Automation and the Future of Dockwork at the San Pedro Bay Port Complex

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UCLA Labor Center

Contents

Executive Summary

"The story of the machine is never new and never old—it is a fact of life."[1] These prophetic words were penned 60 years ago by port-management and longshoring labor leaders, including Harry Bridges. Their joint publication announced a breakthrough agreement to introduce mechanized cargo-handling equipment at longshore terminals along the West Coast. Measured and pragmatic, the authors reframed the question of new technology as a recurring theme in industrial relations, and one that need not spell panic or despair for workers.

Over the intervening decades since that agreement, the Ports of Los Angeles and Long Beach—collectively known as the San Pedro Bay Port Complex—have grown in scale and significance to become the 10th busiest port complex in the world, responsible for more than 30% of domestic containerized imports. Yet new technology, and its impact on operations, workers, the community, and the environment, remains a hotly contested topic at the bargaining table.

Automated cargo-handling equipment—nothing short of a paradigm shift from its mechanized predecessor—was first introduced at the Port of Los Angeles in 2014. Today, three of the San Pedro Bay Port Complex's 12 terminals employ some degree of automation. The longshoring workforce and surrounding community share concerns about automation's potential to erode job quality and threaten career prospects. Nevertheless, some terminal operators appear intent on pushing forward, with a fourth terminal reportedly planning to implement automated infrastructure in the near future.

In 2020, the California Legislature passed Assembly Bill 639, which requires the California Workforce Development Board to commission the UCLA Labor Center to conduct a mixed-methods study of the potential impacts of increased automation at the San Pedro Bay Port Complex. A panel of 10 industry stakeholders drove this research, composed of two legislative appointees with backgrounds in workforce development, as well as representatives of the International Longshore and Warehouse Union (ILWU), the Pacific Maritime Association (PMA), and the Los Angeles and Long Beach Port Authorities. This panel convened six times over 18 months, and individual panelists participated in a series of in-depth interviews.

Based on our review of the existing literature, an analysis of our interview data, and expert research and testimony gathered over the course of AB 639 proceedings, we have found that:

Industry stakeholders generally agreed on issues facing the San Pedro Bay Port Complex. Increased competition for discretionary cargo, insufficient government investment, inefficiencies across other segments of the supply chain, and stringent local regulations have presented significant challenges over the past decade. In particular, the recently proposed "indirect source rule" that aims to introduce heightened emissions standards will put newfound pressures on terminal operators and the port workforce, further threatening competitiveness and sustainability.

Industry stakeholders championed a wide range of possible solutions other than automation, including increasing hours of operation, investing in inland ports, better worker-training programs, and optimizing existing infrastructure to achieve standardization across terminals. There was considerable enthusiasm for shifting a greater share of containerized cargo to on-dock rail systems, which could serve as an immediate means of both alleviating congestion and increasing cargo velocity. The planned Goods Movement Training Campus offers opportunities to update and improve worker training across the sector. Unlike automation, these solutions offer a systematic approach to maximizing port productivity and mitigating job loss.

Industry stakeholders questioned the immediate benefits of increased automation. Terminal operators and labor representatives alike expressed significant doubts about automation's presumed efficiencies. Neither their experience nor the relevant literature unequivocally demonstrates that automation is more productive, safer, or cheaper than conventional cargo-handling equipment. Globally, there remains little evidence of positive return on investment at terminals that have implemented large-scale automated infrastructure.

Industry stakeholders identified a number of potentially negative impacts of automation. There was broad consensus that automation could pose immediate safety risks for workers, lead to increased workplace surveillance and control, and produce indirect, unforeseen ripple effects across other segments of the supply chain.

Industry stakeholders feared that increased automation would adversely affect the harbor community. Increased automation may undermine one of the key engines for economic stability and upward mobility in the harbor community, effectively extracting its wealth and exporting it in the form of profits for international shipping conglomerates. Given the unique pride fostered by the local longshoring industry—often shared across generations—the prospect of job loss driven by automation has existential stakes for the community.

We conclude that automation is too narrowly conceived as a silver-bullet solution for increasing cargo-handling efficiency. The most pressing issues facing the San Pedro Bay Port Complex will require holistic solutions that address cargo flow across the entire supply chain. We offer the following recommendations:

1. **Advocate** for better alignment between local and federal regulatory frameworks.
2. **Establish** systems of feedback and evaluation driven by worker input to assess the impact of terminal automation.
3. **Increase** transparency around operational data to ensure accountability and collaboration between port stakeholders, policymakers, and researchers.
4. **Prioritize** community input to ensure that development of the Goods Movement Training Campus is aligned with community needs.
5. **Expand** opportunities for collaboration between labor, management, and the port authorities.
6. **Commission** further research into key topics identified by industry stakeholders.

Introduction

Assembly Bill 639

In 2020, AB 639 mandated the formation of a multiyear collaborative stakeholder process aimed at developing recommendations on how best to mitigate the employment impacts of automation at the Port of Los Angeles and the Port of Long Beach.[2] This bill represents the recognition by California legislators that labor and other key stakeholders from the community deserve to have their voices heard in discussions about the transition to a lower-carbon economy and the future of work in the state.

The Ports of Los Angeles and Long Beach were identified as preeminent sites for examining these issues, given the outsized role these two ports collectively play in the local and regional economies. The text of this bill outlines the procedural requirements of an associated industry panel, to be convened and facilitated by the UCLA Labor Center. The panel comprises 10 members, drawn from different port stakeholder groups, including terminal operators, labor representatives, port authority leaders, and legislative appointees.[3]

The San Pedro Bay Port Complex

Based on our review of existing scholarship and input from a range of experts, we identified three factors unique to the Ports of Los Angeles and Long Beach (together referred to as the San Pedro Bay Port Complex) as especially pertinent for assessing the potential impacts of automation on the workforce and community: the relationship between labor, management, and the surrounding community; the structure of employment for the port workforce; and the specific operational role of these ports in the circulation of goods. The following discussion will provide requisite background and context for the subsequent analysis of our findings.

ILWU, PMA, and the Harbor Community

The two ports composing the San Pedro Bay Port Complex constitute the largest maritime gateway in the nation, measured in terms of total twenty-foot equivalent unit (TEU) container throughput. Three-quarters of all West Coast TEU volume and more than 30% of all domestic containerized imports travel through the San Pedro Bay Port Complex.

Altogether, its 12 terminals encompass more than 10,000 acres and span 68 miles of the San Pedro Bay coast, connected by both highway and rail to the large Southern California market and destinations farther inland. It is a critical component in the national economic engine and is the socioeconomic keystone of the local community.

Individually, both ports rank in the top 20 globally, and when combined, they join the global top 10, handling nearly twice as much capacity per year as the next largest domestic container port complex, in New York / New Jersey. There are seven container terminals at the Port of Los Angeles and five at the Port of Long Beach, operated by international and domestic shipping companies that lease land from their respective port authorities. Many of these operators are subsidiaries of ocean carrier lines, indicating the growing trend of vertical integration in maritime operations.[4]

A single labor agreement governs all 29 ports on the US West Coast, from San Diego in the south to Bellingham in the north. This agreement is renegotiated periodically by the ILWU, the union representing dockworkers, and the PMA, a trade group representing shipping companies and terminal operators. The collective bargaining agreement covers more than 20,000 workers in 30 different ILWU locals, including longshoremen, clerks, and foremen, as well as other port workers.

ILWU-represented ports in the Pacific Northwest handle predominantly exports, including the majority of domestic grain production. The Ports of Los Angeles and Long Beach, however, are the primary hubs for imports from Asia, with a growing number of imports passing through the San Pedro Bay Port Complex. Over the past two decades, the share of imports passing through Los Angeles and Long Beach has grown by more than 20%, while total exports have declined by more than 40%.[5] Currently, the value of imports arriving at the San Pedro Bay Port Complex is more than eight times the value of exports leaving from it, with the vast majority of this imbalance occurring at the Port of Los Angeles. In 2021, 72% of containers leaving the San Pedro Bay Port Complex were empty, though these figures have historically fluctuated and will likewise be affected by future infrastructural investments.[6]

Activity at the San Pedro Bay Port Complex has grown rapidly in recent years. According to data shared by the PMA, total container volume at the San Pedro Bay Port Complex ballooned by more than 30% between 2015 and 2021. During this same period, the total ILWU workforce in Los Angeles and Long Beach grew 11.2%, compared to 8.4% for the rest of West Coast ports.[7]

For more than a century, longshore work has been an economic and cultural anchor of the communities surrounding the San Pedro Bay Port Complex, including the Los Angeles

neighborhoods of San Pedro, Harbor City, and Wilmington, as well as the city of Long Beach. Longshoring jobs at the Ports of Los Angeles and Long Beach are highly sought after as vehicles of economic stability, dignified wages, and upward mobility, and longshoring is especially central to the identity of the harbor community where these workers live and spend their wages.

The composition of the port workforce broadly reflects the demographics of the region, according to data compiled by Economic Roundtable (ERT), with notable exceptions.[8] Female participation in the port workforce lags behind the county as a whole, with women representing approximately a quarter of total port employment—though these figures are roughly consistent with the female share of employment across the county's transportation sector.

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84% of the port workforce lives in Los Angeles County, with the largest concentration of dockworkers residing near the ports in San Pedro, Long Beach, and Wilmington.[9] The average earnings of dockworkers are 83% greater than the wages earned by those who do not work at the ports but live in the areas surrounding the San Pedro Bay.[10] In effect, there is a *port premium* enjoyed by dockworkers and their families that holds even when accounting for differences in age, sex, ethnicity, and educational attainment.

The "port premium" results from the continued strength of the ILWU amid the decline of manufacturing employment elsewhere in Southern California. Wages earned at the ports boost the entire economy in the harbor community where dockworkers live. The cities of Long Beach and Los Angeles capture nearly half of the economic stimulus of dockworker wages in the form of rent, mortgages, utility payments, and discretionary spending.[11]

Automation at the San Pedro Bay Port Complex will look very different from ports elsewhere in the nation. While union density in longshoring is relatively high compared to other sectors, many domestic ports operate under significantly different employment models.[12] To illustrate the unique character of the San Pedro Bay Port Complex, we can consider, for example, the Port of Charleston in South Carolina. Situated in a right-to-work state that boasts the lowest union density in the nation, where just 1.7% of the state's workforce are members of a union, the Port of Charleston relies upon a hybrid labor model. This means that longshoring work is split between union members, who perform maintenance, repair, and clerical work, and non-union state employees, who operate the cranes and perform most other on-dock longshoring tasks. A new terminal in Charleston, however, will reportedly break from this hybrid model and employ strictly unionized workers.[13] Nevertheless, the process of negotiating infrastructural investment

and working conditions varies significantly between ports, based on the structure of labor-management relations.[14]

Employment at the Ports

To be a dockworker at the San Pedro Bay Port Complex is to steadily climb a ladder of seniority, with each hour logged leading to higher wages and the opportunity for more autonomy. While there are exceptions, longshore workers typically progress from the "casual" pool to limited registration (or class B) to full registration (or class A). Generally speaking, these categories are indicators of seniority, with total cumulative hours worked serving as the primary metric for advancement at the ports.

The majority of ILWU longshore workers begin their tenure at the ports in the "casual" pool, and are allotted hours depending on day-to-day demand from operators. The opportunity to join the casual pool is highly sought after in the harbor community, as it represents the possibility of a long-term and dignified career in an industry that is absolutely central to the local identity, both culturally and economically.

More than 10,000 dockworkers at the San Pedro Bay Port Complex are "casual," but the precise number of *active* casuals is not always clear given the broad variance in long-term employment goals among these workers.[15] Some casuals check in at dispatch every day, eager to amass a sufficient number of hours to earn their shot at ILWU registration as quickly as possible. Many other casuals, however, hold part- or full-time jobs, perhaps with a different goal in mind—picking up longshore work as a supplement to other income sources or as a flexible employment option while enrolled in school. Casuals do not hold voting rights in union matters, do not receive any medical benefits, and cannot be appointed to leadership positions but do earn all protections afforded to ILWU-represented workers as stipulated in the collective bargaining agreement while on the job.

Workers may remain in the casual pool for several years before logging enough hours to become registered, depending in large part on the overall economic climate and its demand for labor. Once an individual has had the opportunity to register with ILWU Local 13, they generally receive day-to-day employment assignments—including both position and terminal location—at the dispatch hall in advance of each shift they choose to work, be it morning, evening, or the overnight "hoot" shift.

After five years in class B, a longshore worker is promoted to full registration, or class A. Some fully registered ILWU workers, especially those with relative seniority, opt to work "steady," which entails a set schedule at a single terminal over a given period of time, obviating the traditional dispatch process. Crane operators, for example, are often steady, given

the specialized skill set required, the different equipment in use at different terminals, and the high-stakes nature of the work.

In addition to the three categories indicating a worker's seniority (casual, class A, class B), there are four categories based on credentials earned through elective training. All workers begin in the "basic" category and are able to advance to skill rates one, two, and three based on completion of specialized trainings. Lashing, for example, falls under the basic category, while operating a lift truck is considered skill rate one if the truck is under 15 tons and skill rate two if larger. Skill rate three, which may take an ILWU worker more than a decade to achieve, is reserved for operating cranes and other highly specialized equipment.

While seniority on the dock is paramount and is the key determinant for many aspects of one's career path, it does not always correlate with these more specialized, higher skill rate positions. Some workers prefer more manual work even as they rise in the ranks of seniority, continuing to opt for positions like lashing, which they find to be more engaging and rewarding. Other dockworkers transition to registration with Locals 63 and 94, which represent the clerks and foremen, respectively.

Port automation raises different questions for each category of port employment. Casuals, registered members, and steadies will each be impacted in distinct ways. Basic and "skill" positions will possibly be impacted in counterintuitive ways. The three primary ILWU locals that keep the Ports of Los Angeles and Long Beach operating each day will be confronted with different challenges.

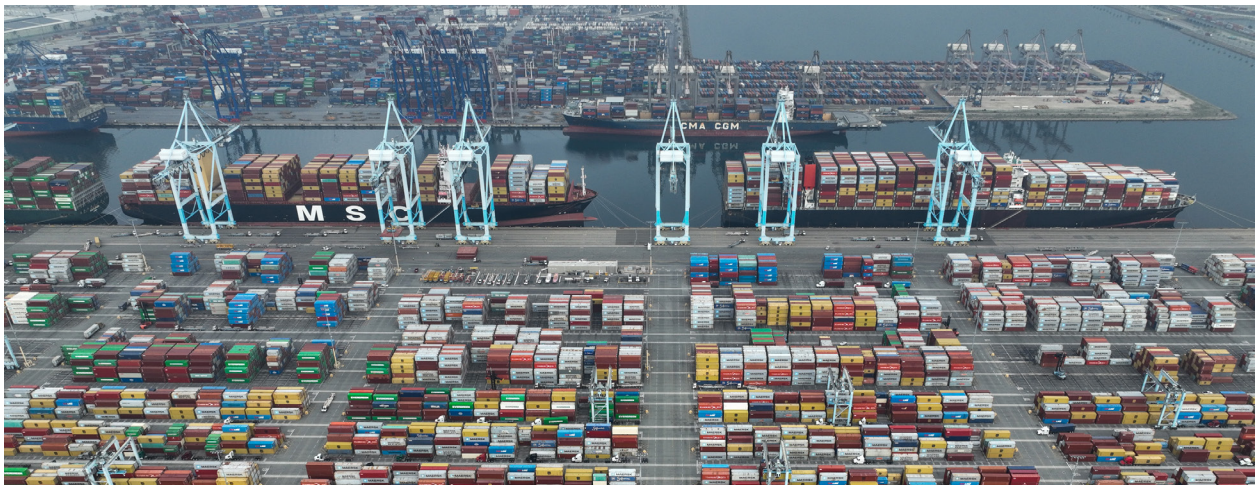
Cargo Flow in the San Pedro Bay

From port to port, infrastructure varies dramatically depending on specific patterns of goods movement unique to each site. This variation makes large-scale technological solutions less generalizable.[16] The San Pedro Bay Port Complex operates primarily as a throughput port, also known as a gateway port, meaning that the vast majority of containers that arrive on a shipping vessel are unloaded and mounted onto truck chassis or railcars, for transport to inland destinations. To unload and load an entire megaship containing upwards of 20,000 TEUs at a throughput port can take several days of work, requiring hundreds of longshoring workers across multiple shifts. As average vessel call size continues to increase, the existing port infrastructure and its workforce are subject to growing pressure, a bottleneck felt acutely at high-capacity throughput ports like the Ports of Los Angeles and Long Beach.[17]

Container management at throughput ports differs from that of transshipment ports. Unlike at throughput ports, which typically serve as singular destinations for import/export cargo, vessels arrive at transshipment hubs and unload only a portion of their total containers—many distributed among other arriving vessels headed to different destinations, and a smaller number received as direct imports—before continuing on to another port. Transshipment ports, in other words, serve primarily as nodes within an interconnected network of cargo flow. This distinction—between the import/export shipping model of a throughput port and the sea-to-sea transshipment model—is critical for understanding both port operations broadly, as well as the local viability of automation and its effects on the associated workforce.

To demonstrate the importance of the distinction between throughput and transshipment ports, we can compare the San Pedro Bay Port Complex, which handled about 20 million TEUs in 2021, with the Port of Singapore, a major transshipment port. The Los Angeles metropolitan area has more than three times the population of Singapore, yet handled less than half as many TEUs in the same period. This disparity in TEU volume is explained only by taking stock of the operational differences between each port's respective role in its local and national economies, and the metrics used to measure cargo flow. On any given day, for example, the port of Singapore sees more than 100,000 TEUs moved, while the San Pedro Bay Port Complex moves half that volume. However, one particularly illustrative metric for drawing out this contrast is the average moves per vessel call, which is a measure of the number of containers unloaded per arriving vessel, and is vastly greater at throughput ports. The megaships arriving at the San Pedro Bay Port Complex are enormous and typically discharge the vast majority of their total carrying capacity, producing a moves-per-vessel-call average that is globally unparalleled, even at other large throughput ports.

A number of researchers have demonstrated that transshipment ports tend to be much more volatile in terms of fluctuating volume and therefore are arguably less amenable to automation, which depends upon a higher degree of predictability and control.[18] Yet others claim that existing automation at transshipment terminals around the world has realized marked increases in productivity when measuring for total moves per hour, given the relatively agile process of discharging only a small portion of a higher number of arriving vessels.[19] In contrast, throughput terminals, according to Ping Wang, Joan P. Mileski, and Qingcheng Zeng, "generally have more captive container volumes—implying less throughput uncertainty—so they tend to be relatively more suitable for automation."[20] This argument points to the fact that automated equipment, as many analysts have noted, entails a certain rigidity in operations. This dynamic can be observed at the level of strategic planning for port operators across the world, as will be discussed below.[21]



Port Automation

Drawing from peer-reviewed journal articles, policy reports, trade journals, legal documents, popular media coverage, and promotional materials, we aim here to identify key themes, patterns, and questions that emerge from other relevant inquiries into international and domestic port automation. We benefit from two recently conducted studies examining automation specific to the San Pedro Bay Port Complex. Taken together, general and specific port automation literature informed our methodological considerations and analysis, as well as the recommendations that conclude this report.

International and Domestic Port Automation

The inordinate amount of attention paid to the issue of automation at ports—in popular media, trade journals, scholarship, and policy reports—obscures a simple fact: there is very little automated cargo-handling equipment in use at domestic or international ports.[22] One widely cited figure suggests only 4% of global container capacity is handled by automated equipment, the majority at international ports.[23] Likewise, there is no clear correlation between automated terminals and geography, throughput, or scale. Operators have implemented various forms of automation at terminals in 23 countries spanning five continents, and at ports ranging from 250,000 TEUs to over 4 million TEUs, including both throughput and transshipment ports.[24]

Further, coverage of port operations regularly conflates "automated cargo-handling equipment"—which could refer to a large number of existing and speculative forms of port technology—with "full automation," a term implying the total elimination of human input.[25] By most accounts, "full automation" is a misnomer at best and a misdirection at worst. Like other buzzy tech rhetoric, "full automation" engenders a sense of technological inevitability and faith in nonexistent solutions.[26] As the anthropologist of technology Nick Seaver has argued regarding workplace automation, "if you cannot see a human in the loop, then you just need to look for a bigger loop."[27]

In the context of port automation, this conflation of any automated equipment with "full automation" is particularly troubling. For example, one can consider the impact of automated straddle carriers or automated guided vehicles at the San Pedro Bay Port Complex. This equipment has displaced a large percentage of drivers but in turn has foisted additional work onto the clerks that now oversee a larger number of these vehicles. Likewise, there are early indications that crane operations are becoming more prone to automation; however, the work of a crane operator has not necessarily disappeared. Rather, it has evolved from a human sitting in an operating cab high above the dock, moving containers from vessel to shore, to a human sitting in an office off the dock, consulting video monitors and moving containers using a digital joystick.

"Full automation" is a misnomer at best and a misdirection at worst.

"Full" automation is not a particularly useful descriptor at the level of individual pieces of equipment nor in a higher-level accounting of overall port operations. As of 2021, only about a quarter of the top 100 international ports have any automated equipment whatsoever, typically including only a limited number of automated cranes or guided vehicles at a portion of the port's individual terminals.[28] The adoption of automated equipment at any given port is inconsistent across its terminals and operators, thereby creating a nonstandardized operational landscape and widely varying working conditions for the longshoring workforce. Specificity in discussing port operations, therefore, is paramount for successful policy interventions related to automation.

The Port of Rotterdam, currently the 10th busiest port in the world, introduced the world's first automated equipment in 1993. The remainder of the top 10 ports are high-volume transshipment ports located in Asia, only half of which use any automated cargo-handling equipment. Because transshipment ports do not serve the same domestic purpose as throughput ports like those in the San Pedro Bay, drawing direct comparisons regarding the viability of automation presents a methodological challenge.

Nine American ports rank within the top 100 globally, calculated based on total annual TEU volume (table 1).[29] Of these, four currently have automated equipment in use at one or more terminals—Los Angeles, Long Beach, New York / New Jersey, and Virginia. The remaining five—Savannah, Seattle/Tacoma, Houston, Charleston, and Oakland—have no automated terminals. At the Port of New York / New Jersey, Global Container Terminal has implemented automated rail-mounted gantry cranes, and two terminals in Virginia—Norfolk International and Virginia International—have adopted the same gantry cranes, as well as automated stacking cranes. Of those without automation, Seattle/Tacoma and Oakland are operated by ILWU workers, while workers at Savannah, Houston, and Charleston are represented by the International Longshoremen's Association (ILA).

Table 1: Automation and Labor at the Busiest US Ports

Internationally, we can compare the impact of automation at ports of various scales. At Port Botany in Sydney, Australia, which handled about one-tenth the TEU volume of the San Pedro Bay Port Complex in 2021, automated straddle carriers were introduced at the Patrick Terminal in 2014. Within two years the workforce had been more than halved, decreasing from 436 to just 213.[31] At the other end of the spectrum, the Yangshan deep-water terminal at the Port of Shanghai, the busiest port in the world, boasts 30 automated bridge cranes, 130 automated guided vehicles, and 120 rail-mounted automated cranes, an unprecedented investment that port executives claim has reduced overall labor costs by 70%.[32]

Both of these terminals would generally be considered "partially automated," as a remaining human workforce is still critical to operations, even while a significant amount of the workforce has been deemed redundant. Accordingly, all automation scenarios raise questions about the nature of the remaining work: Which jobs are left unimpacted? How are jobs transformed? Does the remaining workforce need to learn new skills? Are workers open to upskilling/reskilling? What ripple effects does this transformation have on the surrounding community?

Some analysts, including a team of researchers at the Los Angeles County Economic Development Corporation (LAEDC), have argued that the displaced jobs tend to be more physically demanding. As the remaining workforce is shifted into "control rooms," they contend, longshoring work may evolve from heavy industry to something that resembles IT-based office work. But this elides preliminary evidence to the contrary, underscored in our interviews with longshore workers, who stated that some of the most physically challenging and dangerous tasks—especially lashing—are, in fact, the most resistant to automation. Further, shipside positions—including lashing and other tasks performed aboard vessels—prove harder to automate, and have been relatively less impacted than corresponding dockside positions by automation at the San Pedro Bay Port Complex.

The relative susceptibility to automation of dockside versus shipside hours points to another recurring theme in the literature. Automated technology in all sectors typically requires a tightly controlled and predictable environment—something that hardly describes the unwieldy work of discharging a contemporary megaship. Longshore workers, over many years of on-the-job training, hone a form of tacit judgment that lets them seamlessly collaborate with other workers and creatively solve problems on the fly, even when confronted with unexpected or unfamiliar outcomes.

This capacity for fluid decision-making—known colloquially by dockworkers as the "audibles of labor"—ensures operations continue apace, productively and safely. Economist David Autor has written at length on this phenomenon, arguing that the "tasks that have proved most vexing to automate are those that demand flexibility, judgment, and common sense."[33] Automated systems, by contrast, are not reliably equipped to deal with unfamiliar inputs or exceptional

circumstances, so on-dock cargo flow that depends predominantly on automation becomes particularly brittle, vulnerable to gridlock and serious ripple effects. Some scholars have noted a particular irony associated with attempts to implement automated systems aimed at displacing human workers, suggesting that "the more advanced a control system is, so the more crucial may be the contribution of the human operator."[34]

There remains significant uncertainty about whether operators actually realize a positive return on their investments in automated cargo-handling infrastructure.

More qualitative research must be undertaken to better understand the ways that automation won't just eliminate or displace longshoring jobs in the San Pedro Bay, but rather transform the remaining jobs and create new operational choke points. For example, one study of automation at a port terminal in Australia found that despite predictions of mass job loss, the most significant observed effect was a transformation of the work itself: "A completely different port terminal worker has emerged with a different job role and skills profile."[35] Of note, the recently ratified collective bargaining agreement between the ILWU and the PMA formalizes a new employment category, the "automation clerk," tasked with monitoring and resolving exceptions for any cargo being handled by automated cargo-handling equipment.[36]

Finally, nearly all literature on port automation repeatedly acknowledged significant disparities between expectations and reality regarding the impacts of automation. As outlined in a 2021 report published by the International Transport Forum (ITF), automated equipment is extremely capital intensive, requiring operators to make broad, speculative predictions about trade patterns and operational flows far in advance of implementation.[37] ITF and others conclude that there remains significant uncertainty about whether operators actually realize a positive return on their investments in automated cargo-handling infrastructure.[38]

Respondents to an industry survey conducted by McKinsey reported high expectations of cost savings and increased productivity in particular were rarely achieved regardless of the degree of automation that was implemented.[39] The LAEDC report similarly modeled its automation scenarios based on a 10% *gain* in productivity despite acknowledging the observed *losses* in existing scenarios of port automation around the world. At the Port of Auckland, for example, a multiyear automation program was halted after it led to substantial decreases in net productivity, ultimately costing the local economy the equivalent of 17 years of port profits, according to analysts.[40]

Automation at the San Pedro Bay Port Complex

Numerous industry studies have attempted to assess the impacts of automation on port productivity and employment around the world. Until 2022, none had yet examined the San Pedro Bay Port Complex specifically. Two 2022 reports—one from LAEDC and another from independent local research firm ERT—attempted to quantify the local economic impacts of current and prospective automation in the San Pedro Bay Port Complex.[41] Our analysis benefits from and expands upon their quantitative findings.

The ERT study, *Someone Else's Ocean: Dockworkers, Foreign Shippers and Economic Outcomes*, examined the capital-intensive investments in automated equipment at two terminals in the San Pedro Bay Port Complex, the Long Beach Container Terminal (LBCT) and Trans Pacific Container Service Corporation (TraPac). They found that the share of containers handled by LBCT and TraPac has doubled since these terminals automated some operations, mostly as a result of diverted cargo from other, conventional terminals.[42] The capital costs of implementing automation at these two terminals has been substantial.

In 2014, $700 million—the majority of which came from the Port of Los Angeles to cover infrastructural upgrades—was invested at the TraPac terminal to implement an automated rail system. LBCT completed its much larger automation initiative in 2016, led by a $1.4 billion investment in infrastructure from the Port of Long Beach and a significant expenditure by LBCT for new automated cargo-handling equipment.[43] Together, these terminals handle approximately 18% of the container traffic at the San Pedro Bay Port Complex, up from 9% in 2013. LBCT in particular is now responsible for more than a quarter of the containers moving through the Port of Long Beach.[44]

ERT offered two primary metrics to assess the impact of automation at LBCT and TraPac: hours of dockwork per container and the ratio of shipside to dockside hours. The first metric measures overall changes in cargo-handling work at the two terminals, while the second captures the decline of on-land work relative to on-ship work, which is more difficult to automate. By their count, automation at LBCT and TraPac resulted in the loss of 572 to 627 jobs, or between 4.4% and 4.8% of some 13,000 dockworkers at San Pedro Bay in a given year.[45] This job loss amounted to a reduction of $49.5 million in local spending and the loss of 254 jobs supporting dockworkers in the surrounding community.

Based on these findings, ERT modeled two future automation scenarios: 50% and 75% of dockwork hours lost to automation. These scenarios result in the loss of between $401.87 and $627.82 million in dockworker wages annually, which would result in $476.32 to $743.89 million less local spending and 2,445 and 3,818 fewer jobs supporting dockworkers.[46] Relative to existing estimated losses associated with automation at LBCT and TraPac, ERT projected that a 50% decrease of dockside hours would quadruple job loss and diminish local spending by a factor of 10.

The LAEDC study, *The Impact of Automation at the San Pedro Bay Ports in Los Angeles County*, shared much in scope and intent with the ERT report but differs methodologically in significant ways. The authors simulated the impacts of automation over a 10-year period, using three scenarios that assume 50%, 70%, and 90% of identified "at-risk" port jobs, respectively, are automated.[47] Each of these simulations also assumed that automation will result in a 10% productivity gain at the San Pedro Bay Port Complex, despite observed productivity *losses* of between 7% and 15% at ports elsewhere in the world that have automated some of their operations.[48]

LAEDC predicted that the San Pedro Bay economy would adapt to increased port productivity and mitigate job and economic losses. Nevertheless, it estimated that total job losses relative to a nonautomated baseline at the end of the simulations amounted to between 3,480 jobs (in the 50% scenario) and 6,450 jobs (in the 90% scenario). Cumulative losses to the local economy (measured by LAEDC as gross county product) amounted to between $5.1 and $9.5 billion over the 10-year simulation period, while cumulative economic output declined by between $12.5 and $23.5 billion. Finally, LAEDC estimated that wages would never recover, resulting in cumulative wage losses of between $4.7 and $8.6 billion due to automation.[49] Thus, even accepting the assumption that automation will increase port productivity, LAEDC's simulations still indicated substantial losses to county economic activity, jobs, and labor income. Any surpluses potentially generated by automation will not accrue to the local harbor community, but rather to the terminal operators and their parent companies.

Internationally and domestically, ports compete with one another for cargo. ERT and LAEDC framed their analyses with very different assessments of the competitive pressures facing the San Pedro Bay Port Complex and the dynamics of the American goods movement ecosystem more broadly. LAEDC's study foregrounded increasing regional competition among North American ports for so-called discretionary cargo transported from ports by truck or rail to other final destinations. LAEDC presented current and projected losses of market share to East Coast, Gulf Coast, and other West Coast port complexes as a powerful competitive force for terminal operators in the San Pedro Bay. Looking to stay competitive, operators view automation as a mechanism to reduce per-container costs and increase port efficiency.[50]

By contrast, the ERT study emphasized the resilience of the San Pedro Bay Port Complex, evidenced by the large Southern California market for imported goods and the dominant position of the Ports of Los Angeles and Long Beach in handling total West Coast container volumes.[51] Rather than interregional competition for discretionary cargo, the most pressing challenge for the San Pedro Bay's ports and surrounding communities, according to ERT, is the lopsided number of imported goods arriving in the ports relative to the number of exported goods leaving from them.[52] This trade imbalance is a long-term consequence of the globalization of production and the decline in American, and specifically Californian, manufacturing employment. ERT argued that by fostering linkages with California-based manufacturers and taking advantage of the current political

environment—in which reshoring domestic manufacturing capacity has become a national priority—the Ports of Los Angeles and Long Beach can play a key role catalyzing local industrial growth.[53]

The distinct framing of the two reports informed their respective policy recommendations. Taking future automation as the inevitable outcome of competitive pressures, LAEDC emphasized the importance of retraining and upskilling the port workforce; coordinating "modernization" strategies among port operators and establishing metrics for assessing their success; and devising policies that can strengthen the competitiveness of the San Pedro Bay Port Complex by, for example, streamlining state permitting processes and more equitably aligning federal funding to ports with the overall annual container volume they handle.[54]

ERT's recommendations, by contrast, sought to leverage the San Pedro Bay Complex in the service of renewed local industrial policy. Recommendations included disincentives for automation, such as fees for displaced workers and taxes on automated equipment to offset job and economic losses. They also included incentives to improve balance of trade through both surcharges on empty exported containers and discounts on exported containers carrying cargo. Finally, ERT recommended that the port authorities require ILWU to review and comment on pending terminal lease agreements before their execution and withhold their approval of future automation unless it can be demonstrated to produce a net benefit for California workers.[55]

Recent Contract Negotiations

On July 1, 2022, the master contract in force at the West Coast ports since 2014 expired. A new round of contract negotiations between the ILWU and the PMA began in May 2022. After a lengthy negotiation process, a tentative agreement was reached between the two parties on June 14, 2023. Across the West Coast, 75% of the ILWU's participating membership voted to ratify the new contract. In the San Pedro Bay specifically, 71% of Local 13, representing longshoremen, and 78% of Local 63, representing clerks, voted to approve ratification.56 The new labor contract is in force until 2028 and contains updated provisions on automation.

Prior to the most recent round of negotiations, the master ILWU/PMA agreement already featured several stipulations that bear directly on the ability of terminal operators to automate operations at the port. These include minimum manning requirements for "basic gangs" and "robot operations," supplemented by additional specified workforce requirements for breakbulk work, loading, discharge, and crane operations. The contract also requires that any new modes of operation that may reduce the number of workers required to complete a given task—including through the introduction of labor-saving technology—be communicated to the union ahead of time, with a codified arbitration procedure for resolving disputes that may result. While there are several exceptions, the contract also grants the ILWU jurisdiction over installation and maintenance of new technologies at the ports as a way of offsetting the potential job losses associated with their implementation. Despite these protections, the contract also underscores the right in principle of the employer to introduce labor-saving technology.

The scope and effect of future automation were major factors in the 2022–23 negotiations, and the new contract updates the language on automation in several important ways:

- **Establishes specific minimum manning requirements for terminals introducing automated equipment.**
- **Sets limits on the scope of potential automation by prohibiting the automation of coning and de-coning operations (i.e., lashing) and requiring that all remote work (i.e. crane operations) take place on-dock.**
- **Elaborates an arbitration process for determining violations of ILWU jurisdiction that result from the introduction of automation. If in this process an independent arbitrator determines that the contractual rights of longshoremen are being violated, the employer forfeits its right to continue automating operations until such violations are remedied.**
- **Reiterates that all future automation decisions shall be discussed between the union and employers.**
- **Establishes new manning requirements for "automation clerks," who are tasked with monitoring and resolving exceptions for any cargo being handled by automated container-handling equipment.**
- **Commits the ILWU and the PMA to establish training facilities for mechanics in Northern California and the Puget Sound region, modeled after the San Pedro Bay facilities.**

Findings and Analysis

Based on our analysis of the literature, interview data, and expert research and testimony gathered over the course of AB 639 proceedings, we have found the following:

1. Industry stakeholders generally agreed on issues facing the San Pedro Bay Port Complex.

There was broad consensus regarding the leading factors currently affecting port operations. Interviewees answered questions about economic constraints, environmental standards, labor relations, and working conditions, as well as the state of the supply chain in the wake of the COVID-19 pandemic. Several themes arose frequently and across interviews with each category of industry stakeholder, including terminal operators, labor representatives, port authorities, and legislative appointees. What is striking here is the general agreement between parties about the root causes of these issues, which is not always reflected in coverage of labor-management relations at the port.

Above all, interviewees noted that competition in the American maritime and logistics sector is increasing, and shippers have more options for their discretionary cargo than ever before.[57] Our interviewees registered several potential causes, including the high fixed costs of doing business in Southern California and the relatively stringent regulatory climate that determines the various labor, ecological, and financial requirements associated with port operations. One interviewee spelled out this dynamic as nothing new, but rather something that has gradually shifted business priorities over a longer period: "I think the number one issue was a loss of market share over the past 20 years due to really high fixed cost."

Some of this cost might be offset, according to interviewees, by proportionate resources directed toward the San Pedro Bay Port Complex.[58] Given the significant role played by these ports in the national economy, one port authority executive asserted that Los Angeles and Long Beach are simply "not getting commensurate [federal] dollars in order to invest." According to data provided by one interviewee, the federal government allocated more than 10 times as much investment to East Coast ports than to West Coast ports when measured against the actual TEU volume and attendant economic activity of either respective coast.

"We need a national strategy."

Multiple interviewees suggested that without broadly enforced, comprehensive federal standards, stringent local regulations make the San Pedro Bay Complex less competitive and redirects discretionary cargo to ports with weaker regulations. Absurd outcomes can result. Shipping companies may elect for a considerably longer journey from Asia to a Gulf or East Coast port, thereby producing greater net emissions simply to avoid higher fixed costs resulting from California's environmental standards. A labor representative pointed to the contradictions inherent in localizing regulatory enforcement like this, and instead insisted: "We need a national strategy."

Interviewees were particularly emphatic about an "indirect source rule" (ISR) currently being developed by the South Coast Air Quality Management District (SCAQMD) as an example of the adverse effects that can follow from a misalignment of state and federal regulatory standards. A suite of rulemaking procedures aimed at reducing pollution across the goods movement industry—including marine ports, railyards, warehouses, and commercial airports—the proposed ISR targets mobile sources of pollutants such as nitrogen oxides and particulate matter, including trucks and ships.[59] In the case of the San Pedro Bay Port Complex, the ISR sets emission caps that both port authorities and terminal operators must meet by predetermined deadlines.[60]

SCAQMD initiated the ISR process after failing to reach a voluntary memorandum of understanding on pollution reduction measures at the San Pedro Bay Port Complex.[61] Recent negotiations with railyards over voluntary reductions have stalled, and as the panelists observed, no other domestic port faces similar protocols for addressing mobile emissions.[62] This patchwork of competing standards, interviewees argue, could have the effect of rerouting discretionary cargo to dirtier ports—not only producing greater net greenhouse gas emissions in the process, but also likely eliminating jobs due to decreases in cargo volume.[63]

2. Industry stakeholders championed a wide range of possible solutions other than automation.

Interviewees put forward a number of alternatives to automation that they saw as possible means to effectively address competition, congestion, and other common issues identified in the preceding portion of the interview.

Given the scale and volume of the San Pedro Bay ports, interviewees proposed measures to optimize operations and better reflect the practices employed by other top-ranking global ports. Automation is not utilized at many of the world's busiest ports. One interviewee underscored this point, foregrounding a different shared characteristic: "The fact of the matter is, of the top 10 ports [globally], only a few were automated. But the majority did have 24/7 operations." While there are round-the-clock shifts available to dockworkers in Los Angeles and Long Beach, the overnight "hoot" shift is staffed only intermittently, based on fluctuations in container volume arriving on vessels. Increasing the port's hours of operation, according to interviewees, would combat congestion with existing resources and infrastructure. For one interviewee, it was a simple premise: "If we work more hours, more cargo goes through."

Any uptick in throughput applies new pressure on the local and regional supply chain. But automation, according to interviewees, is often conceived of as a silver-bullet solution rather than a holistic component in dynamic, intermodal systems of cargo movement. Interviewees pointed to geographic and infrastructural advantages unique to goods movement in Southern California, especially a robust rail system already in use. One interviewee suggested investment in inland ports to maximize rail efficiency. Also known as dry ports, these centralized hubs for cargo handling serve to absorb and redistribute some of the congestion that is otherwise concentrated at shoreline terminals and drayage yards. The Barstow International Gateway, a recently announced inland port initiative helmed by BNSF Railway and situated just 130 miles from the San Pedro Bay Port Complex, demonstrates the clear interest stakeholders have in pursuing this option.[64] Seizing the emerging opportunities for alignment between waterfront and inland ports could alleviate some of the pressures faced by operators in the San Pedro Bay that are often cited as prevailing factors in their consideration of automation. According to one legislative appointee we interviewed, "[inland ports are] coming and they're coming a lot faster than you can automate."

To best take advantage of inland ports, operators must streamline use of existing terminal infrastructure. For one interviewee, "the biggest thing is building systems [across terminals] to move cargo more effectively." "Systems-level thinking" offers efficiencies of scale, without necessitating dramatic overhaul of terminals or outsized investment in new technology. The rail systems implemented in terminals spanning the San Pedro Bay Port Complex in particular, according to one interviewee, are a prime example: "You have 12 terminals that have on-dock rail and none of them work together." On-dock rail alleviates intermodal pressure on trucks, both expediting cargo movement and improving net emissions, while creating conditions that make increased hours of operation more viable.[65]

Finally, terminal operators in particular underscored the importance of a strong training curriculum for workers, standardized across all terminals as much as possible. The majority of each day's workforce circulates between terminals, shift to shift, based on

dispatch needs. "When you start talking about safety protocols, location [of equipment], and familiarity with your yard operation," one terminal operator noted, the lack of standardization can begin to undermine productivity. Workers are more productive when readily equipped with the skills and experience to work seamlessly across different terminals. With higher levels of proficiency across the longshoring workforce, one operator said, "we can offer a better product to take on competition."

Interviewees pointed out that new cargo-handling equipment will demand the acquisition of new skills for those tasked with repairing the equipment when it inevitably wears down. "A mechanic who traditionally had used a wrench on a diesel engine," one speculated, "will [eventually] have to use a computer in order to do maintenance." One terminal operator acknowledged that while some forms of automated equipment could conceivably be repaired remotely—i.e., using remote-access digital tools to debug the algorithms that power these machines—this sort of development should be understood as a question of labor jurisdiction and training, not merely a technological innovation. They insisted that measures should be taken to ensure that mechanic jobs remain represented by the ILWU.

The current and future role of mechanics at the San Pedro Bay Port Complex arose numerous times across our interviews and occupies a somewhat contentious place in this discussion.[66] Becoming a trained mechanic has historically been an alternative, accelerated path to achieving ILWU registration. Some have suggested that increased automation will create an influx of mechanic jobs to support this complex and sophisticated equipment. However, one representative from labor decried this claim as an "empty promise," because very few total workers been successfully reskilled to earn the status of registered mechanic to date. In another interview, reference was made to several examples of terminal operators proposing reskilling and upskilling initiatives that failed to materialize.[67]

The mechanic issue demonstrates how promises of transition that are not supported by compelling data can distract from the more immediate impacts of automation. To this end, the recently announced Goods Movement Training Campus represents an unprecedented opportunity.[68] But as one interviewee reiterated, if these stated goals are to be realized, "we need to make good decisions right now."

3. Industry stakeholders questioned the immediate benefits of increased automation.

Even among terminal operators, interviewees expressed ambivalence about the short- and long-term benefits of automation. One terminal operator cited the tumultuous experience of a competitor who had recently implemented automated equipment, suggesting that it might be wise to proceed cautiously and see how such a decision played out over a longer period of time, rather than rush to implement similar technology. "I don't want to be the guinea pig," this interviewee told us, seeming to opt for data-driven pragmatism over high-risk investments. This sentiment is supported in

the literature, which has likewise documented "a lengthy testing and start-up period [that] can temper the cost reduction potential of automation."[69]

> *"The jury is still out on whether automation is even an issue of productivity."*

A number of interviewees observed that data can mislead without clear articulation of goals and vocabulary. Terms like "productivity" and "efficiency" are not self-evident nor consistently used, but are ubiquitous in discussions of automation. The presumption, often, is that automation will necessarily increase productivity and/or efficiency. Yet according to a report by Moody's, there is acknowledgment from certain terminal operators around the world that some forms of automation actually decrease productivity—"on the order of 25 to 30 crane moves per hour [with automation equipment], compared to 30 to 40 crane moves per hour for conventional operations"—but are nevertheless worth implementing based on other variables like labor-cost savings and performance consistency.[70] As one port authority representative told us, "the jury is still out on whether automation is even, in fact, an issue of productivity." Productivity and efficiency should be understood not strictly as proxies for cost savings—especially when the primary cost to be cut is assumed to be labor—but rather as measures of the complex relationship between capital costs, labor costs, volume, velocity, and other externalities associated with cargo handling.

Some interviewees expressed frustration that automation shifts resources and attention away from the ways that existing infrastructure could be maximized. "Don't put $5 billion into automating a terminal instead of maximizing rail," warned one labor representative. On-dock rail, they argued, is already in use at many terminals and can help to remedy issues related to cargo velocity in a way that automated equipment cannot, yet the value of the existing rail system remains underappreciated. This, some interviewees argued, was the most viable and immediate way to boost port productivity.

Ultimately, automated terminals run the risk of "putting all the eggs in one basket," according to one interviewee, making each terminal less dynamic and more beholden to rigid operational plans. This could render operators less agile when confronted with both micro and macro shifts in the shipping business.

4. Industry stakeholders identified a number of potentially negative impacts of automation.

Interviewees from each represented category expressed concern about what they saw as indirect and unforeseen outcomes associated with automation. Multiple labor representative interviewees worried that automated equipment will shift the agency of workers and undermine good faith labor-management relations in the future. "Being honest," one interviewee told us, "I believe that the question of automation is more about control than about any kind of efficiency."

One new dimension of surveillance and control is the emergent role of digital computation and artificial intelligence in automated cargo-handling.[71] Newer forms of AI-based automation depend upon the capture and processing of "training data."[72] For example, each move made by a crane operator can be collected and converted into a suitable format such that an algorithmic model can be designed that attempts to simulate the same decision-making patterns performed by the human worker. This phenomenon of surveillance and displacement is playing out in other work settings as well, perhaps most notably in Hollywood. Writers and actors in Los Angeles just concluded a lengthy strike that was centered around, among other issues, the question of whether their ideas, stories, and likenesses could be used as training data for algorithmic models.[73]

One of our longshoring interviewees bluntly called out the way this dynamic might be experienced on the dock: "Now, we're not being compensated for [providing this training data for AI], and I don't think I gave you permission to steal my skill, right? If you want to learn it, you've got to sit in the seat, and you've got to do it yourself." While AI technology is not yet fully viable, it is nevertheless being experimented with across industries and does represent the possibility of significant and unforeseen disruption to port working conditions.[74]

Automation dramatically affects the health and safety of the remaining human workforce. Proponents of automation often cite improved safety as one potential advantage, partially based on the assumption that fewer workers on the dock will lead to fewer injuries. The evidence is not conclusive.[75] At the Port of Auckland, for example, the introduction of automation in 2016 created newfound inefficiencies compared to the conventional operations that had earned the port the title of most productive in Oceania in the years prior. This led management to push for unrealistic productivity goals, which put new pressures on workers and led not only to increased injuries but to the deaths of three stevedores in the first four years. In 2022, following this spate of injuries and a failure to address problems of congestion, the Port of Auckland abandoned its automation project entirely, at the cost of $1.2 billion to the port and the wider New Zealand economy.[76]

> ***"Automation is more about control than about any kind of efficiency."***

This concern was echoed in our interview with a legislative appointee: "I wish I had some assurance that things were going to become safer, but with automation, I feel like they're going to be more dangerous." Another interviewee recounted an incident in which an automated guided vehicle (AGV) already in use at one Long Beach terminal caught fire due to a battery issue that, under conventional operations, would have likely been prevented with routine human oversight. Battery fires like this are notoriously dangerous and difficult to extinguish, our interviewee shared, which creates the possibility of rapid and uncontrollable spread given that many AGVs are operating in tandem without real-time human supervision.

One interviewee relayed accounts from other workers about how automated crane operation affected their ability to perform at the high level demanded by the position. Unlike conventional crane operations, which require constant mental and physical engagement and fast-paced judgment, automated crane operators have found it hard to concentrate, as the machine does most of the job but still requires intermittent input. These momentary lapses can have serious implications for safety and overall efficiency. This dynamic has been reported in other sectors where automation has been introduced, notably including warehousing.[77] Some research has supported this observation, demonstrating that even when humans remain in the loop with newly introduced automated technologies, the relative lack of autonomy felt by workers breeds a pattern of distraction or complacency, thereby increasing the risk of injury or undermining productivity.[78]

Finally, in the event that automation does, in fact, increase throughput, other segments of the supply chain would experience new pressures. Our interviewees made it clear that solving for congestion on the dock achieves little without significant overhaul of the subsequent links in goods movement, including especially trucking and rail. Concerns about the net environmental impact of automation were raised. One interviewee acknowledged that while some automated equipment represents a positive ecological intervention—swapping diesel for electricity, for example—and could increase throughput, this would be canceled out by the additional dirty truck trips required to move cargo, displacing emissions and congestion to the freeway: "[Automation at just a single terminal] could add 3 million truck trips a year to the 710."[79] This observation points to the futility of narrow solutions that don't address the supply chain holistically.

5. Industry stakeholders feared that increased automation would adversely affect the harbor community.

All interviews revealed a unique pride in longshoring, often shared across generations. Given the overall economic climate, this is exceedingly rare and should be seen as a particularly valuable resource powering the port. Faced with the prospect of job loss—be that from automation, an evolving supply chain, or turbulent economic conditions—interviewees expressed fear regarding the current transformation of the ports, as well as the outlook for the future: "The people whose jobs are at risk and are going away, they have families to feed. . . . Will this job be passed on to their children?"

The promise of a long-term, dignified career as a dockworker—something the ILWU has fought to earn and protect over many decades—underwrites the hierarchy of employment that defines one's trajectory at the ports and ensures a reliable supply of specialized labor. When a worker enters the casual pool, she trades employment uncertainty in the near term for long-term job security, exceptional benefits, higher wages, and a pension once fully registered with the ILWU. Increases in automation do not affect all workers in the same way, with disparate impacts based on variables like demography, education, and wages. For example, studies have shown that when automation is introduced into a

workplace, "highly-paid workers are more commonly affected, but the effects are more severe for less well-paid workers," with older and less-educated workers experiencing the most adverse overall impacts.[80] Given the tightly controlled hierarchy of ILWU employment and the relative diversity of the aging workforce—as ERT notes, the average age of a San Pedro Bay dockworker is 50—this presents an array of critical questions that should catalyze future research.[81]

Automation poses a real risk of disrupting this long-term path for dockworkers, eliminating the structural incentives that have historically made entry into the casual pool such a desirable prospect for members of the community. One interviewee described the upshot of this career path, asserting that "workers in San Pedro need to continue to be able to think, Okay, I'm going to retire with dignity."

The harbor community also stands to lose in the event of substantial increases in automation, according to some interviewees. Automated equipment, one interviewee pointed out, will be owned and operated by the terminal operators, who are by and large multinational conglomerates, not locally owned firms. The effect of automation, therefore, will be to deplete the local tax base and export profits: "Do you want to take a billion dollars out of the local economies? That's what automation will accomplish for the profit of foreign-owned shipping lines." As such, shifting the capital allocation of port operations away from labor and toward investment in automated equipment could have drastic effects on the overall character of the harbor community, culture, and economy.[82]

Finally, interviewees representing labor stressed that they were not "anti-technology," a premise often suggested by proponents of automation who view workers as stubbornly getting in the way of innovation. Rather, interviewees shared concern about the ways that proposals surrounding automation have undercut processes of democratic decision-making. "We're going to have to evolve and understand that it's not just about fighting against technology," one labor representative told us, "but making sure we're included in the future."

"Do you want to take a billion dollars out of local economies? That's what automation will accomplish."

Goods Movement Training Campus

During the course of this research, state officials allocated $110 million for the development of a first-of-its-kind training facility, specifically designed to support supply chain workers in the San Pedro Bay area. Dubbed the Goods Movement Training Campus, this initiative is aimed at facilitating the transition to zero-emissions cargo-handling equipment and bolstering the future of Southern California's logistics sector. The 20-acre campus will be located on land adjacent to both ports and is projected to open by 2029.

The industry stakeholders we convened in conjunction with AB 639 expressed considerable interest in learning more about how this investment in training infrastructure might inform near-term decision-making around port automation. Following discussion with panelists, several precedent-setting case studies from around California were identified given the insights they might provide related to training:

- ***Shirley Ware Education Center***

  Partnership between Service Employees International Union–United Healthcare Workers West and the Joint Employer Education Fund, providing education and training to community members and healthcare workers

- ***Hospitality Training Academy***

  Formed out of a panel of industry, community, and labor leaders established to promote opportunities for African American workers in the Los Angeles hospitality sector, including certification programs and job placement initiatives

- ***California Transit Works!***

  Statewide consortium of transit agencies, transit unions, and colleges focused on transit workforce development, workplace safety, and the transition to zero-emissions equipment

- ***Net Zero Plus Electrical Training Institute***

  Provides apprenticeship training for individuals interested in becoming certified electricians and adapting to new net-zero standards and regulations, led by International Brotherhood of Electrical Workers Local 11

- ***Los Angeles / Long Beach Joint Accident Prevention Committee***

  Three-year partnership between labor and employers at the San Pedro Bay Port Complex to assess the efficacy of previous lasher training, resulting in redesign and implementation of a new curriculum and evaluation method

Interviews with program staff about their organizational structure and governance protocols, funding and resource management, curriculum design, and measures of success guide the following best practices to inform the Goods Movement Training Campus:

1. **Joint governance.** By enlisting both labor and management in organizational structure and programming, the Goods Movement Training Campus can build in accountability between parties that has proven critical for the success of these case studies.
2. **Data-driven decision-making.** Metrics of success must be carefully selected and frequently revised to ensure that the Goods Movement Training Campus remains responsive to needs related to social justice goals, workforce composition, and employment opportunities as they emerge. Systems of feedback and evaluation from participants, educators, and other stakeholders are essential.
3. **Leveraging worker network.** Each case study uniquely demonstrated the value in the interconnected network of workers and their community. Workers often have strong, accurate sensibilities about what is needed and how problems might be resolved. Curriculum design and pedagogy should, accordingly, be envisioned from the ground up, driven by the trust and creativity of workers.

Recommendations

To conclude, we present the following recommendations to the California Workforce Development Board, as per the requirements of AB 639.

1. Advocate for better alignment between local and federal regulatory frameworks.

The outsized significance of the San Pedro Bay Port Complex in the national economy presents a prime opportunity to pursue increased synergy between state and federal policymakers. Disparities in regulatory benchmarks associated with labor and emissions standards create a skewed incentive structure that has the effect of localizing negative externalities like job loss while simultaneously failing to address major systemic problems like climate change. The indirect source rule currently under consideration in Southern California is one particularly salient example of this lack of alignment. As our panelist interviewees repeatedly underscored, there is a critical distinction to be drawn between port *electrification* and port *automation*, and the former does not necessarily imply the latter. However, when local regulations so drastically differ from those in effect at other domestic ports, there is a real risk of driving terminal operators to pursue port automation under the pretense of meeting environmental standards, when other operational solutions are readily available.

2. Establish systems of feedback and evaluation driven by worker input to assess the impact of terminal automation.

Given the unique employment structure used by the ILWU—i.e., casuals, limited and full registration, and steadies—as well as the fact that there are three respective locals that represent this workforce, further research should be conducted to assess the specific impacts of automation on different segments of the workforce. Without primary data drawn from direct engagement with workers, the findings and recommendations in the existing literature remain limited. Job loss, while assuredly one of the most significant variables in determining the overall state of the ports, must be considered in tandem with *job transformation*. Considerable research in other sectors has demonstrated that one recurring facet of increased automation is a general deterioration in job quality.[83] Future research must directly investigate the *quality*—not just the *quantity*—of the remaining jobs, to ensure maximum safety and productivity.

3. Increase transparency around operational data to ensure accountability and collaboration between port stakeholders, policymakers, and researchers.

Given the high-stakes nature of this industry for both the local and national economies, it would be prudent to mandate more expansive and standardized systems for reporting and sharing data between parties. The maritime industry's can undermine strategic planning and input from external experts who don't have ready access to relevant and timely data. The relationship between the longshoring sector and other segments of the supply chain, including especially trucking, rail, and warehousing, could be bolstered with more transparency around best practices for employers and greater advocacy from organized labor in support of other supply chain workers. When data remains centralized and inaccessible, it can be used to advance causes that may not be aligned with the interests of those most immediately affected by operational decision-making, especially the port workforce and harbor community. Accordingly, data transparency should be understood as a matter of both efficiency and equity.

4. Prioritize community input to ensure that development of the Goods Movement Training Campus is aligned with community needs.

Given the inextricable links between the San Pedro Bay Port Complex and the harbor community, the opportunity presented by the landmark investment in the Goods Movement Training Campus is truly unprecedented. Those at the helm should seek early and ongoing input from those with the most to gain: members of the harbor community, as well as all segments of the port workforce, not solely those represented by the ILWU. They should invest in popular education and engagement with the San Pedro Bay community about the training campus to determine its near-term scope and long-term goals.

5. Expand opportunities for collaboration between labor, management, and the port authorities.

As evidenced by both the successful panel meetings convened in relation to this report and the 2019 lasher training program, there is clearly an appetite for direct collaboration between the central parties composing the San Pedro Bay Port Complex. However, too often these parties come together only during contract negotiations—an important venue for the exchange of ideas, but one that is perhaps less amenable to large-scale and dynamic problem-solving. Though the union and terminal operators have a deep and continuous working relationship, the creation of more structured spaces for dialogue along the lines mandated by AB 639 can produce greater accountability, transparency, and cooperation and lead to more productive collaboration between stakeholders.

6. Commission further research into key topics identified by industry stakeholders.

A number of recurring recommendations emerged out of the AB 639 panelist proceedings and interviews, all aimed at addressing the port's most pressing challenges. Three ideas in particular merit further inquiry: (1) the potential efficiencies of scale and velocity that might be achieved with expanded investment in on-dock rail, (2) the impact on overall port competitiveness were the San Pedro Bay Port Complex to adopt 24/7 operations, and (3) the unique opportunities for supply chain innovation presented by inland ports. In each preceding example—especially the prospect of inland ports, which will create a significant number of new jobs—priority should be made to bolster union representation, given the clear evidence that this drives prosperity and sustainability in the local communities. Additionally, there was considerable enthusiasm surrounding the prospect of continuing to convene stakeholder meetings, based on the model pioneered by this AB 639 panel and the best practices gleaned over the course of this initiative. Expanding the composition of this advisory panel to include representatives from other supply chain sectors, including trucking, warehousing, and rail, would undoubtedly enrich the findings and strengthen the recommendations of any subsequent research mandate put forward by this panel.

Appendix

AB 639 Proceedings and Methodology

AB 639 convened a panel of stakeholders at the San Pedro Bay Port Complex to develop recommendations for how to mitigate the negative impacts of automation on port employment and surrounding communities. This industry stakeholder panel comprised 10 individuals, including three representatives of the ILWU, representing Locals 13, 63, and 94; three representatives from the PMA industry trade group; two executive-level representatives of the Los Angeles and Long Beach Port Authorities; and two legislative appointees with backgrounds in workforce development (see table 2).

Six panel meetings were convened between April 2022 and October 2023. Panels were conducted both in person and remotely. Together with the Labor and Workforce Development Agency and the California Workforce Development Board, the UCLA Labor Center organized, oversaw, and introduced each of these meetings and provided regular updates to panelists on the status of the research process. The date, focus, and outcome of each meeting are indicated in table 3 below. Early on in the process, panelists also invited researchers from the Labor Center to tour the San Pedro Bay Port Complex to better understand how longshoring work is organized and carried out.

In addition to operating as a noncontract space for stakeholders representing both labor and employers to discuss automation, the panel functioned as a venue for the UCLA Labor Center to solicit feedback on the scope and direction of research undertaken.

Based on the recommendations provided by panelists, six case studies representing possible models for the planned Goods Movement Training Campus were selected. In-depth interviews focusing on the design and successes of these programs were conducted with representatives from the Shirley Ware Education Center, an Oakland-based training initiative for healthcare workers, and California Transit Works!, a statewide consortium focused on transit workforce development. Interviews were conducted remotely and lasted between one and two hours. Interviewees were asked about the curriculum and funding structures of these programs, how governance was shared between stakeholders, and the overall impact these programs have had on workforce development.

This research into possible models for future training programs was supplemented by a guided activity in which panelists were asked to reflect on the successes and limitations of a 2019 joint labor-management initiative at the San Pedro Bay Port Complex to improve safety outcomes for lashers, the port workers responsible for securing containers to one another aboard vessels.

In addition to participating in the panel itself, the UCLA Labor Center conducted in-depth interviews with each of the 10 panelists. Interviews lasted between 60 and 90 minutes and were conducted remotely. No compensation was provided, as panelists were participating as legislative appointees.

These interviews offered an opportunity for panelists to provide insights in an anonymous setting outside of the panel context. Questions focused on interviewees' career trajectories; their perceptions of critical issues facing the ports; current training resources available to the port workforce; desired outcomes for the planned Goods Movement Training Campus; and the future of the goods movement industry broadly. Interviews were transcribed and thematically coded by the UCLA Labor Center's research team.

An additional survey instrument targeting the port workforce was proposed by and designed with input from panel participants. The purpose of this survey was to gather primary data on the San Pedro Bay Port Complex workforce and its working conditions, information that has not been collected and analyzed to date by other researchers. The survey included questions about workers' job duties at the port, career trajectories, views on and experiences with automation, and demographic characteristics. Ultimately, the survey was excluded from the research design due to the sensitivity of ongoing contract negotiations between the ILWU and the PMA; however, there was broad interest among panelists in surveying the port workforce. This represents a possible avenue for future research.

Beyond the panel itself, this report draws from both published and unpublished reports on the impacts of port automation in the global goods movement industry and in the local San Pedro Bay context. These include peer-reviewed academic articles, trade journals, and industry reporting. Other textual sources consulted include legal and contract documents negotiated at the San Pedro Bay Port Complex and in other contexts.

Table 2: AB 639 Participants

Name	Affiliation	Type
Gene Seroka	Port of Los Angeles	Port authority
Mario Cordero	Port of Long Beach	Port authority
Andrew Gutierrez	ILWU Local 94	Labor representative
Sal DiCostanzo	ILWU Local 13	Labor representative
Rich Dines	ILWU Local 63	Labor representative
Alan McCorkle	Yusen Terminals	Terminal operator
Bob Johnson	Total Terminals International, LLC	Terminal operator
Steven M. Trombley	Fenix Marine Services	Terminal operator
Vivian Malauulu	Long Beach Community College District	Legislative appointee
Nilza Serrano	Serrano & Associates	Legislative appointee

Table 3: AB 639 Panel Meetings

Name	Focus	Outcome
April 28, 2022	Panelist introductions, AB 639 background, and discussion of ongoing supply chain issues	Aligned panelists and research team on scope of project
September 1, 2022	Establishing research timeline, soliciting panelist feedback on proposed survey instrument	Determined panel convening process, established scope and methodology of research
March 8, 2023	Discussion of planned Goods Movement Training Campus and its implications for AB 639 mandate	Expanded scope of research to include possible case studies / industry models for joint workforce training initiatives
April 18, 2023	Presenting background on training center case studies, leading guided panelist exercise on 2019 lasher training program	Provided high-level overview of potential models for Goods Movement Training Campus, achieved consensus regarding best practices of prior port training initiative
May 16, 2023	Presenting findings from existing published and unpublished literature on port automation, reviewing methodology for panelist interview process	Scheduled panelist interviews, aligned panelists on existing reports on automation and its impacts at San Pedro Bay Port Complex
October 27, 2023	Summarizing findings from interviews with panelists and training center case studies, determining timeline for finalizing report and future panel activities	Determined final report scope and timeline for circulation

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Endnotes

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