



// INTRODUCTION //

Automation of the freight transportation sector will fundamentally transform the sprawling ports, large rail yards, millions of miles of roads, and massive warehouse complexes that make up a significant part of our built environment and economy. This transformation could also have profound effects on the millions of people who work and live most closely to the freight system.

Freight's frontline workers and area residents face many struggles.

Maria, a resident of San Bernardino, CA, works at an Amazon Fulfillment Center, a large warehouse that helps move vast quantities of goods from supplier to customer. Her work is physically demanding: often she carries boxes as heavy as 60 pounds. Sometimes she has a small team to help her, but other times she's on her own. She feels she doesn't have the option of not picking up heavy boxes, because it would hold up her line.

The intense work has meant stress and physical pain, and the risk of injury. According to Maria, management doesn't provide back support braces, gloves, or other protective gear; it's up to workers to get the support they need. Once she hurt her hip because of the job's demands, but like many of her coworkers, she decided not to report the injury. Why not?

“[W]hen people get hurt on our job they don’t get paper cuts, they don’t get headaches. When people get hurt on the docks they lose limbs or they lose lives.”

– Vivian Malauulu, ILWU Local 13 Registered Longshore Worker and Benefits Officer

“Porque no te van ayudar. Es tan común que no te ponen atención.” *[Because they won’t help you. [Injuries] are so common that they don’t pay attention to you.]*

The COVID-19 pandemic has also amplified Maria’s stress. She says management was slow in getting workers masks and other personal protective equipment. Although workers can now miss work by letting management know when they don’t feel well, there’s no paid time off. Even with the temporary extra \$2 per hour during the pandemic, people are afraid to go to work because of the virus.

Outside, diesel trucks rumble to and from the warehouse. With other warehouses, industrial and commercial facilities, a railyard and a freeway, residents of San Bernardino face intense levels of air pollution. Maria’s two daughters have asthma, as do many of her coworkers. She’s very aware of the risks. “La realidad es que hay una necesidad de trabajo y por el otro lado es lo que te está perjudicando, la salud tuya y de tu familia.” *[The reality is that there is a need to work and on the other hand the work is hurting you, your health, and your family.]*

Maria’s daughters are now 12 and 14 years old. The schools they attend are close to freeways and the railyard, so there is often a lot of truck traffic. There is also a community center and park with a daycare facility right next to the railyard. The school installed air filters in the classrooms, but students still go outside to play. There’s a truck ban by her house, but it’s not enforced. She is also a school crossing guard and has noted an increase of trucks in her neighborhood. She has participated in truck counts with a community organizer from the Center for Community Action and Environmental Justice, a nonprofit organization based in Jurupa Valley, CA, and she was shocked at the findings: “Me vine sorprendidísima que vine contándole a mi esposo y más preocupación me dio mis hijas que...tienen asma y yo tengo alergias. Pues que triste que en una hora hayamos contando más de 600 camiones por casas y escuelas.” *[I left there astonished that I came home telling my husband and I’m more worried about my daughters who...have asthma and I have allergies. It is so sad that we counted more than 600 trucks in 1 hour so close to homes and schools.]*

When Maria's older daughter was a 14 months old, she was hospitalized for 4 days because of her asthma. Now the children know how to monitor their own symptoms and can use their inhalers. Maria links their asthma to the pollution exposure in San Bernardino. She considered moving to Fresno, CA, thinking there was better air quality given the number of farms. But her research showed the air quality was just as bad there. She also looked into moving to Long Beach, CA, but its port and freight infrastructure mean the air pollution is bad in that community too.

Maria's experience is all too common. For the frontline workers and communities closest to the US freight transportation system, the hours are long, the work is hard and sometimes dangerous, the pay is often low, and the impacts are significant and inequitable.

For more than 35 years, Jorge Mayorga has driven short- and long-haul trucks both as an employee and an independent contractor. He describes the pride he takes in his work, and the struggles he has faced to make ends meet:

En los tiempos de navidad, tenía mi camión que con todo el esfuerzo había comprado verdad y si me dio satisfacción porque era una manera de cómo sobrevivir. ... [U]na semana antes de la Navidad, se me quebró el motor y tuve que reparar todo el motor. ... [P]ero el gasto, se me hizo más de lo que yo creía o de lo que me dijo el mecánico y tuve que hacer préstamos para poder arreglar el camión. Lo más triste es que llegamos el 24 en la noche cuando todo mundo está cenando—nuestra costumbre es de celebrarse el 24 y el 25—el 25 alrededor de los apartamentos ver a los niños con sus juguetes y yo no pude. No alcancé, no alcancé para darle ese regalo a la niña, no alcancé para llevar el alimento que siempre comíamos.

[During Christmas time, I had my truck that with all the effort I had bought, right, and it gave me satisfaction because it was a way to survive. ... [A] week before Christmas, my engine broke and I had to repair the whole engine. ... [B]ut the expense was more than I thought or what the mechanic told me and I had to take out loans to fix the truck. The saddest thing is that on the 24th [Christmas Eve] when everyone is having their dinner—our tradition is to celebrate the 24th and 25th—and on the 25th around the apartments you see the children playing with their toys and I couldn't. I did not have enough, I did not have enough to get a gift for my little girl, I did not have enough to buy the food we always ate.]

For longshore worker Vivian Malauulu, port work is dangerous work. “[W]hen people get hurt on our job they don't get paper cuts, they don't get headaches. When people get hurt on the docks they lose limbs or they lose lives.” She also fears what automation in two terminals at the Ports of Long Beach and Los Angeles has already done to employment:

Prior to automating, and on their busiest days...each of these terminals ordered approximately 500-800 jobs out of our Dispatch Hall. Today, on the same busiest days, these terminals will only order approximately 200 jobs, if that. That equates to a significant job loss of almost 500 jobs daily at each terminal, and 1,000 jobs daily combined at both terminals. It is important to note that in addition to these job losses, there are also much longer delays,

such as container-delivery wait times, due to constant deficiencies in technology. There are also increased accidents for the same reason. Some of these accidents have resulted in injuries to labor and independent truck drivers, as well as damage to equipment.

When asked to describe the freight system, Jesse Marquez, the founder of the Coalition for a Safe Environment based near the Ports of Los Angeles and Long Beach, summed it up as follows: “The ports and freight transportation industry have a significant negative impact on my life, that of my family, and environmental justice community.” He listed the following negative influences:

- Increased air pollution
- Increased noise
- Increased ground vibration
- Increased traffic congestion
- Increased accidents
- Increased multiple public health problems, costs
- Increased premature deaths
- Increased public safety risks
- Increased insurance costs
- Increased blight
- Property depreciation

Frontline workers and fence-line community members echo these stories across the US freight transportation infrastructure. They often work in low-paying jobs with few benefits. The neighborhoods through which freight rumbles are typically low-income communities and communities of color. The country's freight transportation delivers goods—and fosters inequities.

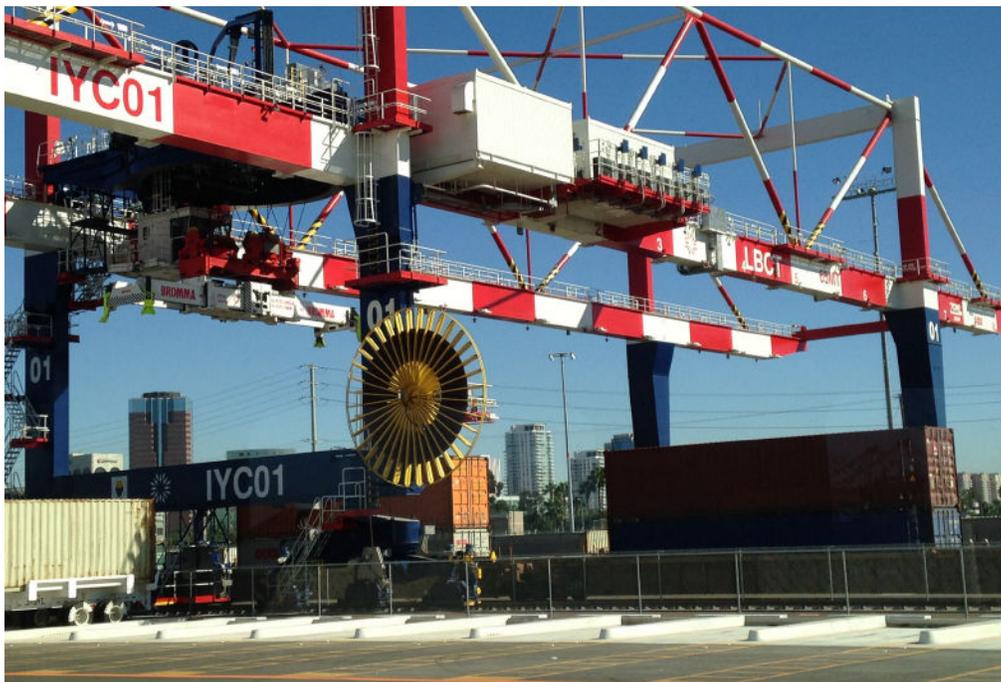
Against the backdrop of these inequitable burdens comes automation.

Just a few years ago, a fully autonomous tractor-trailer carrying Budweiser beer drove more than 100 miles on an interstate from Colorado Springs to Fort Collins, CO. While a person was in the vehicle monitoring the trip, he spent most of the time in the truck's sleeper cab and did not drive.¹ Guinness World Records later designated the milestone as “the longest continuous journey by a driverless and autonomous lorry [semitrailer truck].”²

Highway restriping and multiple test runs preceded the trip; the truck was also escorted by state troopers.^{3,4} Still, the test sponsors lauded the trip for its technological accomplishment. Anheuser-Busch Companies, the producer of Budweiser beer, said, “As we continue to partner with long-haul carriers to ship our beers, we hope to see this technology widely deployed

across our highways to improve safety for all road users and work towards a low-emissions future.”⁵ The Colorado Department of Transportation claimed the event was “[a] monumental step forward in advancing safety solutions that will help Colorado move towards zero deaths on our roads.”⁵

Although truck automation is still in its nascent stage, port automation is not. At southern California’s Ports of Los Angeles and Long Beach, one of the busiest port areas in the United States, some portions are largely human-free zones as computer-controlled equipment and vehicles hum around docks. Meanwhile, in freight warehouses adjacent to the nation’s commerce arteries, driverless forklifts move pallets, and robotic arms select items from bins for processing.



Proponents of freight sector automation describe an array of benefits, including relief for congested roads, air quality improvements for nearby communities, safer streets, and new high-paying jobs for many. Certainly such benefits are needed; a system that can deliver grapes from Chile and electronics from China currently has extremely high costs. Fence-line communities bear the brunt of the impacts of the freight sector, including noise, vibrations, pedestrian collisions, air pollution, and pollution-related health conditions like asthma, cancer, and heart disease. Employment within the freight sector, such as warehouse workers, short-haul drivers around ports, and many others, is often of low wage, with minimal benefits, and, at times, very dangerous.

Are the promises of automation real? Will improvements benefit the workers and communities that need them the most?

This report explores freight automation and the related public health and equity implications—positive and negative—for Maria, Jorge, Vivian, and Jesse (featured at the beginning of this section) and other freight workers and fence-line community members across the United States. For example, will automation-related efficiency gains lead to improved air quality? Or will pollution increase as more and more trucks jam crowded roads? Where automation leads to the reduction of jobs, will new jobs be ready and available for the same workers?

OUR FOCUS

TRUCKS, TRAINS, WAREHOUSES AND PORTS



Trucks, trains, ships, planes, and all manner of facilities—from mega-ports to a small truck stop—are each an integral part of the freight system, and automation is leaving few areas untouched. This report focuses primarily on trucks, trains, warehouses, and ports for two reasons. First, these vehicles and facilities make up a substantial portion of the freight system in the United States. Second, these are some of the components of the freight system that involve both many workers and are close to communities experiencing health burdens. Because of time and resource constraints, and guidance from the Community Advisory Committee, this report doesn't cover every aspect of automation in the freight system; for example, ships and air cargo are not included. Although examining the health and equity implications of automation in every component of the freight system isn't in the scope of this report, our hope is these can be addressed soon. ■

For years, community and environmental justice advocates, public health allies, forward-thinking policymakers, and some industry representatives have pursued a vision in which, for example, communities near the port of New York and New Jersey no longer subsidize, with their health and well-being, the cost of a cheap television sold in Colorado. This report aims to add to that larger discussion of health and equity by exploring how freight automation can contribute to a built environment that is healthy rather than harmful, and that creates economic security for the freight system workforce. By identifying automation-related issues, assessing their potential impacts, and providing policy and program recommendations, our principal objective is to shape future technology and infrastructure investments in automation that result in healthier, more equitable communities.

Conventional thinking tends to equate technological change with societal improvement. In this project, we take the view that freight automation *might* promote public health and equity. Where it does, we recommend ways to accelerate that progress. Where it doesn't, we recommend ways to prevent or mitigate problems.

In this report, we

1. Review the state of US freight automation, such as different technologies, use in different sectors, and pace of change, with an emphasis on the next 5 to 10 years
2. Examine the public health and equity implications of freight automation in the areas of air quality, workforce and economic development, traffic-related safety, and noise and vibrations
3. Provide broad policy and program recommendations to promote health and equity within freight automation

Lessons learned from the current struggle for health and equity within the freight system only reinforce the urgency of exploring these issues. Although fence-line communities have known for years about the system's negative impacts, only more recently has there been widespread understanding to fuel the political will for cleanup efforts. In the meantime, ports have expanded. Warehousing complexes have mushroomed. Truck volumes have increased. Pollution control technologies have offered only modest air quality improvements; because of the technologies' upfront investment costs, they delay the use of more effective technologies in the future. More recently, the COVID-19 pandemic has brought disruption and uncertainty into the freight transportation system. It's still very early; however, there are indications the pandemic may accelerate, rather than decelerate, freight automation.

KEY TERMS AND DEFINITIONS

Automation: Technology that augments or replaces human labor, either incrementally or fully. This includes, for example, software and artificial intelligence programs that manage vast amounts of information and driverless vehicles and robots. Automation encompasses both digital and physical approaches.

Fence-line communities: People living in immediate or close to ports, rail yards, truck routes, warehouses, and other components of the freight system. These communities are predominantly low-income communities and/or communities of color.

Freight transportation: The infrastructure—including ports, rail yards and trains, long- and short-haul trucks, warehouses, and other modes of transit—that moves physical goods across the country. Also called the goods movement system, the logistics industry, and other terms.

Frontline workers: People working most closely to the freight system's physical infrastructure. These include truck drivers, port workers, train conductors, and warehouse workers, many of whom are low-income workers and/or people of color.

Health equity: Everyone has a fair and just opportunity to be as healthy as possible. To achieve this, we must remove obstacles to health (e.g., such as poverty, discrimination, deep power imbalances) and their consequences, including lack of access to good jobs with fair pay, quality education and housing, safe environments, and health care.

Racial justice: The creation and proactive reinforcement of policies, practices, attitudes, and actions that produce equitable power, access, opportunities, treatment, and outcomes for all people, regardless of race.

Social determinants of health: The social, environmental, and economic conditions in which people live, work, and learn that affect health outcomes. ■