S.-Mexico border has significantly increased with the implementation of the North American Free Trade Agreement.

30. Blackman, Batz, and Evans, "Maquiladoras, Air Pollution," 19.

31. Blackman, Batz, and Evans, "Maquiladoras, Air Pollution," 2.

32. Anne J. Obee, Ernst C. Griffin, and Richard D. Wright, "Using a GIS to Overcome Data Adversity: Industrial Air Pollution Risk Modeling in Tijuana, Mexico," *Photogrammetric Engineering & Remote Sensing* 64, no. 11 (November, 1998): 1093.

33. Obee, Griffin, and Wright, "Using a GIS," 1096.

*North American Free Trade Agreement*

Implemented in 1994, the North American Free Trade Agreement (NAFTA) sought to ease trade restrictions between Mexico, the United States, and Canada through the elimination of tariffs on many goods. Mexico's main motivation in pursuing the free trade agreement came from the government's desire to stabilize the Mexican economy, promote economic growth through foreign direct investment, increase exports and create jobs.[34] Moreover, NAFTA brought a wave of jobs in the maquiladora industry along the U.S.-Mexico border as the tariffs to import and export materials were reduced.[35]

The implementation of NAFTA has often been attributed to increasing industrial air pollution along the U.S.-Mexico border. In his book *Free Trade and the Environment*, policy analyst Kevin P. Gallagher quantifies the net effect of air pollutant emissions before and after the ratification of NAFTA in 1994. Gallagher finds a net growth in air pollutant emissions from Mexico's manufacturing sector in the years following the ratification of NAFTA.[36] He finds net levels of particulate matter grew by 33 percent, sulfur oxides grew by 34 percent, and nitrogen oxides grew by 41 percent.[37] The increasing industrialization patterns spurred by NAFTA increased the levels of Mexico's industrial air pollution as the growth of the manufacturing sector led to greater air pollutant emissions. The manufacturing and logistics sector have also emitted particulate matter as a byproduct of the more than 70% of NAFTA goods which are transported

34. Fiona Gladstone et al., "NAFTA and environment after 25 years: A retrospective analysis of the US-Mexico border." *Environmental Science and Policy* 119 (2021): 19. https://doi.org/10.1016/j.envsci.2020.10.017.

35. Gladstone et al., "NAFTA and environment," 19.

36. Kevin P. Gallagher, *Free Trade and the Environment: Mexico, NAFTA, and Beyond* (Stanford: Stanford University Press, 2004), 43.

37. Gallagher, *Free Trade and Environment*, 43.

by trucks.[38] These trucks often do not meet U.S. emissions standards and have been connected to health risks, such as cancer, asthma, respiratory diseases, and birth defects.[39]

The literature on NAFTA's environmental consequences focuses on the trade of various goods, such as vehicles. Economists Lucas Davis and Matthew Kahn arise in the literature as some of the first scholars to discuss the environmental consequences of international trade in the used vehicle industry. The trade in used cars and trucks between the U.S. and Mexico was deregulated between 2005 and 2008, prompting the importation of more than 2.5 million used U.S. vehicles into Mexico.[40] During this time period, vehicles 10-15 years old were allowed entry into Mexico tax free.[41] Given the greater amount of air pollutants emitted by older vehicles, uplifted trade restrictions emerging from NAFTA contributed to increasing air pollution levels from the vehicular industry. Moreover, vehicle retirement rates are lower in Mexico than the U.S.,[42] hence older and more polluting vehicles are in use for longer time periods, emitting more air pollutants. Although used vehicular trade decreased emissions in the U.S., it has not been found enough to offset increased emissions in Mexico.[43] Moreover, in regions such as the U.S.-Mexico border where cities often share an airshed, increased emissions from used vehicles are likely to impact both the United States and Mexico.

---

38. Cameron Parsons, "NAFTA and the Environment in Mexico," Modern Latin America: web supplement for 8th Edition, Brown University Library, Accessed March 9, 2023, https://library.brown.edu/create/modernlatinamerica/chapters/chapter-12-strategies-for-economic-developmen/nafta-free-trade-and-the-environment-in-mexico/.

39. Parsons, "NAFTA and the Environment."

40. Lucas W. Davis and Matthew E. Kahn, "International Trade in Used Vehicles: The Environmental Consequences of NAFTA," *American Economic Journal: Economic Policy* 2, no. 4 (November 2010): 59, JSTOR.

41. Davis and Kahn, "International Trade Used Vehicles," 62.

42. Davis and Kahn, "International Trade Used Vehicles," 60.

43. Davis and Kahn, "International Trade Used Vehicles," 60.

Economist Gamper-Rabindran argues that increasing industrialization from NAFTA did not worsen air pollution on border communities along the U.S.-Mexico border. Nonetheless, Gamper-Rabindran bases their conclusion on the analysis of air monitoring data from ambient monitoring stations along the border.[44] As will be discussed later in this section, there is a debate on the accuracy of ambient air quality monitoring stations along the border given the location and scarcity of these monitoring stations. NAFTA arises in the literature as a major contributor to air pollution within the industrial sector, however, NAFTA continued until the year 2020, when it was replaced by the USMCA.

*United States-Mexico-Canada Agreement*

Ratified in 2020, the United States-Mexico-Canada Agreement (USMCA) made some minor changes in trade restrictions compared to NAFTA. Negotiations around trade restrictions focused on the origin of auto part raw materials and the improvement of labor laws in Mexico, doing very little to address environmental concerns from trade.[45] Although there is limited scholarship on the impacts of the USMCA on air pollution, given its recent ratification, scholars expect its impacts to be fairly similar to those of NAFTA. Scholarship on the impacts on the USMCA currently address environmental impacts broadly rather than going in depth into air, soil, or groundwater pollution.

Those in support of the USMCA argue that the agreement does more for the environment because of its inclusion of an "Environment" chapter. However, geographer and political ecologist Fiona Gladstone notes that under the provisions of the USMCA, a party cannot bring up

44. Shanti Gamper-Rabindran, "NAFTA and the Environment: What Can the Data Tell Us?," in *Economic Development and Cultural Change*, (Chicago: The University of Chicago, 2006), 615.

45. Gladstone et al., "NAFTA and environment," 29.

environmental disputes unless it directly creates trade benefits for the accused party.[46] These provisions limit the possibility of those impacted by air pollution along the U.S.-Mexico border to bring up their concerns unless it can be proven the air pollution caused creates trade benefits for the other country. Gladstone described the USMCA as "reflecting significant neglect of border environmental issues that have emerged or worsened as a result of expanded trade".[47] The USMCA makes substantial emphasis on increasing international trade between the United States, Mexico, and Canada while doing very little to address international, transboundary pollution between the border region. Given its similarity to NAFTA, scholars anticipate no major changes between the environmental impacts of the USMCA and the environmental impacts of NAFTA.

The U.S.-Mexico border has a long history of air pollution stemming from the industrial and international trade sectors. The state of the economy plays an important role in shaping industrial and trade pollution patterns along the U.S.-Mexico border. Efforts to industrialize the U.S.-Mexico border and shift employment south of the border led to the implementation of the BIP. The BIP spurred the growth of the maquiladora industry which coupled with the ratification of NAFTA, further industrialized and increased trade between the border region. Industrialization and international trade remain a priority for the U.S. and Mexico as showcased through the USMCA, leaving very little room to address air pollution and other environmental concerns emergent from the industrial and international trade sectors. Along with the industrial and international trade sectors, vehicles constitute a major pollution source in the border region.

46. Gladstone et al., "NAFTA and environment," 29.

47. Gladstone et al., "NAFTA and environment," 29.

### *Air Pollution From Vehicles at Border POE*

Applegate stated that vehicles are not only the main mobile-source polluter, but also the overall greatest source of air pollutants in the border region.[48] Since the 1970s, vehicles have been flagged as one of the major air pollutants in cities along the U.S.-Mexico border. Applegate is also one of the earliest scholars to acknowledge the unique role that the U.S. Customs and Border Protection (CBP) officers and international bridge crossings contribute to air pollution along the U.S.-Mexico border.[49]

*Border Security and Cross-Border Trips*

The U.S.-Mexico border is different from other international border regions given the presence of international border POE and the high indices of cross border trips. Delays at border POE have always been a concern for scholars, nonetheless, major delays in border wait times, the time it takes to cross the border from the end of the line to the inspecting station, are attributed to the increase in border security following 9/11.[50] After the terrorist attacks of September 11, 2001, the U.S. government sought to strengthen border security across all of its border POE.[51] These efforts to improve border security increased border wait times along the U.S.-Mexico border as the inspection process from Customs Border Protection officers (CBP) became more meticulous.

There currently exist four major POE within the El Paso and Ciudad Juarez region - the Paso Del Norte bridge, also known as Santa Fe, the Stanton bridge, Bridge of the Americas, and

48. Applegate, *Environmental Problems of Borderlands*, 21.

49. Applegate, *Environmental Problems of Borderlands*, 28.

50. Penelope J.E. Quintana et al., "Risky Borders: Traffic Pollution and Health Effects at US-Mexican Ports of Entry," *Journal of Borderlands Studies* 30, no. 3 (2015): 289, https://doi.org/10.1080/08865655.2015.1066697.

51. Quintana et al., "Risky Borders," 289.

the Ysleta-Zaragoza bridge.[52] Through these four border POE in EPJ, more than 18.7 million people crossed in personal vehicles and 7.6 million people crossed as pedestrians from Juarez to El Paso in 2019.[53] All border POE have northbound and southbound traffic except for the downtown bridges, Paso Del Norte supports northbound traffic while Stanton bridge supports southbound traffic. Moreover, the Paso Del Norte bridge has the highest pedestrian traffic given it connects the downtown areas of both cities while the Ysleta-Zaragoza bridge has seen increased traffic demand from the growth along the east side of El Paso and Juarez.[54]

Texas A&M Transportation Institute researcher Erick Vargas and others have studied the characteristics of cross-border trips between El Paso and Ciudad Juarez. In their research based on crowdsourced data, Vargas and others have found that EPJ residents conduct cross-border trips for different purposes. Some of these purposes include work, education, shopping, medical care, and visiting family members and friends.[55] Since a majority of cross-border commuters from Juarez to El Paso travel for work and school, scholars have found that POE are most crowded on weekdays and least crowded on Sundays, with passenger vehicles being the most common vehicles crossing.[56] Nonetheless, passenger vehicles are not the only type of vehicle crossing, since freight trucks responsible for the flow of materials and goods constantly cross the U.S.-Mexico border. Similar to passenger vehicles, commercial traffic from freight trucks is also the highest during weekdays.[57] The Bridge of the Americas and Zaragoza-Ysleta are the only POE directly along the

52. Erik Vargas et al., "Exploration of Cross-Border Trip Characteristics Using Crowdsourced Data," *Texas Transportation Researcher* 58, no. 1 (2021): 2, Texas A&M Transportation Institute.

53. Vargas et al., "Exploration Cross-Border Trip." 3.

54. Vargas et al., "Exploration Cross-Border Trip." 4.

55. Vargas et al., "Exploration Cross-Border Trip." 4.

56. Vargas et al., "Exploration Cross-Border Trip." 23-24.

57. Vargas et al., "Exploration Cross-Border Trip." 24.

EPJ border with the infrastructure to support commercial traffic.[58] Understanding the characteristics of cross border trips remains crucial to fully understand how and when air pollutants from private and commercial vehicles are emitted.

*Vehicular Traffic at Border POE*

Professor of Environmental Health Penelope Quintana and others have conducted extensive research on the impacts of traffic pollution on border POE and the surrounding communities. Most of their research focuses on the exposure to air pollutants along the San Ysidro-San Diego border, the busiest POE. The EPJ border region is the second busiest border region following San Ysidro,[59] hence their findings are relevant to understand traffic pollution in EPJ. Along the U.S.-Mexico border POE, bridge crossings were not designed with the infrastructure to address air pollution. For example, in many POE pedestrian commuters wait in extended lines adjacent to idle vehicles, exposing pedestrians to air pollutants from traffic.[60] The amount of air pollutants that pedestrians can be exposed to depends on a variety of factors, such as number of vehicles in line, type of vehicle, speed, load, and number of lanes open.[61] Commercial trucks emit more pollutants than passenger vehicles while newer passenger vehicles emit less pollutants than older passenger vehicles.[62] Therefore, the amount of traffic pollutants pedestrians are exposed to derives from a series of variables that can alter air pollutant exposure on a daily basis.

---

58. Vargas et al., "Exploration Cross-Border Trip." 23.

59. Vargas et al., "Exploration Cross-Border Trip." 3.

60. Quintana et al., "Risky Borders," 289.

61. Quintana et al., "Risky Borders," 295.

62. Quintana et al., "Risky Borders," 295.

Cross-border pedestrians do not constitute the only group of people impacted by air pollutants from traffic delays at international POE. In a study of air pollutant concentrations throughout four areas near the San Ysidro POE, Quintana and others analyzed the impact of traffic pollutant emissions on the nearby border communities. Although there are a series of variables to account for, such as other pollutant sources, wind speeds, solar radiation and humidity, Quintana and others found high pollutant levels when winds were blowing from the northeast where commercial trucks cross San Ysidro.[63] Although the field is developing, their results indicate that proximity to POE along the U.S.-Mexico border can increase exposure to traffic pollutants within the surrounding local communities.[64]

The literature shows that air pollution from vehicles at border POE can have dire health consequences for pedestrian cross-border commuters and nearby border communities. Proximity to freight trucks and large numbers of idling vehicles expose pedestrian commuters and border communities to higher levels of air pollutants given traffic pollutant concentrations are higher near the source compared to farther away.[65] Exposure to these air pollutants have been linked to adverse health effects, such as cardiovascular problems, respiratory illness, asthma, and birth problems.[66] Moreover, exposure to traffic pollutants has also been linked with Type II diabetes and mortality.[67]

---

63. Penelope J.E. Quintana et al., "Traffic-related air pollution in the community of San Ysidro, CA, in relation to northbound vehicle wait times at the US-Mexico border Port of Entry," *Atmospheric Environment* 88 (2014): 360, http://dx.doi.org/10.1016/j.atmosenv.2014.01.009.

64. Quintana et al., "Traffic-related air pollution," 360.

65. Alex A. Karner, Douglas S. Eisinger, and Deb A. Niemeier, "Near-Roadway Air Quality: Synthesizing the Findings from Real-World Data," *Environmental Science and Technology* 44, no. 14 (2010): 5336, https://doi.org/10.1021/es100008x.

66. Quintana et al., "Risky Borders," 291.

67. Ole Raaschou-Nielsen et al., "Lung cancer incidence and long-term exposure to air pollution from traffic," *Environmental Health Perspectives* 119, no. 6 (2011): 865, doi:10.1289/ehp.1002353.

Within the general population, children, pregnant women, and people with pre-existing cardiopulmonary disease are more susceptible to traffic air pollution.[68]

Air pollution along the U.S.-Mexico border can be attributed to a combination of stationary and mobile sources, such as maquiladoras and international trade spurred by NAFTA/USMCA, and traffic caused by the increased post-9/11 border security at border POE. These different sources in conjunction with patterns of the physical environment interact to expose residents along the U.S.-Mexico border to unsafe levels of air pollutant concentrations.

## ***Addressing Air Pollution Through Data***

Accurate data on air pollutant concentrations and pollutant sources is crucial to assist policymakers and regulatory agencies dealing with air pollution in the EPJ region of the U.S. - Mexico border. However, a series of disagreements prevail on the accuracy of placement of ambient monitoring sites and the pollutants these respective monitoring stations measure. Part of the literature on air quality data along the U.S.-Mexico border debates the effectiveness of ambient monitoring site placement when it comes to interpreting air pollutant concentrations.

### *Challenges in Bilateral Air Monitoring*

Air quality monitoring data from the Mexican side of the border is managed by municipal agencies and reported to the SEMARNAT[69] and the INECC. The data is displayed in the SINAICA platform which provides hourly updates of air quality levels.[70] From the U.S. side of the border, air quality data is managed by state-level agencies and displayed in AirNow, the official U.S.

68. Quintana et al., "Risky Borders," 291.

69. Secretariat of the Environment and Natural Resources

[70]Lauren Eades, "Air Pollution at the U.S.-Mexico Border: Strengthening the Framework for Bilateral Cooperation." *Journal of Public and International Affairs* (2018): 69, jpia.princeton.edu.

platform for air quality data.[71] In the case of the EPJ region, air quality data from El Paso is managed by the Texas Commission on Environmental Quality (TCEQ). Given air quality data at each side of the border is managed by its respective country, foreign affairs officer Lauren Eades has called for the increase in joint monitoring stations.[72] Eades argues the increase in joint monitoring stations will address air pollution hot spots, improve bilateral cooperation, and ensure bilateral agencies collect the same type of air quality data.[73] Mueller also advocates for an increase in joint monitoring stations, noting there currently only exist five transborder monitoring stations.[74] Air quality data collection from U.S. state agencies bound by their respective boundaries, rather than a national collection system, is also seen as a barrier to bilateral air monitoring.[75] A general increase in ambient monitoring stations is required to properly collect data on air quality levels along the U.S-Mexico border.

Mueller has identified the U.S.-Mexico border as an underserved area for data monitoring sensors. When mapping blind spots of monitoring sensors, Mueller found border cities host fewer sensors than other metropolitan areas in the U.S..[76] Moreover, the U.S.-Mexico border is found to have less sensors than the U.S.-Canada border and coastal areas. Within the U.S.-Mexico border, Mueller identifies the EPJ region as particularly subject to several blind spots in data monitoring sensors.[77] Some of the causes of blind spots in data monitoring include the inconsistent

71. Eades, “Air Pollution U.S.-Mexico Border,” 69.

72. Eades, “Air Pollution U.S.-Mexico Border,” 73.

73. Eades, “Air Pollution U.S.-Mexico Border,” 73.

74. Mueller, “Mapping Blindspots,” 9.

75. Mueller, “Mapping Blindspots,” 9.

76. Mueller, “Mapping Blindspots,” 5.

77. Mueller, “Mapping Blindspots,” 6.

maintenance of these monitoring stations and the investment priorities of data monitoring along the U.S.-Canada border.[78] Mueller calls for increased funding to improve air pollution monitoring systems along the U.S.-Mexico border. Scholars note, however, it remains important to not only increase the amount of monitoring stations, but also to be strategic about where these ambient monitoring stations are placed.

*Placement of Ambient Monitoring Stations*

In their study of traffic-related air pollutants near schools in Ciudad Juarez and El Paso, civil engineer Amit Raysoni, epidemiologist Jeremy Sarnat and others found high levels of intra-urban spatial variability in air pollutant concentrations in EPJ, prompting them to critique the lack of diverse placement of monitoring stations along the border.[79] The critique on monitoring station placement is extended by Quintana and others who question the lack of air monitoring stations along border ports of entry, where air pollutant concentrations tend to be the highest, and power plants.[80] Air monitoring stations are purposely located away from local pollution sources, hence they reflect average pollution levels rather than identifying hotspots within border cities.[81] Nonetheless, it remains important to identify hotspots in the EPJ region given the high levels of intra-urban spatial variation in air pollutant concentrations.

The quantity and placement of air monitoring stations is determined by a variety of factors, such as funding streams from bilateral institutions. The literature notes the lack of appropriate

78. Mueller, "Mapping Blindspots," 2.

79. Amit U. Raysoni et al., "Binational school-based monitoring of traffic-related air pollutants in El Paso, Texas (USA) and Ciudad Juarez, Chihuahua (Mexico)," *Environmental Pollution* 159, (2011): 2484, doi:10.1016/j.envpol.2011.06.024.

80. Quintana et al., "Risky Borders," 290.

81. Quintana et al., "Risky Borders," 290.

funding for data monitoring. As Eades notes, funding sources are varied and "sensitive to the priorities of national, state, and local governments".[82] Moreover, bilateral environmental agreements, such as the Border 2021 Program discussed in the following section, have seen decreases in their federal budgets, making the funding process for air monitoring stations more challenging.[83] Accurate air pollutant data remains crucial to inform the multiple binational agreements and bureaucratic institutions tasked with addressing air pollution in El Paso and Ciudad Juarez. The efficiency of these air pollutant data, however, is extensively tied to the governmental institutions that manage and fund air monitoring stations.

### *Addressing Air Pollution Through Environmental Governance*

Early efforts of bilateral environmental cooperation emerged with a focus on water management and the establishment of the International Boundary and Water Commission (IBWC) in 1889. The oldest of the bilateral environmental institutions, the IBWC is the best established and headquartered in the EPJ region. Although bilateral environmental cooperation started with the management of water issues, other concerns of transboundary pollution, such as air quality, made their way into the political agenda by the early 1970s.[84] With the early efforts to address air pollution along the U.S.-Mexico border, there came the acknowledgement of air circulation patterns beyond international borders. Applegate discussed the need for bilateral cooperation between the U.S. and Mexico by mentioning, "any effort to abate air pollution must be coordinated

82. Eades, "Air Pollution U.S.-Mexico Border," 67.

83. Eades, "Air Pollution U.S.-Mexico Border," 70.

84. Irasema Coronado and Stephen Mumme, "Environmental Governance at the U.S.-Mexico Border: Institutions at Risk," in *Binational Commons: Institutional Development and Governance on the U.S.-Mexico Border*, eds. Tony Payan and Pamela L. Cruz (University of Arizona Press, 2020), 160, https://doi.org/10.2307/j.ctv16b77c6.10.

with efforts in Mexico".[85] The literature on environmental governance along the U.S.-Mexico border analyzes binational agreements and bureaucratic institutions, the most prominent being the La Paz Agreement, the Border Environment Cooperation Commission (BECC), the North American Development Bank (NADB), and the series of Border binational programs.[86]

*La Paz Agreement*

Signed in 1983, the Border Environmental Cooperation Agreement, known as the La Paz Agreement, became the main framework to address bilateral cooperation on border environmental challenges. Under the provisions of the La Paz Agreement, the EPA and the SEMARNAT were tasked with working together on environmental protection issues.[87] The agreement can be updated with the incorporation of annexes, such as the incorporation of Annex V that addresses transnational air pollution in urban areas.[88] Despite the improvements of the agreement on advancing bilateral cooperation, scholars critique its effectiveness in solving environmental challenges. Professor of Transborder Studies Irasema Coronado and Professor of Political Science Stephen Mumme note the main deficiencies of the La Paz agreement to be the lack of a secretariat or commission to finance solutions to border environmental problems.[89] Moreover, each party was responsible for the cost of its own participation in the agreement which meant funding for border environmental programs often came from leftover funding of other programs.[90] Environmentalists'

85. Applegate, *Environmental Problems of Borderlands*, 24.

86. Coronado and Mumme, "Environmental Governance U.S.-Mexico Border," 160-162.

87. Eades, "Air Pollution U.S.-Mexico Border," 68.

88. Eades, "Air Pollution U.S.-Mexico Border," 68.

89. Coronado and Mumme, "Environmental Governance U.S.-Mexico Border," 161.

90. Stephen P. Mumme and Kimberly Collins, "The La Paz Agreement 30 Years On," *The Journal of Environment and Development* 23, no. 3 (September 2014): 305-306, https://www.jstor.org/stable/10.2307/26197933.

frustration with the agreement spurred opposition to the ratification of NAFTA which in turn, led to the establishment of the BECC and NADB.

*BECC and NADB Institutions*

The BECC and NADB institutions were established in 1993 following the ratification of the North American Agreement on Environmental Cooperation (NAAEC), NAFTA's environmental side agreement.[91] The purpose of these two institutions was to provide the mechanisms for the approval and financing of environmental projects along the U.S.-Mexico border. The NADB was tasked with financing border environmental infrastructure projects while the BECC was tasked with certifying and designing these projects.[92] The loan payments to access funding from the NADB placed a burden on border communities seeking environmental infrastructure projects. Therefore, in 1997 the NADB established the Border Environmental Infrastructure Fund (BEIF) to accept payments from government sources and use them to finance grants for border communities in need.[93] With a US$170 million contribution from the EPA, the BEIF was inaugurated.[94]

Despite the BECC and NADB's ability to finance or assist in financing several projects, the post-9/11 events led to a dramatic shift in the future of these institutions. The events of 2001 shifted U.S. domestic border priorities away from environmental concerns, causing a substantial decrease in institutional funding. In 1998 the EPA's contribution to the BEIF was reduced to US$75 million, however, by 2006 annual contributions had been reduced to a significantly low

91. Eades, "Air Pollution U.S.-Mexico Border," 68.

92. Eades, "Air Pollution U.S.-Mexico Border," 68.

93. Coronado and Mumme, "Environmental Governance U.S.-Mexico Border," 167.

94. Coronado and Mumme, "Environmental Governance U.S.-Mexico Border," 168.

US$10 million.[95] Moreover, political pressure and budget cuts led to the BECC merging into the NADB in 2017.[96] Although the merged institution's ability to endure four presidential administrations suggests its strong institutional presence, some environmentalists have critiqued the consistent lack of federal funding and the failure to incorporate the public's environmental interests.[97] Apart from the establishment of the NADB and BECC in 1993, the binational Border environmental programs were also started in the early 1990s.

*Evolution of the Border Environmental Programs*

Stemming from the public's critique of the ad-hoc nature and low priority setting of the La Paz Agreement, the U.S. and Mexican governments gathered to create a coordinated, interagency environmental protection plan led by both federal environmental ministries, but also engaging other stakeholders in the border.[98] The first of these environmental protection plans was the 1992-94 Integrated Border Environmental Program, however, it was sharply criticized and soon replaced by the Border XXI Program.[99] Effective from 1995-2002, the Border XXI Program established nine interagency and binational working groups to collaborate on border environmental concerns, such as air and pollution prevention.[100] Coronado and Mumme also note the program embraced policy decentralization by involving state and local agencies in program implementation.[101] Border

95. Coronado and Mumme, "Environmental Governance U.S.-Mexico Border," 168.

96. Eades, "Air Pollution U.S.-Mexico Border," 68.

97. Coronado and Mumme, "Environmental Governance U.S.-Mexico Border," 169.

98. Coronado and Mumme, "Environmental Governance U.S.-Mexico Border," 173.

99. Coronado and Mumme, "Environmental Governance U.S.-Mexico Border," 176.

100. Kellye Kratch, "U.S.-Mexican Improvement Project to Promote Sustainable Development," *Water Environment and Technology*, September 1996, 32, JSTOR.

101. Coronado and Mumme, "Environmental Governance U.S.-Mexico Border," 176.

XXI was replaced by an updated version of the ten-year binational interagency agreement, Border 2012.

Effective in 2002, the Border 2012 program sought to build on the achievements of Border XXI. Border 2012 sought to further decentralize the program by delegating planning and implementation efforts to border state and municipal authorities.[102] While the program remained under EPA and SEMARNAT oversight, its efforts were assigned to regional and border-wide workgroups broken down into regional and community-level task forces responsible for addressing concerns and implementing projects.[103] Part of the changes from Border 2012 also included the shift from nine areas of concern to six goals, of which reducing air pollution was one of them.[104] Border 2012 produced some major achievements, such as the establishment of binational air monitoring in El Paso and Ciudad Juarez.[105] Nonetheless, funding curtailed the effectiveness of the program, particularly the 90% drop in BEIF grant funding from the time it was inaugurated to 2007.[106] The Border 2012 program was replaced by Border 2020.

Heavily modeled after Border 2012, the Border 2020 program sought to build on the achievements of its previous program version. Border 2020 emphasized its focus on five goals, reducing air pollution being one of them, and six different strategies for achieving each goal.[107] As with each new program, Border 2020 has seen a budget decline to US$2.97 million.[108] As each

102. Coronado and Mumme, "Environmental Governance U.S.-Mexico Border," 176.

103. Coronado and Mumme, "Environmental Governance U.S.-Mexico Border," 176.

104. Mumme and Collins, "The La Paz Agreement," 307.

105. Mumme and Collins, "The La Paz Agreement," 308.

106. Mumme and Collins, "The La Paz Agreement," 308.

107. Coronado and Mumme, "Environmental Governance U.S.-Mexico Border," 178.

108. Coronado and Mumme, "Environmental Governance U.S.-Mexico Border," 179.

version seeks to increase stakeholder participation, Border 2020 sought to increase collaboration through partnerships with state, local, and tribal governments along the U.S.-Mexico border.[109] Associate Professor Carolina Prado critiques the increasing collaboration efforts from Border 2020 agencies as they note community participation to be rendered marginal. Border 2020 characterized itself with the implementation of a "bottom-up" approach where community participation is enhanced through websites, forums, and working group meetings.[110] Nonetheless, Prado notes that members from non-profit and non-governmental organizations are the main ones to attend working group meetings. Border 2020 is not reaching the most marginalized community members who do not have access to formal organizations because of a variety of structural barriers to participation, such as lack of time, childcare, and transportation.[111] Border 2020 was replaced by the Border 2025 program in 2021. The literature on Border 2025 remains very limited given its recent implementation.

Bilateral environmental governance efforts along the U.S.-Mexico border began around issues of water and boundary management with the creation of the International Boundary and Water Commission (IBWC). As public concern for the environment increased, a variety of issues, such as air pollution, were incorporated into the political agenda. The 1983 La Paz Agreement laid the framework for bilateral cooperation on a variety of environmental issues. The successes and failures of this agreement would lead to a variety of new efforts to address transboundary pollution issues. The need to create funding mechanisms for environmental projects led to the creation of the NADB and BECC. The desire to decentralize power from the EPA and SEMARNAT while

109. Coronado and Mumme, "Environmental Governance U.S.-Mexico Border," 178.

110. Carolina Prado, "Community Participation and Recognition Justice in Border Environmental Governance," *Journal of Borderlands Studies* 37, no. 2 (2022): 363, DOI: 10.1080/08865655.2020.1774407.

111. Prado, "Community Participation Recognition Justice ," 367.

increasing collaboration across stakeholders would lead to a series of Border Environmental Programs aimed at reducing air pollution along the U.S.-Mexico border, among other goals. Although there have been improvements in bilateral environmental collaboration, scholars note some deficiencies within existing environmental governance efforts. Among these deficiencies are the consistent decrease in funding for the NADB and Border programs as well as failure to include marginalized communities in decision making processes. Including marginalized communities, those impacted the most by air pollution along the U.S.-Mexico border, in decision making processes is crucial to address transboundary air pollution as shown by the literature on environmental justice along the border.

## *Addressing Air Pollution Through Environmental Justice*

Numerous scholars note how border communities are disproportionately impacted by air pollution along the U.S.-Mexico border, constituting a case of environmental injustice. Although a variety of bilateral governmental institutions are tasked with addressing transboundary air pollution, community participation is often limited, calling for an intersectional approach through a lens of environmental justice.

### *Transnational Environmental Justice*

The literature on environmental justice, or the disproportionate burden of environmental hazards on poor and minority communities, is well-documented and attributed to the 1982 protests against a toxic waste landfill in Warren County, North Carolina.[112] Although most of the scholarship work on environmental justice addresses events in the USA, the study of global

112. Stacey K. Sowards, "Environmental Justice in International Contexts: Understanding Intersections for Social Justice in the Twenty-First Century," *Environmental Communication: A Journal of Nature and Culture* 6, no. 3 (2012): 285, https://doi.org/10.1080/17524032.2012.700205.

environmental justice has become a developing field. Sociologist J. Timmons Roberts has noted some of the main differences between environmental justice discourses in the U.S. and global environmental justice. Roberts argues some of these differences to be that global environmental justice places a greater focus on extraction companies and their environmental effects as well as the global patterns of inequality in environmental exposures, exacerbated in poor, nonwhite communities.[113] Scholars have applied the global environmental justice framework to discuss air pollution along the U.S.-Mexico border stemming from maquiladoras and the trade provisions of NAFTA.

Sociologist Sara E. Grineski and others argue the growth of the maquiladora sector south of the U.S.-Mexico border demonstrates a case of global environmental injustice. Through the maquiladora industry, unequal exchange relations occur between transnational corporations from the Global North and residents of the Global South.[114] The Global North reaps most of the economic profits and acquires supplies from trade while the negative externalities - air pollution and low wages - are beared by the Global South.[115] Therefore, transnational corporations from the U.S. acquire the majority of the economic profits and supplies for the nation, while Mexican residents bear the cost of low wages and border residents bear the cost of air pollution. While those in power deal with bilateral issues from a distance, border communities are actively in the region, bearing the burden of economic activities that benefit U.S. residents and Mexican elites.[116] For

113. J. Timmons Roberts, "Globalizing Environmental Justice," in *Environmental Justice and Environmentalism: The Social Justice Challenge to the Environmental Movement*, eds. Ronald Sandler and Phaedra C. Pezzullo (Cambridge: MIT Press, 2007), 286.

114. Sara E. Grineski et al., "No Safe Place: Environmental Hazards and Injustice along Mexico's Northern Border," *Social Forces* 88, no. 5 (2010): 2257, http://www.jstor.org/stable/40927545.

115. Bandy, "Reterritorializing Borders," 82.

116. Kathleen Staudt and Irasema Coronado, *Fronteras No Mas: Toward Social Justice at the US Mexican Border* (New York: Palgrave Macmillan, 2002), 67.

example, heavy truck traffic and air pollution negatively impacts border communities, while the entire U.S. benefits from the availability of agricultural produce and other equipment at low costs, due to low labor costs in Mexico.[117]

The presence of the U.S.-Mexico border is an important element that shapes the interactions between actors. The border permits the maquiladora industry to exist within a zone of limited corporate responsibility and the militarized border supervises the adequate movement of labor.[118] Sociologist Joe Bandy argues that even though borders create the basis for unequal power, they also provide the spaces to identify commonalities and opportunities for collaboration.[119] These opportunities for collaboration open the invitation for a transnational environmental justice movement where communities along both sides of the border can work together through an increase in new transnational cultures of solidarity.[120] Cross-border cooperation on issues of air pollution remains crucial to reach effective solutions.

Coronado and Mumme note that institutional mechanisms for environmental governance have improved over time, however, air pollution problems have not been fully addressed. The failure to fully address air pollution problems calls for a new approach where governmental institutions can collaborate with NGOs making great binational efforts.[121] Binational efforts to reduce air pollution remain crucial given the dire air quality situation in the El Paso and Ciudad Juarez region. In 2021, the EPA designated the EPJ area nonattainment status for ozone pollution

117. Staudt and Coronado, *Fronteras No Más*, 71.

118. Bandy, "Reterritorializing Borders," 87.

119. Bandy, "Reterritorializing Borders," 87.

120. Bandy, "Reterritorializing Borders," 91.

121. Staudt and Coronado, *Fronteras No Más*, 69.

in El Paso County.[122] This is not the first time the EPJ region has been designated nonattainment status, however, since El Paso County has a history of nonattainment for ozone and PM10 as early as the 1990s.[123] The literature highlights the importance of addressing air pollution in El Paso and Ciudad Juarez, given the increasing cases of respiratory illnesses in children along the border and the threats of vehicle-related pollution to communities situated near border ports of entry.[124]

Although the literature on air pollution in El Paso and Ciudad Juarez represents different disciplines, such as environmental science, economics, public health, sociology, international relations, borderlands studies, and environmental justice, all scholarship has focused on air pollution in either El Paso or Ciudad Juárez, with few studies discussing transboundary air pollution from a binational viewpoint. Given the nature of air, a binational resource that engages a variety of stakeholders, more is needed in examination of the interconnectivity between the historical, social, and political processes that have placed the EPJ region under consistent nonattainment status for criteria pollutants. An analysis on the interconnections between transboundary urban air pollution is also needed to address the current binational challenges in terms of cooperation between El Paso and Ciudad Juarez. For the remainder of this thesis, I will be discussing the contribution of my research to this area of study. I will analyze the nature of the stateless agent from a multidisciplinary perspective that seeks to understand why transboundary air pollution continues to be an issue in the EPJ region and develop a transnational response that accounts for the health and safety of EPJ residents. Air pollution along the U.S.-Mexico border is a multidisciplinary problem that must be viewed from a multidisciplinary perspective.

---

122. Texas Commission on Environmental Quality, "El Paso: Current Attainment Status."

123. Texas Commission on Environmental Quality, "El Paso: Current Attainment Status."

124. Sara E. Grineski et al., "Environmental Health Injustice: Exposure to Air Toxics and Children's Respiratory Hospital Admissions in El Paso, Texas," *The Professional Geographer* 65, no. 1 (2013): 41-43, DOI: 10.1080/00330124.2011.639625.; Quintana et al., "Traffic-related air pollution," 360.

## Chapter 1: Cross-Border Data Monitoring Systems

> *To alleviate the continued undue environmental and public health burdens on borderland populations, there is a need to investigate several pressing questions: …whether the data and analysis provided is adequate in service of these populations.*
>
> *- Stephen Mueller, Resilient City, 2022*

Scholars critique the lack of cross-border collaboration in air data collection and management practices throughout the U.S.-Mexico border. Although there is agreement in the air quality standards for pollutants, such as particulate matter and ozone, a lack of standardization is displayed in the EPJ region through different numbers of stations monitoring for different types of pollutants. Ambient monitoring stations collect and display air data for the city and country under their jurisdiction, however, the stateless agent being monitored does not stop its influence at the U.S.-Mexico border. Therefore, a bilateral air monitoring network is needed in the EPJ region to adequately serve borderland communities.

### *Air Quality Standards*

Ambient monitoring stations collect data on air pollutant concentrations that might be harmful to the general public. The data collected is generally assessed based on the pollutant concentrations' proximity to air quality standards. Separated by the U.S.-Mexico border, El Paso and Ciudad Juarez are each bound to the air quality standards of their respective country. Therefore, El Paso follows the air quality standards of the EPA while Ciudad Juarez follows the air quality standards of the Secretaria de Salud[125]. Following the 1990 amendment of the Clean Air Act, the EPA was required to set National Ambient Air Quality Standards (NAAQS) for six principal pollutants that can be harmful to the public and the environment, known as "criteria" air

125. Secretary of Health

pollutants.[126] Ozone and particulate matter are among these criteria pollutants. The NAAQS for ozone is a concentration of 0.070 parts per million (ppm) by volume while the standard for PM.2.5 is 12.0 micrograms per cubic meter of air (µg/m3).[127] The standard for PM10, respectively, is 150 µg/m3.[128] Pollutant concentrations that exceed these national standards are in nonattainment and can place vulnerable populations at risk for negative health impacts. Although there are significant differences between the data collection practices of El Paso and Ciudad Juarez, as will be further discussed, both cities are bound to similar air quality standards.

Ciudad Juárez follows the air quality standards implemented by the Secretaria de Salud, known as the Normas Oficiales Mexicanas (NOM) de Calidad del Aire Ambiente[129]. The NOM for ozone is a concentration of 0.070 ppm and the standard for PM2.5 is 12.0 µg/m3.[130] The standard for PM10 is 75 µg/m3.[131] Although Ciudad Juarez and El Paso are bound to different standards for PM10, their standards for ozone and PM2.5 are the same value. Following the same standards for criteria pollutants makes the collaboration process in the EPJ region easier as both cities are in agreement over what concentrations are considered unsafe for the public. While both cities follow similar standards, however, their data collection and communication practices differ in meaningful ways, raising concerns on how the EPJ community is continuously underserved by present data mechanisms.

---

126. U.S. Environmental Protection Agency, *NAAQS Table*, Accessed March 25, 2023, https://www.epa.gov/criteria-air-pollutants/naaqs-table.

127. U.S. Environmental Protection Agency, *NAAQS Table*.

128. U.S. Environmental Protection Agency, *NAAQS Table*.

129. Official Mexican Standards for Ambient Air Quality

130. Gobierno de México, *Normas Oficiales Mexicanas (NOM) de Calidad del Aire Ambiente*, December 31, 2017, https://www.gob.mx/cofepris/acciones-y-programas/4-normas-oficiales-mexicanas-nom-de-calidad-del-aire-ambiente.

131. Gobierno de México, *Normas Oficiales Mexicanas.*

### *Data Collection Practices North of the Border*

Air data on the El Paso side of the border is collected by its respective state-level agency, the Texas Commission on Environmental Quality (TCEQ). TCEQ displays the status of their monitoring stations and the pollutants each station measures on its website. This information is available to the public and can be accessed in a variety of formats, such as an ArcGIS map and data charts, all found on the TCEQ website. As displayed on the agency's ArcGIS map, TCEQ operates twelve ambient monitoring stations in El Paso County, of which only seven monitor for ozone - Ojo de Agua, Skyline Park, El Paso UTEP, El Paso Chamizal, Ascarate Park SE, Ivanhoe, and Socorro Hueco - , six monitor for PM10 - Ojo de Agua, Van Buren, El Paso UTEP, El Paso Mimosa, Ivanhoe, and Socorro Hueco - , and four monitor for PM 2.5 - El Paso UTEP, El Paso Chamizal, Ascarate Park SE, and Socorro Hueco.[132] Of the twelve ambient monitoring stations operated by TCEQ, only two stations monitor for ozone, PM10, and PM2.5 - El Paso UTEP and Socorro Hueco. Apart from these two stations, the other ten stations measure for a mixture of meteorological variables and air pollutants, however, each station varies on the types and number of pollutants it collects data for.[133] The fact that only two stations collect data on ozone, PM10 and PM2.5 demonstrates a lack of standardization within the air monitoring network serving the El Paso community. Prior to the establishment of a bilateral air monitoring network, local, state, and federal efforts must be increased to ensure monitoring stations in El Paso can collect data for similar air pollutants. A set standardization in the number and type of pollutants stations monitor can create a more robust air monitoring network that will provide more accurate data and better serve EPJ residents.

---

132. "GeoTAM Map Viewer," Texas Commission on Environmental Quality, Accessed March 25, 2023, https://tceq.maps.arcgis.com/apps/webappviewer/index.html?id=ab6f85198bda483a997a6956a8486539.

133. Texas Commission on Environmental Quality, "GeoTAM Map Viewer."

Discrepancies within the air monitoring system can impede the analysis of accurate air data, as sometimes monitoring stations need to be repaired, are missing equipment, or are out of service. These discrepancies can be seen with the El Paso UTEP station that often finds itself to be "temporarily out of service".[134] El Paso UTEP is one of the few monitoring stations that collects data for both ozone, PM2.5, and PM10. Therefore, the El Paso UTEP's current status being out of service impedes the collection of data on ozone and particulate matter, pollutants of concern in the EPJ region. When the El Paso UTEP station finds itself out of service, the Socorro Hueco station becomes the only station to provide the EPJ region with data on ozone, PM 2.5, and PM10 at the same time. This station, however, is at the eastern edge of El Paso, located far from POE like the Bridge of the Americas and Santa Fe Bridge.

The environmental agency for the state of Texas, TCEQ monitors and operates ambient monitoring stations in El Paso. While TCEQ does display its air data on its website, the data is also sent to the EPA for regulation and certification. The EPA has its own platform, AirNow, dedicated to making air quality data easily accessible to the public. AirNow is a centralized data system that reports air quality using the official U.S. Air Quality Index (AQI). Using a color-coded scale, the AQI was developed by the EPA to make information on the health effects of the five most common air pollutants easily accessible to the public.[135] Air quality information reported on the AirNow site is solely dedicated to informing the public, however, and cannot be used to determine attainment status for criteria air pollutants. AirNow data has not been certified by the EPA, once the data is submitted and certified by the EPA, it is incorporated into the EPA's

134. "El Paso UTEP: Monitoring Information," Texas Commission on Environmental Quality, Accessed April 1, 2023, https://www17.tceq.texas.gov/tamis/index.cfm?fuseaction=report.view_site&siteID =165&siteOrderBy= name&showActiveOnly=0&showActMonOnly=1&formSub=1&tab=mons.

135. AirNow, *About AirNow*, Accessed April 1, 2023, https://www.airnow.gov/about-airnow/.

regulatory database, the Air Quality System (AQS).[136] AQS data are used to determine attainment of the National Ambient Air Quality Standards (NAAQS).[137] Because data analysis of the stateless agent is currently subjected to national boundaries rather than airshed boundaries, data on the El Paso portion of the EPJA can be accessed through the TCEQ site, the AirNow site, and the EPA AQS. These sites only provide air data on El Paso, however, forcing EPJ residents to navigate through different data collection mechanisms to access data on the Ciudad Juarez portion of the EPJA.

### *Data Collection Practices South of the Border*

Air data on the Ciudad Juarez side of the border is collected by the Red de Monitero Atmosferico de Juarez[138] managed by a local government department, the Dirección de Desarrollo Urbano y Ecología de Ciudad Juárez[139]. This air monitoring network began in 1993 with data collection of PM10, although monitoring stations for ozone soon followed.[140] Although air data is collected and managed by the local government, this data is not updated on the local government's website, making it difficult for the public to access air quality data on Ciudad Juarez. The most recent air data available on the Ciudad Juarez local government's website includes PM10 data from October 2020.[141] This dataset is from more than three years ago and it only includes data for one pollutant of concern in the EPJ region. The outdated information in the Ciudad Juarez

136. AirNow, *About the Data*, Accessed April 1, 2023, https://www.airnow.gov/about-the-data/.

137. AirNow, *About the Data*.

138. Atmospheric Monitoring Network of Ciudad Juarez

139. Department of Urban Development and Ecology of Ciudad Juarez

140. Marcelo E. Korc and Rodolfo Saenz, "Monitoreo de la Calidad del Aire en América Latina," *Publications CEPIS* (1999): 8, https://iris.paho.org/handle/10665.2/55453.

141. Gobierno Municipal de Ciudad Juárez, *Red de Monitoreo Atmosférico de Juárez: Datos IMECAS PM-10,* Accessed March 31, 2023, https://www.juarez.gob.mx/calidad-del-aire/.

governmental website shows the need for up-to-date air data platforms as EPJ residents deserve the right to easy access to air quality data in their own communities.

Although air data for El Paso can be found both in the TCEQ and EPA website, air data for Ciudad Juarez can only be found in the SINAICA website. Just as TCEQ reports its air data to the EPA, Ciudad Juarez's ecology department reports its data to SINAICA. Ciudad Juarez started sending air data to the SINAICA platform in 2019, way behind other cities in border states like Baja California and Nuevo Leon.[142] Ciudad Juarez started sharing its air data with the SINAICA platform less than four years ago, hence progress must be made to ensure the city's air monitoring stations are up to date with other major border cities along the U.S.-Mexico border. The SINAICA platform displays four air monitoring stations in Ciudad Juarez of which three are operated by the city government and one is operated in partnership with a university. All four monitoring stations collect data for ozone - Advance, Canales Lira, Planta de Tratamiento de Aguas Residuales Norte, and Instituto de Ingeniería y Tecnología - while only one station collects data for PM10 and PM2.5 - Instituto de Ingenieria y Tecnologia.[143] Although the local government of Ciudad Juarez has ten monitoring stations for particulate matter, this pollutant data is not available to the public. The only data from these ten monitoring stations available to the public derives from the PM10 data last updated in the city government website in 2020.[144] Consequently, EPJ residents only have access to PM10 data from the Instituto de Ingenieria y Tecnologia station displayed in the SINAICA platform.

---

142. Paola Gamboa, "Actualizan el sistema para monitoreo del aire en Juárez," *El Heraldo De Juárez*, November 20, 2019, https://www.elheraldodejuarez.com.mx/local/actualizan-el-sistema-para-monitoreo-del-aire-en-juarez-4478333.html.

143. Sistema Nacional de Información de la Calidad del Aire, *Red de monitoreo: Municipio de Juárez (CJU)*, 2023, https://sinaica.inecc.gob.mx/.

144. Gobierno Municipal de Ciudad Juárez, *Red de Monitoreo Atmosférico de Juárez: Datos IMECAS PM-10*.

Compared to TCEQ's air monitoring stations, there is more agreement in the pollutants measured in SINAICA's monitoring stations as all but one measure for the same pollutants. However, SINAICA only displays information for four monitoring stations, while TCEQ displays information for twelve monitoring stations of which seven report data on ozone and particulate matter. Binational efforts to increase the quantity of data monitoring stations in Ciudad Juarez are well underway with the inauguration of a new data monitoring station on February 16, 2023.[145] This new monitoring station, funded through a MX $2million donation from the Marathon Petroleum Foundation and NADB, is set to collect pollutant concentrations for ozone and particulate matter.[146] Nonetheless, local, state, and federal efforts must be increased to establish more data monitoring stations in Ciudad Juarez. Not only is there a lack in the quantity of data monitoring stations in the Ciudad Juarez portion of the EPJA, but also a lack of public access to air data from the existing stations. The insufficient public access to air data is further exacerbated by the absence of a public tool to communicate air quality to EPJ residents.

While El Paso has access to the AQI system that communicates air quality status to residents using a color coded and numerical scale, Ciudad Juarez does not have access to such a tool. In an interview with Borderzine, Dr. Adrian Vazquez, environmental engineering professor in Ciudad Juarez, mentioned, "In the case of Ciudad Juarez, by not having an air quality program destined to inform the community, we do not have an information system because we have nothing to inform, we do not have an index system like El Paso."[147] The absence of a public tool intended

145. Roberto Gonzalez Talamantes, "Inauguran cuarta estación de monitoreo ambiental," *Somos UACJ* (Ciudad Juárez, Chihuahua), February 16, 2023, https://comunica.uacj.mx/16-02-2023/32809.

146. Talamantes, "Inauguran cuarta estación de monitoreo ambiental."

147. Leslie Borrayo, "Ciudad Juárez no cuenta con la tecnología para medir el aire contaminado," *Borderzine: Reporting Across Fronteras* (El Paso, TX), November 10, 2016, https://borderzine.com/2016/11/ciudad-jurez-no-cuenta-con-la-tecnologia-para-medir-el-aire-contaminado/.

to give communities easy access to air quality status complicates the process of air quality understanding for border communities. Under such a situation, Juarez residents only have access to data from the SINAICA platform which is communicated in pollutant concentrations and their respective units (ppm), rather than an overall air quality score. The insufficient public access to air data on Ciudad Juarez demonstrates the need for a transnational response that includes the development of a color-coded and numerical scale intended to inform EPJ residents on the air quality status of Ciudad Juarez. In their analysis of data monitoring stations along U.S border areas, Mueller identified the EPJ region as a prominent blind spot for data monitoring stations.[148] This blind spot must be addressed through an increase in data monitoring stations in EPJ as part of a transnational response to improve the air quality status of EPJ.

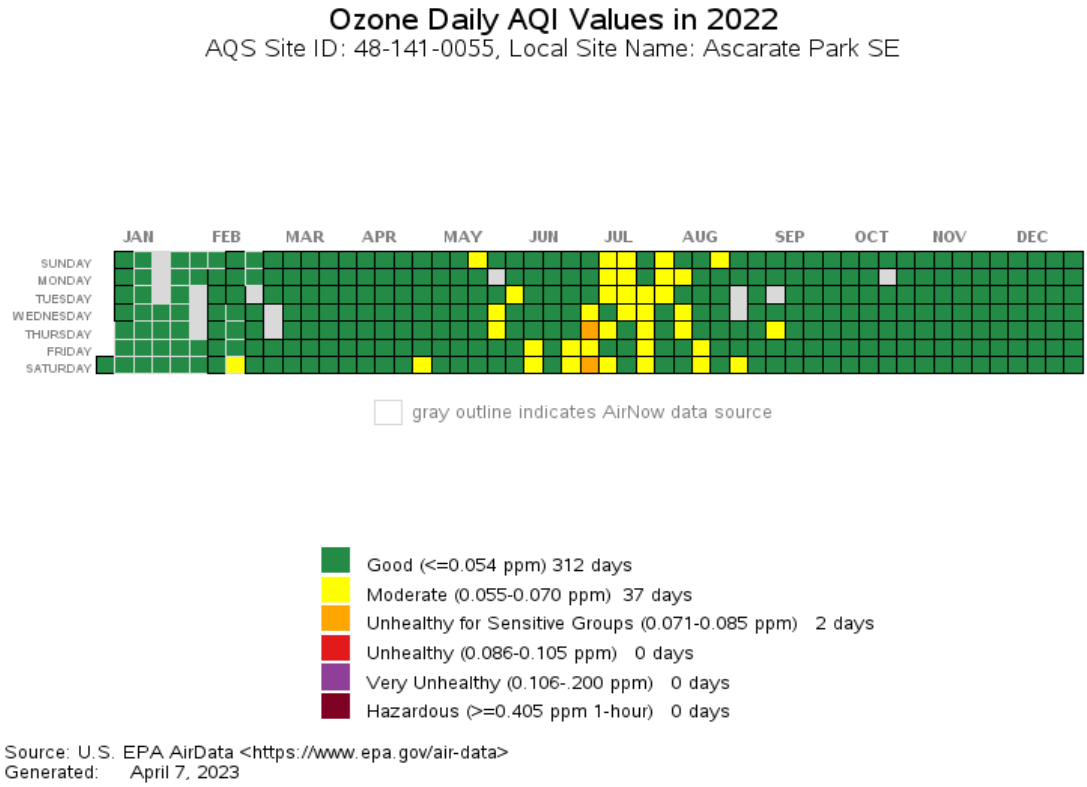
### *Intra-Urban Spatial Variability*

Raysoni and Sarnat have critiqued the disparate placement of monitoring stations along the U.S.-Mexico border.[149] There are high levels of intra-urban spatial variation in air pollutant concentrations throughout EPJ, hence a diversified monitoring network is crucial to account for the microenvironments of vulnerable communities. The intra-urban spatial variability in pollutant concentrations can be seen in areas of El Paso such as Ascarate Park and El Chamizal Park which less than four miles apart from each other, report different concentrations for ozone. Tile plots developed by the EPA showcase the intra-urban spatial variability between Ascarate and El Chamizal as El Chamizal has more days with moderate air quality and air quality unhealthy for

148. Mueller, "Mapping Blindspots," 6.

149. Raysoni et al., "Binational school-based monitoring," 2484.

sensitive groups in comparison to Ascarate (see Figure 2).[150] The contrast is pronounced given the two monitoring stations in these parks are less than four miles away from each other. While both monitoring stations detect lower ozone concentrations in the months of October to April, their ozone concentrations between May and August are more variable, with El Chamizal reporting one more day of ozone concentrations deemed unhealthy for sensitive groups. The difference in ozone concentrations is more variable when comparing El Paso monitoring station data to a monitoring station in Ciudad Juarez.




150. U.S. Environmental Protection Agency, *Outdoor Air Quality Data: Air Data - Tile Plot*, Accessed April 7, 2023, https://www.epa.gov/outdoor-air-quality-data/air-data-tile-plot.

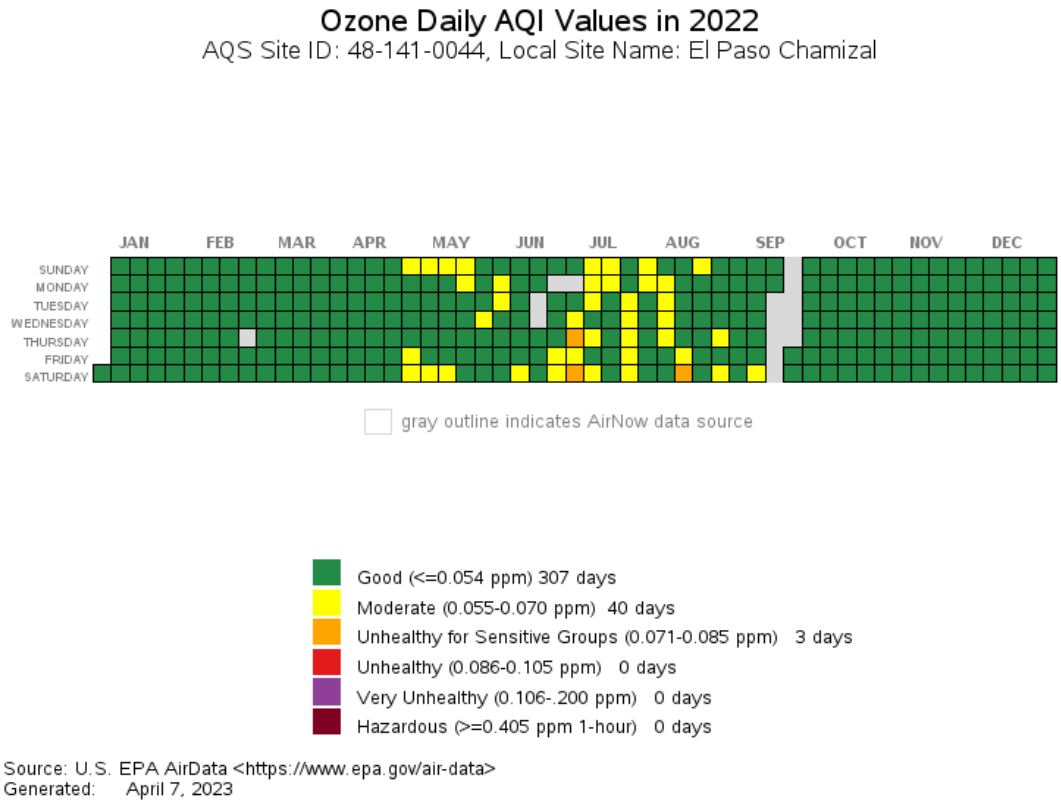



Figure 2. Color-coded tile plots visualizing the maximum daily ozone concentration for the Ascarate Park SE and El Paso Chamizal TCEQ ambient monitoring stations. Each tile represents a day of the year 2022. (Source: U.S. EPA AirData, *Ozone Daily AQI Values in 2022*, Generated April 7, 2023, https://www.epa.gov/air-data.)

A tile plot with ozone data from the Advance Station in Ciudad Juarez further demonstrates the intra-urban spatial variability in pollutant concentrations north and south of the U.S.-Mexico border. Less than six miles away from the El Paso Chamizal monitoring station, the Advance Station reports higher maximum concentrations of moderate air quality and air quality unhealthy for sensitive groups, than the Chamizal and Ascarate Park monitoring stations. Moreover, in the months of June and July, the Advance station reports maximum ozone concentrations that are very unhealthy for all members of the populations in contrast to the Chamizal and Ascarate Park stations in El Paso (see Figure 3).[151] The higher ozone concentrations in the Advance station demonstrate

151. Sistema Nacional de Información de la Calidad del Aire, *Estación: Advance (ADV)*, 2023, https://sinaica.inecc.gob.mx/.

not only the intra-urban spatial variation between El Paso and Ciudad Juarez ozone concentrations, but also the worsened air quality that Ciudad Juarez residents are exposed to. The Advance monitoring station is located within a major maquiladora industrial park in Ciudad Juarez[152], however, not all maquiladora industrial parks in Ciudad Juarez have an air data monitoring station nearby. The intra-urban spatial variability in pollutant concentrations, such as ozone, calls for an increase in ambient monitoring stations in EPJ, with a particular emphasis on monitoring stations near major pollution sources.

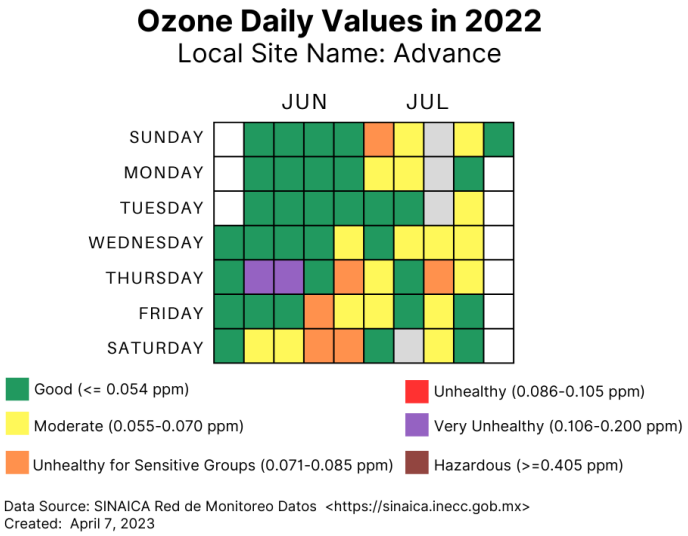



Figure 3. Color-coded tile plot visualizing the maximum daily ozone concentration for the Advance Station in the months of June and July 2022. Graphic created on Canva. Data adapted from the SINAICA portal. (Data Source: SINAICA, *Datos Crudos Estación Advance*, Accessed April 7, 2023, https://sinaica.inecc.gob.mx.)

Quintana and others have called for an increase in monitoring stations near power plants, ports of entry, and other major pollution sources along the U.S.-Mexico Border.[153] With its high index of maquiladoras, border POE, and cross-border travel, EPJ constitutes a region of the U.S.-Mexico border that needs more monitoring stations near major pollution sources. Environmental laws in the U.S. apply to airshed level concentrations rather than local hotspots, hence monitoring

152. Sistema Nacional de Información de la Calidad del Aire, *Estación: Advance (ADV)*.

153. Quintana et al., "Risky Borders," 290.

stations are purposely located away from local pollution sources.[154] However, the placement of monitoring stations away from local pollution sources leads to datasets that reflect average pollution levels in EPJ rather than identifying hotspots for ozone and particulate matter pollution. The failure to adequately collect ozone and PM data on pollutant hotspots in EPJ places the communities who live near local pollution sources at risk, such as residential communities near maquiladora industrial parks without a monitoring station nearby.

General mapping of local air pollution sources and air data monitoring stations in EPJ (see Figures 4-6) demonstrates the need for more monitoring stations in the EPJ region. In El Paso, monitoring stations are generally located along the U.S.-Mexico border or in the outskirts of the city, such as in Socorro. However, there are no monitoring stations in close proximity to Marathon Oil Refinery, a local pollution source located in central El Paso and home to a predominantly Mexican and low-income population. Apart from the oil refinery, border POE constitute other major pollution sources in EPJ. International border POE have been identified as major polluters in border cities,[155] yet data collection on the EPJ border POE remains very limited.

From the four main POE in the EPJ border, only the Bridge of the Americas has a monitoring station in close proximity. The Santa Fe, Stanton, and Ysleta-Zaragoza bridges do not have monitoring stations nearby, hence communities around these POE are disproportionately underserved by current data collection mechanisms. The absence of a monitoring station near the Ysleta-Zaragoza bridge is even more problematic given the cluster of maquiladoras on the southern border of the bridge. In Ciudad Juarez, monitoring stations are absent in the outskirts of the city, where the most impoverished communities live. Moreover, there is an absence of monitoring

154. Quintana et al., “Risky Borders,” 290.

155. Quintana et al., “Risky Borders,” 290.

stations in southeast Ciudad Juarez, where a significant cluster of maquiladoras and industrial parks exist. Although monitoring stations in EPJ are placed to reflect average pollution levels, there needs to be an increase in monitoring stations to account for the blind spots in data monitoring in EPJ. General mapping of monitoring stations and local pollution sources in EPJ demonstrates that some of the region's blind spots in data monitoring are located around El Paso's Marathon Oil Refinery, Ciudad Juarez's outskirts and southeastern maquiladora clusters, and all border POE except for the Bridge of the Americas.

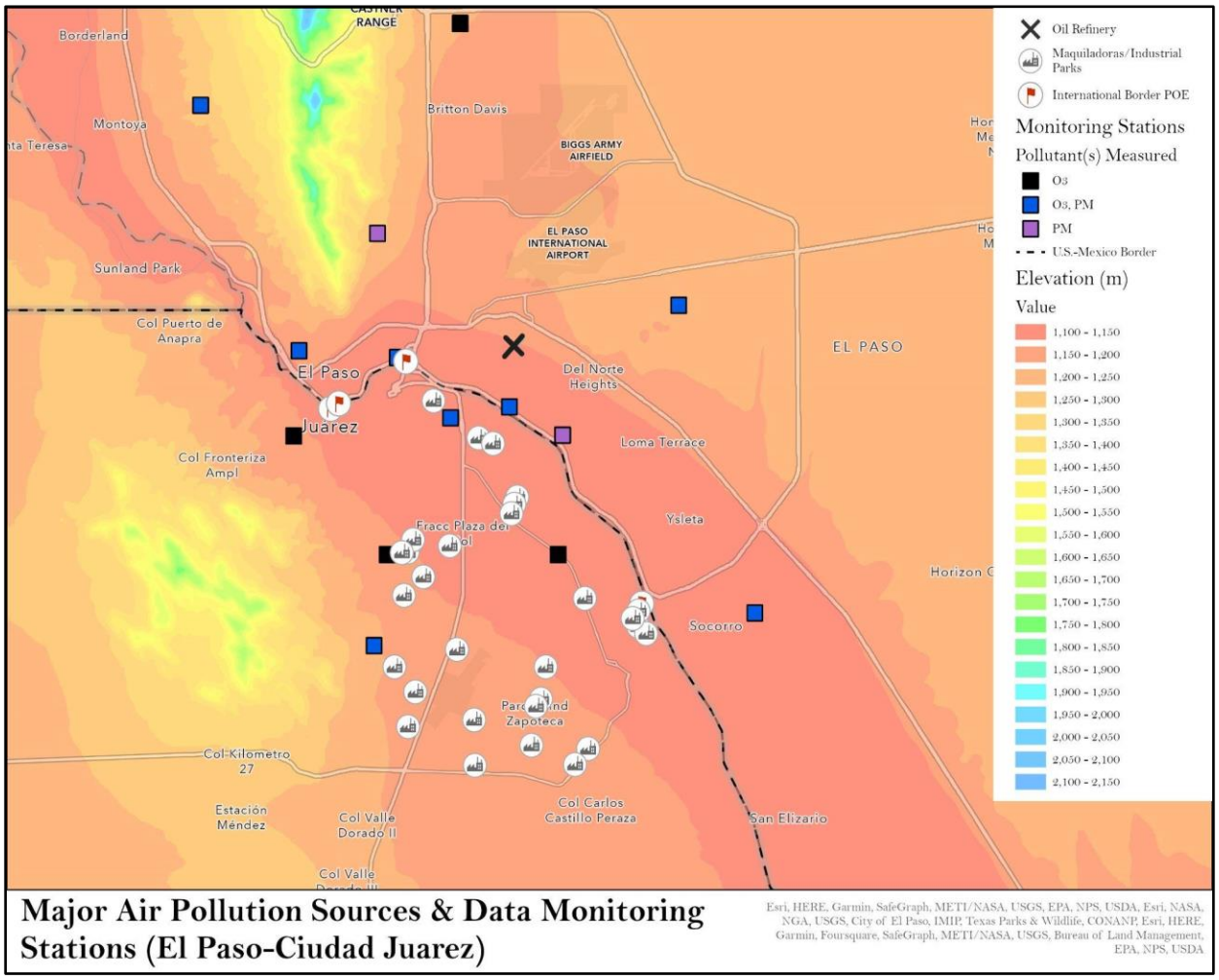



Figure 4. Map of major pollution sources – oil refineries, maquiladoras, and international border POE – and ambient monitoring stations in the EPJ region. Elevation changes note where pollutants are most likely to be trapped. Map created using ArcGIS (GIS software). Version 10.0. (Elevation Layer Data Source: Web GIS, *El Paso-Texas Terrain Data*, Accessed April 9, 2023, http://www.webgis.com/terr_pages/TX/dem1/elpaso.html.)

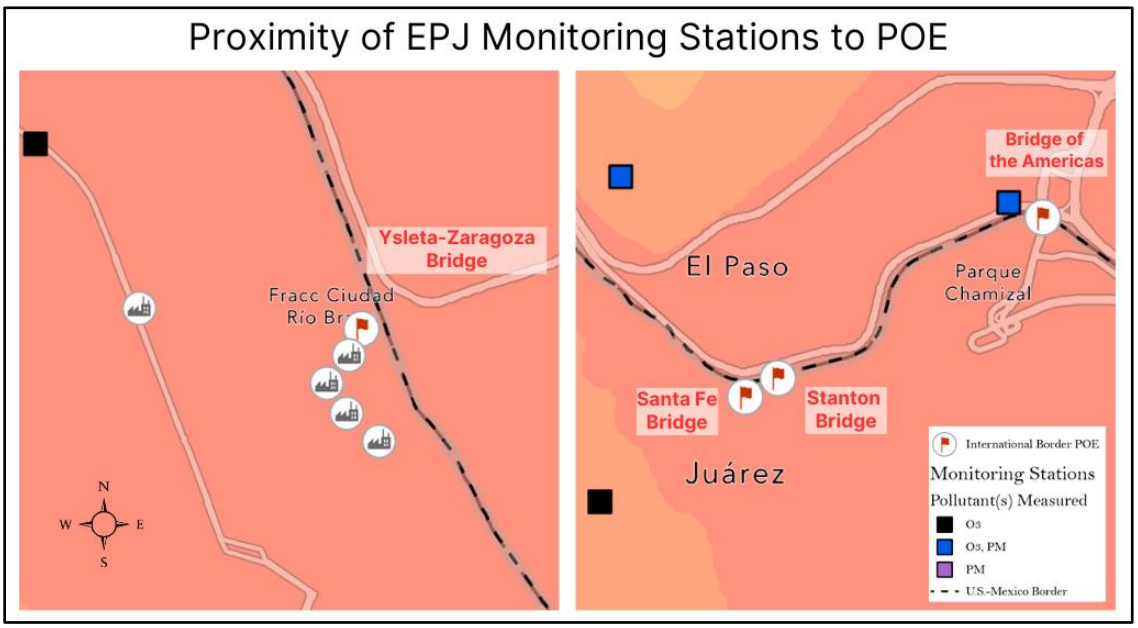



Figure 5. Close-up of Figure 4 highlighting the proximity of international border POE - Ysleta-Zaragoza, Santa Fe, and Stanton - to ambient monitoring stations in the EPJ region. Note the Bridge of the Americas is the only border POE in close proximity to a monitoring station. Graphic created on Canva.

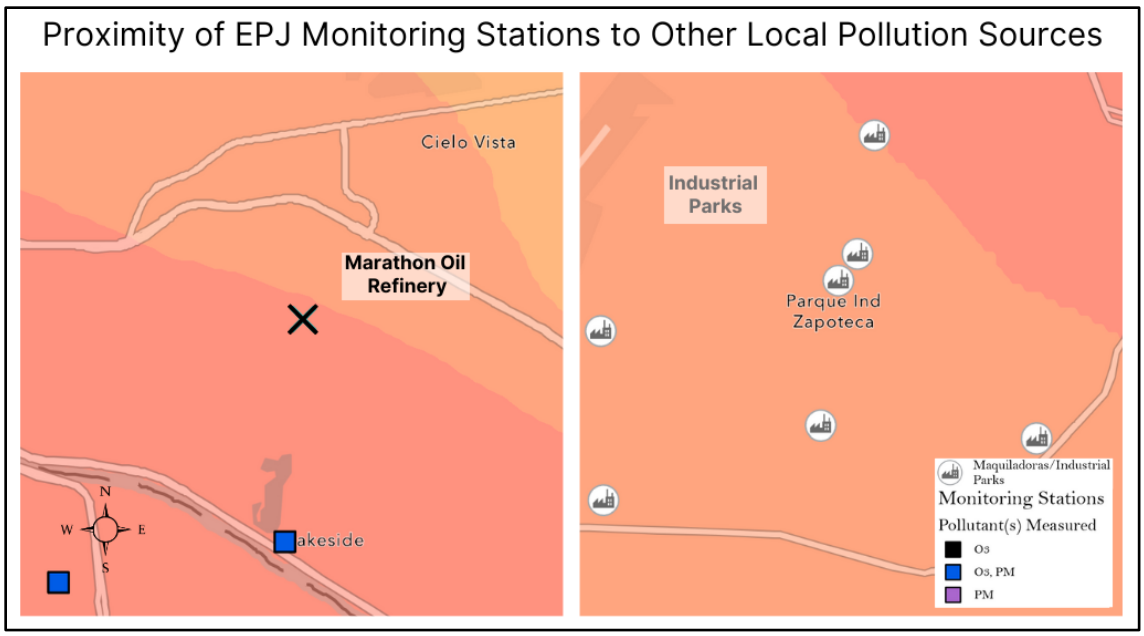



Figure 6. Left panel is a close-up of Figure 4 highlighting the far proximity of Marathon Oil Refinery to ambient monitoring stations in the EPJ region. Right panel displays the maquiladora cluster in southeast Ciudad Juarez with no monitoring stations in close proximity. Graphic created on Canva.

Data on pollutant concentrations in the EPJA determines whether El Paso is in nonattainment status for criteria pollutants and informs policy decisions on both sides of the

border. An assessment of data monitoring stations in EPJ demonstrates major differences between monitoring stations in El Paso and Ciudad Juarez. El Paso has more monitoring stations for ozone and particulate matter than Ciudad Juarez. Nonetheless, both cities have monitoring stations collecting data on either ozone, particulate matter, or both, only producing variable datasets on a particular pollutant in a particular section of EPJ. Ozone data from monitoring stations in central El Paso demonstrates intra-urban spatial variability in ozone concentrations despite the close proximity of these two monitoring stations. The intra-urban spatial variability is even more pronounced when comparing ozone concentrations from a monitoring station in south central Ciudad Juarez, which has higher maximum ozone concentrations. Based on my mapping of major pollution sources and ambient monitoring stations in EPJ, it was found there are several blind spots in air monitoring near local pollution sources such as an oil refinery, maquiladora and industrial park clusters, and border POE. However, not only is the lack of monitoring stations an issue in EPJ, but also access to air data from the existing monitoring stations. To access air data on the EPJA, residents must navigate through different platforms. While EPJ residents can access data on El Paso pollutant concentrations in the TCEQ and EPA websites, they can only access data on Ciudad Juarez concentrations in the SINAICA website. Moreover, El Paso residents have access to the AQI scale that simplifies communication on air quality levels while Ciudad Juarez residents do not have access to such a tool.

While current data collection mechanisms report data bound to a side of the U.S.-Mexico border, the stateless agent is not bound to borders. Therefore, there is a need for a transnational response to address data collection mechanisms in the EPJ region. This transnational response includes the increase of monitoring stations along both sides of the border. Efforts must also be made to increase the presence of monitoring stations near local pollution sources, such as the POE

and maquiladora clusters. Increasing the quantity of EPJ monitoring stations will most accurately reflect intra-urban spatial variability and better serve border communities not represented in the air monitoring network. The transnational response must also include increased efforts to improve air data access in EPJ. A bilateral monitoring network must be implemented in such a way that EPJ residents can access pollutant concentration data in one platform. This platform must also include a tool that provides Ciudad Juarez residents with simple access to air quality levels, such as El Paso residents have access to the AQI scale. A transnational response to improve data collection mechanisms in the EPJ region will most adequately serve the EPJ communities that are underserved by current monitoring stations.

## Chapter 2: Cross-Border Government Collaboration

> *If the political boundary did not exist, environmental issues would be dealt with at the local level. Because of the political boundary, environmental issues become foreign policy issues and escalate to the higher level of government, one less connected to local communities.*
>
> *- Irasema Coronado, Fronteras No Más, 2002*

Because the stateless agent is not bound to the limits of the U.S.-Mexico border, air quality in Ciudad Juarez and El Paso is determined by the actions of both cities. The dependence of both border cities on each other calls for an increase in bilateral environmental governance efforts driven by collaboration and participation of all involved stakeholders. Environmental governance in EPJ is driven by stakeholders across all government levels - local, state, and federal - and involves parties across both sides of the border.

### *Border 2025: U.S.-Mexico Environmental Program*

One of the most pronounced environmental governance efforts to address environmental issues along the U.S.-Mexico border involves the implementation of the Border 2025: United States-Mexico Environmental Program. Border 2025 represents the most updated version of the series of Border Environmental Programs. Updated every five years, Border 2025 (2021-2025) represents a bilateral effort to address environmental challenges in the border region. Overseen and administered by the EPA and SEMARNAT, Border 2025 constitutes an environmental governance effort led by federal-level agencies and in close partnership with corresponding state-level agencies and other relevant stakeholders.[156] Other relevant stakeholders in the EPJ region include TCEQ and the NADB. The NADB itself participates in Border 2025 by providing funding and assistance for the implementation of Border 2025 projects. In collaboration with the EPA, the

156. U.S. Environmental Protection Agency, *Border 2025: United States-Mexico Environmental Program*. June 2021, 2.

NADB announced funding for 11 projects in Region 6 which includes the border states of Texas in the U.S. and Chihuahua, Coahuila, Tamaulipas, and Nuevo Leon in Mexico.[157] This funding totaled $791, 225.[158]

Under the organizational structure of Border 2025, the EPA and SEMARNAT national coordinators provide guidance to Policy Workgroups, Regional Coordinators, and Task Forces (see Figure 7). Policy Workgroups provide technical and policy support on issues while working

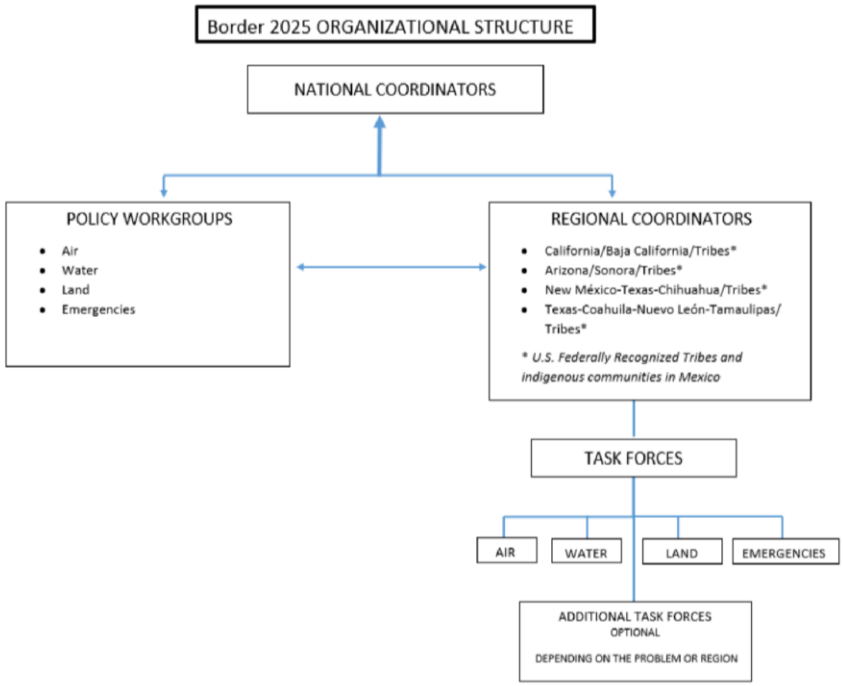



Figure 7. Border 2025 Organizational Structure. (Source: U.S. EPA, *Border 2025: U.S.-Mexico Environmental Program*, Retrieved April 9, 2023, p.26.)

with Regional Coordinators to manage and accomplish their Border 2025 Goals.[159] Regional Coordinators also work with Task Forces to oversee projects in the four geographic regions of the

157. "Border 2025: U.S. Mexico Border Program," Our Projects, North American Development Bank, Accessed April 9, 2023, https://www.nadb.org/our-projects/border-2025-projects.

158. North American Development Bank, "Border 2025: U.S. Mexico Border Program."

159. U.S. Environmental Protection Agency, *Border 2025*, 7.

U.S.-Mexico border.[160] The EPJ area falls under EPA's Region 6 and includes the Texas-New Mexico-Chihuahua region. Under Border 2025, the EPA stakeholders involved in addressing air pollution along the EPJ region include the Air Policy Workgroup, the Region 6 Regional Coordinators, and the Air Task Force also known as the Joint Advisory Committee (JAC).[161]

Collaborative efforts between the U.S. and Mexico began with international water and boundary management under the IBWC. However, in recent years air pollution has emerged as one of the major environmental issues in the U.S.-Mexico border. The reduction of air pollution is listed as the first goal in Border 2025.[162] This goal is broken down into five broad objectives accompanied by specific objectives to be achieved in 2023, 2024, or 2025. Border 2025 lists the five objectives pertaining to air pollution and their specific objectives to be achieved by 2023 as follows:

> Objective 1: Establish reliable and sustainably operated air monitoring networks and provide real-time access to air quality data.
> - Objective 1a: By 2023, increase knowledge-transfer and provide at least one training opportunity on performance standards and applications of low-cost air quality sensors.
>
> Objective 2: Increase the quality and exchange of data from emissions inventories across the border and among federal, state, local, Tribal governments and Mexican Indigenous communities and Afro-Mexican people.
> - Objective 2a: By 2023, strengthen intergovernmental linkages, increase the exchange of information, and pursue greater harmonization when developing and improving national, state, and municipal emissions inventories, starting with at least two binational airsheds. The initial focus will be on "criteria" pollutants and their precursors.
>
> Objective 3: Reduce vehicle emissions in the border region, including by establishing or strengthening programs that reduce the number of vehicles that do not comply with vehicle emissions standards.

160. U.S. Environmental Protection Agency, *Border 2025*, 7.

161. U.S. Environmental Protection Agency, *Overview: TX-NM-CHIH Region*, Accessed April 9, 2023, https://www.epa.gov/usmexicoborder/overview-tx-nm-chih-region.

162. U.S. Environmental Protection Agency, *Border 2025*, 13.

- Objective 3a: (There are no objectives for 2023.) By 2024, increase cross-border (interagency, interstate, and international) access to databases that officials can use to verify that used vehicles meet emission standards.

Objective 4: Deploy strategies and technologies to reduce pollutant emissions and improve public health outcomes.

- Objective 4a: By 2023, implement a program on air-quality-related health effects and/or a communication campaign on air-quality-related health risks and mitigation measures in at least one additional urban airshed.

Objective 5: By 2025, support update and/or completion of climate action plans in each of the six northern Mexican Border States and build the necessary capacity to guarantee sustained implementation.[163]
(There are no specific objectives listed within this objective.)

While all EPA regions along the U.S.-Mexico border are bound to this framework and these objectives, each region is responsible for the development of an Action Plan that addresses how projects will meet the Border 2025 objectives. Border 2025 Action Plans were scheduled to be approved by the EPA and SEMARNAT in 2021 and 2023.[164]

Published in March 2023, the Border 2025 Action Plan (2021-2023) for the Texas-New Mexico-Chihuahua Region summarized the ongoing actions to meet Goal 1 objectives (air pollution reduction) in the region and their completion status based on expected results for the 2021-2023 period.[165] Out of six actions to reduce air pollution in the TX-NM-CHIH Region pertaining to 2023 objectives, three were achieved by March 2023 and one more is scheduled to be completed by August 2023.[166] Pertaining to objective 1a, efforts to increase knowledge transfer through analysis and monitoring of particulates have been met and a study on PM monitoring at

163. U.S. Environmental Protection Agency, *Border 2025*, 14-15.

164. U.S. Environmental Protection Agency, *Border 2025*, 29.

165. U.S. Environmental Protection Agency, *Border 2025 Action Plan (2021-2023) Texas-New Mexico-Chihuahua Region*, March 2023, 1, https://www.epa.gov/system/files/documents/2023-03/R6%203State%20B2025%20Action%20Plan%20English%20%28Feb%2026%202023%29%20Final.pdf.

166. U.S. Environmental Protection Agency, *Border 2025 Action Plan (2021-2023) Texas-New Mexico-Chihuahua Region*, 1-11.

26 school sites is expected to be completed in August 2023.[167] The action to install a monitoring station in west Ciudad Juarez by 2023 has not been completed[168], hence collaboration must be increased to ensure this action is completed as close to the overdue deadline as possible. The installation of a monitoring station in west Ciudad Juarez would benefit communities with minimal access to air data that represents their sector of the city. Pertaining to objective 4a, actions to map urban heat islands in El Paso have been completed and efforts to raise awareness on air quality issues in El Paso's Ysleta tribal communities have also been completed.[169] The action to monitor and assess PM2.5 emissions at the Bridge of the Americas has not been completed.[170] It's of crucial importance that relevant stakeholders collaborate to complete this study given the extensive literature on the impacts of POE emissions on surrounding communities.

Although the TX-NM-CHIH Region has completed most of its objectives for 2023 and is making progress towards its objectives for 2024 and 2025, the absence of actions towards completing objectives 2a and 3a is notable within the region's Action Plan.[171] While each region is responsible for implementing actions to achieve the objectives outlined in Border 2025, the EPJ region does not have any actions listed to complete objectives 2a and 3a. Objective 2a is crucial to bilateral environmental governance efforts given its emphasis on intergovernmental linkages and the exchange of information. The failure to include actions for such an objective deprioritizes

167. U.S. Environmental Protection Agency, *Border 2025 Action Plan (2021-2023) Texas-New Mexico-Chihuahua Region*, 1-3.

168. U.S. Environmental Protection Agency, *Border 2025 Action Plan (2021-2023) Texas-New Mexico-Chihuahua Region*, 2.

169. U.S. Environmental Protection Agency, *Border 2025 Action Plan (2021-2023) Texas-New Mexico-Chihuahua Region*, 11.

170. U.S. Environmental Protection Agency, *Border 2025 Action Plan (2021-2023) Texas-New Mexico-Chihuahua Region*, 10.

171. U.S. Environmental Protection Agency, *Border 2025 Action Plan (2021-2023) Texas-New Mexico-Chihuahua Region*, 8.

efforts to link air data on the EPJ region. Nonetheless, the exchange of information within the EPJ region is crucial since both cities share the same airshed.

The absence of actions to address objective 3a also represents a major failure for the TX-NM-CHIH Region. Objective 3a focuses on the reduction of vehicle emissions through an increase in cross-border access to databases on used vehicles.[172] The literature shows that vehicles are one of the leading polluters in the EPJ region.[173] Ciudad Juarez tends to have higher indices of used vehicles due to eased NAFTA trade restrictions, such as those between 2005-2008 that allowed for the massive importation of more than 2.5 million used U.S. vehicles into Mexico, tax free.[174] Moreover, used vehicles in Ciudad Juarez have lower retirement rates than in El Paso, emitting more air pollutants.[175] The absence of actions on objective 3a represents a major failure for bilateral collaboration efforts in EPJ given the impact of used vehicles on increasing pollutant emissions. Federal bilateral collaborative agreements like Border 2025 can include objectives to reduce vehicle emissions, however, it is up to state and local institutions in the EPJ region to actively prioritize the implementation of actions that will assist Region 6 in the completion of these objectives. Moreover, the objectives to reduce vehicle emissions in EPJ also call for the implementation of actions that provide EPJ residents with more efficient public transportation systems that shift away from car dependency. While federal bilateral agreements like the Border 2025: U.S.-Mexico Environmental Program embrace collaboration to set objectives on the

172. U.S. Environmental Protection Agency, *Border 2025 Action Plan (2021-2023) Texas-New Mexico-Chihuahua Region*, 8.

173. Blackman, Batz, and Evans, "Maquiladoras, Air Pollution," 19.

174. Davis and Kahn, "International Trade Used Vehicles," 59.

175. Davis and Kahn, "International Trade Used Vehicles," 60.

reduction of air pollution, the spirit of collaboration is more tense and ambiguous at the state level as displayed in the EPA and TCEQ dispute for ozone attainment status in El Paso.

### *Nonattainment Status Disputes*

The attainment status designation for El Paso has been a contested topic following the revised 2015 NAAQS for ozone to 0.070 ppm. Following the updated ozone standard, the EPA designated El Paso to be in attainment effective August 2018.[176] However, the city of Sunland Park, NM and environmental organizations challenged in court the EPA's attainment designation for El Paso.[177] In 2020, the D.C. Circuit Court of Appeals issued a recommendation for the EPA to revoke El Paso's attainment designation and required the EPA to issue a new designation for El Paso.[178] Following this recommendation, a series of correspondence documented the exchange between the TCEQ and EPA where TCEQ requested the EPA keep El Paso's attainment designation and the EPA responded with a letter notifying Texas governor Greg Abbott of the intention to modify El Paso's designation to nonattainment for ozone.[179] The letter not only notified Abbott of the intention to designate El Paso as nonattainment, but also informed the decision to merge El Paso into the existing Sunland Park nonattainment area.[180]

TCEQ responded with a request the EPA not modify El Paso's attainment designation citing El Paso does not contribute to nonattainment in New Mexico and citing most ozone

176. Environmental Protection Agency, "Additional Air Quality Designations for the 2015 Ozone National Ambient Air Quality Standards." *Federal Register* 83, no. 107 (June 4, 2018): 25832, https://www.govinfo.gov/content/pkg/FR-2018-06-04/pdf/2018-11838.pdf.

177. Texas Commission on Environmental Quality, "El Paso: Current Attainment Status."

178. Texas Commission on Environmental Quality, "El Paso: Current Attainment Status."

179. Texas Commission on Environmental Quality, "El Paso: Current Attainment Status."

180. David W. Gray to Governor Abbott, May 25, 2021, *EPA El Paso 120 Day Letter*, Texas Commission on Environmental Quality, https://www.tceq.texas.gov/downloads/air-quality/sip/ozone/designations/naaqs-2015/tx-120-day-letter_05-25-2021-signed.pdf.

emissions in the area come from Ciudad Juarez.[181] The dispute over El Paso's ozone attainment status exemplifies a rhetoric of blame where blaming Ciudad Juarez for nonattainment does little to advance collaborative environmental governance efforts in the EPJ region. The following excerpt from TCEQ's letter to EPA's Region 6 Administrator highlights part of the argument TCEQ made for why El Paso should not be designated nonattainment:

> As discussed in this section regarding the analysis for the five factors the EPA considers relevant for determining boundaries for nonattainment areas, regional air quality is being impacted by emissions from Mexico. Additionally, without contribution from Mexico, it is unclear whether there would be any area "nearby to El Paso County that does not meet the relevant NAAQS," making a contribution analysis as to El Paso County improper and beyond the EPA's statutory authority.[182]

TCEQ not only stated regional air quality is impacted by Ciudad Juarez, but went further to claim that without contributions from Ciudad Juarez it is unclear whether El Paso and surrounding regions would be in nonattainment for ozone.

By directly blaming Ciudad Juarez for El Paso's proposed nonattainment designation, TCEQ fails to acknowledge El Paso's role in contributing to ozone emissions in the EPJ region. TCEQ attributed most on-road mobile source emissions to the more than 12 million passenger cars, trucks, buses, and trains that crossed from Ciudad Juarez into El Paso, citing vehicles from Mexico contribute to the total vehicle miles traveled (VMT) in El Paso.[183] However, TCEQ did not mention that these 12 million cars, trucks, buses, and trains also account for the El Paso residents who conduct cross-border trips for work, education, shopping, medical care, and to visit

181. Jon Niermann to Acting Administrator Gray, July 26, 2021, *Texas 120-Day Response*, Texas Commission on Environmental Quality, https://www.tceq.texas.gov/downloads/air-quality/sip/ozone/designations/naaqs-2015/elp_2015ozonedesignation_120-day_response-to-epa_07262021.pdf. July 26, 2021.

182. Niermann, letter.

183. Niermann, letter.

friends and family.[184] While TCEQ does not have jurisdiction over the VMT of Ciudad Juarez vehicles in El Paso, it should acknowledge El Paso's contributions to Ciudad Juarez ozone emissions from the VMT of El Paso vehicles in Ciudad Juarez. Moreover, TCEQ did not account for the increased ozone emissions at international ports of entry that are linked to increased border wait times. These increased border wait times present themselves at El Paso's side of the border and are a direct result of increased border security following 9/11.[185] TCEQ claimed El Paso would be in attainment were it not for Ciudad Juarez's emissions, yet it did not account for the intertwined nature of the border cities where residents cross back and forth the U.S.-Mexico border and the U.S. side of the border has stringent border security measures.

In November 2021 the EPA published their final decision where they designated El Paso marginal nonattainment and incorporated it into the El Paso-Las Cruces, Texas-New Mexico nonattainment area.[186] Since El Paso was classified nonattainment after Las Cruces, TCEQ had an extended deadline of December 30, 2022 to submit a State Implementation Plan (SIP) that would address El Paso's marginal nonattainment status.[187] Nonetheless, the dispute over El Paso's attainment status continues as TCEQ pushes for the consideration of international emissions in the determination of El Paso's status. The EPA found the El Paso-Las Cruces nonattainment area was not in attainment for the 2015 ozone NAAQS by the attainment deadline of August 2021.[188] When

184. Vargas et al., "Exploration Cross-Border Trip." 4.

185. Quintana et al., "Risky Borders," 289.

186. Texas Commission on Environmental Quality, "El Paso: Current Attainment Status."

187. Environmental Protection Agency, "Additional Revised Air Quality Designations for the 2015 Ozone National Ambient Air Quality Standards: El Paso County, Texas and Weld County, Colorado," *Federal Register* 86, no. 227 (November 30, 2021): 67870, https://www.govinfo.gov/content/pkg/FR-2021-11-30/pdf/2021-25451.pdf.

188. Environmental Protection Agency, "Determination of Attainment by the Attainment Date But For International Emissions for the 2015 Ozone National Ambient Air Quality Standard; El Paso-Las Cruces, Texas-New Mexico," *Federal Register* 88, no. 44 (March 7, 2023): 14096, https://www.govinfo.gov/content/pkg/FR-2023-03-07/pdf/2023-04634.pdf.

an area in marginal nonattainment does not meet attainment by the established deadline, the law dictates the area must be reclassified to moderate nonattainment and becomes subject to stricter standards.[189] However, the EPA proposes the El Paso-Las Cruces nonattainment area would have achieved attainment had it not been for international emissions from Ciudad Juarez. Citing evidence from TCEQ's ambient monitoring stations sited along the EPJ border and collaborative efforts underway, such as Border 2025, the EPA proposes to designate the El Paso-Las Cruces area as "attainment but for international emissions".[190] The EPA cites federal collaborative efforts that will reduce ozone emissions, such as Border 2025. However, the Texas Border 2025 Action Plan did not include any actions to meet the objectives of reducing vehicle emissions in the EPJ region. If the EPA makes the final decision to approve the proposed update, the El Paso-Las Cruces area would remain as marginal nonattainment rather than being reclassified into moderate nonattainment.[191] The EPA's final decision on El Paso's ozone attainment status is expected after May 8, 2023 when the extended period for public commentary closes.[192]

TCEQ's present efforts to reclassify El Paso as an attainment area base themselves on placing responsibility for most ozone emissions on Ciudad Juarez. The rhetoric of blame on Ciudad Juarez does little to advance collaborative environmental governance efforts in the EPJ region. By blaming Ciudad Juarez for El Paso's nonattainment status, TCEQ is not addressing the main problem, ozone pollution in the EPJ region, but rather it is looking for where to shift the responsibility for the problem. Moreover, if ozone emissions in ambient monitoring stations along the EPJ border are in nonattainment, those emissions already impact El Paso communities because

189. Environmental Protection Agency, "Determination of Attainment," 14096.

190. Environmental Protection Agency, "Determination of Attainment," 14096.

191. Environmental Protection Agency, "Determination of Attainment," 14103.

192. Environmental Protection Agency, "Determination of Attainment," 14095.

both border cities share an airshed. Rather than using data from ambient monitoring stations to prove why Ciudad Juarez is responsible for most ozone emissions, TCEQ should collaborate with city and state authorities in Ciudad Juarez to address the reduction of ozone emissions. While TCEQ argues why Ciudad Juarez is responsible for most ozone emissions, EPJ residents continue being exposed to harmful levels of ozone emissions that are above the threshold for the NAAQS.

Although air pollution has taken a primary role among environmental issues in the U.S.-Mexico border, bilateral environmental governance efforts that prioritize the health and safety of EPJ residents need to be increased. Border 2025 represents a collaborative framework to reduce air pollution at the federal level, however, each EPA region has the autonomy to decide what actions it wants to implement to achieve the objectives under air pollution reduction. The 2023 Action Plan for the EPJ region listed a series of actions to reduce air pollution, yet it did not include any actions to reduce emissions from used vehicles, a prominent polluter in Ciudad Juarez, nor did it include actions to increase governmental information exchanges. Collaborations at the state level are even more ambiguous and limited when state level institutions argue over which side of the EPJ border is to blame for ozone emissions rather than identifying opportunities for collaboration. While the EPA and the TCEQ dispute El Paso's attainment status, residents along both sides of the border continue being exposed to ozone emissions above the threshold level for the NAAQS. The existence of the U.S.-Mexico border places an additional layer on the status of the air quality of the EPJ region as federal and state governmental institutions located away from the EPJ border dictate decisions on the future and wellbeing of border communities. To account for the health and safety of border communities, a transnational response that increases existing environmental governance efforts, eliminates the rhetoric of blame, and includes border communities in decision-making processes, is needed. Border communities are disproportionately impacted by air pollution

in the EPJ region, hence it's important to listen to the experiences of EPJ residents and include them in more decision-making processes.

## Chapter 3: Envisioning a Transnational Environmental Justice Network

> *Even as borders form the basis for unequal power, they define the spaces where we may recognize our ever more evident commonalities…And of the efforts to redefine living conditions under neoliberalism, border environmental justice movements are among the most experimental and instructive.*
>
> *- Joe Bandy, Reterritorializing Borders, 1997*

Although communities in the EPJ region are separated by the U.S.-Mexico border, they share one commonality among many, the negative impacts of the stateless agent. Border communities along the EPJ region represent some of the most marginalized communities in the U.S. and Mexico. In the context of the U.S., El Paso represents a city with a Latine, low-income, and linguistically isolated population higher than the national average.[193] In the context of Mexico, Ciudad Juarez represents a city with one of the highest vulnerable migrant populations and median household monthly incomes lower than the national average.[194] These demographic factors combine to create an EPJ border community rendered marginal in both the U.S. and Mexico, making it more vulnerable to the multiple environmental injustices the EPJ region is exposed to. EPJ communities bear a disproportionate burden for the increased border security and benefits of free trade along the U.S.-Mexico border. While U.S. and Mexico residents benefit from the increased flow of goods along the border, EPJ residents bear with the negative externalities of increased air pollution stemming from the maquiladora industry, traffic at international border POE, and higher indices of used vehicles.[195] These series of environmental injustices combine to

193. Environmental Protection Agency, "Determination of Attainment," 14102.

194. Grineski et al., "No Safe Place," 2245.

195. Grineski et al., "No Safe Place," 2242; Bandy, "Reterritorializing Borders," 87; Staudt and Coronado, *Fronteras No Más*, 67; Davis and Kahn, "International Trade Used Vehicles," 60.

negatively impact EPJ communities in multiple ways, including the health and safety of EPJ residents.

Multiple studies show that increased ozone and particulate matter pollution in the EPJ region have led to higher indices of asthma and other respiratory illnesses in El Paso[196] and Ciudad Juarez residents[197]. A prominent theme in the environmental justice movement, the negative impacts of air pollution are not equally felt by all community members, but rather specific segments of the population are highly vulnerable. Such is the case in the EPJ region, where although all EPJ residents are exposed to unsafe levels of air pollution, sensitive groups such as children, the elderly, and those with asthma are disproportionately impacted. Moreover, social factors such as living in a female-headed household, living in an older household, living in an area with higher indices of poverty, and not having access to health insurance coverage, have been found to make children in the EPJ region more susceptible to the negative health effects of air pollution.[198] These negative health effects can have a long-term impact on the academic success and future of EPJ school children given higher levels of air pollution have been linked with lower grade point averages among elementary school children in the region.[199] Although separated by the U.S.-Mexico border, Ciudad Juarez and El Paso communities share one airshed, hence the constant flow of air pollutants across the border constitutes not an El Paso problem or a Ciudad Juárez problem, but an EPJ transboundary air pollution problem in which communities along both

196. Grineski et al., "Environmental Health Injustice," 41.

197. Leticia Hernández-Cadena et al., "Relación entre consultas a urgencias por enfermedad respiratoria y contaminación atmosférica en Ciudad Juárez, Chihuahua," *Salud Pública de México* 42, no. 4 (July 2000): 294, SciELO.

198. Grineski et al., "Environmental Health Injustice," 41.

199. Stephanie Clark-Reyna et al., "Residential Exposure to Air Toxics is Linked to Lower Grade Point Averages among School Children in El Paso, Texas, USA," *Population and Environment* 37, no. 3 (2016): 336, doi:https://doi.org/10.1007/s11111-015-0241-8.

sides of the border are disproportionately impacted by a plethora of environmental injustices. These collective environmental injustices open up the opportunity to implement what scholar Joe Bandy calls "transnational cultures of solidarity".[200] Through an approach that emphasizes a transnational culture of solidarity, existing organizations addressing air pollution in the EPJ border would collaborate to address a broader transboundary air pollution problem.

### *Transnational Networks*

Transnational networks addressing environmental issues in the U.S.-Mexico border have emerged before, particularly centered on the opposition to the anticipated environmental degradation from NAFTA. These environmental U.S.-Mexico transnational networks emerged along the border states of California, Arizona, New Mexico, and Texas, and resulted in the creation of networks such as the Arizona Border Ecology Project, the Alianza Binacional Ecologista del Bravo[201], and the Southwest Network for Environmental and Economic Justice.[202] Specific to the EPJ region, the Alianza Binacional Ecologista del Bravo, integrated by the Consejo Ecologico de Ciudad Juarez[203], the Grupo Sierra Blanca[204] and the Alert Citizens for the Environment of New Mexico and El Paso, constituted the first transnational environmental network in the EPJ region.[205] The Alianza Binacional Ecologista del Bravo represented the first major effort in EPJ to address

200. Bandy, "Reterritorializing Borders," 91.

201. Del Bravo Binational Ecologist Alliance

202. Miriam Alfie Cohen, "Alianzas y desafíos: Grupos y redes de defensa ambientalistas en la frontera México —Estados Unidos," *European Review of Latin American and Caribbean Studies* 73 (October 2002): 35, https://www.jstor.org/stable/25675986.

203. Ecology Council of Ciudad Juarez

204. Sierra Blanca Group

205. Miriam Alfie Cohen, "Imágenes de ONG ambientalistas en la frontera México-Estados Unidos," *Frontera Norte* 14, no. 27 (January 2002): 18, Redalyc.

border environmental issues through the meaningful involvement of organizations, community members, and activists along both sides of the border. The transnational network addressed major problems relevant to the environmental conditions of the 1990s, such as opposition to nuclear waste sites in Sierra Blanca, the production and transportation of radioactive materials, the emergent globalization from NAFTA, and the contamination of water in the Rio Bravo.[206] Although the emergent globalization from NAFTA and water contamination are still relevant themes, there is also a need for a new transnational network that addresses transboundary air pollution, a major environmental problem in the EPJ region.

A new transnational network must address not only transboundary air pollution, but also how certain members of the population are disproportionately impacted by the multiple environmental injustices stemming from the transboundary air pollution. A transnational network that addresses transboundary air pollution in the EPJ region and the environmental injustices from such, would create a transnational environmental justice movement in the EPJ region. Moreover, a transnational network must actively work to address limitations between cross-border organization collaboration, such as differences in financing and membership.[207] Organizations in Ciudad Juarez have less access to financing and established membership databases than their El Paso counterparts, hence El Paso members of a transnational network must actively work to support their Ciudad Juarez counterparts in order to be able to address their shared concern, transboundary air pollution in the EPJA. Drawing from the framework of the Alianza Binacional Ecologista del Bravo, a transnational network that addresses transboundary air pollution must

206. "Alianza Internacional Ecologista Del Bravo AIEB," Wiser Directory, Accessed April 11, 2023, https://wiser.directory/organization/alianza-internacional-ecologista-del-bravo-aieb/.

207. Cohen, "Alianzas y desafíos," 36.

prioritize the meaningful involvement of organizations working on air pollution and related issues across both sides of the border.

### *Community Organizations in El Paso*

Several organizations addressing environmental concerns like conservation and water quality work in El Paso, of which only a couple work in the realm of air pollution. One of the most active community organizations in El Paso is Familias Unidas del Chamizal[208] which, led by mostly single mothers, organizes families in Barrio Chamizal to solve major problems the community faces.[209] The work of Familias Unidas del Chamizal represents the multiple intersections within the environmental justice movement as Latina single mothers denounce the air pollution in Barrio Chamizal that constantly impacts the health of their children and sends them to the hospital for respiratory illnesses. Located next to an international border POE, the Bridge of the Americas, Barrio Chamizal constitutes one of the poorest neighborhoods in El Paso and the U.S., where a high percentage of public housing is located and linguistic isolation rates are higher than the national average. El Paso residents of Barrio Chamizal are exposed to multiple sources of air pollution within their community. Community leader Hilda Villegas has compared the neighborhood to a "dumping ground," citing the multiple sources of air pollution within the area.[210] These sources of air pollution include the Interstate 10 Border Highway, the international POE, a

208. United Families of Chamizal Park

209. Familias Unidas del Chamizal. "Información," Facebook, https://www.facebook.com/comitedefamiliasunidas/?locale=es_LA.

210. Isa Gutierrez et al., "Like a dumping ground: Latina moms in Texas border city are fighting air pollution," *NBC News*, February 22, 2022, https://www.nbcnews.com/news/latino/-dumping-ground-latina-moms-texas-border-city-are-fighting-air-polluti-rcna16789.

bus depot, an industrial waste recycling facility and a nearby oil refinery.[211] The multiple air pollution sources and the documented asthma cases in children within the Barrio Chamizal area display an instance of environmental injustice where low-income Latino families that live directly in the U.S.-Mexico border are rendered marginal. In an interview with NBC news Hilda Villegas stated, “We struggle to feed our children, to provide a roof, and then now we’re overburdened with their health."[212] The disproportionate burden of air pollution placed on Barrio Chamizal families drives the community organizing efforts of the neighborhood.

One of the organization’s community victories included its successful participation in the court case that challenged the 2018 EPA’s designation of El Paso to be in attainment and led to the city’s reclassification into marginal nonattainment. Nonetheless, appeals from the TCEQ have fueled the ongoing dispute over El Paso’s attainment status, prompting Familias Unidas del Chamizal in collaboration with the El Paso Chapter of the Sierra Club to denounce TCEQ’s actions.[213] Familias Unidas del Chamizal advocates for the EPA to further classify El Paso as moderate ozone nonattainment given the city’s failure to reach attainment by the 2021 deadline.[214] Through community meetings and public forums, Familias Unidas del Chamizal engages Barrio Chamizal members to raise awareness on the community’s air pollution issues. In the dispute over El Paso’s attainment status, the organization held events such as drop-in hours at a local cafe where community members could receive assistance to submit their public comments to the EPA

211. Isa Gutierrez et al., “Like a dumping ground: Latina moms in Texas border city are fighting air pollution.”

212. See note 211 above.

213. Danielle Prokop, “The biggest fight yet: Environmental groups push for stricter emissions restrictions,” *El Paso Matters*, January 31, 2022, https://elpasomatters.org/2022/01/31/the-biggest-fight-yet-environmental-groups-push-for-stricter-emissions-restrictions/.

214. Prokop, “The biggest fight yet: Environmental groups push for stricter emissions restrictions.”

demanding the right to clean air.[215] Apart from drop-in hours, the organization has also attended TCEQ public hearings where members gave their testimony and denounced TCEQ for protecting polluters over the people.[216] El Paso's attainment status dispute is not the only air pollution issue of concern for Familias Unidas del Chamizal as the possible expansion of the Bridge of the Americas border POE poses an increased risk on the wellbeing of Barrio Chamizal communities.

The Bridge of the Americas POE is receiving $600 million in federal funding from President Biden's Bipartisan Infrastructure Bill.[217] While the federal funding is intended to fund infrastructure projects to reduce emissions, Familias Unidas del Chamizal opposes the funds being used to expand the Bridge of the Americas, citing the expansion will lead to higher levels of air pollution from the increased congestion of trucks crossing through the POE.[218] By expanding the Bridge of the Americas to include more crossing lanes into Barrio Chamizal, Familias Unidas del Chamizal believes the renovations will benefit trade from the maquiladora industry at the expense of the long-overdue environmental concerns of the Barrio Chamizal community.[219] The organization has mobilized the community on this issue through the creation of a press conference where the public and the press were invited to learn more about the community's opposition to the

215. Familias Unidas del Chamizal. "Clean air is a human right. Please join us this Saturday, January 7th at Cafe Mayapan at 2000 Texas Ave.," Facebook, January 4, 2023, https://www.facebook.com/comitedefamiliasunidas/?locale=es_LA.

216. Familias Unidas del Chamizal. "Familias Unidas del Chamizal and local environmental groups gave testimony at the TCEQ public hearing and told them to protect the people NOT polluters!," Facebook, July 20, 2022, https://www.facebook.com/comitedefamiliasunidas/?locale=es_LA.

217. Familias Unidas del Chamizal. "PRESS ADVISORY: FAMILIAS UNIDAS DEL CHAMIZAL DEMAND HEALTH & ENVIRONMENTAL CONCERNS PRIORITIZED FOR RENOVATION PROJECT OF EL PUENTE LIBRE," Facebook, April 3, 2023,https://www.facebook.com/comitedefamiliasunidas/?locale=es_LA.

218. Familias Unidas del Chamizal, "PRESS ADVISORY: FAMILIAS UNIDAS DEL CHAMIZAL DEMAND HEALTH & ENVIRONMENTAL CONCERNS PRIORITIZED FOR RENOVATION PROJECT OF EL PUENTE LIBRE."

219. See note 218 above.

Bridge of the Americas, also known as Puente Libre, expansion (see Figure 8). The work of Familias Unidas del Chamizal highlights efforts to address air pollution in the EPJ region from one of the most marginalized communities in El Paso. Disproportionately burdened by the multiple point source polluters in the EPJ border, it remains crucial for Familias Unidas del Chamizal to collaborate with other organizations in the area to collectively address air pollution issues in the region.


Figure 8. Familias Unidas del Chamizal flyer inviting the public to attend a press conference on the proposed Bridge of the Americas renovations. (Source: Familias Unidas del Chamizal (@comitedefamiliasunidas), "Familias Unidas del Chamizal Invite The Public To A Press Conference," Facebook, April 3, 2023, https://www.facebook.com/comitedefamiliasunidas/?locale=es_LA.)

Familias Unidas del Chamizal has collaborated with the Rio Grande chapter of the Sierra Club, covering New Mexico and El Paso, in their support for the EPA to further classify El Paso

as an area of moderate ozone nonattainment.[220] In addition to the Rio Grande chapter of the Sierra Club and Familias Unidas del Chamizal, Sunrise El Paso, the El Paso hub for the national Sunrise Movement, has been instrumental in the fight over El Paso's attainment status. The three organizations have collaborated in past efforts to denounce TCEQ's intention of blaming Ciudad Juarez for El Paso's nonattainment status.[221] Sunrise El Paso embraces an intersectional approach that seeks to address multiple facets of the climate crisis in the entire city of El Paso. Within the intersectional approaches, the organization has done work that influences air pollution levels in EPJ and other related climate concerns.

Sunrise El Paso addresses the city's climate concerns through a series of campaigns. Some of these campaigns influence air pollution levels in the city, such as the campaign to reject the construction of the Newman 6 plant.[222] El Paso Electric, the public utility company, sought to build a new fracked gas plant in the middle of Northeast El Paso.[223] Sunrise El Paso's work to reject the construction of this fracked gas plant directly influences air pollution levels in the EPJ region as the organization's work aims to prevent the construction of what would be another major polluter in EPJ. Moreover, Sunrise El Paso has actively worked to end the pollution of communities, such as Barrio Chamizal, by Marathon Oil Refinery in central El Paso.[224] A major polluter in central El Paso, Sunrise El Paso organized to submit public comments to the TCEQ urging them to reject the

220. Prokop, "The biggest fight yet: Environmental groups push for stricter emissions restrictions."

221. "TCEQ Must Stop Blaming Mexico For El Paso Air Quality," Sierra Club Lone Star Chapter, February 1, 2022, https://www.sierraclub.org/texas/blog/2022/02/tceq-must-stop-blaming-mexico-for-el-paso-air-quality.

222. "Campaigns,"Sunrise El Paso, Accessed April 10, 2023, http://sunriseelpaso.org/.

223. Sunrise El Paso, "Campaigns."

224. Sunrise El Paso, "Campaigns."

permit renewal for Marathon Oil Refinery.[225] Although not an organization solely dedicated to addressing air pollution in EPJ, Sunrise El Paso's work to address the climate crisis in El Paso highlights the intersectionalities within environmental justice movements which include the exposure of marginalized communities to multiple forms of pollution, such as air pollution.

The organizations mentioned, Familias Unidas del Chamizal, Sierra Club Rio Grande Chapter, and Sunrise El Paso, display multiple community efforts to address air pollution concerns in El Paso. As air pollution continues to be an important problem in the EPJ region, these organizations find themselves in the frontlines against major air polluters in El Paso by uplifting the voices of the communities most impacted by the pollution. Although collaboration between nongovernmental organizations and governmental institutions is important to address the air pollution problem in El Paso, such has not been the case in the city. On the contrary, partnerships between Familias Unidas del Chamizal, the Sierra Club, and Sunrise El Paso, emerged from their opposition to TCEQ's court appeals urging the EPA to keep El Paso's marginal nonattainment status for ozone. When governmental institutions tasked with protecting communities do not respond adequately, it is up to the community to mobilize and advocate for their own wellbeing. In the case of El Paso, where TCEQ opposes stricter air emission regulations for major polluters, the responsibility to address air pollution falls on the local communities, those that live in the polluted environments and must bear with the negative health repercussions of such on a daily basis. While El Paso community organizations have made numerous efforts to address air pollution in El Paso, El Paso and Ciudad Juarez share an airshed, hence the impact on air pollution levels would be maximized through cross-border collaborations with community organizations in Ciudad Juarez.

225. Sunrise El Paso, "Campaigns."

### *Community Organizations in Ciudad Juárez*

In mapping community organizations in Ciudad Juarez in 2001, Cohen found most community organizations confronted a variety of challenges which severely limited their ability to remain continuous throughout the years. Inadequate access to financing posed a major challenge for community organizations in Ciudad Juarez, limiting the organizations' ability to create websites and engage in other areas of community outreach.[226] From such limitations, community organizations in Ciudad Juarez tend to address environmental issues that directly pose a threat to the community's wellbeing. After extensive research on Facebook to identify if the organizations Cohen mapped in 2001 were still active and in efforts to find new active organizations, it was found that most community organizations in Ciudad Juarez focus on issues of water extraction, trash-clean up, protection of green spaces, and environmental education. An organization directly addressing air pollution in its community work was not found, although Juarez Limpio A.C. was identified as an organization that mentions air pollution within its deliverables.

Similar to other environmental community organizations in Ciudad Juarez, Juarez Limpio A.C. has a broad vision for its work that consists of advocating for the right to a clean and safe environment in the city.[227] Some of the organization's work revolves around partnerships with neighborhoods to clean-up trash, programs to plant trees around the city, and environmental education workshops aimed at schools.[228] Moreover, Juarez Limpio A.C. launched a new program, Amazonas Del Desierto[229], aimed at providing young women with a space to address the

226. Cohen, "Alianzas y desafíos," 36.

227. "Nuestra Misión," Juárez Limpio A.C., 2023, https://juarezlimpio.org/nosotros/.

228. Juárez Limpio A.C.,"Nuestra Misión."

229. Amazons of the Desert

intersectionality between environmental injustices and gender-based violence in their communities.[230] Although the organization does not explicitly address air pollution in its current programming, it provides a brief overview of the unsafe levels of particulate matter pollution Ciudad Juarez residents are exposed to in its 2022 Annual Report.[231] Juarez Limpio A.C. acknowledges the unsafe levels of air pollution that residents are exposed to, hence combined with adequate support from El Paso community organizations, there exists potential for Juarez Limpio A.C. to expand its programming to address air pollution issues in the community. Adequate support from El Paso community organizations to their Ciudad Juarez counterparts would assist in the expansion of cross-border collaboration efforts to address the negative health impacts of transboundary air pollution in the EPJ region.

Transboundary air pollution in EPJ poses a health risk on border communities along both sides of the border. While EPJ communities are disproportionately burdened by all the major sources of air pollution in the EPJ region, marginalized communities within EPJ are especially vulnerable to the pollution. Marginalized communities, such as those that live in poverty, do not have health insurance, and face linguistic isolation, are especially vulnerable to the environmental injustices of the region, exposing them to increasing rates of respiratory illnesses correlated with lower GPAs in schoolchildren. A transboundary air pollution problem calls for a transnational response that embraces environmental justice at its core and meets the needs of the most marginalized of its community members. Transboundary air pollution in the EPJ region calls for the establishment of a transnational environmental justice network where community organizations, such as Familias Unidas del Chamizal, the Rio Grande Chapter of the Sierra Club,

230. Juárez Limpio A.C.,"Nuestra Misión."

231. Plan Estratégico de Juarez, A.C., *Informe Medio Ambiente 2022*, (Ciudad Juarez: Juárez Limpio A.C, 2022).

Sunrise El Paso, and Juarez Limpio A.C. can work together to collectively address air pollution problems in the EPJ region. When the EPA and the TCEQ, governmental institutions tasked with addressing air pollution in EPJ, fail to protect the air quality of EPJ residents, it is up to community organizations along both sides of the border to advocate for the wellbeing of their communities.

## Conclusions

A multidisciplinary analysis on the nature of the stateless agent along the EPJ region of the U.S.-Mexico border reveals that EPJ communities are disproportionately underserved in many ways. EPJ communities are disproportionately underserved by the ambient monitoring network that collects data on pollutant concentrations and informs attainment of criteria pollutants. Although intra-urban spatial variations in ozone levels north and south of the border are evident, most monitoring stations were found to be placed far from major pollution sources in EPJ. Moreover, EPJ communities are disproportionately underserved by the federal and state governmental institutions tasked with addressing air pollution concerns in the region. The EPA's Border 2025 program serves as a framework to address air pollution in EPJ, yet the EPJ's Action Plan was not found to list strategies on data information exchange and the reduction of vehicular ozone emissions. An ongoing dispute over El Paso's ozone attainment status was also identified, in which TCEQ has implemented a "rhetoric of blame" to place responsibility for ozone emissions on Ciudad Juarez. While community organizations in El Paso have partnered up to denounce air pollution in their communities, the state government continues advocating for a more lenient reclassification of El Paso's attainment status. The continuous marginalization of Latine border communities in EPJ by the ambient monitoring network and governmental institutions makes these communities more vulnerable to the negative health effects of transboundary air pollution in the U.S.-Mexico border. It is from such marginalization that a transnational response addressing transboundary air pollution and accounting for the wellbeing of EPJ border communities must be implemented.

Based on my findings, a transnational response to address transboundary air pollution in EPJ is complex and involves multiple stakeholders. In this response, I call to implement a bilateral

ambient monitoring network where EPJ residents can access air data on one platform, develop an AQI tool for Ciudad Juarez communities, and increase the quantity of ambient monitoring stations near major pollution sources. For governmental institutions, it also calls to increase meaningful collaboration between TCEQ and Ciudad Juarez authorities, prioritize the adequate use of resources to address air pollution, eliminate the "rhetoric of blame" from TCEQ's part, and meaningfully include border communities in decision making processes. For border communities, in this transnational response I call for the implementation of a transnational environmental justice network devoted to cross-border air pollution concerns and increased support from El Paso community organizations to assist their Ciudad Juarez counterparts in their developmental and administrative needs. A transnational response that implements said actions in the EPJ border would account for the wellbeing of EPJ residents that have historically been disproportionately burdened by the major pollution sources placed in their communities.

Because environmental issues are often interconnected with issues of social justice, economics, and politics, a multidisciplinary approach was taken to develop a holistic perspective of transboundary air pollution issues in the EPJ region. As was expected, the U.S.-Mexico border plays an important role in the transboundary air pollution problem in EPJ. The presence of the border permeates into everyday activities and institutions along EPJ, requiring familiarity with the ways of knowing of two countries in order to address air pollution concerns in EPJ. Several other cities in the U.S. and Mexico face air pollution problems like El Paso and Ciudad Juarez, however, the presence of the border in the EPJ region complicates this air pollution issue. The U.S.-Mexico border in the EPJ region requires cross-collaboration efforts and analysis of two communities bound to different governmental institutions and ways of being.

This analysis focused on transboundary air pollution as it pertains to major pollution sources like maquiladoras, vehicles, international border POE, and oil refineries. However, to better understand the contributions of all pollutant sources in the EPJ region, future studies could address the role of brick kilns, unpaved roads, and fracking in the Permian Basin in contributing to transboundary air pollution in the EPJ region. Nonetheless, this research contributes to scholarship through the implementation of a multidisciplinary and binational approach to transboundary air pollution issues in the EPJ region. While most studies addressing air pollution concerns in the EPJ region focus on either El Paso or Ciudad Juárez, this research focuses on air pollution issues faced by communities along both sides of the border. Due to the presence of the U.S.-Mexico border, the EPJ region shares similar experiences with other U.S.-Mexico border regions, such as Tijuana-San Diego and Mexicali-Calexico. These similarities include large clusters of maquiladoras and air pollution from international border POE, hence findings from this research could also be relevant to other regions along the U.S.-Mexico border.

The EPJ region represents a binational community that has long been rendered marginal by federal and state authorities. Disproportionately burdened by the proximity of major pollution sources, the Latine border communities in EPJ deal with the negative health implications of what constitutes living on the border. While federal and state institutions located away from EPJ debate the state of transboundary air pollution issues in the area, it is the border communities located in the region that bear all the disproportionate impacts. Borders represent man-made concepts of division, power, and conquest, and the U.S.-Mexico border is no different. Transboundary air pollution is not the first problem and will not be the last problem faced by EPJ residents, a community that has dealt with border militarization, terrorism, violence, and femicides. However,

EPJ residents have united before to address these issues and they will do the same to protect the health and wellbeing of border communities.

## Bibliography

AirNow. *About AirNow*. Accessed April 1, 2023. https://www.airnow.gov/about-airnow/.

AirNow. *About the Data*. Accessed April 1, 2023. https://www.airnow.gov/about-the-data/.

American Lung Association. "El Paso-Las Cruces, TX-NM." State of the Air. 2023. https://www.lung.org/research/sota/city-rankings/msas/el-paso-las-cruces-tx-nm#ozone.

Applegate, Howard G. *Environmental Problems of the Borderlands.* The University of Texas at El Paso: Texas Western Press, 1979.

Bandy, Joe. "Reterritorializing Borders: Transnational Environmental Justice Movements on the U.S./Mexico Border." *Race, Gender & Class* 5, no. 1 (1997): 80–103. http://www.jstor.org/stable/41674850.

Blackman, Allen, Michael Batz, and David Evans. "Maquiladoras, Air Pollution, and Human Health in Ciudad Juarez and El Paso." *Resources For The Future* (2004): 1-22. AgEcon Search.

Borrayo, Leslie. "Ciudad Juárez no cuenta con la tecnología para medir el aire contaminado." *Borderzine: Reporting Across Fronteras* (El Paso, TX), November 10, 2016. https://borderzine.com/2016/11/ciudad-jurez-no-cuenta-con-la-tecnologia-para-medir-el-aire-contaminado/.

Clark-Reyna, Stephanie, Sara E. Grineski, and Timothy W. Collins. "Residential Exposure to Air Toxics is Linked to Lower Grade Point Averages among School Children in El Paso, Texas, USA." *Population and Environment* 37, no. 3 (2016): 319-340. doi:https://doi.org/10.1007/s11111-015-0241-8.

Cohen, Miriam Alfie. "Imágenes de ONG ambientalistas en la frontera México-Estados Unidos." *Frontera Norte* 14, no. 27 (January 2002): 83-122. Redalyc.

Cohen, Miriam Alfie. "Alianzas y desafíos: Grupos y redes de defensa ambientalistas en la frontera México —Estados Unidos." *European Review of Latin American and Caribbean Studies* 73 (October 2002): 23-42. https://www.jstor.org/stable/25675986.

Coronado, Irasema, and Stephen Mumme. "Environmental Governance at the U.S.-Mexico Border: Institutions at Risk." In *Binational Commons: Institutional Development and Governance on the U.S.-Mexico Border*, edited by Tony Payan and Pamela L. Cruz, 159–90. University of Arizona Press, 2020. https://doi.org/10.2307/j.ctv16b77c6.10.

Davis, Lucas W., and Matthew E. Kahn. "International Trade in Used Vehicles: The Environmental Consequences of NAFTA." *American Economic Journal: Economic Policy* 2, no. 4 (November 2010): 58-82. JSTOR.

Eades, Lauren. “Air Pollution at the U.S.-Mexico Border: Strengthening the Framework for Bilateral Cooperation.” *Journal of Public and International Affairs* (2018): 64-79. Jpia.princeton.edu.

Environmental Protection Agency. “Additional Air Quality Designations for the 2015 Ozone National Ambient Air Quality Standards.” *Federal Register* 83, no. 107 (June 4, 2018): 25776-25848. https://www.govinfo.gov/content/pkg/FR-2018-06-04/pdf/2018-11838.pdf.

Environmental Protection Agency. “Additional Revised Air Quality Designations for the 2015 Ozone National Ambient Air Quality Standards: El Paso County, Texas and Weld County, Colorado.” *Federal Register* 86, no. 227 (November 30, 2021): 67864-67874. https://www.govinfo.gov/content/pkg/FR-2021-11-30/pdf/2021-25451.pdf.

Environmental Protection Agency. “Determination of Attainment by the Attainment Date But For International Emissions for the 2015 Ozone National Ambient Air Quality Standard; El Paso-Las Cruces, Texas-New Mexico.” *Federal Register* 88, no. 44 (March 7, 2023): 14095-14104. https://www.govinfo.gov/content/pkg/FR-2023-03-07/pdf/2023-04634.pdf.

Familias Unidas del Chamizal. “Información.” Facebook. https://www.facebook.com/comitedefamiliasunidas/?locale=es_LA.

Familias Unidas del Chamizal. “Familias Unidas del Chamizal and local environmental groups gave testimony at the TCEQ public hearing and told them to protect the people NOT polluters!” Facebook, July 20, 2022. https://www.facebook.com/comitedefamiliasunidas/?locale=es_LA.

Familias Unidas del Chamizal. “Clean air is a human right. Please join us this Saturday, January 7th at Cafe Mayapan at 2000 Texas Ave.” Facebook, January 4, 2023. https://www.facebook.com/comitedefamiliasunidas/?locale=es_LA.

Familias Unidas del Chamizal. “PRESS ADVISORY: FAMILIAS UNIDAS DEL CHAMIZAL DEMAND HEALTH & ENVIRONMENTAL CONCERNS PRIORITIZED FOR RENOVATION PROJECT OF EL PUENTE LIBRE.” Facebook, April 3, 2023. https://www.facebook.com/comitedefamiliasunidas/?locale=es_LA.

Gallagher, Kevin P. *Free Trade and the Environment: Mexico, NAFTA, and Beyond.* Stanford: Stanford University Press, 2004.

Gamboa, Paola. “Actualizan el sistema para monitoreo del aire en Juárez.” *El Heraldo De Juárez,* November 20, 2019. https://www.elheraldodejuarez.com.mx/local/actualizan-el-sistema-para-monitoreo-del-aire-en-juarez-4478333.html.

Gamper-Rabindran, Shanti. “NAFTA and the Environment: What Can the Data Tell Us?” In *Economic Development and Cultural Change,* 605-633. Chicago: The University of Chicago, 2006.

Gladstone, Fiona, Diana Liverman, Roberto Alejandro Sanchez Rodriguez, and Aaron Eduardo Morales Santos. “NAFTA and environment after 25 years: A retrospective analysis of the US-Mexico border.” *Environmental Science and Policy* 119 (2021): 18-33. https://doi.org/10.1016/j.envsci.2020.10.017.

Gobierno De México. *Normas Oficiales Mexicanas (NOM) de Calidad del Aire Ambiente*. December 31, 2017. https://www.gob.mx/cofepris/acciones-y-programas/4-normas-oficiales-mexicanas-nom-de-calidad-del-aire-ambiente.

Gobierno De México. “Population And Housing.” Data Mexico. 2023. https://datamexico.org/en/profile/geo/juarez-8037#population-and-housing.

Gobierno Municipal de Ciudad Juárez. *Red de Monitoreo Atmosférico de Juárez: Datos IMECAS PM-10*. Accessed March 31, 2023. https://www.juarez.gob.mx/calidad-del-aire/.

Gray, David W.. *EPA El Paso 120 Day Letter*. Texas Commission on Environmental Quality. https://www.tceq.texas.gov/downloads/air-quality/sip/ozone/designations/naaqs-2015/tx-120-day-letter_05-25-2021-signed.pdf. May 25, 2021.

Grineski, Sara E., Timothy W. Collins, Maria de Lourdes Romo Aguilar, and Raed Aldouri. “No Safe Place: Environmental Hazards and Injustice along Mexico’s Northern Border.” *Social Forces* 88, no. 5 (2010): 2241-2265. http://www.jstor.org/stable/40927545.

Grineski, Sara E., Timothy W. Collins, Jayajit Chakraborty, and Yolanda J. McDonald. “Environmental Health Injustice: Exposure to Air Toxics and Children’s Respiratory Hospital Admissions in El Paso, Texas.” *The Professional Geographer* 65, no. 1 (2013): 31-46. DOI: 10.1080/00330124.2011.639625.

Gutierrez, Isa, Jackie Montalvo, Carlos P. Beltran, and Albinson Linares. “Like a dumping ground: Latina moms in Texas border city are fighting air pollution.” *NBC News*, February 22, 2022. https://www.nbcnews.com/news/latino/-dumping-ground-latina-moms-texas-border-city-are-fighting-air-polluti-rcna16789.

Hernandez-Cadena, Leticia, Martha Ma. Tellez-Rojo, Luz Helena Sanin-Aguirre, Marina Lacasaña-Navarro, Armando Campos, and Isabelle Romieu. “Relación entre consultas a urgencias por enfermedad respiratoria y contaminación atmosférica en Ciudad Juárez, Chihuahua.” *Salud Pública de México* 42, no. 4 (July 2000): 288-297. SciELO.

Instituto Nacional de Ecología y Cambio Climático. *Informe Nacional de la Calidad del Aire 2020*. Ciudad de México: INECC, 2022.

Juárez Limpio A.C..“Informe Medio Ambiente 2022.” Plan Estratégico de Juárez, A.C.. 2022. https://juarezlimpio.org/wp-content/uploads/2023/01/Informe-Medio-Ambiente.pdf.

Juárez Limpio A.C.. “Nuestra Misión.” 2023. https://juarezlimpio.org/nosotros/.

Karle, Nakul N., Suhail Mahmud, Ricardo K. Sakai, Rosa M. Fitzgerald, Vernon R. Morris, and William R. Stockwell. “Investigation of the Successive Ozone Episodes in the El Paso-Juarez Region in the Summer of 2017.” *Atmosphere* 11, no. 532 (2020): 1-24. https://doi:10.3390/atmos11050532.

Karle, Nakul N., Rosa M. Fitzgerald, Ricardo K. Sakai, David W. Sullivan, and William R. Stockwell. “Multi-Scale Atmospheric Emissions, Circulation and Meteorological Drivers of Ozone Episodes in El Paso-Juarez Airshed.” *Atmosphere* 12, no. 1575 (2021): 1-20. https://doi.org/10.3390/atmos12121575.

Karner, Alex A., Douglas S. Eisinger, and Deb A. Niemeier. “Near-Roadway Air Quality: Synthesizing the Findings from Real-World Data.” *Environmental Science and Technology* 44, no. 14 (2010): 5334-44. https://doi.org/10.1021/es100008x.

Korc, Marcelo E., and Rodolfo Saenz. “Monitoreo de la Calidad del Aire en América Latina.” *Publications CEPIS* (1999): 1-20. https://iris.paho.org/handle/10665.2/55453.

Kratch, Kellye. “U.S.-Mexican Improvement Project to Promote Sustainable Development.” *Water Environment and Technology*, September 1996. JSTOR.

Mueller, Stephen. “Mapping Blindspots in Urban Atmospheric Pollution Assessment in the U.S.-Mexico Borderland.” *ARCC/EAAE 2022 Conference: Resilient Cities [Conference Proceedings]* (2022): 1-10. Researchgate.net.

Mumme, Stephen P., and Kimberly Collins. “The La Paz Agreement 30 Years On.” *The Journal of Environment and Development* 23, no. 3 (September 2014): 303-330. https://www.jstor.org/stable/10.2307/26197933.

Niermann, Jon. *Texas 120-Day Response.* Texas Commission on Environmental Quality. https://www.tceq.texas.gov/downloads/air-quality/sip/ozone/designations/naaqs-2015/elp_2015ozonedesignation_120-day_response-to-epa_07262021.pdf. July 26, 2021.

North American Development Bank. “Border 2025: U.S. Mexico Border Program.” Our Projects. Accessed April 9, 2023. https://www.nadb.org/our-projects/border-2025-projects.

Obee, Anne J., Ernst C. Griffin, and Richard D. Wright. “Using a GIS to Overcome Data Adversity: Industrial Air Pollution Risk Modeling in Tijuana, Mexico.” *Photogrammetric Engineering & Remote Sensing* 64, no. 11 (November, 1998): 1089-1096.

Parsons, Cameron. “NAFTA and the Environment in Mexico.” Modern Latin America: web supplement for 8th Edition. Brown University Library. Accessed March 9, 2023. https://library.brown.edu/create/modernlatinamerica/chapters/chapter-12-strategies-for-economic-developmen/nafta-free-trade-and-the-environment-in-mexico/.

Populationstat. “Ciudad Juárez, Mexico Population (2023).” 2023. https://populationstat.com/mexico/ciudad-juarez.

Populationstat. “El Paso, United States Population (2023).” 2023. https://populationstat.com/united-states/el-paso.

Prado, Carolina. “Community Participation and Recognition Justice in Border Environmental Governance.” *Journal of Borderlands Studies* 37, no. 2 (2022): 359-377. DOI: 10.1080/08865655.2020.1774407.

Prokop, Danielle. “The biggest fight yet: Environmental groups push for stricter emissions restrictions.” *El Paso Matters*, January 31, 2022. https://elpasomatters.org/2022/01/31/the-biggest-fight-yet-environmental-groups-push-for-stricter-emissions-restrictions/.

PuenteLibre.mx. “Así será la línea para cruzar a El Paso por el Santa Fe.” November 7, 2021. http://puentelibre.mx/noticia/asi_sera_la_linea_para_cruzar_a_el_paso_por_el_santa_fe_ciudad_juarez/.

Quintana, Penelope J.E., Jill J. Dumbauld, Lynelle Garnica, M. Zohir Chowdhury, Jose Velascosoltero, Arturo Mota-Raigoza, David Flores, Edgar Rodriguez, Nicolas Panagon, Jamison Gamble, Travis Irby, Cuong Tran, John Elder, Vanessa E. Galaviz, Lisa Hoffman, Miguel Zavala, and Luisa T. Molina. “Traffic-related air pollution in the community of San Ysidro, CA, in relation to northbound vehicle wait times at the US-Mexico border Port of Entry.” *Atmospheric Environment* 88 (2014): 353-361. http://dx.doi.org/10.1016/j.atmosenv.2014.01.009.

Quintana, Penelope J.E., Paul Ganster, Paula E. Stigler Granados, Gabriela Muñoz-Meléndez, Margarito Quintero-Núñez, and José Guillermo Rodríguez-Ventura. “Risky Borders: Traffic Pollution and Health Effects at US-Mexican Ports of Entry.” *Journal of Borderlands Studies* 30, no. 3 (2015): 287-307. https://doi.org/10.1080/08865655.2015.1066697.

Raaschou-Nielsen, Ole, Zorana Jovanovic Andersen, Martin Hvidberg, Steen Solvang Jensen, Matthias Ketzel, Mette Sørensen, Steffen Loft, Kim Overvad, and Anne Tjønneland. “Lung cancer incidence and long-term exposure to air pollution from traffic.” *Environmental Health Perspectives* 119, no. 6 (2011): 860-865. doi:10.1289/ehp.1002353.

Raysoni, Amit U., Jeremy A. Sarnat, Stefanie Ebelt Sarnat, Jose Humberto Garcia, Fernando Holguin, Silvia Flores Luevano, and Wen-Whai Li. “Binational school-based monitoring of traffic-related air pollutants in El Paso, Texas (USA) and Ciudad Juarez, Chihuahua (Mexico).” *Environmental Pollution* 159, (2011): 2476-2486. doi:10.1016/j.envpol.2011.06.024.

Roberts, J. Timmons. “Globalizing Environmental Justice.” In *Environmental Justice and Environmentalism: The Social Justice Challenge to the Environmental Movement*, edited by Ronald Sandler and Phaedra C. Pezzullo, 285-307. Cambridge: MIT Press, 2007.

Schwartz, Scott M. “The Border Industrialization Program of Mexico.” *Southwest Journal of Business and Economics* 4, no. 4 (Summer, 1987): 1-51. ProQuest.
Sierra Club Lone Star Chapter. “TCEQ Must Stop Blaming Mexico For El Paso Air Quality.” February 1, 2022. https://www.sierraclub.org/texas/blog/2022/02/tceq-must-stop-blaming-mexico-for-el-paso-air-quality.

SINAICA. *Datos Crudos Estación Advance*. Accessed April 7, 2023. https://sinaica.inecc.gob.mx.

Sistema Nacional de Información de la Calidad del Aire. *Estación: Advance (ADV)*. 2023. https://sinaica.inecc.gob.mx/.

Sistema Nacional de Información de la Calidad del Aire. *Red de monitoreo: Municipio de Juárez (CJU)*. 2023. https://sinaica.inecc.gob.mx/.

Sowards, Stacey K. “Environmental Justice in International Contexts: Understanding Intersections for Social Justice in the Twenty-First Century.” *Environmental Communication: A Journal of Nature and Culture* 6, no. 3 (2012): 285-289. https://doi.org/10.1080/17524032.2012.700205.

Staudt, Kathleen, and Irasema Coronado. *Fronteras No Mas: Toward Social Justice at the US Mexican Border*. New York: Palgrave Macmillan, 2002.

Sunrise El Paso. “Campaigns.” Accessed April 10, 2023. http://sunriseelpaso.org/.

Talamantes, Roberto Gonzalez. “Inauguran cuarta estación de monitoreo ambiental.” *Somos UACJ* (Ciudad Juárez, Chihuahua), February 16, 2023. https://comunica.uacj.mx/16-02-2023/32809.

Texas Commission on Environmental Quality. “El Paso: Current Attainment Status.” December 12, 2022. https://www.tceq.texas.gov/airquality/sip/elp/elp-status.

Texas Commission on Environmental Quality. “GeoTAM Map Viewer.” Accessed March 25, 2023.https://tceq.maps.arcgis.com/apps/webappviewer/index.html?id=ab6f85198bda483a997a6956a8486539.

Texas Commission on Environmental Quality. “El Paso UTEP: Monitoring Information.” Accessed April 1, 2023. https://www17.tceq.texas.gov/tamis/index.cfm?fuseaction=report.view_site&siteID=165&siteOrderBy=name&showActiveOnly=0&showActMonOnly=1&formSub=1&tab=mons.

United States Census Bureau. “QuickFacts El Paso city, Texas; United States.” 2023. https://www.census.gov/quickfacts/fact/table/elpasocitytexas,US/PST045221.

U.S. Department of State. “Statelessness.” 2023. https://www.state.gov/other-policy-issues/statelessness/.

U.S. Environmental Protection Agency. *Border 2025 Action Plan (2021-2023) Texas-New Mexico-Chihuahua Region*. March 2023. https://www.epa.gov/system/files/documents/2023-03/R6%203State%20B2025%20Action%20Plan%20English%20%28Feb%2026%202023%29%20Final.pdf.

U.S. Environmental Protection Agency Air Data. *Ozone Daily AQI Values in 2022.* Generated April 7, 2023. https://www.epa.gov/air-data.

U.S. Environmental Protection Agency. *Border 2025: United States-Mexico Environmental Program*. June 2021.

U.S. Environmental Protection Agency. *NAAQS Table*. Accessed March 25, 2023. https://www.epa.gov/criteria-air-pollutants/naaqs-table.

U.S. Environmental Protection Agency. *Outdoor Air Quality Data: Air Data - Tile Plot*. Accessed April 7, 2023. https://www.epa.gov/outdoor-air-quality-data/air-data-tile-plot.

U.S. Environmental Protection Agency. *Overview: TX-NM-CHIH Region.* Accessed April 9, 2023. https://www.epa.gov/usmexicoborder/overview-tx-nm-chih-region.

U.S. Environmental Protection Agency. “Transboundary Air Pollution.” 2023. https://www.epa.gov/international-cooperation/transboundary-air-pollution.

Vargas, Erik, Ipek N. Sener, Okan Gurbuz, David Salgado, and Rafael M. Aldrete. “Exploration of Cross-Border Trip Characteristics Using Crowdsourced Data.” *Texas Transportation Researcher* 58, no. 1 (2021): 1-62. Texas A&M Transportation Institute.

Web GIS. *El Paso-Texas Terrain Data.* Accessed April 9, 2023. http://www.webgis.com/terr_pages/TX/dem1/elpaso.html.

Wiser Directory. “Alianza Internacional Ecologista Del Bravo AIEB.” Accessed April 11, 2023. https://wiser.directory/organization/alianza-internacional-ecologista-del-bravo-aieb/.