

CORRIDORS AS FACTORIES:
SUPPLY CHAINS, LOGISTICS AND LABOUR
IS THIS THE WORLD YOU WANT?

Nicholas Hildyard, The Corner House

Counter Balance
Challenging Public Investment Banks

February, 2020

Produced by Counter Balance Challenging Public Investment Banks

Endorsed by GRESEA

DISCLAIMER: this product was produced with the financial support of the European Union under the Citizens for Financial Justice project. The contents of this product reflect the views of Counter Balance and can under no circumstances be regarded as the equivalent or a reflection of the European Union.

PREFACE

In a previous report, **How infrastructure is shaping the World**,[1] *Counter Balance sought to probe the political and economic interests driving "mega-corridors" – the transcontinental road, rail, air and sea networks that are being constructed to service just-in-time delivery systems and to enable ever more remote sources of minerals and other raw materials to be extracted, at great environmental and social cost.*

Such corridors, the report concluded, are a deliberate attempt to "re-engineer economic geography" for the benefit of capital. To achieve "integrated corridor management", for example, the corridors are being transformed into free trade zones in which tariffs are progressively removed – together with the border controls, paperwork and other "man-made barriers" that, in the words of the World Bank, "increase distance[2]*" by slowing down the transport of goods. Workers' rights and wages are also eroded as corridor planners form pools of cheap labour by "agglomerating" people into clustered economic zones.*

The trajectory is towards ever more "extreme infrastructure". **EXTREME** *because of the scale of the infrastructure that is planned – every continent except Antarctica is affected.* **EXTREME** *because it enables extraction that is even more destructive than extraction used to be, opening up deposits of oil and minerals in areas previously considered unexploitable.* **EXTREME** *because it is premised on even more exploitative production, enabling capital to move wherever labour is cheapest and most vulnerable. Extreme because it depends on a kind of finance that is even more extreme than previous forms of finance, involving, for example, new, highly risky asset classes. And* **EXTREME** *because it can operate only through an extreme politics, involving elitist forms of planning that are profoundly undemocratic.*

In **Corridors as Factories**, *Counter Balance attempts to dig deeper into the assault on labour through the globalisation of supply chains and their associated infrastructure corridors. Drawing on the work of academics, such as Deborah Cowen, this current report looks at the grip that "logistics" (the managerial practices that orchestrate the movement of goods along corridors and supply chains) now exerts on global production, distribution and consumption – and how such practices have enabled capital to stretch production beyond the conventional factory right the way down the supply chain and beyond, allowing businesses to increase profits by squeezing labour at every stage.*

More and more of us – North and South – are now "logisticised"[3] *(in the words of Geoff Mann, Professor of Geography at Simon Fraser University) relying for our everyday provisioning on networks of political and economic power whose purpose is not mutual survival but profit: and the more entangled we become in these networks, the more our every move is fed into a system of unequal, unjust and destructive wealth production.*



/ PART ONE / *of the report looks at the worldwide proliferation of logistics hubs – consisting of seaports, inland "dry" ports, "aerotropolises", highway interchanges and facilities for manufacturing, processing, sorting, storing and distributing goods – as the movement of goods around the world is increasingly orchestrated by "logistics".*

/ PART TWO / *explores the ways in which outsourcing, offshoring and logistics have dramatically transformed the whole notion of production. It is not just assembly line workers who are now considered producers – but truckers, port workers and (as data extracted from everyday acts of consumption becomes an increasingly valuable commodity) consumers too. Logistics has transformed production processes so that they now extend far beyond the traditional factory gate, enabling profits to be extracted at many more points in global supply chains. The implications for labour are profound. Automation (including technologies such as blockchain), in combination with just-in-time management regimes, are subjecting workers to degrading just-in-time labour practices: more work is now contingent piece work; workers are increasingly subjected to electronic monitoring; wages are increasingly squeezed; and new forms of unpaid labour are being brought online.*

/ PART THREE / *explores the likely direction of travel if logistics is unchallenged. The path is towards increased exploitation of workers; new forms of corporate control and power, notably through the restructuring of capital around digitally captured information "platforms"; an ineluctable increase in energy use; and spiralling environmental destruction. The section also looks at resistance to logistics and the challenges of building alliances that might shift its intrinsically destructive vector. How might non-governmental organisations (NGOs), trade unions and other activists (many of whom may not be at the sharp end of logistics) help rather than hinder those whose reaction to logistics is a visceral (but perhaps, as yet, unarticulated) sense that "This is not the world we want"? What paths might activists* **refuse** *to take – and how might such "refusals" assist struggles to oppose logistics, infrastructure corridors and what Anna Tsing terms "supply chain capitalism"?*[6]

PART ONE THINK LOGISTICS, ACT LOGISTICS, BE LOGISTICS [7]

When I travel to London from my home in Dorset in the west of England, I usually take the train; but, on the occasions that I drive, my route takes me cross-country to Salisbury, whose medieval cathedral spire beckons from miles afar, before joining the M3 motorway, a branch corridor of the Trans-European Transport Network that connects the container port of Southampton (which serves the Northern Europe-Far East trade) [8] to other corridor routes north via London.

On recent trips, I have noticed a change in the trucks using the motorway: more and more now seem to carry corporate logos that eschew such humdrum straplines as "transportation", "freight delivery" or "haulage" in favour of "logistics". Examples include **Girteka Logistics** ("transporting salmon from Norway, dairy products from France or fruits from Spain" to supermarkets including Tesco [9]): **Europa Worldwide Logistics** ("cutting edge, integrated delivery solutions to suit your business");[10] **Ice Co° Storage & Logistics** [11]**: XPOlogistics** (handling "more than 160,000 shipments and seven billion inventory units daily");[12] Poland's **LCL - Lubuskie Centrum Logistyczne** ("all kinds of cargo to every corner of European Union");[13] and Germany's **BLG Logistics.**[14]

To be sure, such trucks still appear to be the exception rather than the rule: but my perception is that their numbers are increasing. Proof that a revolution is afoot in the trucking business? Hardly. One logistics-branded swallow does not make a logistics spring; and my somewhat idiosyncratic encounter with logistics-as-advertising is hardly evidence of logistics as a new organising principle of production, distribution and consumption. But it is not just trucking companies that now pronounce themselves "logistics" enterprises. Up and down Britain, "logistics centres" (some the size of small towns) [15] are springing up along the main transportation corridors. The countryside between the M1, M6 and M42 motorways, for example, is now home to three of the country's biggest logistics centres: the 550-acre Magna Park logistics park ("Europe's premier logistics location") at Lutterworth,[16] developed by Gazeley, a leading manager of European logistics real estate;[17] Prologis' RFI DIRFT distribution hub near Rugby (one of 26 logistics parks developed by the company throughout the UK);[18] and Eurohub at Crosby.[19]

Beyond this "golden triangle of logistics", [20] rival logistics corridors are also emerging,[21] notably along the M40, linking London to Birmingham.[22] London has seen the construction of DP World's London Gateway Logistics Park, said to be "UK's most integrated logistics facility",[23] as part of the wider development that includes "an expansive land bank for the flexible and fast development of logistics facilities and warehouse".[24] The Gateway's state-of-the-art deep-sea port is built to handle the world's largest vessels,[25] while its associated railway terminal is the terminus for the China Railway Express' once-weekly train service from Yiwu in China via Duisburg in Germany to London.[26] Perhaps significantly, bookings for this "Iron Silk Road"[27] train, whose 23-day journey time shaves thousands of dollars off the cost of transporting containers to and from China, are handled not by the train's operating company but by the logistics firm OTTLogistics.[28] [29]

Britain is not alone. Around the globe, logistics is on the march as capital seeks to speed up the production and exchange of commodities by better linking points of resource extraction, points of production and points of consumption, notably through the construction of infrastructure corridors.[30]

Logistical hubs (also known as "freight villages"[31]) have been established in "virtually every country" [32] of the world (**see** *Logistics Hubs as Zones of Exception*). According to a 2015 report by CBRE, an investment and real estate firm, some 30 such hubs – each connected to major international transportation networks – now provide "the backbone of the global logistics supply chain and global trade".[33]

Some, like Shanghai (the world's busiest container port) are massive, covering an area of 3,619 square kilometres, roughly a quarter of the size of Northern Ireland.[34] Similarly, in Northern Italy, a vast swathe of country from Genoa to Venice (known as "logistics valley") now forms a "complex logistical matrix of centers and peripheries, intermodal transport terminals, warehouses, IT infrastructure, container parks and shipping ports, interspersed with suburbs, green belts, roads, railways, water systems and barren land".[35] Other centres in Europe, such as Rotterdam in The Netherlands, are smaller but expanding. In the United Arab Emirates, Dubai World Centre[36] (an "airport city"[37] which modestly promotes itself as the "Centre of Tomorrow"[38]) is envisaged to include a Logistics City, a Commercial City, a Residential City, an Aviation City, a Media City,[39] an Internet City and, just in case executives feel overworked, a Golf City.[40]

New "emerging" hubs identified by CBRE include Busan[41] in South Korea, Santiago[42] in Chile; Bajio in Mexico (described as "an auto manufacturing distribution hub"[43]); Istanbul in Turkey, which now boasts the world's largest airport[44]; and Barcelona in Spain ("the first logistics hub in Southern Europe"[45]). In China alone, 212 logistic hubs are planned: 30 are slated to be completed by 2020 and another 150 by 2025.[46]

LOGISTICS HUBS AS ZONES OF EXCEPTION

Logistics hubs – broadly defined as areas specialising in the processing, warehousing and onward transportation of goods in a supply chain – now dot the globe.

Researchers at CBRE, the world's largest commercial real estate services and investment firm,[47] have ranked the world's major logistics hubs in terms of the facilities they provide, their "business climate" and their catchment area. Nine of the largest are in North America (including Los Angeles, New Jersey and Dallas/Fort Worth), eleven in Europe (including Rotterdam, Frankfurt and Antwerp), one in Latin America (Sao Paulo, Brazil), and seven in Asia, of which five (Shanghai, Shenzhen, Guangzhou, Tianjin and Hong Kong) are in China.[48]

Most such hubs constitute what architect, academic and writer Keller Easterling[49] terms "zones of exception", exempted to varying degrees from the customs, tax, employment, land acquisition, permitting and licensing laws that apply elsewhere in a country.[50]

In the USA, over 90 percent of so-called "logistics clusters" overlap with one of the country's 358 designated Foreign-Trade Zones, where goods are free of US customs duties and tariffs.[51] Borders, it would seem, are for Mexicans, Guatemalans and other Latin Americans, not for the goods they produce.

In the European Union (EU), many logistics clusters (such as the recently-opened Logistics Free Zone[52] close to the Free Port of Trieste in Italy[53]) have similarly developed in or around the EU's 80 designated Free Trade Zones[54], where they benefit from simplified customs procedures and relief on customs duties. Others have coalesced in specially designated "development zones", where fiscal incentives such as lower business rates are on offer[55] In total, there are some 240 major logistics hubs in the EU, the majority concentrated in just four countries – Germany, Spain, France and Italy.[56]

In the Global South, Special Economic Zones (SEZs) are the location of choice for logistics firms. Indeed, the ability of such zones to continue to attract manufacturers increasingly depends on their logistics infrastructure.[57]

Businesses using Nigeria's privately-funded Lagos Free Trade Zone, which includes dedicated "logistics" and "warehousing" zones,[58] are guaranteed "a host of preferential policies and 100 percent incentives by the Government of Nigeria", designed to "make the Lagos Free Trade Zone a 100 percent hassle free business proposition for all".[59] Such incentives include exemptions from "all tax, custom duties and levies".[60]

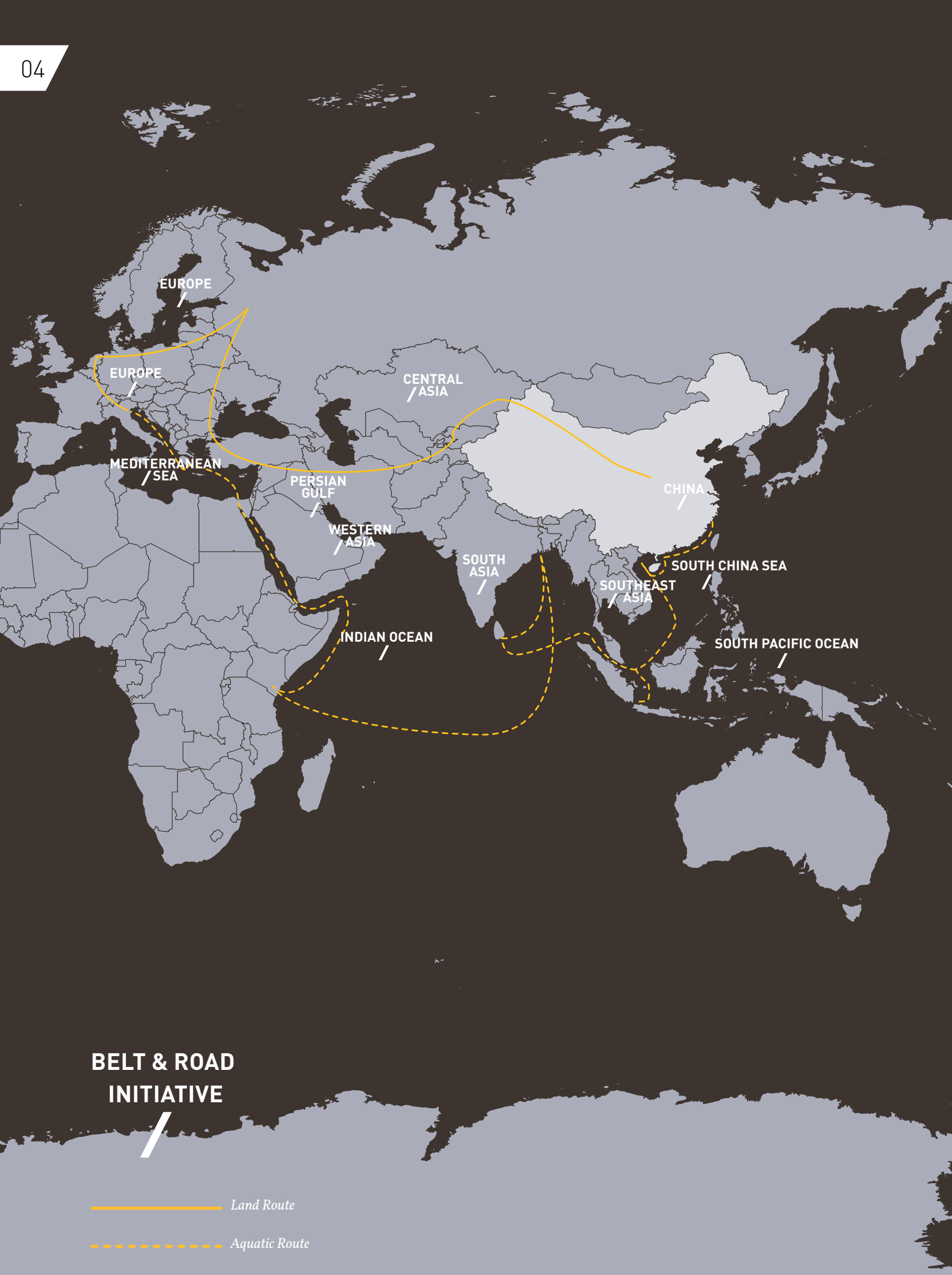
Tax exemptions also feature prominently in the inducements offered by other Special Economic Zones. In Dubai's Logistics City, companies enjoy, among other benefits, "0 percent corporate tax for 50 years (a concession that is renewable), no restriction on capital repatriation, 0 percent import or re-export duties [and] 0 percent personal income tax".[61] Iran's IKIA airport city and Pakistan's Gwadar Port, part of China's Belt and Road Initiative, similarly offer tax holidays of 20 years.[62]

Beyond, zero taxes, logistics companies setting up in many SEZs have historically enjoyed total exclusion from national labour laws protecting the right to strike and to organise trade unions. Freedom of association and collective bargaining is prohibited in export processing zones in Pakistan, for example, and Nigeria's Export Processing Zones Act 1992,[63] which governs the Lagos Free Trade Zone,[64] specifically bans strikes and lockouts "for a period of 10 years following the commencement of operations within a Zone.[65]

In most countries, however, governments have responded to years of workers' struggle against labour repression in SEZs by restoring (at least on paper) some, if not all, labour rights.[66] But even where union activities are legally permitted on paper, they are often not respected in practice. As a 2017 report by the European Parliament notes: "In the Philippines there is an alleged unofficial policy of 'no unions, no strike' by the Export Processing Zone Authority (EPZ). In Sri Lanka, although workers in EPZs are now legally allowed to join trade unions, attempts to associate and bargain collectively continue to be frustrated in practice".[67] Other SEZ-related labour concerns documented in the report were "excessive working hours, poverty wages, the gender pay gap and other forms of sex discrimination".[68]

*"Logistics" brings further oppressions for workers in SEZs. In order to meet the demands of transnational production and distribution, working conditions, legalisation and the built environment throughout the zones are now "logistically synchronised" to the "nth degree" (in the words of Kay Dickinson, Professor of Film Studies at Concordia University).[69] For workers, that means more surveillance, more regimentation to the dictates of just-in-time delivery and increasing downward pressure on wages (**see** Part Two, main text).*

With logistics now permeating every nook and cranny of production and distribution, there is increasing osmosis between the regimes of SEZs and the regimes of production and distribution outside of SEZ enclaves. Indeed, SEZs are now morphing from fenced-off zones of exclusion to a management model for society as a whole.


EUROPE
EUROPE
CENTRAL ASIA
MEDITERRANEAN SEA
PERSIAN GULF
WESTERN ASIA
CHINA
SOUTH ASIA
SOUTH CHINA SEA
SOUTHEAST ASIA
INDIAN OCEAN
SOUTH PACIFIC OCEAN
BELT & ROAD INITIATIVE
Land Route
Aquatic Route

Now a $4.7 trillion industry,[70] said to be the world's largest employer,[71] logistics has been described as "the vascular system of global trade".[72] Even within communities that still largely provision themselves, many consumer items – from plastic buckets to bicycles, water pumps and jeans – rely for their delivery "on the calibration of an astonishing cast of characters, multiple circulations of capital, and complex movements across great distances".[73] For those who depend predominantly on supermarkets and shopping malls to provide their household goods, the reliance on logistics is near total. Few of the goods on sale escape "logistics": at every stage in their manufacture, delivery and disposal, logistics companies mediate their movement – loading component parts into containers, transporting them by road, sea, rail and air to the next point in their manufacture, unloading and repacking them, and repeating the process until they are sold to the consumer and (ultimately) discarded. At any point in the day, logistics determines the movement of the ten million containers – transporting "ninety percent of 'everything'"[74] – that are said to be simultaneously on the move.[75] Freeze frame the world at any given moment and 2 percent of the world's Gross Domestic Product (some $2.3 trillion dollars-worth of goods) will likely be in the airplanes,[76] delivery trucks and vans of just one logistics company, UPS.[77]

With more and more people shopping online (not just in the North but also increasingly in the emerging economies of the global South – China is now the world's largest e-commerce market, with 23 percent of all recorded retail goods being bought online),[78] the direction of travel is towards greater and greater everyday entanglement with logistics. Each click on a product causes a robot or a human somewhere to collect an item off a shelf, to package it, sort it for delivery and reorder it from the manufacturer. And each of those actions in turn causes something, somewhere to be moved further down the supply chain – a process that not only involves trucks, trains, containers, gantries, cargo ships, forklift trucks, human hands, road, railways and shipping lanes but also algorithms, synchronised computers, microwave relay stations, satellites, server farms and "huge agglomerations of circuitry, cables and cooling systems".[79]

It is logistics that increasingly coordinates this "seemingly innocuous"[80] global infrastructure of wires, concrete, steel and people.

Unsurprisingly, within commercial circles, logistical thinking is now second nature: as the slogan for a recent conference would have it, "Think Logistics, Act Logistics, Be Logistics".[81] "Logistics" has not only entered into the lingua franca of business managers worldwide,[82] its disciplines now dictate how production is organised, where new infrastructure corridors are being built, how costs and benefits are calculated[83] and even how space and time are conceived.[84]

But, for those who engage with logistics only as consumers, logistics is largely "tucked out of sight".[85] Logistics' moving parts may be ubiquitously visible – those trucks on the motorway, the containers stacked at docks, or the next-day-delivered package from Amazon – but logistics as the operating system that coordinates those moving parts in the interests of capital accumulation remains largely unexplored, even by socially and environmentally conscious activists. Most of us are (to borrow a phrase from Pink Floyd) "comfortably numb"[86] to logistics' operations and consequences. Indeed Deborah Cowen, a pioneer inquirer into the political economy of logistics, has described the restructuring of capital's global operations though logistics as "arguably the most underinvestigated revolution of the twentieth century".[87]

Cowen's work, and that of other academic activists, such as the "Into the Black Box" collective in Italy,[88] has done much to expose the violence of logistics and the central role that it now plays in moulding global production, distribution and consumption to the requirements of contemporary capital.

A better understanding of logistics is thus surely critical to informing strategies and tactics of dissent, critical inquiry and activism, whether in respect of infrastructure corridors or extractivism or supply chains. What does it mean to be "logisticised"? What specific forms of power have made logistics possible as an organising principle of society? How are elements of capital reorganising as new digital technologies – from robotics to blockchain – are integrated into logistics operations? What new alliances are firms making? And how might these necessitate changes in the strategies of current struggles against extraction, infrastructure corridors or labour abuses in the factories, ports, warehouses and retail stores that make up today's global supply chains? What new alliances might a better understanding of logistics open up for social and environmental justice movements? [89] What new connections might emerge between seemingly disconnected acts of exploitation and dispossession? And how might a deeper understanding of those connections "foster new analytical and political linkages among the moments where value is appropriated, produced, distributed, and realized"? [90]

PART TWO LOGISTICS AND LABOUR

The logistics industry likes to present itself as a highly proficient relay team, ensuring that the baton of production and distribution is smoothly handed over from one stage in a supply chain to the next – all the way from extraction through manufacturing to the final "last mile" delivery of products to the consumer. The job of logistics is to ensure that the right "products, services, equipment, people, money and information" [91] are in the right place, in the right quantities, at the right time. [92] [93]

This much is true. Logistics does indeed involve the orchestration of supply chains, broadly defined as "the sequence of processes involved in the production and distribution of a commodity".[94] As such, logistics encompasses numerous managerial activities – from forecasting to sourcing, purchasing, designing, manufacturing, scheduling, warehousing, packaging, sorting and transporting.[95] Its managerial web embraces everything needed to position inventory in the supply chain – and the technologies it now uses to accomplish this extend beyond trucks and containers to "biometric sensing technologies that monitor the productivity of manual and white-collar laborers";[96] barcodes that constantly collect and feedback information on sales;[97] and digital blockchain ledgers (**see** Blockchain and the Mechanisation of Trust *page 17*).

But focusing on the gizmos and technocratic tasks of logistics obscures logistics' primary purpose and outcome. Far from being simply "a mundane science of cargo movement or a discrete industry among others",[98] logistics is better viewed as the means through which capital now squeezes labour at every stage in the production process. This is the prime "efficiency" that logistics brings to supply chains: it is one fix through which capital has sought to respond to recent falls in the rate of profit.[99]

Deborah Cowen,[100] for example, dates the ascendency of logistics within contemporary business practice back to the prolonged profit squeeze of the early 1950s, when US companies began to look for cost savings in transport (notably from the factory to the retailing outlet) as a means of boosting profits.[101] By the 1960s, management gurus such as Peter Drucker were proselytising a "whole business" approach to flows of materials, information and people in order to add value throughout the entire chain from manufacture to consumption.[102]

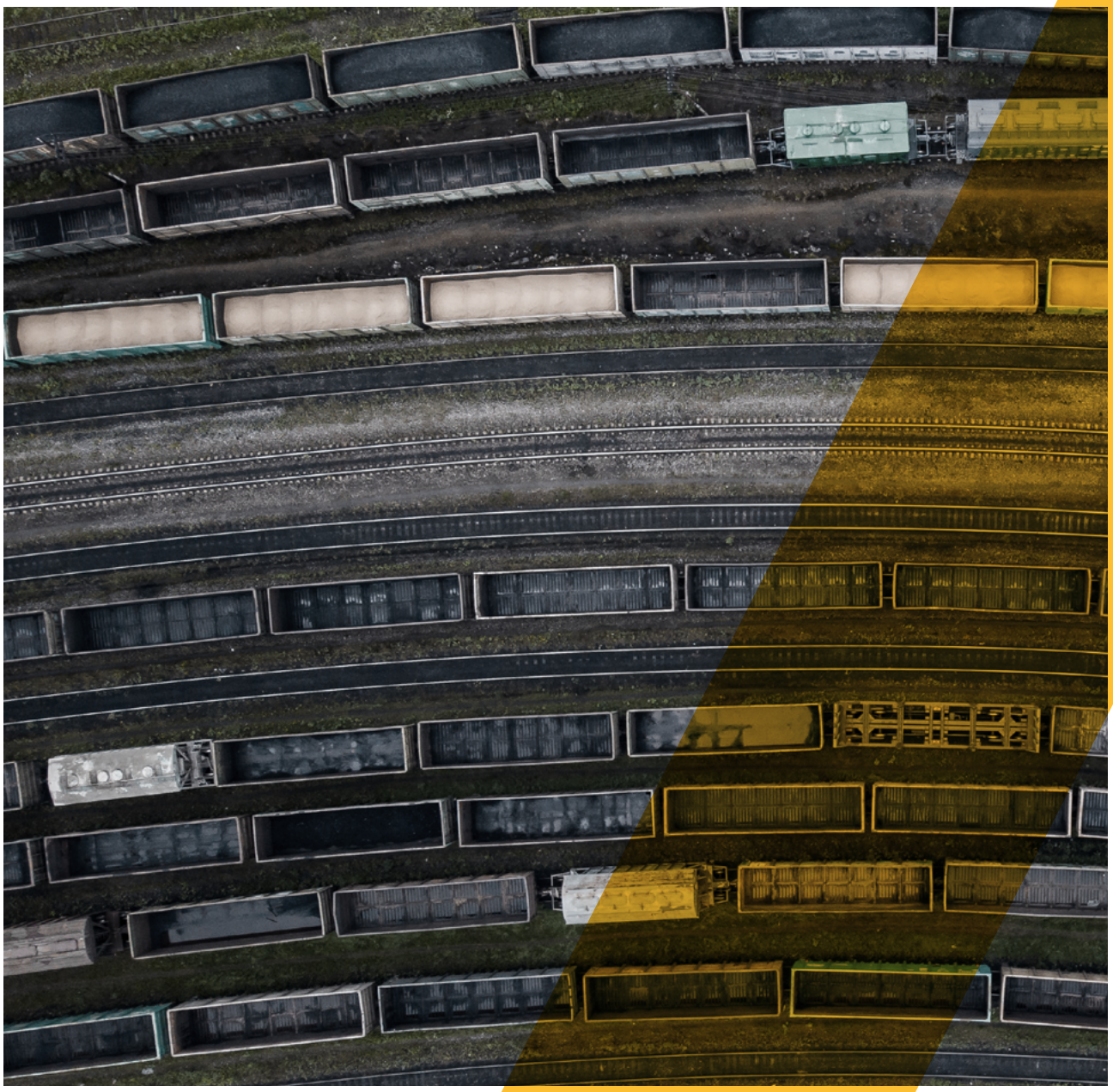
But it was the outsourcing and offshoring of manufacturing in the 1980s that really embedded logistics as the all-encompassing management system that it is today. With profits again declining, companies restructured their operations by relocating within and between countries in search of new markets, the weakest trade unions, the most flexible rules on working conditions and the largest subsidies.[103] Relocation was possible, however, only with increased connectivity and global systems of management: as activist academic Brett Neilson notes, "cheap labour in China or cheap minerals in South America are of no practical use if they cannot be brought cheaply and efficiently into the manufacturing process and into the market".[104] Hence logistics and hence the frenzied construction of new infrastructure corridors to connect the previously unconnected and to ensure the smooth and speedy flow of materials between points of extraction, points of manufacture and points of consumption.

Capital is now increasingly able to arbitrage labour, seeking out the lowest wages anywhere in the world and to play workers off against each other.[105] But outsourcing, offshoring and logistics have also dramatically transformed the whole notion of production. In the traditional Fordist factory, the preponderance of a firm's manufacturing processes was concentrated in one place. Ford's own River Rouge plant, for example, was intended to be as self-sufficient as possible: it had its own "steel mill; rubber and tire, glass, and cement plants; press and motor-buildings, tool and die shops; and several less obvious production facilities".[106] Within the plant, transportation costs were minimal since the main transportation needs were in moving parts from one area of the Rouge River plant to another (just as in the cotton factories of the 19th century, transport was only needed to move cotton, in Marx's words, "from the carding to the spinning room" [107]). The main transportation costs came **after** production: when Ford's cars came off the end of the assembly line and were taken by trucks to the retailers' forecourt where they were sold.

But with the adoption of outsourcing and the demise of the vertically-integrated factory, transportation between points of production – now separated by thousands of miles rather than a few yards – took on a new importance. Instead of being conceived of as "the residual act of distributing commodities after production",[108] transport became a vital element in the production process itself, with profound implications for value creation and hence profit-making.

Now that the supply chain has, in the words of Deborah Cowen, "superseded" the Fordist factory, production is increasingly located in the logistics networks that move commodities from one point of production to another – in effect, logistics networks have become "the factory".[109]

As production is broken up into its component parts and rearranged into new configurations that stretch around the globe, the distinction between "making and moving" becomes increasingly blurred.[110] Areas of work (such as warehousing) that were once deemed outside of the production process have been transformed so that they are now part and parcel of it: warehouses no longer serve primarily to store goods (inventories are kept to a minimum)[111] but as "distribution centres", where workers "perform work once considered to be in the manufacturing sector",[112] notably processing parts, controlling quality, customising and packaging.[113] Moreover, with digitalisation, it is not only the boundary between production and distribution that is blurred. Consumption itself has become a site of production. Through point of sale technologies (barcodes and the like) retailers are able to collect huge amounts of information on who buys what, where and when: every act of consumption becomes a potential act of production – the product being data, which, once itself processed, has now become a major commodity.



/

CONSUMERS AS PRODUCERS - BIG DATA AND VALUE

Capital has long sought to control consumers in order better to synchronise production with consumption, developing a range of techniques, notably advertising, to do so.[114]

The "digital revolution" has now supplied new tools that grant companies increased powers to influence patterns of buying than they ever previously enjoyed. Monitoring consumers has become integral to the operation of supply chains – and the trajectory is towards greater and greater corporate intrusion into the daily lives of consumers on a scale that pre-internet advertisers and retailers could only dream of.

Every time you make a purchase with a banker's card or a store loyalty card, the purchase (when? where? how much was spent? what on?) generates data that is used to build up a picture of your shopping habits in order to "personalise" sales and maximise your purchase of "stuff". Every web page visited, the time spent on it and the frequency of visits adds to the profile.[115] *Other data are fed in from tweets, videos watched, your Facebook networks, customer loyalty cards, blogs, insurance claims, web searches and so on. Collated together with hundreds of thousands of other such profiles, patterns can be discerned about what products sell best, how best to market them, where they sell and how likely you and others are to buy them in the future. In turn, these discerned patterns are used to make decisions on where to site distribution centres, new roads and new retail stores. Data collected from monitoring workers as they stack and move products or truckers and train drivers as they transport them provides yet further streams of information that can be used to refine production and distribution to increase profits.*

Data harvesting is increasingly core to the business model of many logistics companies "fundamentally changing the way world trade operates".[116] *For the management consultancy firm EY, data is "the new 'blood' within the lifelines of the world, carrying within it the nutrients for future success".*[117]

Logistics companies have the potential to harvest huge data sets from the millions of shipments every day that are moved around the world. The accountants KPMG predict that the data generated will grow "exponentially", [118] *making or breaking companies if they fail to capitalise on the trend. Already cargo is tracked minute by minute as it moves along supply chains, providing information "to open the throttle" (as logistics multinational DHL puts it) for "accelerating business processes".*[119]

The amount of data collected – through barcodes, point-of-sale systems, embedded sensor technologies, wearables, and apps – is now staggering. By one estimate, the number of "available digital information pieces (bits)" now surpasses the number of stars in the universe.[120] *Walmart "captures every single exchange occurring at each of their retail stores, and every day records roughly 20 million customer transactions through its 140,000 POS-systems worldwide".*[121] *Amazon "collects data on historical buying and browsing patterns, web pages visited, duration of viewing an item, overall length of visit to an Amazon site, links hovered over, and so on".*[122]

The Internet of Things (in which objects digitally interact with each other) will massively increase even those data mining hauls. By 2020, the number of internet-connected "things" collecting data[123] *– from fridges to chip-enabled milk cartons that signal when milk needs reordering – is predicted to reach 50 billion.*[124] *Within ports, more than 500 million deliveries are already said to be tracked through some 9 million installed devices.*[125] *DHL also foresees huge potential revenue streams for logistics firms from equipping trucks with sensors to collect "rich sets of information on the go", such as information on "ozone and fine dust pollution, temperature and humidity, as well as traffic density, noise, and parking spot utilization along urban roads".*[126] *Selling this data to public health and environmental authorities (not to speak of estate agents)*

could provide logistics firms with "complementary revenues to subsidize, for example, the maintenance of a large delivery fleet".[127]

CISCO, the American multinational technology conglomerate, estimates that companies could extract trillions in value from the data now available to them, principally through reduced costs, greater labour productivity and speeding the flow of goods to market.[128] [129] *The logistics and retailing sectors are already major beneficiaries. Once processed, the data collected allows firms to map continuously where parts are at any one time; what distribution centres they should be moved to and by what route; how products should be redesigned to meet changing consumer needs even as goods are in the process of production; and how assembly lines should be managed to maximise productivity.*[130] *It also enables companies to match commodities to particular consumers;*[131] *and to ensure that local retailers have stocks of what particular customers are likely to want.*[132]

By analysing point-of-sale data, for example, it is possible to predict when a woman is pregnant, enabling them to be targeted with advertisements and sales vouchers for goods that they are likely to need as the pregnancy progresses.[133]

Stored in massive computer servers and transmitted around the world by a network of cables and satellites, data is now a major commodity in its own right. In future, according to Kalmar Global, a company specialising in the automation of cargo handling,[134] *data will be "the most precious commodity" in the world.*[135]

Much of the data is produced through the paid labour of workers – their every movement on the job tracked and logged – but the unpaid work of consumers is also critical to data generation. Through their card purchases, web searches, GPS-tracked journeys and the like, consumers have been sucked into "a high-speed feedback loop" [136] *in which they give up the details of their daily behaviour without compensation to boost corporate profits.*

As feminists have long documented, production has always been integrated into spaces beyond the conventionally-understood workplace.[137] *Capital has always relied for its survival and expansion on work in the "social factory" of labour reproduction – the schools that prepare workers for work, the hospitals that keep them well enough to work and the homes that care and socialise them into work.*[138] *The bulk of this work is undertaken unwaged by women as carers, mothers, home makers and providers;*[139] *and although state payments in the form of welfare, pensions, social housing and national health services have provided an element of compensation, even these "social wages" are now being cut to the bone through austerity programmes.*[140] *The unpaid work of data generation thus takes place in a context where workers have fewer and fewer safety nets.*

Some contest that such data generating work constitutes "labour" in the Marxist sense of the word. One reason, argues Nick Srnicek, author of Platform Capitalism, is that "it is not subject to the standard capitalist imperatives" – for example, there is no attempt "to rationalise the production processes, to lower costs, to increase productivity and so on".[141] *Others, such as Christian Fuchs and Sebastian Sevignani, disagree, insisting that the work is clearly exploitative, not least because those who do the work are alienated from the fruits of their labour, the profits being extracted by the owners of the data produced.*[142]

What is clear is that the production process in supply and distribution chains no longer ends neatly with the act of exchange or consumption of physical goods. It continues to the point where the data extracted from such acts is sold or rented to companies seeking to hone their advertising or improve their manufacturing processes. As everyday social interactions become increasingly mediated and preyed upon by apps and algorithms, so more and more of us are caught up in the process – to the point where the digital pillaging of our data becomes, for many, a trade-off for simply having a social life.

As the supply chain and its interconnections becomes "the factory" so more and more workers are drawn into the production process. The labour of the train driver moving parts from one manufacturing supplier to the next;[143] the docker unloading containers; the distribution centre worker processing, sorting and repackaging parts; the consultants on supply chain security;[144] the technicians standardising products so that they can be transported and processed more easily;[145] the computer programmer whose algorithm controls an inventory management system; the biologist who devices the environmental and carbon offset programmes that allow a road to be built or a company to pollute; all this and more – from the labour of mine workers to oil and gas workers, windfarm and solar farm workers and workers building roads, railways, ports and airports – is labour that is now integral to the production process. As the geographer Martin Danyluk observes, this is therefore labour from which surplus value can be (and is) extracted in precisely the same manner as it is extracted from assembly-line workers in a manufacturing plant: by paying them less than the value they create for their employer.[146] Unsurprisingly, as logistics and transportation become accumulation strategies in their own right,[147] the "drive to extract ever-greater amounts of surplus value from transportation and distribution workers is one of the structural forces that has underpinned the modernization of logistics systems over the past 50 years".[148]

Critical to the process of extracting value from logistics networks has been the deliberate creation of pools of cheap labour, where wages can be driven down by pitting a surplus of workers against each other in a competition for jobs. The construction of infrastructure corridors and "special economic zones" has been central to this strategy: an explicit aim of the Almaty–Bishkek Corridor in Kazakhstan, for example, is the planned "agglomeration" of 70 percent of the country's population into three planned megacities[149] in order to provide an overflowing pool of labour for dedicated mining, agribusiness, manufacturing and logistics "hubs" along the corridor route.[150]

Less dirigiste but no less effective in keeping wages down is the siting of logistics hubs in corridor-connected areas of high unemployment or under-employment where pools of cheap labour already exist. In the UK, for example, Corby's Eurohub logistics centre sells itself on the basis that local wages are considerably lower than those elsewhere in Britain (£446 a week versus £541),[151] while an advertising brochure for Prologis' DIRFT logistics park invites companies to let "the labour pool stats speak for themselves" – a "growing workforce to supply DIRFT comparable to competing schemes"; a "30 minute drive" labour catchment area, providing a workforce that is "available in 30 minutes" (ideal, one assumes, for "just-in-time" piece-work contracts); and an established location where "wage growth is limited compared to competing schemes".[152] In the US, in the 1990s, the logistics giant UPS reportedly sought to circumvent the difficulties of obtaining short-term labour for its Louisville Worldport distribution site – notorious for its reported "low wages and miserable work conditions" – by creating a special university programme designed "to fit the needs of UPS" which supplied student-workers for night shifts as part of their course.[153] The practice has been imitated in China where schoolchildren, often required to work nights, have reportedly been drafted in to make Amazon's Alexa devices "as part of a controversial and often illegal attempt to meet production targets".[154]

At every stage in the logistics-as-production process, labour is thus under assault as workers are squeezed to increase productivity for lower and lower wages and subjected to increasing surveillance, disciplining, precarious terms of employment, racialised forms of exploitation and more.[155] While the particularities of exploitation differ for different groups of workers in different segments of the supply chain, some features apply across the board.[156] **These include:**

/ UNION BUSTING /

The deregulation of industries such as trucking and shipping, coupled with **re**regulation to make union organising more difficult, have dramatically undermined the power of labour in the transport sector. In shipping, the relaxation of registration rules allowed ship owners to roll back gains made by seafarers' unions internationally simply by "reflagging" ships so that they were subject to the rules of countries where marine workers' rights were less protected.[157] Union membership amongst US truckers was likewise undercut in the 1980s after deregulation "encouraged the widespread use of non-union 'owner operators'", whose self-employed status was, in the words of Deborah Cohen, close to that of sharecroppers.[158] The resulting savings in trucking costs – amounting by one estimate to some $5.7 billion – were "largely taken directly from workers".[159]

Beyond deregulation, the trans-nationalisation of supply chains has added a further weapon in the armoury of capital. As Jasper Bernes of Commune magazine argues, planetary-wide supply chains have "effectively encircled labour . . . laying siege to its defensive emplacements" by enabling recalcitrant workforces to be outflanked through the sourcing of supplies from places where labour is more repressed or less militant.[160]

Infrastructure corridors have proved critical to this outflanking, the "fungibility"[161] they create enabling businesses to simply bypass workers who demand higher wages and better conditions. Shipping lines, for example, recently used the threat of diverting cargo through the upgraded Panama Canal "to exercise discipline over West Coast longshore workers" in the US when they sought better wages and conditions, forcing them to compromise.[162] Similarly, Amazon tried to bypass and undermine strikes in Germany "by shifting orders between warehouses",[163] a strategy that would not have been possible without the "geographical flexibility" (to use Martin Danyluk's phrase) that road and rail links enable by making any one distribution centre in Europe "logistically" interchangeable with another.[164]

The growing insecurity of workers' contracts (of which more below) adds to the problems facing labour since part-time, contingent work makes organising more difficult. Even where workers have come together to protest their condition, immense pressure is placed upon them. Workers at an Amazon distribution centre in Poland (Amazon now being one of the largest logistics companies in the world)[165] record how the company prevented them from regularly leafleting outside the workplace; reassigned activists from one position to another so they could not form close relations with colleagues; and replaced union activists with temporary agency workers.[166]

Elsewhere, the UNI union has accused Deutsche Post DHL – the largest logistics company in the world[167] – of not fully respecting the rights of workers to join a union. The union has presented extensive evidence that "in countries such as Turkey, Malawi, Indonesia, Colombia, Guatemala and the USA, DHL systematically aims to limit freedom of association, collective bargaining and the presence of a union within its workforce".[168] Although DHL insists that it "respects the rights of its employees and, in particular, the right to freedom of association",[169] the union counters that there is a pattern "of a consistent and systematic policy of violations of labour rights throughout the company's global operations over a number of years".[170] The union cites a ruling in the US which required a DHL subsidiary (together with the staffing agency it used) "to pay back $213,000 in illegal deductions as well as $143,000 in fines for health and safety violations".[171] In Colombia, Costa Rica, and South Africa, DHL has also been accused of using lie detector tests on workers in the warehouses and transport sector.[172] DHL denies the allegations.[173]

Inevitably, the declining power of organised labour has resulted in immense downward pressure on wages throughout supply chains. In some US states, nearly one in three Amazon workers are on food stamps.[174] Workers at the Foxconn factories in China, which make Apple's iphones, are paid $130 per month, "about one 31,000th of the salary of Apple's then CEO, the late Steve Jobs, who was on $48 million a year".[175] As for those schoolchildren now making Apple's Alexa devices, they earn a reported 16.54 yuan an hour (£1.93) inclusive of overtime and other add-ons, with a basic salary of £1.18 an hour, undercutting the wages of agency workers, themselves on a paltry 20.18 yuan an hour.[176]

/ "996 WORKING" AND SURVEILLANCE /

Working conditions within many of the facilities that make up the global logistics network are often "of the Middle Ages", to quote a dockworker in Piraeus, Greece.[177] Within many Special Economic Zones, so-called "996 working" is the norm, with workers expected to work from 9am to 9pm, six days a week.[178] Even in countries where this draconian work regime is not permitted, conditions are dire, with workers subjected to constant, intrusive monitoring and disciplining. In Poland, an Amazon employee records having to log into a system that identifies even the briefest moment when a worker may be doing something classified as "time off task".[179] Each such "break" is recorded for potential disciplinary action. In the UK, where Amazon workers are reportedly subject to a "points system", with points recorded for any action (including talking to fellow workers)[180] that might interfere with productivity targets, a recent survey by Organise found that 74 percent of the company's warehouse workers were afraid to go to the toilet during a shift out of fear of being penalised.[181] One Amazon worker described the atmosphere as "what I imagine a low-security prison would feel like".[182] In 2018, Amazon's aggressive anti-union approach was captured in a leaked training video for managers, which encouraged them to watch out for "early warning signs" of workers organising, such as talk of "living wages".[183] Amazon executives reject the allegations that its workers are treated badly.[184]

As e-commerce adds to the pressure within supply chains – with customers now expecting same day delivery – so the pressures on workers are increased. Walmart (like Amazon, a logistics company rather than simply a retailer)[185] now aims for "35 second processing time" when customers return online purchases to one of its stores.[186] The surveillance and regimentation of workers' routine is thus becoming more and more all-encompassing, aided by advances in digital technologies, such as GPS tracking, radio frequency identification tags, and biometric monitoring devices.[187] As political geographer Kyle Loewen notes, monitoring now includes the entire spectrum of movement of goods and people in a warehouse or on an assembly line – "from the minute gestures of box packers and the pathways of cranes . . . to the rest breaks of freight drivers, the call content and duration of call centre workers, and the passage of commodities shipped around the globe".[188]

Tags embedded in workers' ID cards and clothing or phone applications such as Google's Map Coordinate are used to track the movement of workers to identify "inefficiencies".[189] So-called "wearables", such as the Apple watch, are used to maximise productivity by rerouting workers by the quickest route to wherever they are needed in a factory or warehouse.[190] [191] Cameras in cabs are already used by Caterpillar, the world's largest manufacturer of construction and mining equipment, to monitor driver fatigue "by tracking pupil size and blink frequency".[192] Data collected within the workplace through "the internet of things" – digitally-connected forklift trucks, for example – are used to predict possible strikes.[193] Any slow down by workers can immediately be identified – and responded to by, for example, rerouting shipments.[194]

/ PRECARIOUS EMPLOYMENT AND DISPOSABILITY /

Worldwide, logistics workers face "a rising tide of contingent employment relations and third-party employment systems".[195] From docks to distribution centres, workers are increasingly subjected to "just-in-time" labour contracts,[196] where 24/7 availability is expected of them even though they are paid only for the short periods where they lash a container or unload a truck.[197] For companies, the more contingent the workforce, the easier it is to shift production to a new location to capitalise on more favourable tax, regulatory or low wage conditions.[198]

In distribution centres, the workforce is now commonly supplied by private sector employment agencies and contracted on a self-employed basis. The workers have little protection and no in-work benefits but can be summoned at a moment's notice to deal with, say, the arrival of a trailer that needs unloading.[199] Similarly, dock workers in Piraeus report that they have no clue what hours they will work from day to day: typically, they are summoned by SMS "to be at work in 3 hours".[200] Such precarious labour is psychologically stressful and undermining of labour solidarity: "just-in-time" workers are constantly pitted both against each other and against those who enjoy more solid employment contracts because they are considered less peripheral to the production process. Such divisive employment practices are often exacerbated by the racialisation of labour conflicts, particularly where migrant labour is exploited to undercut wages.[201] Indeed, the exploitation of gender and race differences is integral to the way in which capital controls its increasingly diffuse supply chains.[202]

Even where workers in the supply chain have more secure contracts, they remain low paid and, in the words of Kyle Loewen, "disposable".[203] Loewen's research documents how the emergence of e-commerce has led some logistics companies to reduce their reliance on agency staff because the volume of throughput requires highly trained workers, able to locate, sort and move the right goods at the right time to the right destination in the distribution centre. A mistake can be hard to remedy before goods have been shipped – and can prove costly. Many logistics companies are therefore offering more stable contracts in order to retain staff who know the ropes. Although this leads to cost reductions for companies, since agency fees can be saved, the benefits are not passed on to the workers in the form of higher wages or more stable hours. Instead, Loewen finds, their wages are kept low by devaluing the work they do as "unskilled", even though the work in fact requires expertise built up over long periods of labour in a warehouse.[204] Although distribution centres would not run without the workers' considerable knowledge – as US labour organiser Big Bill Haywood once observed, the "management's brains" are always "under the workman's cap"[205] – it is the management that holds the whip hand in deciding the rates for a job and policing the boundaries of skills.

/ AUTOMATION AND THE DEGRADATION OF LABOUR /

Workers enmeshed in the production chains that make up logistics networks have long found themselves "in the crosshairs of automation".[206] For capital, mechanisation has slashed labour costs in many areas: it now "costs a retailer less to send a shoe to Europe from a factory in Southeast Asia than it does to transport it from a local European warehouse to a shoe store in the same country".[207] Indeed, as in the past, mechanisation has primarily been a means of breaking unions and disciplining labour. For those communities affected by automation, the job losses and degradation of work have caused multiple oppressions, from long periods of unemployment to the erosion of hard-won labour rights and the increasing insecurity of available work.

The introduction of containers in the 1960s, for example, saw hundreds of thousands of dock workers in Europe and the US made redundant as manual unloading of cargo was mechanised and stevedores were replaced by crane operators. The need for portside warehouses was also eliminated – and with it jobs – since the container provided "its own little storehouse".[208] The assault on port labour was continued in the 1990s when computers took over the work of "checkers" who kept track of containers during loading and unloading, replacing them by "computer operators sitting before screens in air-conditioned offices."[209] The next blow, as Marc Levinson records in his history of containerisation, came in the early 2000s when "automated guided vehicles, long used in factories, appeared on the waterfront".[210] In the UK alone, automation caused the number of port workers to decline from 140,000 in the early 1960s to 30,000 by 2000.[211]

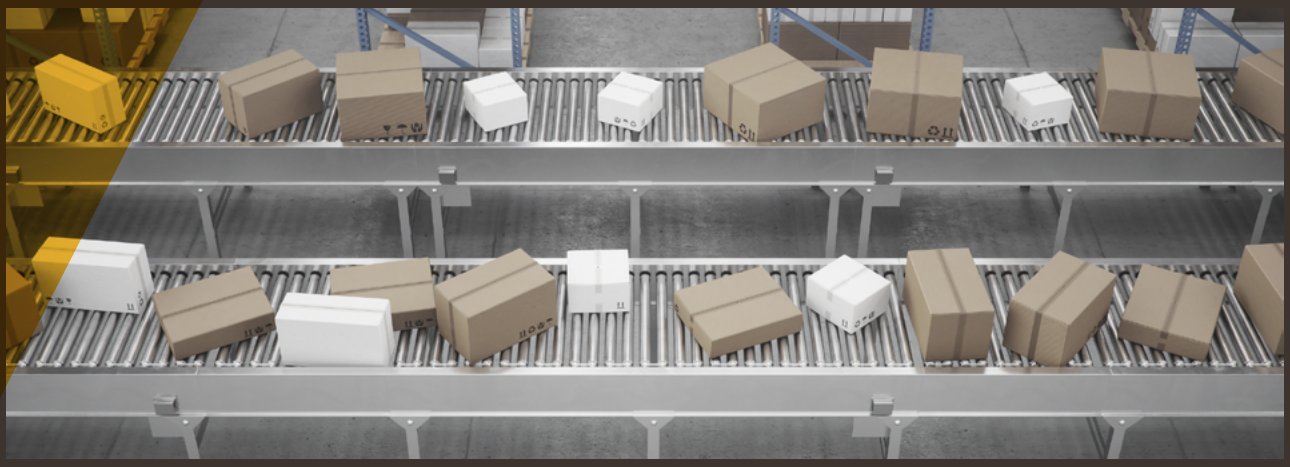
Today, digitalisation and the development of robots are bringing a new wave of job losses to ports.[212] Even processes such as transferring containers from ship to shore, which until recently still required crane drivers, are being automated.[213] Only the task of lashing down and unlashing containers has proved (as yet) unamenable to some element of automation.[214] In China, the Port of Qingdoa (whose Automatic Container terminal already uses artificial intelligence to control the loading and unloading of containers)[215] is looking to use 5G cellular network technology to reduce labour costs by 70 percent.[216] In The Netherlands, Rotterdam's World Gateway now needs just 10-15 operators using automated cranes to handle all the containers passing through its facility. Indeed, the operating company views itself as "an IT company that handles containers" rather than a port manager: using the now obligatory "point zero" suffix, it now describes the port as "a Container terminal 3.0".[217] Ships too are being automated: Rolls-Royce is now designing an "unmanned" cargo vessel, able to monitor its own "health" and operated entirely from shore.[218] A recent report estimates that 80 percent of jobs in transportation, warehousing and logistics are susceptible to automation.[219] Further up the supply chain, mining companies, such as RTZ, have already developed automated haulage trucks, automated drilling systems that are operated remotely and driverless trains to transport mined materials to ports.[220]

The lure of mechanisation for employers is that machines, in the words of one commentator, "can operate 24-7, never unionize, and can be deployed and re-deployed flexibly".[221] The hyperbolic promise held out by proponents of robotics, artificial intelligence and machine learning is of a labourless supply chain; of assembly lines that are entirely robotised; of "smart ports" where ships load and unload automatically; of the smart container that "knows its content and destination", automatically joining other containers that are bound for the same destination;[222] and of so-called "dark warehouses" where there are no human operators and therefore no lights, all the materials being inventoried by collaborative robots and shifted around by indoor drones.[223] [224]

Replacing humans with machines, however, is neither as complete nor as easy as the fantasies of a labourless supply chain make out. The lack of standardised data collection and processing techniques has made automation difficult for many ports – to the point where productivity in some ports has actually decreased.[225] Companies also find that much human labour simply cannot be replaced: the driverless train is all very well until, as recently occurred with a train full of iron ore, it crashes[226] – at which point it is human hands that clear up the mess;[227] and, as strikes by janitors in the US have revealed, even automated factories still need people to clean the toilets, to make sure doors are locked at night, to run the staff cafeteria and so on.[228] In fact, close examination of the claims for full automation frequently reveal that humans are still very much part of the picture: Rolls Royce's "unmanned" ship turns out to be crewed (albeit by a reduced crew); the automated cranes introduced into docks are still "human supported"; and, although numerous port tasks have indeed been mechanised, it turns out that in 2016 only around 2.5 percent of global container volume was handled by fully automated terminals.[229]

As with previous waves of automation, the human labour lost to machines is more often than not **dis**placed rather than **re**placed. Much of the work that containerisation made redundant in docks, for example, has simply migrated to warehouses and distribution centres around ports,[230] where, as already noted, workers now labour in contingent jobs for lower wages and without the protections they previously enjoyed through strong unions.[231] Moreover, the need for labour was expanded elsewhere, not least in constructing, physically and administratively, the global supply chains made possible by containerisation. Bigger ships required bigger canals, deeper harbours and huge dredging works around the world; roads and railways had to be constructed to link manufacturing and distribution centres; and huge amounts of academic and intellectual labour has been necessary to standardise (that standardisation problem again) the moving parts that ensure "interoperability" along the supply chain – containers of the same dimension worldwide so that they can be stacked on ships of the same design worldwide, unloaded by cranes of the same design worldwide and onto trucks and freight wagons that exactly fit their dimensions worldwide.[232] The increased throughput of goods enabled by containerisation also spurred more extraction, with more forests being felled, more land being intensively farmed, more mines being opened up, more oil and gas extracted, and so on.

Far from ending work, past waves of automation have expanded it; and there is no reason to suppose that the current wave of automation will be different. As in the past, job losses are accompanied by new forms of (often hidden) work. Behind the algorithms that power Facebook, Google or the myriad apps now found on mobile phones stands a ragtag army of poorly paid piecework workers – 20 million in the US alone by one count[233]– labouring from home to correct the algorithms when they "trip up"[234] (**see** Ghost Workers *page 15*). Every new advance in "artificial intelligence" and "machine learning" simply creates new roles for these human fixers,[235] whether in filling out surveys, transcribing, vetting content,[236] verifying addresses, testing for user design or creating web content. Far from making human labour a thing of the past – a development that would, in any event, deprive capital of the goose that lays the surplus value egg – artificial intelligence and other new forms of automation, like their counterparts in eras gone by, simply dismantle secure jobs, slicing and dicing them into piecemeal jobs that can be farmed out to people who are then hired on lower wages and poorer conditions[237] (a tactic that the US conglomerate AT&T made explicit in the 1990s when it stated: "We have to promote the whole concept of the workforce being contingent, though most of our contingent workers are inside our walls").[238]



GHOST WORKERS - THE REALITIES OF "LABOURLESS" AUTOMATION

Popular newspaper headlines, drawn from books like Andrés Oppenheimer's The Robots Are Coming![239], warn of a world of artificial intelligence (AI) in which machines eradicate swathes of clerical and manual jobs. The logistics trade press is also hot with reports of the potential of AI to automate "the entire supply chain from end to end".[240]

But behind the robots that replaced 60,000 jobs at the Foxcon factories that make iphones or the robots that move goods around warehouses or drive trucks in ports, there is a hidden army of human workers whose job it is "to tend to automated manufacturing systems when AI hits its limits".[241]

This is not a new phenomenon. Automation has always relied on human workers whose presence is obscured by the machines. As Mary Gray and Siddharth Suri document in their book Ghost Work,[242] the industrial revolution depended on large numbers of "piece workers" doing the jobs that could not be mechanised. Without them the assembly lines would have ground to a halt.

Today, the piece workers are still around. Machines simply cannot learn without human assistance. They have to be taught to recognise, for example, the difference between different kinds of sofas[243] or between Elvis and an Elvis impersonator.[244] And this requires humans, all hidden from view. Gray and Suri call this "the paradox of automation": namely, "the desire to eliminate human labour always generates new tasks for humans".[245]

When an Uber account is flagged because the driver's security selfie (required every time a job is booked) does not match the on-file photograph, someone has to check it out – and this work is done by poorly paid, on-demand workers, often in the global South, working from their living rooms or bedsits.[246]

Other ghost work required by AI includes "doing web research, verifying location addresses, beta testing, user testing for user designs"[247] and a host of other tasks – all parcelled out to online gig workers via platforms such as Mturk, "a crowdsourcing marketplace" that allows business to access "a global, on-demand, 24x7 workforce" which can perform tasks virtually.[248]

As Gary and Suri write: "The truth is, AI is as 'fully-automated' as the Great and Powerful Oz was in that famous scene from the classic film, where Dorothy and friends realize that the great wizard is simply a man manically pulling levers from behind a curtain. This blend of AI and humans, who follow through when the AI falls short, isn't going away anytime soon. Indeed, the creation of human tasks in the wake of technological advancement has been a part of automation's history since the invention of the machine lathe".[249]

/ DIGITALISATION AND THE ERASURE OF NEGOTIATING SPACE /

By providing capital with a Sword of Damocles that, like the threat to move production elsewhere, can be waved over labour, the threat (not just the reality) of automation condemns workers to a permanent, psychologically damaging state of uncertainty: accept these new surveillance techniques and terms of work or the robot will take your job. But even where automation does not directly threaten blue collar jobs, digitalisation is bringing new forms of marginalisation and oppression for workers.

Blockchain, for example, is now widely being touted as the magic bullet that will eliminate fraud in supply chains and allow goods to flow more transparently. As infrastructure corridors speed up the movement of goods, the orchestration of their transport becomes increasingly dependent on the timely completion of thousands and thousands of business contracts between suppliers, manufacturers and retailers every day. These contracts are agreements between parties at specific points in the supply chain – but those further down the chain need to know whether or not they were properly executed: was the shipment made at the time that was agreed? Were the right number of containers loaded? Were the manufacturer's instructions on labelling fulfilled to the letter? Blockchain is billed as the solution: instead of contracts where each party has its own version of "the truth" about the products en route, blockchain uses a "distributed ledger technology" that requires all participants in a given supply chain to sign off on any given transaction, "providing a single, tamper-evident ledger that records the transactions as they occur"[250] that reduces the scope for "multiple versions of the truth" interfering with the smooth flow of goods along the supply chain.

Shippers, manufacturers, logistics centres and road and railway operators will finally be able to "trust data", eliminating "uncertainty".[251] As such, for its proponents, blockchain offers Truth 2.0 – a technology that, by "eliminating" doubt and dispute from transactions, will dramatically speed up the movement of goods along supply. In effect, it provides "a global system for mediating trust and selective transparency",[252] building "value in the supply chain through better transparency and process standardization".[253]

Port authorities, such as the Marseille Fos Port, have already introduced pilot blockchain schemes,[254] as have shippers, such as Pacific International Lines (PIL), one of the top ten ocean carriers.[255] China, the country with the most blockchain patents in the world, is also pushing blockchain as a governing technology for its Belt and Road Initiative (BRI), smoothing transactions and making paying for goods easier along the proposed BRI infrastructure corridors.[256] As envisaged in one account of the technology's potential, transactions along the corridors would be paid for "through mobile pay Chinese blockchain apps developed by private companies through cooperation with the Chinese government";[257] and trucks entering the corridor would have their number, time, date, location, insurance and registration data, container data and drivers data "recorded to the blockchain which cannot be tampered with, altered, or destroyed".[258] A blockchain-based cross border customs clearance system is also being rolled out,[259] including by Cainiao, the logistics arm of Chinese e-retailer Alibaba, for an express train connecting its logistics centre in Shenzhen with Liège in Belgium.[260]

Blockchain technology – in essence, as Larry Lohmann has argued, an ingenious method for mechanising the daily labour of building trust (**see** Blockchain and the automation of trust *page 17*) – is now being extended beyond "verifying" the delivery of goods to "verifying" social and environmental conditions along the supply chain in order to reassure consumers worried by food safety concerns or abuses of human and non-human labour. Provenance, a UK-based startup, encourages business to use its blockchain-based technology to "share your product's journey and your business' impact on environment and society."[261] Dole, Driscoll's, Golden State Foods, Kroger, McCormick and Company, McLane Company, Nestlé, Tyson Foods, Unilever, and Walmart are all working with IBM to "identify new areas where the global supply chain can benefit from blockchain" in order to safeguard against food contamination.[262] Walmart has already developed a blockchain to track the movement of pork from China destined for Walmart stores, while the startup Everledger is using the technology to track the source of diamonds and give jewellers confidence that they are not trading in "blood diamond" products.[263] [264]

And what could be wrong with that? Who could be against better monitoring of supply chains for health hazards or labour abuses? But blockchain is not an impartial monitoring system: the "trust" that it enshrines (if it can be called trust) is a highly one-sided, commercialised form of trust. The singular attraction of blockchain, like other tools that depoliticise decision-making, is the insistence (as Matthew Fuller and Andrew Goffey scathingly put it in their book **Evil Media**) that "crunching algorithms has greater trustworthiness than decisions mediated through the representations of greedy, lazy, whining employees".[265]

No algorithm is apolitical: and the blockchains being developed are no exception. Far from being disinterested, the data reified as "the truth" through the blockchain is always partial. It matters a great deal whether or not "whining employees" are included in "verifying" adherence to human rights and labour standards: exclude them and the blockchain inevitably distorts reality while presenting it as unassailable fact – the ledger always being "The Truth". For workers, no less than for critical consumers and environmentalists, blockchain therefore threatens a whole new wave of oppressions not only because **their** truths are disregarded (nothing new in that) but because the very social processes through which multiple "truths" can be recognised, discussed and negotiated are effectively closed down or further sidelined.

BLOCKCHAIN AND THE AUTOMATION OF TRUST

A Blockchain is, at its simplest, a public, electronically recorded file (known as a "ledger") of transactions. But unlike a ledger that is held by a single individual or company, the blockchain is "distributed": instead of one person recording and verifying each transaction, the ledger is held on the computers of all the participants in a blockchain network. Each transaction is entered into the ledger only after each computer in the network has run the transaction through a complex set of algorithms to determine its validity. Because the transactions are recorded chronologically, each being linked to the one before it, blockchain enables the progress of product to be tracked as it moves along a supply chain.[266] The information on the blockchain can be changed only by an authorised user – and then only if the change is verified by an agreed algorithm.[267]

Blockchain is now the "big idea" in logistics – hailed as "the holy grail" of supply chain management. By providing a "single point of truth",[268] it is argued, blockchain will speed transactions and reduce fraud by automating verification of each of the 200-odd transactions that it typically takes for a shipment to move along a supply chain from manufacture to retailing.[269] No more bureaucratic mess up. No more shipments going missing. No more opportunities for corrupt officials to demand bribes before they will sign off on a consignment being moved: the sign off will be automatically triggered through goods communicating with each other via the Internet of Things – and the transaction will be verified by blockchain.

By producing "an unalterable dataset"[270] that records every transaction along the entire supply chain in real time and in a form that is shared with all the companies involved, everyone will know exactly where everything is and who is to blame for hold ups. Enhanced monitoring of workers – "keeping staff in check" as one commentator puts it [271] – is also (predictably) an intended goal: by assigning staff the cryptographic permissions needed to sign off on a job or transaction, it will be possible to see whether or not they have performed on time and in the correct manner. [272]

The overall cost savings are predicted to be huge. On one estimate, blockchain technologies are expected to benefit supply chain operators by as much as $3.1 trillion by 2030. [273]

Numerous logistics, IT, manufacturers, banks and supply chain companies are now developing blockchain systems. Microsoft, for example, has teamed with Ardents to offer "end-to-end traceability and visibility" in supply chains via a blockchain system called Ardents NovaTrack.[274]

The next step is to link individual blockchains together on a global scale. Already, one transaction between independently-built blockchains has been completed: in 2019, HSBC bank collaborated with Landmark Group, a major Dubai-based retailer, to complete a letter of credit transaction for a shipment from Hong Kong to Dubai.[275] The Dutch ABN AMRO bank, Samsung's logistics and IT arm and the Port of Rotterdam are also developing a digital platform that connects one blockchain to another.[276]

The big selling point of blockchain is "trust". For Deloitte, the management consultants, blockchain "stands as gatekeeper in the emerging 'trust economy'".[277] "Mistrust economy" might be a more accurate description: for the point that Deloitte is making is that blockchain eliminates the need to trust people while ensuring that data can be trusted.[278] With this trust secured, it no longer matters if the humans involved in a transaction can be trusted – as Deloitte puts it, "stakeholders should not have to trust each other".[279]

Indeed, as my Corner House colleague Larry Lohmann argues, blockchain is best viewed as yet another form of automation – in this instance, automation of the labour of trust, namely "the time-intensive, cumbersome, interpretive, 'inefficient' personal relationship-work"[280] that human beings have to do to get to know each other sufficiently well to have confidence in each other's words and actions. Blockchain is a technology for manufacturing "trust (or trust-substitutes)" and making them "available on demand as cheaply and quickly as possible via what The Economist magazine calls a global 'trust machine'".[281] Just as other forms of mechanisation make it possible to "produce huge volumes of cars, paper or cement quickly and cheaply, with minimal trouble from labour", blockchain's automated 'trust machine' "is designed to make it possible to monitor, execute, record and enforce huge numbers of global transactions quickly and cheaply, no matter how tiny, with minimal human oversight".[282]

As ever, a key objective is to control potentially recalcitrant labour – not least by bypassing it. Lohmann quotes a supply chain executive who candidly talks of using the technology to shift the task of optimizing deliveries "to algorithms rather than tribal employee knowledge".[283]

Viewed as a labour issue, rather than just a technology to increase transparency, blockchain takes on a different complexion. Whatever its potential benefits, its use within supply chains will always be inextricably entangled with labour injustices.

PART THREE IS THIS THE WORLD YOU WANT?

What is the trajectory of the logisticised, just-in-time supply chains that now dominate the production, distribution and consumption of commodities worldwide? How might resistance – born of refusals to accept injustice, of struggles against predatory labour practices or challenges to the environmental destruction caused by corridors and other logistical infrastructure – deflect its course? Can the "superexploitation" of supply chain capitalism be reined in? And, if not, what does that imply for those seeking to challenge its direction of travel?

TRAJECTORIES OF EXPLOITATION

To take the trajectory of logistics first. If unopposed, four consequences – born of the inherent properties of logistics and automation – merit highlighting: the increasing exploitation of workers; the emergence of new forms of corporate power; the ineluctable increase in energy use; and spiralling environmental destruction.

/ INCREASED EXPLOITATION OF LABOUR /

For workers, the direction of travel is towards increased downward pressures on wages, increased micro-disciplining of work, increasing insecurity of employment, increasing marginalisation in decision-making and the degradation of many skills. None of this has gone without resistance – not least through strikes and campaigns to improve labour conditions. But capital's retaliation – particularly, that of increasing the fungibility of supply chains – has arguably weakened these as tools for challenging the vector of logistics as a political and economic force: refusals to work, even in choke points along the supply chain, can often be bypassed.

Exploitation of labour is not an unintended consequence of logistics that can be "put right" once it has been pointed out to employers: it is built into every aspect of the logistics-as-production-line project – and it always has been. As Jasper Bernes comments, "the use-value which the logistics industry produces is a set of protocols and techniques that enable firms to seek out the lowest wages anywhere in the world . . ." [284]

If it is cheaper to ship cod caught off Scotland to be filleted by workers in China and then to return it to Scotland for sale than it is to have the job done in Scotland (as it is),[285] then this is in large part because the costs of the 20,000 mile round trip are more than offset by wages in China being a fraction of what they are in Scotland. Remove cheap labour from the logisticised supply chains and the entire rationale of fragmenting production falls apart. Logistics are of value to capital for one reason: they enable "exploitation in its rawest form".[286] Extreme wage differentials are the foundations of the industry.

/ NEW "PLATFORMS" OF CORPORATE CONTROL /

A second trajectory is towards the emergence of new corporate alliances as companies restructure to respond to the opportunities of digitalised logistics, to enhance their power with supply chains or to capitalise on the opportunities of data harvesting.

Online retailers, such as China's Alibaba, are developing new alliances that would give them their own logistics capabilities;[287] logistics companies like DHL are expanding into "e-retailing";[288] Uber is entering the logistics markets;[289] and Amazon is developing a banking arm, allying with Goldman Sachs to create an Apple credit card to offer loans to its customers.[290] In shipping, alliances between different lines are accelerating, concentrating corporate power in the process: in 2018 alone, the Mediterranean Shipping Company and Maersk joined to form the 2M Alliance; CMA CGM, China Cosco Shipping, and Evergreen to form the Ocean Alliance; and Hapag-Lloyd, Yang Ming and Ocean Network Express to form The Alliance.[291] The effect of such alliances has been to concentrate almost 60 percent of container transport capacity in world trade in the hands of just 25 shipping lines.[292]

Other alliances are emerging among shipping companies, ports and logistics companies and IT companies – blurring the lines between sectors that were previously distinct: Maersk, for example, has allied with IBM to form TradeLens, a blockchain technology (DLT) platform for supply chains.[293] And still further alliances are being constructed among ports, trucking firms and shippers to form "platforms" through which data can be shared, thereby integrating their operations.[294] Kerry Logistics and CargoSmart, for example, have teamed up with the accountancy firm Deloitte to create a blockchain platform which "digitizes the exchange of shipping documents between forwarders and carriers, making them more traceable".[295] With increasing amounts of data now being collected along supply chains, Rotterdam Port (in collaboration with IBM, Cisco, Esri and Axians) has also initiated a new Internet of Things (IoT) platform "to facilitate further developments in autonomous shipping, artificial intelligence and real-time analytics".[296]

These alliances are creating corporate behemoths that are able to shape production, distribution and consumption and use their control over the supply chain to reduce costs; the Port of Rotterdam, for example, envisages digitization being "leveraged to develop a global network of smart ports" that will "improve the efficiency of their collective operations".[297] Such efficiencies, history teaches, are likely to include driving down wages and mechanising operations to thwart labour insurgencies.[298]

But the new alliances are also part of a broader transformation towards what economist Nick Srnicek has called "platform capitalism",[299] in which companies seek to position themselves as intermediaries by creating cloud-based "platforms" that allow different users – from ports to warehouses to producers, suppliers, service providers "and even physical objects"[300] – to interact. The model is Amazon, which has always been far more than just an online retailer: Amazon Web Services (AWS) – its cloud-based computer service – now earns more than 10 percent of the company's overall revenues.[301] The platform is used by Netflix, Tesco and a range of other companies, some of them competitors to Amazon.[302]

Platforms make their money by charging users for their services but, more importantly, by harvesting their data and marketing it. As Srnicek explains:

> ***"Data is the basic resource that drives these firms and it is data that gives them their advantage over competitors. Platforms, in turn, are designed as a mechanism to extract and use that data: by providing the infrastructure and intermediation between different groups, platforms place themselves in a position in which they can monitor and extract all the interactions between these groups. This positioning is the source of their economic and political power."***[303]

The tendency is towards increasing monopoly control – the more users that use a platform, the more other users are drawn to it. The result "is a virtuous circle that leads to a winner-takes-all market".[304]

Siemens, the German industrial giant, has developed a new platform – Mindsphere – offering infrastructure services, while General Electric from the USA has developed its Predix platform. By placing themselves "as the intermediary between factories, consumers and app developers", warns Srnicek, these platforms are now "ideally placed to monitor how much of global manufacturing operates, from the smallest actor to the largest factory, and they draw upon these data to further solidify their monopoly".[305]



Consultancy giant KPMG foresees the logistics landscape being reshaped by such platforms.[306] Instead of corporate power being concentrated in companies that operate parts of the supply chain – by owning and managing ships for instance – it will increasingly migrate towards platforms that, through controlling the flow of information between operators, are in a position to integrate the operations of all the actors along the entire chain, without themselves necessarily owning ships or trucks or ports or warehouses themselves.[307] Indeed, the supply chain consultancy Cerasis predicts that, by 2020, "more than 75 percent of supply chain processes will exist in the cloud", pushing "entire supply chains toward a platform-based approach to effective management".[308]

These likely transformations have profound implications for power relations within supply chains.[309] The last thirty years have seen companies such as Walmart (now one of the world's largest companies, with its own satellite communications system and trucking network)[310] use logistics, informed by the data collected on consumption patterns through point-of-sale technologies such as credit cards, to gain effective control over their suppliers. The position of earlier decades (even centuries) where manufacturers produced what they thought would sell and retailers then did their best to shift the manufactured products has been reversed:[311] now the big retailers have the upper hand, designing their own goods on the basis of what they know consumers will buy, getting them produced in low wage countries and using logistics networks to transport them as cheaply as possible.[312] Retailers are "placing ever more stringent requirements on their suppliers", insisting "on speed and perfection in deliveries" and "fining their vendors for the tiniest error or delay" and even requiring them to open up their books "for rigorous cost analysis".[313] Although WalMart and other large retailers do not own their suppliers, they have effective control over them, both through their buying power and their logistical ability to switch from one supplier to another: for suppliers, such as independent contract farmers, self-exploitation becomes the rule as they are reduced to little more than "propertied labourers" by the exacting contracts under which they are forced to work.[314] Nelson Lichtenstein, author of The Retail Revolution, goes further, describing "vendors" (his quote marks) as being linked to the big retailers "by a 'supply chain' that evoke(s) the iron shackles subordinating slave to master."[315]

Platform capitalism threatens more of the same. As Nick Srnicek argues, platforms offer the means "to lead and control industries" by "providing the basic landscape upon which the rest of industry operates".[316] The platform that gains dominance will be in a position to dictate terms not just to suppliers but to shippers, ports, railway operators, warehouses and distribution centres and even retailers.

Again, this is not an unintended side effect: it is the business model on which platform capitalism is founded and its inexorable logic. And, again, many forms of refusal would appear inadequate (in their current form) to deflect this trajectory. Boycotts of Walmart or tax campaigns against Amazon, for example, dent reputations: but they have yet to threaten the business model, any more than calls from small shop owners in the 1950s to boycott mail order firms threatened mail order.[317]

/ MORE AND MORE ENERGY /

Without the ability of capital to undermine labour's bargaining power, there would be no possibilities for extracting surplus value. Brute force is one option: automation another. But (to state the obvious) the use of machines to replace, degrade or control recalcitrant labour requires thermodynamic energy – a robot is a useless pile of junk unless heat can be transformed into mechanical power to make it function. It is this thermodynamic energy that capital needs: and precisely because of the treadmill of mechanisation capital creates for itself, there can never be enough of it.[318]

The trajectory of digitalised logistics – with its blockchains and data harvesting processes, its robots and automated cranes and vehicles – is thus inexorably towards increased energy use: and no amount of energy-saving lightbulbs or home insulation schemes are likely to compensate.

For all the energy saving potential that artificial intelligence is said to promise,[319] the data centres on which the technology relies are the "world's dark little energy guzzling secret".[320] The International Energy Agency estimates that electricity demand by data centres worldwide in 2018 amounted to an estimated 198 Terawatt/hours (TWh), "or almost 1 percent of global final demand for electricity".[321] Others put the figure higher: in 2014, Bank of America Merrill Lynch estimated that such centres were already consuming 10 percent of the world's electricity – 50 percent more energy than the global aviation industry.[322] By 2020, the energy use of data centres, computers, smart phones and the like was predicted to triple.[323] Greenpeace has calculated that the energy consumption of the internet, including manufacture and use of devices, is more than the national total energy use of all the world's countries except the USA, Russia, Japan and China.[324]

Using either a tablet or smartphone connected by wireless to watch just one hour of video a week uses "roughly the same amount of electricity (largely consumed at the data-centre end of the process) as two new domestic fridges".[325] A single Google search produces between 1 and 10 grams of carbon dioxide. According to Quartz, an online news service, Facebook's data centres and business operations resulted in 718,000 metric tons of CO2 emissions in 2016, "which is comparable to the annual CO2 output of about 77,500 US homes running on electricity".[326] By one estimate, creating an artificial intelligence capable of understanding and using human language generates "almost five times the emissions of an average American car over its lifetime, including production" – or the equivalent of "about 315 New York-San Francisco return flights".[327] Researchers at the University of Hawaii have warned that widespread adoption of the energy-hungry bitcoin cryptocurrency – a blockchain technology – could alone produce enough carbon dioxide emissions to push warming above 2 °C within less than three decades.[328]

Data harvesting – the lifeblood of platform capitalism – combined with the automation of supply chains, online retailing and the like can only continue to increase the demand for thermodynamic energy. That demand is not confined to one period during the day or one spot on the globe: what capital needs is the ability to control labour 24/7 wherever production takes place around the world. No other source of thermodynamic energy – which is the only definition of energy that capital can accept – is as convenient as oil, coal and gas. Fossil fuels can be stored easily: they can be transported easily; and they can provide 24/7 thermodynamic work in the remotest regions without having to build new supergrids or to develop as yet non-existent forms of storing electricity.[329]

This reality suggests that a further trajectory of logisticised, just-in-time supply chains is an entrenchment of fossil fuels – or energy sources modelled on fossil fuels – as motive power, placing further obstacles in the way of a transition to any regime that might deserve the name "renewable". So long as mechanisation – and thus thermodynamic energy use – remains fundamental to the shaping of labour relations and the extraction of surplus value, this reality will remain. To neglect this is not only to risk being side-tracked by 'solutions' which are impractical or which are likely to end up with renewables playing an 'add on' role in predominantly fossil fuel energy systems, to the detriment of human and non-human survival; it is also to risk crushing defeats because of the scale of the political forces lined up against change.[330] While many might think they have the luxury of shying away from "taking on capitalism", the entanglements between logisticised supply chain capitalism and fossil fuels are such that to challenge either **is** de facto to challenge capitalism.

Many attempted "refusals" of continuing fossil fuel use – particularly where they take the form of "renewables-can-replace-fossil-fuels" exercises – fail to recognise this. They underestimate the challenge posed to alternative energy generation because they ignore or downplay the role that modern energy plays in controlling and squeezing labour through enabling capital to relocate around the globe, institute round the clock factory shifts and set up the economies-of-scale that make it possible to exploit more and more inaccessible sources of cheap labour and cheap resources. Until labour – and resistance to capitalist forms of work – are put at the heart of the debate on energy transitions, transformative change is likely to prove elusive.

/ INCREASED ENVIRONMENTAL DEGRADATION /

A fourth trajectory of logisticised supply chains is increased environmental destruction. Commodities do not transport themselves to market: to get them there, roads, railways, airports, canals, ports, warehouses and the like are all needed. And because modern supply chains operate on a global scale, the trajectory is towards the re-landscaping of whole continents as infrastructure corridors are created to connect the various nodes of supply chains and to "annihilate space by time" worldwide by speeding transportation.[331]

Infrastructure corridors are not new. But the plans that are now on the drawing board are on a scale as yet unimagined.

Some of the plans are national in scale, others regional and still others continent-wide or near-global. Hundreds of millions of people would be affected.

In Africa, over 30 corridors have been initiated, principally to enable the extraction of agricultural produce and minerals. In Latin America, some 579 projects, costing an estimated US$163 billion, have been identified. China's 'Belt and Road Initiative' (BRI) programme, previously known as One Belt One Road, already embraces 120 countries, stretching from the Pacific to the Baltic Sea.

In and of themselves, these planned corridors augur increased environmental and social injustice as forests are felled, more farmland grabbed, more rivers channelled and dredged, more minerals extracted, and more communities evicted to enable logisticised supply chains to function. The projected 25 million kilometres of new paved roads and 335,000 kilometres of railroad track that will be "required" by 2050[332] will dissect numerous habitats, fragmenting many to the point where their survival is in question.

If constructed, the corridors themselves will trigger yet more degradation as remoter sources of raw materials are opened up to exploitation. The upgrade of the Cuiaba-Santarém highway in Brazil, for example, served to expand the soy and cattle industries, at the expense of forested areas.[333] Likewise, in Indonesia, campaigners are concerned that the construction of new ports, such as that contemplated at Kuala Tanjung in North Sumatra, will stimulate an increase in forest clearance for palm oil. Again, these are not side effects of logisticised supply chains. The economic and political drivers behind corridors are rooted in opening up new areas to exploitation as much as they are to speeding up transportation.

Increased emissions of greenhouse gases will also result. Research led by the Center for Finance and Development at Tsinghua University, China, warns that carbon emissions from the 126 countries that have signed up to the Belt and Road Initiative could more than double by 2050 as a result of the project, potentially heating the planet by more than 2 degrees Celsius above pre-industrial levels[334] – the maximum temperature rise deemed acceptable under the 2015 Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC), a target that is widely viewed as wholly inadequate to protect human and non-human alike. As the researchers note, "the nature of infrastructure projects means that carbon emissions are locked in at design and implementation stage".[335] An overshoot of the 2-degree target is thus inevitable if action is not taken promptly to "decarbonise" the Belt and Road Initiative, assuming (one must add) that such decarbonisation can be achieved.

Necessary and indeed crucial as solidarity campaigns to oppose single projects along corridors are, no single campaign is likely to be able to shift this trajectory of corridor-enhanced environmental destruction and social disruption, although some improvements to projects may result, delays may occur, and some corridor plans may be blocked.



ALLIANCES FOR CHANGE: SOME NEW REFUSALS

Yet the future course of logisticised supply chain capitalism is not set in stone. The direction of travel will ultimately be determined by the interactions of logistics with other vectors that have the potential to deflect its current course. Chief among these are the many and varied forms of resistance to the social and environmental injustices that logistics generates.

Logistics has never gone unchallenged. The push for logisticised supply chains, infrastructure corridors and data harvesting have all been met with multiple "refusals" by labour (notably the refusal to work), affected communities (refusals passively to accept, say, land grabs for corridors or logistics hubs) and consumers (refusals to buy from companies whose practices are deemed socially or environmentally unacceptable).

A 2011 report by PriceWaterhouseCoopers (PwC), for example, records more than 68,000 incidents of disruptive actions by workers that affected supply chains from January 2004 to April 2010.[336] In China, poor pay and working conditions have led to multiple strikes in ports and other supply chain facilities. In 2007, industrial action by 700 crane drivers at the Yantian International Container Terminals, Shenzhen, brought the port to a standstill. The workers reportedly demanded "the founding of a workplace union, with officials elected by all front-line workers".[337] Truck drivers too have resorted to strike action at various ports. In 2011, the Port of Shanghai was brought to a halt by a truckers' strike: and three years later, some 30,000 drivers refused to work for four days at Ningbo port in Zhejiang.[338] In Italy, migrant logistics workers have also seriously disrupted supply chain operations.[339] The economic losses to the logistics industry caused by such workers' actions have been huge. A study by the logistics firm Panalpina found that, between 2009 and 2011, such losses amounted to some $350 billion.[340]

Such refusals highlight the potential power of labour to disrupt – and thereby challenge – supply chain capitalism: as US activist Jo Anne Wypijewski writes in CounterPunch, "The people who move the world can also stop it."[341] Capital, however, is not blind to the threat that workers' actions pose: hence the move to build more ports, more roads and more railways to enable strikes to be bypassed; hence the increased automation of ports; and hence the increasing surveillance of workers at key choke points.

How then might those who are not at the sharp end of logistics' squeeze of labour assist such struggles? What alliances might help in creating greater political space to challenge logistics' direction of travel?

Here other refusals may help. One such refusal would be to resist pressures to restrict inquiry and organising to responding to what Marxist geographer David Harvey has called the "how and where?" questions ("how is the European Investment Bank funding logistics?", for example, or "Where is it funding corridors?") and to probe also the "Why?" questions ("Why logistics? Why now?"). The "how" and "where" questions are, of course, important: but concentrating on them alone leaves the structural drivers behind logistics, corridors, supply chain labour abuses, the relentless creation of consumer "desires" and their transformation into "needs", our entrapment in forms of provisioning that require us to "click" online, and the like at best inadequately explored, at worst not explored at all. Without an understanding of those drivers, campaigns to stop funding for this or that project or to boycott this or that sports shoe – though necessary and desirable – run a high risk of obscuring the intrinsic, systemic nature of the abuses that arise from supply chain capitalism and its embrace of logistics. If the "why" questions highlight the need for "system change", then campaigns that are deracinated from challenging systemic drivers may serve only to put plasters on wounds rather than to shift the direction of travel.

Asking "why" questions may also help in identifying allies willing to come together to explore, tentatively and in the knowledge that the question can never be entirely settled, what constitutes "the good society". If logistics is not creating "the world we want", then what other approaches to provisioning might better secure, for example, the common right of all to collective survival? This question is often shunted to one side in campaigns that focus (understandably) on challenging the "outcomes" of logistics – human rights abuses, environmental abuses and the like. Yet, historically, it is in the processes and political spaces that are opened up through debate over "how the world should be" that social movements capable of challenging oppressive social trajectories have emerged. A second refusal might therefore be to eschew campaign tactics and strategies that set that question aside – and to insist that it made explicit in whatever interventions might suggest themselves.

A third refusal – closely related to the above – is a refusal to be stampeded into providing quick, bullet-point "solutions" to decision-makers or into what Kaye Dickinson calls "top-down, who's pulling the levers" [342] approaches to fighting for change. To grapple seriously with logistics requires a much slower, more patient approach to policy making and advocacy. The hard work of "embracing and building solidarities with the alternative imaginaries and forms of life that stand against this fragile but formidable world of logistics capitalism",[343] to quote academic activist Charmaine Chua, necessarily demands that process, mutual learning, a nuanced understanding of political realities on the ground and the nurturing of relationships of respect and trust are prioritised in evolving campaign demands and strategies.

This is particularly important given the divisive dynamic of supply chain capitalism, notably its use of racialised, gendered divide-and-rule employment practices.[344] In such circumstances, building trust is critical. But "slow campaigning" is also important in building a new shared sense of 'We' among the many and varied groups that have come to view logistics critically.

Here two further refusals come to mind. First a refusal to view "labour", "community" or "social movements" in the abstract – as preconstructed, unitary wholes whose political orientations, solidarities and sympathies come ready made and immutable. It cannot be assumed, for example, that a worker who goes on strike in a port is necessarily opposed to supply chain capitalism or logistics.[345] The striker's motives may well not be much more than gaining a decent wage, with no overt or even conscious anti-capitalist (whatever that means) intention. But it nonetheless involves resistance to something – and an opportunity to begin a wider exploration, should a conversation become possible. It is this possibility that offers the potential for building a broader "We".

"We-expanding" is a process that involves multiple tensions, temporary resolutions and further tensions, not least because of the ambivalent positions that most people have in relation to both capital and the commons at different times in their lives. A worker whose job depends on just-in-time delivery systems may be fearful of opposing infrastructure that benefits the company she works for, but simultaneously be a victim of the company's labour-squeezing disciplines or of the free-trade policies that infrastructure corridors build. A wider sense of "we" is not built simply by pointing out to her where she stands theoretically in relation to capital. It is built, as David Harvey argues, by recognising the ambivalence of her position (and that of others), by discussing and understanding the ambivalences, by exploring their tensions and causes, and by asking 'if and how we want to put checks on the processes of capital accumulation'.[346]

This is not a process that can be rushed: but it is also not a process that can be avoided if the trajectory of logistics is to be successfully challenged and deflected. As workers seek alliances that go beyond the conventional workplace to embrace other struggles – as they done, for example, with the Occupy movement [347] or with environmental and social justice activists focussing on climate change or on the impacts of corridors – and vice versa, the need for sensitive, open-ended relationship building is all the more critical.[348] These "non-workplace" struggles (as they are commonly perceived, despite logistics having stretched the workplace way beyond the factory) are likely to have a very different class character to those in a factory or a warehouse: as David Harvey comments, they are not restricted to "capital against labour" – they involve "capital versus everybody else affected by the thievery and racketeering that goes on".[349] Their success depends critically on recognising and addressing the power imbalances that this wider pool of potential activists – with very different class backgrounds – can generate within movements.[350]

In summary, for those who do not work in warehouses or supply chain factories, "logistics" is often largely hidden from sight – beyond those trucks on the motorway. But understanding how and why logistics has reshaped – and continues to reshape – production, distribution and consumption is surely urgent if the "why?" questions behind infrastructure corridors, supply chain automation and the restructuring of capital around information platforms are to be better understood and challenged. A better understanding exposes how value is created in the supply chain – and thus its vulnerabilities. It also offers a tentative map of potential alliances that might be forged between those whose lives are being shattered by just-in-time capitalism, whether in the workplace or beyond. Exploring those possibilities would now seem urgent.

/

CORRIDORS, LOGISTICS AND THE EUROPEAN UNION

Since its inception, the European Union has been committed to connecting all of Europe's regions through an integrated systems of transportation corridors, consisting of railway lines, roads, inland waterways, maritime shipping routes, ports, airports and railroad terminals. The aim is to facilitate the "seamless, safe and sustainable mobility of persons and goods" throughout the Union. [351]

Central to this programme is the Trans-European Transport Network (TEN-T) project, consisting of nine core regional corridors, [352] *currently stretching from Glasgow in Scotland to Palermo in Italy and from Lisbon in Portugal to Burgas in Bulgaria.* [353] *In 2019, the European Commission pledged to extend the corridor network further north still to "create a strategic EU gateway to the Arctic",* [354] *enabling the intensified extraction of timber and minerals from the region.*

Billions of Euros have been expended on the TEN-T scheme, funded primarily through the European Commission's Connecting Europe Facility (CEF), the European Fund for Strategic Investment (EFSI), Horizon 2020, and various European Structural and Investment Funds (ESIFs). [355] *From 2014 to 2019, the Connecting Europe Facility alone provided some €16 billion in grants for railway projects, €1.9 billion for roads, €1.6 for airports, €1.4 billion for inland waterways, €1.1 billion for ports and €0.5 billion for "multimodal" facilities.*

The European Investment Bank (EIB) has also been central to financing the transport sector, investing for some €323 billion since 1961. [356] *Since 2005, EIB investments in TEN-T projects have constituted over 60 percent of the bank's transport lending – amounting to €153 billion between 2005 and 2015.* [357] *In Poland alone, the EIB has invested more than €20.5bn in some 80 road and rail projects since 1990.* [358]

One area where the EIB appears increasingly active is the development of ports. In 2014, the bank loaned €900m to the Dutch Port of Rotterdam to increase its capacity by a projected 20 percent. [359] *An EIB loan of EUR 100 million is also being used to expand Dublin's port infrastructure to accommodate traffic growth and larger ships. EIB-backed intermediaries, such as the Swedish investment firm Infranode, are also investing in port expansion, notably a new container terminal at the Port of Gävle, which will double the throughput of containers.* [360] *Outside the European Union, ports are also a focus of funding. In Kenya,* [361] *the EIB is also part-financing a US$193 million modernisation programme at the Port of Mombasa in Kenya and the widening of the Panama Canal in Central America.* [362]

Several of the most recent EU investments in transport corridors are intended to link into China's Belt and Road Initiative (BRI) or similar routes eastwards. The EIB, for example, recently loaned €140 million to Cosco, the Chinese company that is developing the Greek port of Piraeus into a key "hub" along the BRI. [363]

The extension of the TEN-T Scandinavian-Mediterranean corridor into Northern Sweden and the Arctic is similarly aimed at connecting to a "Eurasian corridor which eventually ends up in China and other Asian countries, such as Japan and South Korea". [364]

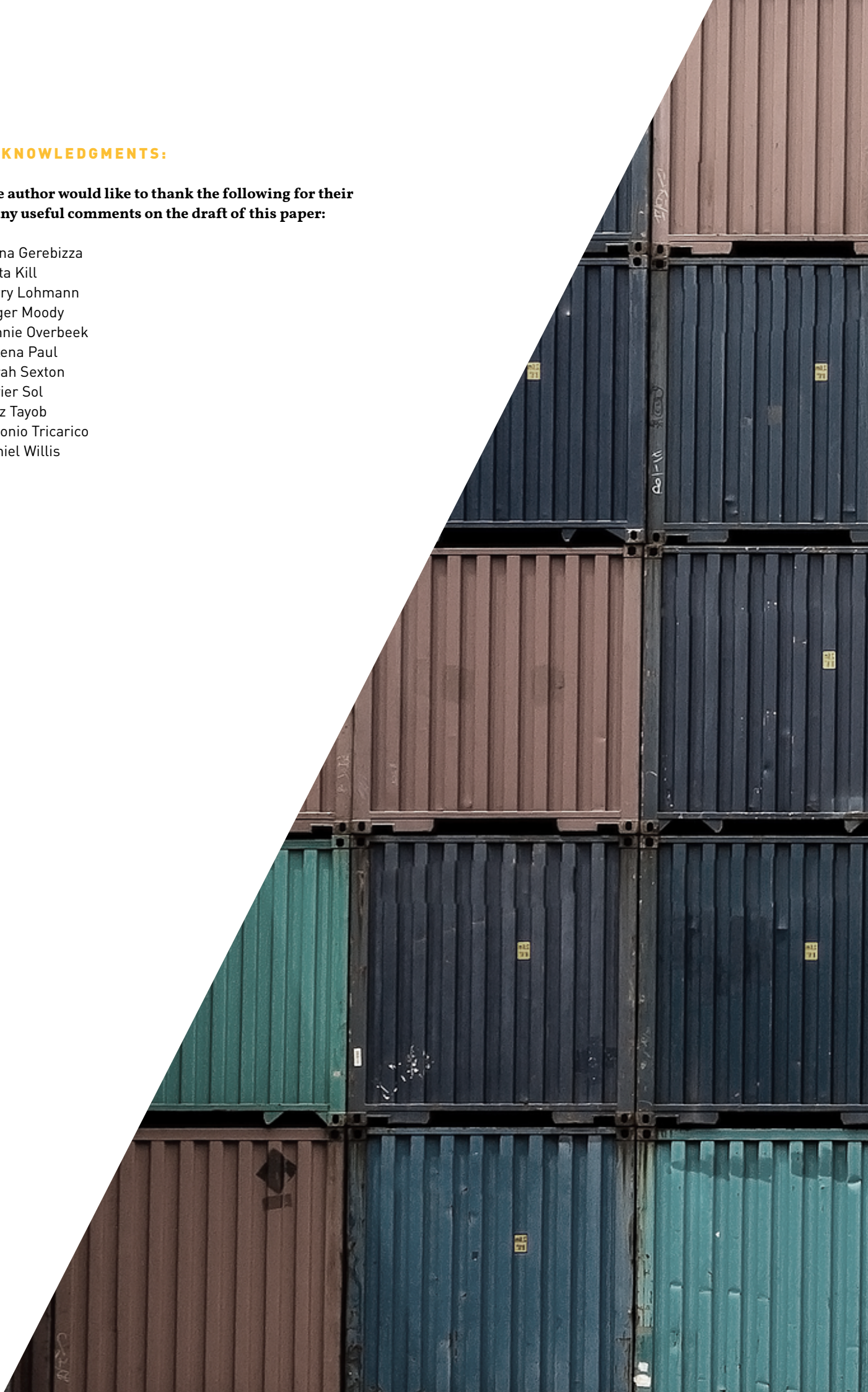
Beyond ports, roads, railways and other physical infrastructure, the European Union is active in developing the "soft infrastructure" necessary to logisticise production. The EIB-funded LOGISMED programme, for example, aims to develop the logistic sector in "partner countries" around the Mediterranean. [365]

EU legislative support has also been key to the promotion of logistics. Many dock labour schemes that advantaged unionised labour have now been ruled by the European Court of Justice to be "incompatible" with EU law, with fines being imposed on both Spain and Belgium for failing to bring their legislation into line. [366] *EU proposals to "liberalise" the port sector have been fiercely resisted by dock workers, who view the proposals as an "unprecedented attack" on their jobs.* [367]

ACKNOWLEDGMENTS:

The author would like to thank the following for their many useful comments on the draft of this paper:

Elena Gerebizza
Jutta Kill
Larry Lohmann
Roger Moody
Winnie Overbeek
Helena Paul
Sarah Sexton
Xavier Sol
Riaz Tayob
Antonio Tricarico
Daniel Willis



DISCLAIMER: this product was produced with the financial support of the European Union under the Citizens for Financial Justice project. The contents of this product reflect the views of Counter Balance and can under no circumstances be regarded as the equivalent or a reflection of the European Union.

Counter Balance

Challenging Public Investment Banks

GRESEA

RESOURCES

1 **Hildyard, N. and Sol, X.**, *How Infrastructure is Shaping the World: A Critical Introduction to Infrastructure Mega-Corridors, Counter Balance, December 2017,* http://www.thecornerhouse.org.uk/sites/thecornerhouse.org.uk/files/Mega%20Corridors.pdf

2 **World Bank,** *World Development Report: Reshaping Economic Geography, 2009, Washington D.C.,* http://documents.worldbank.org/curated/en/730971468139804495/pdf/437380REVISED01BLIC1097808213760720.pdf

3 **Mann, G.,** *"Introduction to the forum and to The Deadly Life of Logistics". In Mann, G., Chua, C., Kanngieser, A., Labban, M. and Cowen, C., "Reading Deborah Cowen's The Deadly Life of Logistics: Mapping Violence in Global Trade", Political Geography 61 (2017), pp 263-271, available at* https://www.academia.edu/35103382/Reading_Deborah_Cowens_The_Deadly_Life_of_Logistics_Mapping_Violence_in_Global_Trade

4 **Mann, G.**, *"Profile",* http://www.sfu.ca/geography/people/profiles/geoff-mann.html

5 **Barber, D.,** *"Review of Keller Easterling, Extrastatecraft: The Power of Infrastructure Space", caa.reviews, 29 January 2018,* http://www.caareviews.org/reviews/2843#.XVWPq3vTXcd

6 **Tsing, A.,** *"Supply Chains and the Human Condition", Rethinking Marxism: A Journal of Economics, Culture & Society, 21:2, 2009,* https://www.sv.uio.no/sai/english/research/projects/anthropos-and-the-material/Intranet/economic-practices/reading-group/texts/tsing-supply-chains-and-the-human-condition.pdf

7 **Richmond Italia Logistics Forum,** *"Think Logistics, Act Logistics, Be Logistics",* https://twitter.com/hashtag/RichmondLogisticsForum

8 **DP World Southampton,** *"About us",* https://www.dpworldsouthampton.com/about/about-us

9 **Girteka Logistics,** *"About Girteka Logistics",* https://www.girteka.eu/about-us.htm

Girteka Logistics, *"TESCO nominated Girteka Logistics as the most effective collaborating logistics partner in 2019", 10 February 2019,* https://www.girteka.eu/2554-tesco-nominated-girteka-logistics-as-the-most-effective-collaborating-logistics-partner-in-2019.html

10 **Europa worldwide group,** *"Europa road",* https://www.europa-worldwide.com/europa-road/

11 **Ice Co Storage & Logistics,** https://www.icecologistics.co.uk/

12 **XPOLogistics,** https://uk.xpo.com/en/about_us/our-company

13 **LCL** - *Lubuskie Centrum Logistyczne,* https://en.lclog.pl/

14 **BLG Logistics,** https://www.blg-logistics.com/en/services/transport-logistics/freight-forwarding/road-freight

15 **Moore, R.,** *"A shed the size of a town: what Britain's giant distribution centres tell us about modern life", The Observer, 15 April 2018,* https://www.theguardian.com/artanddesign/2018/apr/15/shed-the-size-of-town-what-britains-giant-distribution-centres-tell-us-about-modern-life

16 **Magna Park Lutterworth,** *"Introduction to Magna Park",* https://lutterworth.magnapark.co.uk/

17 **Gazeley,** https://gazeley.com/

18 **Prologis,** *"Our Parks",* https://www.prologis.co.uk/park-life/our-parks

19 **Eurohub 277 Corby,** https://web.archive.org/web/20180811114452/http://www.eurohubcorby.co.uk/

20 **NX Group,** *"The Golden Triangle",* https://www.thenxgroup.com/2016/04/06/golden-triangle/

21 **Kate Lupton,** *"Is the 'Golden Triangle' still the centre of logistics?", bis-hendersonspace.com, 25 September 2018,* https://www.bis-hendersonspace.com/is-the-golden-triangle-still-the-centre-of-uk-logistics/

22 **White Commercial.co.uk,** *"Success along the M40 corridor",* https://whitecommercial.co.uk/wp-content/uploads/2016/11/White-Wire-newsletter-2015.pdf

23 **DP World London Gateway,** *"London Gateway: enabling smarter trade & creating a better future for everyone",* https://www.londongateway.com/logisticspark/the-logistics-park

24 **DP World London Gateway,** *"About Us",* https://www.londongateway.com/about/about-us

25 **DP World,** *"Overview",* https://www.londongateway.com/port/the-port

26 **Brunel Shipping,** *"China Rail Freight",* https://brunelshipping.co.uk/china-rail-freight-services.html

27 **Cushman & Wakefield,** *"The Changing Face of Distribution - The Shape of things to come", 14 January 2019,* http://www.cushmanwakefield.co.uk/en-gb/research-and-insight/2019/the-changing-face-of-distribution

28 **OTT Logistics,** *"China-Europe Railway Express",* http://www.123log.co.uk/plus/list.php?tid=27

29 **OTTLogistics,** *"Overview of China Railway Express",* http://www.123log.co.uk/plus/list.php?tid=55

30 **Hildyard, N. and Sol, X.,** *How Infrastructure is Shaping the World: A Critical Introduction to Infrastructure Mega-Corridors, Counter Balance, 2017,* http://www.thecornerhouse.org.uk/resource/how-infrastructure-shaping-world

31 **DGG,** *"What is a Freight Village?",* https://www.gvz-org.de/en/freight-villages/

32 **CBRE,** *Global and Emerging Logistics Hubs 2015,* https://www.cbre.com/research-and-reports/global-emerging-logistics-hubs-2015

33 **CBRE**, Global and Emerging Logistics Hubs 2015, https://www.cbre.com/research-and-reports/global-emerging-logistics-hubs-2015

34 **d'Eramo, M., "Dock Life",** *New Left Review 96, November-December 2015,* https://newleftreview.org/issues/II96/articles/marco-d-eramo-dock-life

35 **Benvegnù, C. and Cuppini, N.,** *"A Dissonant Italian Symphony. Struggles and Grassroots Organizing in an Extended European Choke-point", Into the Black Box, 7 March 2019,* http://www.intotheblackbox.com/articoli/a-dissonant-italian-symphony-struggles-and-grassroots-organizing-in-an-extended-european-choke-point/#_edn3

36 *"Dubai as a Global Logistics Hub: Get Ready for Growth", undated,* https://www.eiseverywhere.com/file_uploads/cbdae203100f6d0fc0a2b2544cac10fe_04_DWCPresentation_DubaiasaGlobalLogisticsHubGetReadyforGrowth.pdf

37 **Dubairports,** *"Dubai World Central (DWC)",* https://www.dubaiairports.ae/corporate/about-us/dwc-dubai-world-central

38 *"Dubai as a Global Logistics Hub: Get Ready for Growth", undated,* https://www.eiseverywhere.com/file_uploads/cbdae203100f6d0fc0a2b2544cac10fe_04_DWCPresentation_DubaiasaGlobalLogisticsHubGetReadyforGrowth.pdf

39 *"Dubai Media City",* http://dmc.ae/

40 **Dubairports,** *"Dubai World Central (DWC)",* https://www.dubaiairports.ae/corporate/about-us/dwc-dubai-world-central

41 *"Why Busan, Strategic Place for Global Logistics",* http://busan.investkorea.org/busan_en/about/hub.do

See also:

Yu Liu, *"The Current Situation and Future Prospects of Korean Logistics Industry", Paper to 2017 2nd International Conference on Test, Measurement and Computational Method, 2017,* https://pdfs.semanticscholar.org/cc88/0faff5fc3ddc23008cbb41071b42aa45e5a7.pdf

42 **Marval Santiago,** *"Cargo Terminal Santiago",* http://www.marval.cl/eng/logistica/santiago/

43 **CBRE,** *Global and Emerging Logistics Hubs 2015,* https://www.cbre.com/research-and-reports/global-emerging-logistics-hubs-2015

44 **Buttkereit,** *J., "World in Progress: Istanbul's mega projects", DW,* https://www.dw.com/en/world-in-progress-istanbuls-mega-projects/av-47108919

45 *"Barcelona port presents itself as the first logistics hub in southern Europe at Transport Logistics fair", PortSEurope, 3 June 2019,* https://www.portseurope.com/barcelona-port-presents-itself-as-the-first-logistics-hub-in-southern-europe-at-transport-logistics-fair/

46 **Yang Yang,** *"China aims to establish 212 national logistic hubs", Chinadaily.com.cn, 25 December 2018,* http://global.chinadaily.com.cn/a/201812/25/WS5c21be3aa310d91214050be2.html

47 **CBRE,** *"Corporate Information",* https://www.cbre.sa/en/about-cbre/corporate-information

48 **CBRE,** *Global and Emerging Logistics Hubs 2015,* https://www.cbre.com/research-and-reports/global-emerging-logistics-hubs-2015

49 *Keller Easterling,* http://kellereasterling.com/

50 **UNCTAD,** *"Chapter IV: Special Economic Zones", World Investment Report, 2019,* https://unctad.org/en/PublicationChapters/WIR2019_CH4.pdf

51 **Rivera, L., Sheffi, Y., and Welsch, R.,** *"Logistics agglomeration in the US", Transportation Research Part A: Policy and Practice, 59, 2014.* https://sheffi.mit.edu/sites/sheffi.mit.edu/files/2017-06/Logistics%20Agglomeration%20in%20the%20US.pdf

52 **Adraports,** *"FREEeste, a new logistics Free zone, is now operative", 25 January 2019,* http://www.adriaports.com/it/node/808

53 **ASPT Astra Friuli Venzia Giulia,** *"The Free Port of Trieste: Location & Logistics infrastructure",* http://www.aspt-astra.it/wp-content/uploads/2016/04/Logistics-network-Infrastructure-Free-Port-of-Trieste-Friuli-Venezia-Giulia.pdf

54 **European Union,** *"Free zones which are in operation in the customs territory of the Union, as communicated by the Member States to the Commission", 17 November 2017,* https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/customs/procedural_aspects/imports/free_zones/list_freezones.pdf

55 **Serwicka, I. and Holmes, P.,** *"What is the extra mileage in the reintroduction of 'free zones' in the UK?", UK Trade Policy Observatory Briefing Paper 28 – February 2019,* https://blogs.sussex.ac.uk/uktpo/publications/what-is-the-extra-mileage-in-the-reintroduction-of-free-zones-in-the-uk/

56 **European Association of Transport & Logistics Centres,** *"Europlatforms: Corporate Presentation", October 2015,* http://www.europlatforms.eu/wp-content/uploads/2016/01/Corporate-Presentation-2015-Europlatforms-Final_20151229.pdf

57 **World Free Zones Organization,** *"Freezone Incentives in Corporate Investment Decisions", Bulletin, Issue 2, 2015,* https://www.worldfzo.org/Portals/0/OpenContent/Files/446/World_FZO_Bulletin02.pdf

58 **Lagos Free Trade Zone,** *"Features",* http://www.lagosftz.com/why-lftz/features.html

59 **Lagos Free Trade Zone,** *"Incentives",* http://www.lagosftz.com/why-lftz/incentives.html

60 **Lagos Free Trade Zone,** *"Incentives",* http://www.lagosftz.com/why-lftz/incentives.html

61 **Ziadah, R.,** *"Transport Infrastructure and Logistics in the making of Dubai Inc.", International Journal of Urban and Regional Research, 2018,* https://eprints.soas.ac.uk/24535/6/Ziadah-2018-International_Journal_of_Urban_and_Regional_Research.pdf

62 **Bridger, R.,** *"Airport-linked special economic zones, areotroplis projects and the race to the bottom", Presentation for Global Tax Justice at a Crossroads conference, City University, London, 6th July 2017,* https://www.academia.edu/34442724/Presentation_Airport-linked_special_economic_zones_aerotropolis_projects_and_the_race_to_the_bottom

63 *"Nigeria Export Processing Zones Authority Decree 1992, Decree No 63, Nigeria Export Processing Zones Act 1992", Federal Republic of Nigeria Official Gazette,* https://www.nepza.gov.ng/images/NEPZA631992.pdf

64 **Lagos Free Trade Zone,** *"Rules and Regulations",* http://www.lagosftz.com/about-lftz/rules-and-regulations.html

65 *Nigeria Export Processing Zones Authority Decree 1992, Decree No 63, Nigeria Export Processing Zones Act 1992", Federal Republic of Nigeria Official Gazette,* https://www.nepza.gov.ng/images/NEPZA631992.pdf

For an overview of labour practices in Nigeria's Export Processing Zones, see: International Trade Union Confederation, Nigeria: The State of Trade Unionism and Industrial Relations Practice in Export Processing Zones, 2011, http://www.oit.org/wcmsp5/groups/public/---ed_dialogue/---actrav/documents/publication/wcms_183546.pdf

66 **Punj, A.,** *"Special Economic Zones: Operational Adjustment of Labour Law", Journal of National Law, New Delhi, 2 August 2018,* https://journals.sagepub.com/doi/full/10.1177/2277401718787955

67 **European Parliament,** *"Labour Rights in Export Processing Zones with a focus on GSP and beneficial countries", Director-General for External Policies, Policy Department, European Parliament, 2017,* http://www.europarl.europa.eu/RegData/etudes/STUD/2017/603839/EXPO_STU(2017)603839_EN.pdf

68 **European Parliament,** *"Labour Rights in Export Processing Zones with a focus on GSP and beneficial countries", Director-General for External Policies, Policy Department, European Parliament, 2017,* http://www.europarl.europa.eu/RegData/etudes/STUD/2017/603839/EXPO_STU(2017)603839_EN.pdf

69 **Dickinson, K. in Brodie, P.,** *"A Conversation on Logistics and Media with Deborah Cowen and Kay Dickinson", Synoptique: An Online Journal of Film and Moving Image Studies, 2019,* https://www.academia.edu/38576686/A_Conversation_on_Logistics_and_Media_with_Deborah_Cowen_and_Kay_Dickinson

70 **Global Logistics Industry Report 2018,** *Research and Markets, June 2019,* https://www.researchandmarkets.com/reports/4775722/logistics-market-global-industry-trends-share

71 **Aru, I.,** *"Blockchain in Logistics Industry Will Improve Transparency, Enhance Process Accountability", 13 January 2018, Cointelegraph,* https://cointelegraph.com/news/blockchain-in-logistics-industry-will-improve-transparency-enhance-process-accountability

72 *"Logistics Industry: Next Step to Global Economy's Blockchainization", Cointelegraph, 15 July 2017,* https://cointelegraph.com/news/logistics-industry-next-step-to-global-economys-blockchainization

73 **Quoted in Mikkola Kjøsen, A.,** *Capital's Media: The Physical Conditions of Circulation, Thesis, University of Western Ontario, 2016,* https://www.academia.edu/29926486/Capitals_Media_The_Physical_Conditions_of_Circulation

74 **Mikkola Kjøsen, A.,** *Capital's Media: The Physical Conditions of Circulation, Thesis, University of Western Ontario, 2016,* https://www.academia.edu/29926486/Capitals_Media_The_Physical_Conditions_of_Circulation

75 **Mikkola Kjøsen, A.,** *Capital's Media: The Physical Conditions of Circulation, Thesis, University of Western Ontario, 2016,* https://www.academia.edu/29926486/Capitals_Media_The_Physical_Conditions_of_Circulation

76 **By 2008,** *UPS had become the ninth-largest airline in the world, with 3,000 pilots, flights around the globe, 268 planes and more aircraft on order. See: Negrey, C., Osgood, J. L and Goetzke, F., "One Package at a Time: The Distributive World City", International Journal of Urban and Regional Research, Volume 35, 4 July 2011 812–31,* https://onlinelibrary.wiley.com/doi/full/10.1111/j.1468-2427.2011.01046.x

77 **Resnick, N.,** *"International Warehouses in Global Ecommerce: A Guide for Expansion", Shopifyplus, 16 August 2017,* https://www.shopify.com/enterprise/international-warehouses-ecommerce-guide

78 **Market Finder,** *"Plan your logistics for China", undated,* https://marketfinder.thinkwithgoogle.com/intl/en_gb/guide/ingram-china-guide/

79 **Harris, J.,** *"Our phones and gadgets are now endangering the planet", The Guardian, 17 July 2018,* https://www.theguardian.com/commentisfree/2018/jul/17/internet-climate-carbon-footprint-data-centres

80 **Keller Easterling,** *Extrastatecraft: The Power of Infrastructure Space, Verso, London, 2016.*

81 **Richmond Italia Logistics Forum,** *"Think Logistics, Act Logistics, Be Logistics",* https://twitter.com/hashtag/RichmondLogisticsForum

82 **For example,** "logística" in Spanish: логистика (pronounced 'logistica') in Russian; लैजमिटविम (laujisatikasa) in Punjabi; logistik in Indonesian; โลจิสติก (locisrik) in Thai; Logistik in German; and logistik in Malay.

83 **Cowan, D.,** *The Deadly Life of Logistics: Mapping Violence in Global Trade, University of Minnesota Press, Minneapolis, 2014.*

84 **Grappi, G.,** *"Logistics, Infrastructures and Governance after Piraeus: Notes on Logistical Worlds", Logistical Worlds, 4 August 2015,* http://logisticalworlds.org/blogs/logistics-infrastructures-and-governance-after-piraeus-notes-on-logistical-worlds

85 **Cowan, D.,** *The Deadly Life of Logistics: Mapping Violence in Global Trade, University of Minnesota Press, Minneapolis, 2014.*

86 **Pink Floyd,** *"Comfortably Numb",* https://www.youtube.com/watch?v=_FrOQC-zEog

87 **Cowan, D.,** *The Deadly Life of Logistics: Mapping Violence in Global Trade, University of Minnesota Press, Minneapolis, 2014.*

88 **Into the Black Box,** *Critical Logistics: A Manifesto, 5 February 2019,* http://www.intotheblackbox.com/manifesto/critical-logistics-a-manifesto/

89 **Danyluk, M.,** *"Capital's logistical fix: Accumulation, globalization, and the survival of capitalism", Environment and Planning D Society and Space, 36(2), April 2017,* https://www.researchgate.net/publication/315875786_Capital's_logistical_fix_Accumulation_globalization_and_the_survival_of_capitalism

90 **Danyluk, M.,** *"Capital's logistical fix: Accumulation, globalization, and the survival of capitalism", Environment and Planning D Society and Space, 36(2), April 2017,* https://www.researchgate.net/publication/315875786_Capital's_logistical_fix_Accumulation_globalization_and_the_survival_of_capitalism

91 **GCSEBusiness,** *"Business Operations",* http://resource.download.wjec.co.uk.s3.amazonaws.com/vtc/2016-17/16-17_1-2/_eng/business3.pdf

92 *For definitions of logistics, see:* http://www.logisticsworld.com/logistics.htm

93 **Manzerolle, V. and Mikkola Kjøsen, A.,** *"Dare et Capere: Virtuous Mesh and a Targeting Diagram", The Imaginary App, University of Windsor,* https://core.ac.uk/download/pdf/72789795.pdf

94 **Lexico,** *"Supply chain",* https://www.lexico.com/en/definition/supply_chain

95 **Cowan, D.,** *The Deadly Life of Logistics: Mapping Violence in Global Trade, University of Minnesota Press, Minneapolis, 2014.*

Mikkola Kjøsen, A., Capital's Media: *The Physical Conditions of Circulation, Thesis, University of Western Ontario, 2016, available at* https://www.academia.edu/29926486/Capitals_Media_The_Physical_Conditions_of_Circulation

Chua. C. and Danyluk, M., *"Introduction: Turbulent Circulation: Building a Critical Engagement with Logistics", Environment and Planning D: Society and Space, 2018,* https://www.academia.edu/37193789/Introduction_Turbulent_Circulation_Building_a_Critical_Engagement_with_Logistics

96 **Chua. C. and Danyluk, M.,** *"Introduction: Turbulent Circulation: Building a Critical Engagement with Logistics", Environment and Planning D: Society and Space, 2018,* https://www.academia.edu/37193789/Introduction_Turbulent_Circulation_Building_a_Critical_Engagement_with_Logistics

97 **Mikkola Kjøsen, A.,** *Capital's Media: The Physical Conditions of Circulation, Thesis, University of Western Ontario, 2016, available at* https://www.academia.edu/29926486/Capitals_Media_The_Physical_Conditions_of_Circulation

98 **Chua. C. and Danyluk, M.,** *"Introduction: Turbulent Circulation: Building a Critical Engagement with Logistics", Environment and Planning D: Society and Space, 2018,* https://www.academia.edu/37193789/Introduction_Turbulent_Circulation_Building_a_Critical_Engagement_with_Logistics

99 **Danyluk, M.,** *"Capital's logistical fix: Accumulation, globalization, and the survival of capitalism", Environment and Planning D Society and Space, 36(2), April 2017,* https://www.researchgate.net/publication/315875786_Capital's_logistical_fix_Accumulation_globalization_and_the_survival_of_capitalism

100 **Cowan, D.,** *The Deadly Life of Logistics: Mapping Violence in Global Trade, University of Minnesota Press, Minneapolis, 2014.*

101 **Larry Lohmann** *(personal communication October 2019) suggests that the trend was arguably in play even earlier. He writes: "Two decades previously it was already being articulated how newly-named 'transaction costs' could be – and had much earlier already been – reduced by incorporating control over at least some of what later came to be called 'logistics' more closely within single corporate boundaries, which was already creating pressures for that all-encompassing societal planning that capital needs today".*

102 **Cowan, D.,** *The Deadly Life of Logistics: Mapping Violence in Global Trade, University of Minnesota Press, Minneapolis, 2014.*

103 **N. Hildyard,** *"Who Competes? Changing Landscapes of Corporate Control", 1 July 1996,* http://www.thecornerhouse.org.uk/resource/who-competes

104 **Neilson, B.,** *"Five Theses on Understanding Logistics as Power", Distinktion: Scandinavian Journal of Social Theory, 2012,* https://www.academia.edu/14865955/Five_Theses_on_Understanding_Logistics_as_Power

105 **Bernes, J.,** *"Logistics, Counterlogistics and the Communist Prospect", Endnotes, September 2103,* https://endnotes.org.uk/issues/3/en/jasper-bernes-logistics-counterlogistics-and-the-communist-prospect

106 **Mikkola Kjøsen, A.,** *Capital's Media: The Physical Conditions of Circulation, Thesis, University of Western Ontario, 2016, available at* https://www.academia.edu/29926486/Capitals_Media_The_Physical_Conditions_of_Circulation

107 **Marx, K.,** *"Chapter 6: The Costs of Circulation", Capital, Volume II,* https://www.marxists.org/archive/marx/works/1885-c2/ch06.htm

108 **Cowan, D.,** *The Deadly Life of Logistics: Mapping Violence in Global Trade, University of Minnesota Press, Minneapolis, 2014.*

109 **Cowan, D.,** *The Deadly Life of Logistics: Mapping Violence in Global Trade, University of Minnesota Press, Minneapolis, 2014.*

110 **Cowan, D.,** *The Deadly Life of Logistics: Mapping Violence in Global Trade, University of Minnesota Press, Minneapolis, 2014.*

111 **Levinson, M.,** *The Box: How the Shipping Container made the World Smaller and the World Economy Bigger, Princeton University Press, Princeton and Oxford, 2016.*

112 **Levinson, M.,** *The Box: How the Shipping Container made the World Smaller and the World Economy Bigger, Princeton University Press, Princeton and Oxford, 2016.*

113 *See, for example, the warehouses on offer at the New Port in Alat, Baku, Azerbaijan:*http://portofbaku.com/en/The-New-Port-in-Alat/

114 *For a history of the struggle by capital to control patterns of consumption, see:* **Beniger, J.R,** *The Control Revolution: Technological and Economic Origins of the Information Society, Harvard University Press, Cambridge, 1986*

115 *"Big Data: Why should you care?", The Guardian, undated,* https://www.theguardian.com/uk?INTCMP=CE_UK

116 **Kalmar Global,** *"Kalmar Port 2060 vision", YouTube, 11 May 2017,* https://www.youtube.com/watch?v=1xaKAYmBgQ4

117 **EY,** *Supply Chain innovation in a digital world, 25 February 2016,* https://consulting.ey.com/supply-chain-innovation-in-a-digital-world/

118 **KPMG,** *Transport Tracker: Global Transport - Market Trends and Views, June 2018,* https://assets.kpmg/content/dam/kpmg/xx/pdf/2018/06/kpmg-transport-tracker-june-2018.pdf

119 **DHL,** *Big Data in Logistics: A DHL perspective on how to move beyond the hype, December 2013,* https://www.dhl.com/content/dam/downloads/g0/about_us/innovation/CSI_Studie_BIG_DATA.pdf

120 **DHL,** *Big Data in Logistics: A DHL perspective on how to move beyond the hype, December 2013,* https://www.dhl.com/content/dam/downloads/g0/about_us/innovation/CSI_Studie_BIG_DATA.pdf

121 **Mikkola Kjøsen, A.,** *Capital's Media: The Physical Conditions of Circulation, Thesis, University of Western Ontario, 2016, available at* https://www.academia.edu/29926486/Capitals_Media_The_Physical_Conditions_of_Circulation

122 **Mikkola Kjøsen, A.,** *Capital's Media: The Physical Conditions of Circulation, Thesis, University of Western Ontario, 2016, available at* https://www.academia.edu/29926486/Capitals_Media_The_Physical_Conditions_of_Circulation

123 **DHL Trend Research & Cisco Consulting Services,** *2015, Internet of Things in Logistics: A Collaborative Report by DHL and Cisco on Implications and Use Cases for the Logistics Industry, 2015,* https://discover.dhl.com/content/dam/dhl/downloads/interim/full/dhl-trend-report-internet-of-things.pdf

124 **Kobie, N.,** *"What is the internet of things?", The Guardian, 6 May 2015,* https://www.theguardian.com/technology/2015/may/06/what-is-the-internet-of-things-google

125 *"Insight: Digital Logistics", Port Technology, 6 March 2019,* https://www.porttechnology.org/news/insight_digital_logistics

126 **DHL,** *Big Data in Logistics: A DHL perspective on how to move beyond the hype, December 2013,* https://www.dhl.com/content/dam/downloads/g0/about_us/innovation/CSI_Studie_BIG_DATA.pdf

127 **DHL,** *Big Data in Logistics: A DHL perspective on how to move beyond the hype, December 2013,* https://www.dhl.com/content/dam/downloads/g0/about_us/innovation/CSI_Studie_BIG_DATA.pdf

128 **Bradley, J., Barbier, J. and Handler, D.,** *"Embracing the Internet of Everything To Capture Your Share of $14.4 Trillion", Cisco, 2013,* https://www.cisco.com/c/dam/en_us/about/ac79/docs/innov/IoE_Economy.pdf

129 **Kshetri, N.,** *"Blockchain's roles in meeting key supply chain management objectives", International Journal of Information Management, 39, 2018,* http://iranarze.ir/wp-content/uploads/2018/02/E6050-IranArze.pdf

130 **Neilson, B.,** *"Beyond Kulturkritik: Along the Supply Chain of Contemporary Capitalism", Culture Unbound, Volume 6, 2014,* https://www.academia.edu/14864939/Beyond_Kulturkritik_Along_the_Supply_Chain_of_Contemporary_Capitalism

131 **Mikkola Kjøsen, A.,** *Capital's Media: The Physical Conditions of Circulation, Thesis, University of Western Ontario, 2016, available at* https://www.academia.edu/29926486/Capitals_Media_The_Physical_Conditions_of_Circulation

132 **Mikkola Kjøsen, A.,** *Capital's Media: The Physical Conditions of Circulation, Thesis, University of Western Ontario, 2016, available at* https://www.academia.edu/29926486/Capitals_Media_The_Physical_Conditions_of_Circulation

133 **Mikkola Kjøsen, A.,** *Capital's Media: The Physical Conditions of Circulation, Thesis, University of Western Ontario, 2016, available at* https://www.academia.edu/29926486/Capitals_Media_The_Physical_Conditions_of_Circulation

134 **Kalmar Global,** https://www.kalmarglobal.com/

135 **Kalmar Global,** *"Kalmar Port 2060 vision", YouTube, 11 May 2017,* https://www.youtube.com/watch?v=1xaKAYmBgQ4

136 **Mikkola Kjøsen, A.,** *Capital's Media: The Physical Conditions of Circulation, Thesis, University of Western Ontario, 2016, available at* https://www.academia.edu/29926486/Capitals_Media_The_Physical_Conditions_of_Circulation

137 **Grappi, G.,** *"Logistics, Infrastructures and Governance after Piraeus: Notes on Logistical Worlds", Logistical Worlds, 4 August 2015,* http://logisticalworlds.org/blogs/logistics-infrastructures-and-governance-after-piraeus-notes-on-logistical-worlds

138 *For a discussion of the "social factory", see:* **Dyer-Witheford, N., Cyber-Marx:** *Cycles and Circuits of Struggle in High-tech Capitalism, University of Illinois Press, Urbana and Chicago,1999.*

139 *For example:*

Federici, S., *Caliban and the Witch, Autonomedia, 2004,* https://libcom.org/files/Caliban%20and%20the%20Witch.pdf

Dalla Costa. M. and James, S., *The power of women and the subversion of the community, Libcom, 2005,* https://libcom.org/library/power-women-subversion-community-della-costa-selma-james

140 **Dyer-Witheford, N.,** *Cyber-Marx: Cycles and Circuits of Struggle in High-tech Capitalism, University of Illinois Press, Urbana and Chicago,1999.*

141 **Srnicek, N.,** *Platform Capitalism, Polity Press, Cambridge, 2017.*

142 **Fuchs, C. and Sevignani, S.,** *"What is Digital Labour? What is Digital Work? What's their Difference? And why do these Questions Matter for Understanding Social Media?", triple, 11(2), 2013,* https://www.researchgate.net/publication/283986007_What_Is_Digital_Labour_What_Is_Digital_Work_What's_their_Difference_And_Why_Do_These_Questions_Matter_for_Understanding_Social_Media

143 **Danyluk, M.,** *"Capital's logistical fix: Accumulation, globalization, and the survival of capitalism", Environment and Planning D Society and Space, 36(2), April 2017,* https://www.researchgate.net/publication/315875786_Capital's_logistical_fix_Accumulation_globalization_and_the_survival_of_capitalism

144 **Chua, C.,** *"Who is the 'we' that the supply chain brings into relation? Questions on solidarity and disruption after the logistics revolution".* **In Mann, G., Chua, C., Kanngieser, A., Labban, M. and Cowen, D.,** *"Reading Deborah Cowen's The Deadly Life of Logistics: Mapping Violence in Global Trade", Political Geography, 61, 2017,* https://www.academia.edu/35103382/Reading_Deborah_Cowens_The_Deadly_Life_of_Logistics_Mapping_Violence_in_Global_Trade

145 **Easterling, K.,** *Extrastatecraft: The Power of Infrastructure Space, Verso, London, 2016.*

146 **Danyluk, M.,** *¨Capital's logistical fix: Accumulation, globalization, and the survival of capitalism", Environment and Planning D Society and Space, 36(2), April 2017,* https://www.researchgate.net/publication/315875786_Capital's_logistical_fix_Accumulation_globalization_and_the_survival_of_capitalism

147 **Chua, C.,** *"Lineages of Infrastructural Power: The Logistical Nightmare of Los Angeles". In Monk, D. and Sorkin, M. (eds.), Between Catastrophe and Revolution: Essays in Honor of Mike Davis, Terreform / Urban Research,* https://www.academia.edu/39480969/Charmaine_Chua_-_Lineages_of_Infrastructural_Power_The_Logistical_Nightmare_of_Los_Angeles._Forthcoming_

148 **Danyluk, M.,** *"Capital's logistical fix: Accumulation, globalization, and the survival of capitalism", Environment and Planning D Society and Space, 36(2), April 2017,* https://www.researchgate.net/publication/315875786_Capital's_logistical_fix_Accumulation_globalization_and_the_survival_of_capitalism

149 **ADB,** *Operationalizing Economic Corridors in Central Asia: A Case Study of the Almaty-Bishkek Corridor, December 2014,* https://www.adb.org/publications/operationalizing-economic-corridors-central-asia-case-study-almaty-bishkek-corridor. Full report at: https://www.adb.org/sites/default/files/publication/153330/economic-corridors-central-asia.pdf

150 **Hildyard, N. and Sol, X.,** *How Infrastructure is Shaping the World: A Critical Introduction to Infrastructure Mega-Corridors, Counter Balance, December 2017,* http://www.thecornerhouse.org.uk/sites/thecornerhouse.org.uk/files/Mega%20Corridors.pdf

151 **Eurohub 277 Corby,** *"Demographics",* https://web.archive.org/web/20180904213745/http://eurohubcorby.co.uk/demographics/

152 **Prologis' Prologist,** *"DIRFT – This is Logistics",* https://www.prologis.co.uk/parks/prologis-rfi-dirft/

153 **Allen, J,** *"Studying logistics", Jacobin, 12 February 2015,* www.jacobinmag.com/2015/02/logistics-industry-organizing-labor/

154 **Chamberlain, G.,** *"Schoolchildren in China work overnight to produce Amazon Alexa devices", The Guardian, 8 August 2019,* https://www.theguardian.com/global-development/2019/aug/08/schoolchildren-in-china-work-overnight-to-produce-amazon-alexa-devices

155 **Alimahomed-Wilson, J. and Ness, I.,** *"Introduction: Forging Workers' Resistance Across the Global Supply Chain". In Alimahomed-Wilson, J. and Ness. I. (eds), Chokepoints: Logistics Workers Disrupting the Global Supply Chain, Pluto Press, London, 2018.*

156 **Bonacich, E. and Wilson, J.B.,** *Getting the Goods: Ports, Labor and the Logistics Revolution, Cornell University Press, Ithaca and London, 2008.*

157 **Cowan, D.,** *The Deadly Life of Logistics: Mapping Violence in Global Trade, University of Minnesota Press, Minneapolis, 2014.*

158 **Cowan, D.,** *The Deadly Life of Logistics: Mapping Violence in Global Trade, University of Minnesota Press, Minneapolis, 2014.*

159 **Cowan, D.,** *The Deadly Life of Logistics: Mapping Violence in Global Trade, University of Minnesota Press, Minneapolis, 2014.*

160 **Bernes, J.,** *"Logistics, Counterlogistics and the Communist Prospect", Endnotes, September 2103,* https://endnotes.org.uk/issues/3/en/jasper-bernes-logistics-counterlogistics-and-the-communist-prospect

161 **Danyluk, M.,** *"Fungible Space: Competition and Volatility in the Global Logistics Network", International Journal of Urban and Regional Research, October 2018,* https://www.researchgate.net/publication/328024478_Fungible_Space_Competition_and_Volatility_in_the_Global_Logistics_Network

162 **Danyluk, M.,** *"Fungible Space: Competition and Volatility in the Global Logistics Network", International Journal of Urban and Regional Research, October 2018,* https://www.researchgate.net/publication/328024478_Fungible_Space_Competition_and_Volatility_in_the_Global_Logistics_Network

163 **Amazon Workers and Supporters,** *'Stop Treating Us Like Dogs!': Worker Resistance at Amazon in Poland, Pluto,* https://www.plutobooks.com/blog/worker-resistance-amazon-poland/

164 **Danyluk, M.,** *"Fungible Space: Competition and Volatility in the Global Logistics Network", International Journal of Urban and Regional Research, October 2018,* https://www.researchgate.net/publication/328024478_Fungible_Space_Competition_and_Volatility_in_the_Global_Logistics_Network

165 **Worstall, T.,** *"Both Amazon and WalMart are really logistics companies, not retailers", Forbes, 11 April 2014,* https://www.forbes.com/sites/timworstall/2014/04/11/both-amazon-and-walmart-are-really-logistics-companies-not-retailers/#2ec9e2592f8b

166 **Amazon Workers and Supporters,** *'Stop Treating Us Like Dogs!': Worker Resistance at Amazon in Poland, Pluto,* https://www.plutobooks.com/blog/worker-resistance-amazon-poland/

167 **UNI,** *"Allegations of labour violations – the case against DP-DHL", 21 November 2012,* https://www.uniglobalunion.org/news/allegations-labour-violations-case-against-dp-dhl

168 **UNI,** *"Workers' abuse at DHL is unacceptable",* https://www.uniglobalunion.org/sites/default/files/attachments/pdf/uni-itf-DHL%20Dossier%20FINAL%20v7-EN.pdf

169 **DHL,** *"Deutsche Post DHL Response, Business and Human Rights", 21 December 2012,* https://www.business-humanrights.org/sites/default/files/media/deutschepostdhl-dec-2012.pdf

170 **UNI and ITF,** *"Response to DHL, Business and Human Rights", January 2013,* https://www.business-humanrights.org/sites/default/files/media/documents/company_responses/rejoinder-itf-uni-re-dhl-jan-2013.pdf

171 **UNI and ITF,** *"Response to DHL, Business and Human Rights", January 2013,* https://www.business-humanrights.org/sites/default/files/media/documents/company_responses/rejoinder-itf-uni-re-dhl-jan-2013.pdf

172 **Kanngieser, A.,** *"Tracking and tracing: geographies of logistical governance and labouring bodies", Environment and Planning D: Society and Space, 31, 2013,* https://www.researchgate.net/publication/274410957_Tracking_and_tracing_Geographies_of_logistical_governance_and_labouring_bodies

173 **DHL,** *"Response by DHL (part of Deutsche Post): Union accuses DHL of intimidating workers who attempt to join unions, & of suspending manager because of union membership", Business and Human Rights, 18 May 2011,* http://www.business-humanrights.org/media/documents/dhl_response_anti-union_purge_sa.pdf

174 **Bloodworth, J.** *"I worked in an Amazon warehouse. Bernie Sanders is right to target them", 17 September 2018, The Guardian,* https://www.theguardian.com/commentisfree/2018/sep/17/amazon-warehouse-bernie-sanders

175 **Hughes, B.,** *The Bleeding Edge: why technology turns toxic in an unequal world, New Internationalist Publication Ltd, Oxford, 2016.*

176 **Chamberlain, G.,** *"Schoolchildren in China work overnight to produce Amazon Alexa devices", The Guardian, 8 August 2019,* https://www.theguardian.com/global-development/2019/aug/08/schoolchildren-in-china-work-overnight-to-produce-amazon-alexa-devices

177 **Cargonauts,** *"About",* http://cargonauts.net/about/

178 **Paul, K.,** *"Microsoft workers decry gruelling '996' working standard at Chinese tech firms", 23 April 2019,* https://www.theguardian.com/technology/2019/apr/22/microsoft-workers-decry-grueling-996-working-standard-at-chinese-tech-firms

179 **Amazon Workers and Supporters**, *'Stop Treating Us Like Dogs!': Worker Resistance at Amazon in Poland, Pluto,* https://www.plutobooks.com/blog/worker-resistance-amazon-poland/

180 *"Amazon: it's more than Bezos", Corporate Watch, 10 September 2018,* https://corporatewatch.org/amazon-its-more-than-bezos/

181 *"Amazon: What's it like where you work?", Organise, 2018,* https://static1.squarespace.com/static/5a3af3e22aeba594ad56d8cb/t/5ad098b3562fa7b8c90d5e1b/1523620020369/Amazon+Warehouse+Staff+Survey+Results.pdf

182 **"Amazon: it's more than Bezos",** *Corporate Watch, 10 September 2018,* https://corporatewatch.org/amazon-its-more-than-bezos/

183 **Menegus, B.,** *"Amazon's Aggressive Anti-Union Tactics Revealed in Leaked 45-Minute Video", Gizmodo, 26 September 2018,* https://gizmodo.com/amazons-aggressive-anti-union-tactics-revealed-in-leake-1829305201

184 *See, for example:* **Spangler, T.,** *"Amazon Exec Fires Back at John Oliver After HBO Segment on Warehouses: 'He Is Wrong'", Variety, 2 July 2019,* https://variety.com/2019/digital/news/amazon-john-oliver-hbo-segment-on-warehouse-conditions-1203257834/

185 **Worstall, T.,** *"Both Amazon and WalMart are really logistics companies, not retailers", Forbes, 11 Aril 2014,* https://www.forbes.com/sites/timworstall/2014/04/11/both-amazon-and-walmart-are-really-logistics-companies-not-retailers/#2ec9e2592f8b

186 **Veridian,** *The Current and Future State of the Omnichannel Supply Chain, 25 July 2018,* https://veridian.info/the-current-and-future-state-of-the-omnichannel-supply-chain-white-paper/

187 **Rossiter, N.,** *Software, Infrastructure, Labor: A Media Theory of Logistical Nightmares, Routledge, New York and Abingdon, 2016.*

188 **Loewen, K.,** *"Reproducing disposability: Unsettled labor strategies in the construction of e-commerce markets", Environment and Planning D Society and Space, 36(4), April 2018,* https://www.researchgate.net/publication/324710004_Reproducing_disposability_Unsettled_labor_strategies_in_the_cosntruction_of_e-commerce_markets

189 **Kanngieser, A.,** *"Tracking and tracing: geographies of logistical governance and labouring bodies", Environment and Planning D: Society and Space, 31, 2013,* https://www.researchgate.net/publication/274410957_Tracking_and_tracing_Geographies_of_logistical_governance_and_labouring_bodies

See also:

Rossiter, N., *Software, Infrastructure, Labor: A Media Theory of Logistical Nightmares, Routledge, New York and Abingdon, 2016.*

190 **Cerasis,** *2017, The Digital Supply Chain: The Landscape, Trends, Types, and the Application in Supply Chain Management,* https://cerasis.com/wp-content/uploads/2017/06/The-Digital-Supply-Chain-E-Book.pdf

191 **Robinson, A.,** *"The Growing Importance of Utilizing Analytics in the Supply Chain", Cerasis, 8 March 2019,* https://cerasis.com/2019/03/08/analytics-in-the-supply-chain/

192 *DHL Trend Research & Cisco Consulting Services, 2015, Internate of Things in Logistics: A Collaborative Report by DHL and Cisco on Implications and Use Cases for the Logistics Industry, 2015,* https://discover.dhl.com/content/dam/dhl/downloads/interim/full/dhl-trend-report-internet-of-things.pdf

193 *DHL Trend Research & Cisco Consulting Services, 2015, Internate of Things in Logistics: A Collaborative Report by DHL and Cisco on Implications and Use Cases for the Logistics Industry, 2015,* https://discover.dhl.com/content/dam/dhl/downloads/interim/full/dhl-trend-report-internet-of-things.pdf

194 **Mezzadra, S. and Neilson, B.,** *"Extraction, logistics, finance, Global crisis and the politics of operations", Radical Philosophy, 178, March/Apr 2013,* https://www.radicalphilosophy.com/article/extraction-logistics-finance

195 **Alimahomed-Wilson, J. and Ness, I.,** *"Introduction: Forging Workers' Resistance Across the Global Supply Chain".* **In Alimahomed-Wilson, J. and Ness, I. (eds),** *Chokepoints: Logistics Workers Disrupting the Global Supply Chain, Pluto Press, London, 2018*

196 **De Stefano, V.,** *"The rise of the just-in-time workforce: On-demand work, crowdwork, and labor protection in the gig-economy", Comparative Labor Law and Policy Journal, 37, 2015.*

197 **Rubinstein, Y.,** *"Platform Economies and the Logistics of Urban Space: The Case of Deliveroo and its East London 'Dark Kitchens'". In "Logistical Territories", Lo Squaderno 51, Explorations in Space and Society No. 51, March 2019,* http://www.losquaderno.professionaldreamers.net/wp-content/uploads/2019/04/losquaderno51.pdf

198 **Bonacich, E. and Wilson, J. B.,** *Getting the Goods: Ports, Labor and the Logistics Revolution, Cornell University Press, Ithaca and London, 2008.*

199 **Bonacich, E. and Wilson, J. B.,** *Getting the Goods: Ports, Labor and the Logistics Revolution, Cornell University Press, Ithaca and London, 2008.*

200 **Cargonauts,** *"About",* http://cargonauts.net/about/

201 **Scott, A.O. ,** *"Awash in Capitalism, a Changing Earth – 'The Forgotten Space,' From Noël Burch and Allan Sekula", New York Times, 14 February 2012,* https://www.nytimes.com/2012/02/15/movies/the-forgotten-space-from-noel-burch-and-allan-sekula.html

202 *For a discussion of how gender, race, ethnicity, nationality, religion, sexuality, age and citizenship status are mobilised to "superexploit" workers in supply chains, see: Tsing, A. "Supply Chains and the Human Condition", Rethinking Marxism: A Journal of Economics, Culture & Society, 21:2, 2009,* https://www.sv.uio.no/sai/english/research/projects/anthropos-and-the-material/Intranet/economic-practices/reading-group/texts/tsing-supply-chains-and-the-human-condition.pdf

See also:

Dyer-Witheford, N., *Cyber-Marx: Cycles and Circuits of Struggle in High-tech Capitalism, University of Illinois Press, Urbana and Chicago,1999*

203 **Loewen, K.,** *"Reproducing disposability: Unsettled labor strategies in the construction of e-commerce markets", Environment and Planning D Society and Space, 36(4), April 2018,* https://www.researchgate.net/publication/324710004_Reproducing_disposability_Unsettled_labor_strategies_in_the_cosntruction_of_e-commerce_markets

204 **Loewen, K.,** *"Reproducing disposability: Unsettled labor strategies in the construction of e-commerce markets", Environment and Planning D Society and Space, 36(4), April 2018,* https://www.researchgate.net/publication/324710004_Reproducing_disposability_Unsettled_labor_strategies_in_the_cosntruction_of_e-commerce_markets

205 **Quoted in Perelman, M.,** Class Warfare in the Information Age, St Martin's Press, London, 1998.

206 **Chua, C. and Danyluk, M.,** *"Introduction: Turbulent Circulation: Building a Critical Engagement with Logistics", Environment and Planning D: Society and Space, 2018,* https://www.academia.edu/37193789/Introduction_Turbulent_Circulation_Building_a_Critical_Engagement_with_Logistis

207 **Braw, E.,** *"Global Supply Chains Are Dangerously Easy to Snap", Foreign Policy, 7 August 2018,* https://foreignpolicy.com/2018/08/07/global-supply-chains-are-dangerously-easy-to-snap/

208 **d'Eramo, M.,** *"Dock Life", New Left Review, 96, November-December 2015,* https://newleftreview.org/issues/II96/articles/marco-d-eramo-dock-life

209 **Levinson, M.,** *The Box: How the Shipping Container made the World Smaller and the World Economy Bigger, Princeton University Press, Princeton and Oxford, 2016.*

210 **Levinson, M.,** *The Box: How the Shipping Container made the World Smaller and the World Economy Bigger, Princeton University Press, Princeton and Oxford, 2016.*

211 **El-Sahli, Z. and Upward, R.,** *"Dockworkers and the introduction of containers in UK shipping in the late 1960s",* https://blogs.lse.ac.uk/businessreview/2017/11/10/dockworkers-and-the-introduction-of-containers-in-uk-shipping-in-the-late-1960s/

212 **van Dijk, T., van Dorsser, H., van den Berg, R., Moonen, H, Negenborn, R.,** *Smart ships and the changing maritime ecosystem: How digitalization and advanced automation of barges, service vessels and sea ships create new opportunities and challenges for the maritime industry, Smart Port, 17 September 2018,* http://smart-port.nl/wp-content/uploads/2019/04/SmartPort-whitepaper-SmartShipping.pdf

213 **Levinson, M.,** *The Box: How the Shipping Container made the World Smaller and the World Economy Bigger, Princeton University Press, Princeton and Oxford, 2016.*

214 **Thomas, M.,** *"Ports and workers' power", Workersliberty.org, 14 September, 2016,* https://www.workersliberty.org/story/2017-07-26/ports-and-workers-power

215 **Bai Ruixue and Au Loong Yu, "Worker Militancy and Strikes in China's Docks". In Alimahomed-Wilson, J. and Ness, I. (eds),** *Chokepoints: Logistics Workers Disrupting the Global Supply Chain, Pluto Press, London, 2018*

216 **"Ericsson to Launch Smart 5G Harbour at Major Chinese Port",** *Port Technology, 26 February 2019,* https://www.porttechnology.org/news/ericsson_to_launch_smart_5g_harbour_at_major_chinese_port

217 **"RWG's Highly Automated Terminal Opens for Business",** *worldmaritimenews.com, 14 September 2015,* https://web.archive.org/web/20171029023842/https://worldmaritimenews.com/archives/171543/rwgs-highly-automated-terminal-opens-for-business/

218 **Rolls-Royce Marine,** *"Autonomous ships: the next steps",* https://www.rolls-royce.com/~/media/Files/R/Rolls-Royce/documents/customers/marine/ship-intel/rr-ship-intel-aawa-8pg.pdf

219 **Oxford Martin Scool/Citi,** *Technology at Work v3.0 - Automating e-Commerce from Click to Pick to Door,* https://www.oxfordmartin.ox.ac.uk/downloads/CITI%20REPORT%20ADR0N.pdf

220 **Rio Tinto,** *Mine of the Future,* http://www.riotinto.com/australia/pilbara/mine-of-the-future-9603.aspx

221 **Frank Dorval,** *"21st Century Warehouse: How to Keep Up with Distribution Center Automation and Digitization", Cerasis,* https://cerasis.com/distribution-center-automation/

222 **Kalmar Global,** *"Kalmar Port 2060 vision", YouTube, 11 May 2017,* https://www.youtube.com/watch?v=1xaKAYmBgQ4

223 **Robinson, A.,** *"What Are Dark Warehouses and What Do I Need to Know?", Cerasis, 11 January 2019,* https://cerasis.com/2019/01/11/dark-warehouses/

224 **Chottani, A., Hastings, G., Murnane, J. and Neuheus, F.,** *"Distraction or disruption? Autonomous trucks gain ground in US logistics", Mckinsey, December 2018,* https://www.mckinsey.com/industries/travel-transport-and-logistics/our-insights/distraction-or-disruption-autonomous-trucks-gain-ground-in-us-logistics

225 **Miller, M. R.,** *"Modernizing Port Operations for the Digital Age", Port Technology, Smart Ports, Edition 86, 2019*

"Insight: Automation with Intelligence", Port Technology, 13 March 2019, https://www.porttechnology.org/news/insight_automation_with_intelligence

226 *"Runaway BHP train deliberately derailed near Port Hedland after travelling 92km with no driver", ABC News, 6 November 2018,* https://www.abc.net.au/news/2018-11-05/runaway-bhp-train-deliberately-derailed-near-port-hedland/10467616

227 **Harney, S. and Moten, F.,** *The Undercommons: Fugitive Planning & Black Study, Minor Compositions 2013, Wivenhoe / New York / Port Watson,* http://www.minorcompositions.info/wp-content/uploads/2013/04/undercommons-web.pdf

228 **Dyer-Witheford, N.,** *Cyber-Marx: Cycles and Circuits of Struggle in High-tech Capitalism, University of Illinois Press, Urbana and Chicago,1999, p.97.*

229 **Thomas, M.,** *"Ports and workers' power", Workersliberty.org, 14 September, 2016,* https://www.workersliberty.org/story/2017-07-26/ports-and-workers-power

230 **Levinson, M.,** *The Box: How the Shipping Container made the World Smaller and the World Economy Bigger, Princeton University Press, Princeton and Oxford, 2016.*

231 **Thomas, M.,** *"Ports and workers' power", Workersliberty.org, 14 September, 2016,* https://www.workersliberty.org/story/2017-07-26/ports-and-workers-power

232 *For a discussion on the importance of the labour of standardisation, see:*

Easterling, K., *Extrastatecraft: The Power of Infrastructure Space, Verso, London, 2016.*

d'Eramo, M., *"Dock Life", New Left Review 96, November-December 2015,* https://newleftreview.org/issues/II96/articles/marco-d-eramo-dock-life

Cowan, D., *The Deadly Life of Logistics: Mapping Violence in Global Trade, University of Minnesota Press, Minneapolis, 2014.*

Mikkola Kjøsen, A., *Capital's Media: The Physical Conditions of Circulation, Thesis, University of Western Ontario, 2016, available at* https://www.academia.edu/29926486/Capitals_Media_The_Physical_Conditions_of_Circulation

233 **Smith, A.,** *Gig Work, Online Selling and Home Sharing, Pew Research Centre, 17 November 2016,* https://www.pewinternet.org/wp-content/uploads/sites/9/2016/11/PI_2016.11.17_Gig-Workers_FINAL.pdf. *Cited in Gray,* **M.L. and Suri, S.,** *Ghost Work: How to stop Silicon Valley from building a new global underclass, Houghton Mifflin Harcourt, Boston, 2019.*

See also:

Chen, A., *"How Silicon Valley's successes are fueled by an underclass of 'ghost workers': The invisible labor that makes our technology run", The Verge, 13 May 2019,* https://www.theverge.com/2019/5/13/18563284/mary-gray-ghost-work-microwork-labor-silicon-valley-automation-employment-interview

O'Brien, H., *"Ghosts in the machines: the invisible human labour behind AI", New Statesman, 5 June 2019,* https://www.newstatesman.com/2019/06/ghosts-machines-invisible-human-labour-behind-ai

Gray, M. L. and Suri, S., *"The Humans Working Behind the AI Curtain", Harvard Business Review, 9 January 2017,* https://hbr.org/2017/01/the-humans-working-behind-the-ai-curtain

234 **O'Brien, H.,** *"Ghosts in the machines: the invisible human labour behind AI", New Statesman, 5 June 2019,* https://www.newstatesman.com/2019/06/ghosts-machines-invisible-human-labour-behind-ai

235 **O'Brien, H.,** *"Ghosts in the machines: the invisible human labour behind AI", New Statesman, 5 June 2019,* https://www.newstatesman.com/2019/06/ghosts-machines-invisible-human-labour-behind-ai

236 **Chen, A.,** *"How Silicon Valley's successes are fueled by an underclass of 'ghost workers': The invisible labor that makes our technology run", The Verge, 13 May 2019,* https://www.theverge.com/2019/5/13/18563284/mary-gray-ghost-work-microwork-labor-silicon-valley-automation-employment-interview

237 **Chen, A.,** *"How Silicon Valley's successes are fueled by an underclass of 'ghost workers': The invisible labor that makes our technology run", The Verge, 13 May 2019,* https://www.theverge.com/2019/5/13/18563284/mary-gray-ghost-work-microwork-labor-silicon-valley-automation-employment-interview

238 *Quoted in* **Perelman, M.,** *Class Warfare in the Information Age, St Martin's Press, London, 1998.*

239 **Oppenheimer, A.,** *The Robots Are Coming!, Vintage, New York, 2019.*

240 **Barratt, R.,** *"How automation is changing the supply chain", Supply and Demand Chain Executive, 10 October 2016,* https://www.sdcexec.com/warehousing/article/12267524/how-automation-is-changing-the-supply-chain

241 **Gray, M.L. and Suri, S.,** *Ghost Work: How to stop Silicon Valley from building a new global underclass, Houghton Mifflin Harcourt, Boston, 2019.*

242 **Gray, M.L. and Suri, S.,** *Ghost Work: How to stop Silicon Valley from building a new global underclass, Houghton Mifflin Harcourt, Boston, 2019.*

243 **Gray, M.L. and Suri, S.,** *Ghost Work: How to stop Silicon Valley from building a new global underclass, Houghton Mifflin Harcourt, Boston, 2019.*

244 **Lohmann, L.,** *Labour, Justice and the Mechanization of Interpretation, Corner House, 3 August 2019,* http://www.thecornerhouse.org.uk/resource/labour-justice-and-mechanization-interpretation

245 **Gray, M.L. and Suri, S.,** *Ghost Work: How to stop Silicon Valley from building a new global underclass, Houghton Mifflin Harcourt, Boston, 2019.*

246 **Gray, M.L. and Suri, S.,** *Ghost Work: How to stop Silicon Valley from building a new global underclass, Houghton Mifflin Harcourt, Boston, 2019.*

247 **Chen, A.,** *"How Silicon Valley's successes are fueled by an underclass of 'ghost workers': The invisible labor that makes our technology run", The Verge, 13 May 2019,* https://www.theverge.com/2019/5/13/18563284/mary-gray-ghost-work-microwork-labor-silicon-valley-automation-employment-interview

248 *"Amazon Mechanical Turk: Access a global, on-demand, 24x7 workforce",* https://www.mturk.com/

249 **Gray, M.L. and Suri, S.,** *"The Humans Working Behind the AI Curtain", Harvard Business Review, 9 January 2017,* https://hbr.org/2017/01/the-humans-working-behind-the-ai-curtain

250 **Lehmacher, W.,** *"Blockchain in the Belt and Road: Connectivity 2.0 between East and West", Port Technology, Blockchain, Edition 86, 2019*

251 **Robinson, A.,** *"Unlocking the Value in Blockchain for Logistics", Cerasis,* https://cerasis.com/value-in-blockchain-for-logistics/

252 **Casey, M. J. and Wong, P.,** *"Global Supply Chains Are About to Get Better, Thanks to Blockchain", Harvard Business Review, 13 March 2017,* https://hbr.org/2017/03/global-supply-chains-are-about-to-get-better-thanks-to-blockchain

253 **Robinson, A.,** *"Unlocking the Value in Blockchain for Logistics", Cerasis,* https://cerasis.com/value-in-blockchain-for-logistics/

254 *"Marseille Backs European Blockchain Pilot", Port Technology, 11 March 2019,* https://www.porttechnology.org/news/marseille_backs_european_blockchain_pilot

255 *"IBM and PIL Launch Chinese New Year Blockchain Trial", 1 February 2019, Port Technology,* https://www.porttechnology.org/news/ibm_and_pil_launch_chinese_new_year_blockchain_trial

256 *"Blockchain: The President of China wants to win the blockchain race", Altcoin Magazine, 1 October 2018,* https://medium.com/altcoin-magazine/blockchain-the-president-of-china-wants-to-win-the-blockchain-race-14c9bb390248

257 *"Blockchain: The President of China wants to win the blockchain race", Altcoin Magazine, 1 October 2018,* https://medium.com/altcoin-magazine/blockchain-the-president-of-china-wants-to-win-the-blockchain-race-14c9bb390248

258 *"Blockchain: The President of China wants to win the blockchain race", Altcoin Magazine, 1 October 2018,* https://medium.com/altcoin-magazine/blockchain-the-president-of-china-wants-to-win-the-blockchain-race-14c9bb390248

259 **Wood, M.,** *"China to use blockchain for cross-border customs clearance", Ledger Insights,* https://www.ledgerinsights.com/china-blockchain-cross-border-customs-clearance/

260 *"New China-Europe dedicated cross-border e-commerce railway corridor launched in central China", Acolink, 3 April 2019,* https://acolink.com/news/2019/china-ecommerce-euro-express-train-zhengzhou-belgium

261 *Quoted in* **Casey, M. J. and Wong, P.,** *"Global Supply Chains Are About to Get Better, Thanks to Blockchain", Harvard Business Review, 13 March 2017,* https://hbr.org/2017/03/global-supply-chains-are-about-to-get-better-thanks-to-blockchain

262 *"Major Blockchain Collaboration with Walmart and Others to Address Food Safety Worldwide", Supplychain247, 17 October 2017,* https://www.supplychain247.com/article/major_blockchain_collaboration_to_address_food_safety_worldwide

263 **Casey, M. J. and Wong, P.,** *"Global Supply Chains Are About to Get Better, Thanks to Blockchain", Harvard Business Review, 13 March 2017,* https://hbr.org/2017/03/global-supply-chains-are-about-to-get-better-thanks-to-blockchain

264 *For further examples, see: "Logistics Industry: Next Step to Global Economy's Blockchainization", Cointelegraph, 15 July 2017,* https://cointelegraph.com/news/logistics-industry-next-step-to-global-economys-blockchainization

265 **Fuller, M. and Goffey, A.,** *Evil Media, MIT Press, Cambridge, 2012,* https://archive.org/stream/FullerMatthewGoffeyAndrewEvilMedia/Fuller%2C%20Matthew%3B%20Goffey%2C%20Andrew%20-%20Evil%20Media_djvu.txt . *Quoted in Rossiter, N., "Logistical Worlds", Cultural Studies Review, Volume 20, Number 1, March 2014,* https://www.academia.edu/8755941/Logistical_Worlds

266 *IQS Directory, undated, "How Blockchain Is Improving The Global Supply Chain",* https://www.iqsdirectory.com/resources/how-blockchain-is-improving-the-global-supply-chain/

267 **Deloitte Tax & Consulting,** *Continuous interconnected supply chainUsing Blockchain & Internet-of-Things in supply chain traceability, 2017,* https://www2.deloitte.com/content/dam/Deloitte/lu/Documents/technology/lu-blockchain-internet-things-supply-chain-traceability.pdf

268 **Hackius, N., Petersen, M.,** *"Blockchain in Logistics and Supply Chain: Trick or Treat?" In Kersten, W., Blecker, T. and Ringle, C.M. (Eds), Digitalization in Supply Chain Management and Logistics, October 2017,* https://tore.tuhh.de/bitstream/11420/1447/1/petersen_hackius_blockchain_in_scm_and_logistics_hicl_2017.pdf

269 **KPMG,** *Transport Tracker: Global Transport - Market Trends and Views, June 2018,* https://assets.kpmg/content/dam/kpmg/xx/pdf/2018/06/kpmg-transport-tracker-june-2018.pdf

270 **KPMG,** *Transport Tracker: Global Transport - Market Trends and Views, June 2018,* https://assets.kpmg/content/dam/kpmg/xx/pdf/2018/06/kpmg-transport-tracker-june-2018.pdf

271 **Casey, M. J. and Wong, P.,** *"Global Supply Chains Are About to Get Better, Thanks to Blockchain", Harvard Business Review, 13 March 2017,* https://hbr.org/2017/03/global-supply-chains-are-about-to-get-better-thanks-to-blockchain

272 **Casey, M. J. and Wong, P.,** *"Global Supply Chains Are About to Get Better, Thanks to Blockchain", Harvard Business Review, 13 March 2017,* https://hbr.org/2017/03/global-supply-chains-are-about-to-get-better-thanks-to-blockchain

273 **KPMG,** *Transport Tracker: Global Transport - Market Trends and Views, June 2018,* https://assets.kpmg/content/dam/kpmg/xx/pdf/2018/06/kpmg-transport-tracker-june-2018.pdf

274 **Robinson, A.,** *"The Hurdles & Current Challenges of Using Blockchain in Supply Chain & Logistics", Cerasis,* https://cerasis.com/using-blockchain-in-supply-chain-logistics/

275 *"HSBC's Blockchain-Enabled Supply Chain", Port Technology, 8 July 2019,* https://www.porttechnology.org/news/watch_hsbcs_blockchain_enabled_supply_chain/

276 **Beije, A. and van Veen, O.,** *"Globally connected ports: Port of Rotterdam's stepwise approach and blockchain's role", Port Technology, Blockchain, Edition 86, 31 July 2019,* https://www.porttechnology.org/technical-papers/port-of-rotterdams-stepwise-approach-and-blockchains-role/

277 **Deloitte Tax & Consulting**, *Continuous interconnected supply chainUsing Blockchain & Internet-of-Things in supply chain traceability, 2017,* https://www2.deloitte.com/content/dam/Deloitte/lu/Documents/technology/lu-blockchain-internet-things-supply-chain-traceability.pdf

278 **Deloitte Tax & Consulting,** *Continuous interconnected supply chainUsing Blockchain & Internet-of-Things in supply chain traceability, 2017,* https://www2.deloitte.com/content/dam/Deloitte/lu/Documents/technology/lu-blockchain-internet-things-supply-chain-traceability.pdf

279 **Deloitte Tax & Consulting,** *Continuous interconnected supply chainUsing Blockchain & Internet-of-Things in supply chain traceability, 2017,* https://www2.deloitte.com/content/dam/Deloitte/lu/Documents/technology/lu-blockchain-internet-things-supply-chain-traceability.pdf

280 **Lohmann, L., Labour,** *Justice and the Mechanization of Interpretation, Corner House, 3 August 2019*, http://www.thecornerhouse.org.uk/resource/labour-justice-and-mechanization-interpretation

281 **Lohmann, L., Labour,** *Justice and the Mechanization of Interpretation, Corner House, 3 August 2019,* http://www.thecornerhouse.org.uk/resource/labour-justice-and-mechanization-interpretation

282 **Lohmann, L., Labour,** *Justice and the Mechanization of Interpretation, Corner House, 3 August 2019,* http://www.thecornerhouse.org.uk/resource/labour-justice-and-mechanization-interpretation

283 *"New Digital Supply Chains are Powered by Artificial Intelligence and Predictive Analytics", Supply Chain 24/7, 17 December 2018,* https://247customsbroker.com/index.php/2018/12/18/new-digital-supply-chains-arepowered-byartificial-intelligence-and-predictive-analytics/. *Quoted in* **Lohmann, L., Labour,** *Justice and the Mechanization of Interpretation, Corner House, 3 August 2019,* http://www.thecornerhouse.org.uk/resource/labour-justice-and-mechanization-interpretation

284 **Bernes, J.,** *"Logistics, Counterlogistics and the Communist Prospect", Endnotes, September 2103,* https://endnotes.org.uk/issues/3/en/jasper-bernes-logistics-counterlogistics-and-the-communist-prospect

285 **George, R.,** *Ninety Percent of Everything: Inside shipping, the invisible industry that puts clothes on your back, gas in your car and food on your plate, Picador, New York, 2013.*

286 **Bernes, J.,** *"Logistics, Counterlogistics and the Communist Prospect", Endnotes, September 2103,* https://endnotes.org.uk/issues/3/en/jasper-bernes-logistics-counterlogistics-and-the-communist-prospect

287 **KPMG,** *Transport Tracker: Global Transport - Market Trends and Views, June 2018,* https://assets.kpmg/content/dam/kpmg/xx/pdf/2018/06/kpmg-transport-tracker-june-2018.pdf

288 **Lierow, M., Janssen, S. and D'Inca, J.,** *"Amazon Is Using Logistics To Lead A Retail Revolution", Forbes, 18 February 2016,* https://www.forbes.com/sites/oliverwyman/2016/02/18/amazon-is-using-logistics-to-lead-a-retail-revolution/#59c3daa54e43

289 **PwC,** *Shifting Patterns: The Future of the logistics industry, undated,* https://www.pwc.com/sg/en/publications/assets/future-of-the-logistics-industry.pdf

290 **Meadway, J.,** *"A Design for Life: How Platforms Are Weaving Their Way Into the Fabric of Capitalism", Novara Media, 29 March 2019,* https://novaramedia.com/2019/03/29/a-design-for-life-how-platforms-are-weaving-their-way-into-the-fabric-of-capitalism/

291 **UNCTAD/RMT,** *Review of Maritime Transport 2018, 3 Oct 2018,* https://unctad.org/en/pages/PublicationWebflyer.aspx?publicationid=2245

292 **Gallegos, C. M.,** *Trends in Maritime Transport and Port Development in the Context of World Trade, undated,* https://www.oas.org/cip/english/docs/cecip/past_meetings/ordinary_meetings/2meeting_barbados00/12_trends_maritime_transport_doc30_00.doc.doc

293 **Allison, I,** *"IBM and Maersk Struggle to Sign Partners to Shipping Blockchain", Coindesk, 26 October 2018,* https://www.coindesk.com/ibm-blockchain-maersk-shipping-struggling

294 **Bacrot, C. and Rodriguez, L.,** *"Policy-making after the WTO Trade Facilitation Agreement: towards a broader trade logistics approach?" UNCTAD Transport and Trade Facilitation Newsletter, N°78 - Second Quarter 2018, Article No. 19,* https://unctad.org/en/pages/newsdetails.aspx?OriginalVersionID=1821

295 *"Tri-Party Venture to Drive Digitization of Logistics", Port Technology, 4 February 2019,* https://www.porttechnology.org/news/tri_party_venture_to_drive_digitization_of_logistics

296 *"Port of Rotterdam Part 1: Digital Port Vision", Port Technology, 5 February 2019,* https://www.porttechnology.org/news/rotterdam_outlines_digital_port_vision

297 *"Port of Rotterdam Part 2: Smart Port Networks", Port Technology, 7 February 2019,* https://www.porttechnology.org/news/port_of_rotterdam_creating_global_logistics_chains

298 **Dyer-Witheford, N.,** *Cyber-Marx: Cycles and Circuits of Struggle in High-tech Capitalism, University of Illinois Press, Urbana and Chicago, 1999*

299 **Srnicek, N.,** *Platform Capitalism, Polity Press, Cambridge, 2017.*

300 **Srnicek, N.,** *Platform Capitalism, Polity Press, Cambridge, 2017.*

301 **Hern, A.,** *"The two-pizza rule and the secret of Amazon's success", The Guardian, 24 April 2018,* https://www.theguardian.com/technology/2018/apr/24/the-two-pizza-rule-and-the-secret-of-amazons-success

302 **Hern, A.,** *"The two-pizza rule and the secret of Amazon's success", The Guardian, 24 April 2018,* https://www.theguardian.com/technology/2018/apr/24/the-two-pizza-rule-and-the-secret-of-amazons-success

303 **Srnicek, N.,** *"The challenges of platform capitalism: understanding the logic of a new business model", IPPR, 20 September 2017,* https://www.ippr.org/juncture-item/the-challenges-of-platform-capitalism

304 **Srnicek, N.,** *"The challenges of platform capitalism: understanding the logic of a new business model", IPPR, 20 September 2017,* https://www.ippr.org/juncture-item/the-challenges-of-platform-capitalism

305 **Srnicek, N.,** *Platform Capitalism, Polity Press, Cambridge, 2017, pp.69-70.*

306 **KPMG,** *Transport Tracker: Global Transport - Market Trends and Views, June 2018,* https://assets.kpmg/content/dam/kpmg/xx/pdf/2018/06/kpmg-transport-tracker-june-2018.pdf

307 **KPMG,** *Transport Tracker: Global Transport - Market Trends and Views, June 2018,* https://assets.kpmg/content/dam/kpmg/xx/pdf/2018/06/kpmg-transport-tracker-june-2018.pdf

308 **Robinson, A.,** *"The Top 5 Warehouse Management Technologies Shaping the Supply Chain", Cerasis, 15 February 2019,* https://cerasis.com/2019/02/15/warehouse-management-technologies/

309 **Allen, J.,** *"Studying logistics", Jacobin, 12 February 2015,* www.jacobinmag.com/2015/02/logistics-industry-organizing-labor/

310 **Bonacich, E. and Wilson, J. B.,** *Getting the Goods: Ports, Labor and the Logistics Revolution, Cornell University Press, Ithaca and London, 2008.*

311 **Bonacich, E. and Wilson, J. B.,** *Getting the Goods: Ports, Labor and the Logistics Revolution, Cornell University Press, Ithaca and London, 2008.*

See also:

Bernes, J., *"Logistics, Counterlogistics and the Communist Prospect", Endnotes, September 2103,* https://endnotes.org.uk/issues/3/en/jasper-bernes-logistics-counterlogistics-and-the-communist-prospect

312 **Levinson, M.,** *The Box: How the Shipping Container made the World Smaller and the World Economy Bigger, Princeton University Press, Princeton and Oxford, 2016.*

Bonacich, E. and Wilson, J. B., *Getting the Goods: Ports, Labor and the Logistics Revolution, Cornell University Press, Ithaca and London, 2008.*

Mikkola Kjøsen, A., *Capital's Media: The Physical Conditions of Circulation, Thesis, University of Western Ontario, 2016,* https://www.academia.edu/29926486/Capitals_Media_The_Physical_Conditions_of_Circulation

313 **Tsing, A.,** *"Supply Chains and the Human Condition", Rethinking Marxism: A Journal of Economics, Culture & Society, 21:2, 2009,* https://www.sv.uio.no/sai/english/research/projects/anthropos-and-the-material/Intranet/economic-practices/reading-group/texts/tsing-supply-chains-and-the-human-condition.pdf

314 **Tsing, A.,** *"Supply Chains and the Human Condition", Rethinking Marxism: A Journal of Economics, Culture & Society, 21:2, 2009,* https://www.sv.uio.no/sai/english/research/projects/anthropos-and-the-material/Intranet/economic-practices/reading-group/texts/tsing-supply-chains-and-the-human-condition.pdf

315 **Lichtenstein, N.,** *The Retail Revolution: How Wal-Mart Created a Brave New World of Business, Picador, New York, 2010. Quoted in Allen, J., "Studying logistics", Jacobin, 12 February 2015,* www.jacobinmag.com/2015/02/logistics-industry-organizing-labor/

316 **Srnicek, N.,** *Platform Capitalism, Polity Press, Cambridge, 2017.*

317 **Beniger, J. R.,** *The Control Revolution: Technological and Economic Origins of the Information Society, Harvard University Press, Cambridge, 1986*

318 **Hildyard, N. and Lohmann, L.,** *Energy, Work and Finance, Corner House, 27 March 2014,* http://www.thecornerhouse.org.uk/sites/thecornerhouse.org.uk/files/EnergyWorkFinance%20%282.57MB%29.pdf

319 **Victor, D. G.,** *"How artificial intelligence will affect the future of energy and climate", Brookings Institute, 10 January 2019,* https://www.brookings.edu/research/how-artificial-intelligence-will-affect-the-future-of-energy-and-climate/

320 **Kaminska, I.,** *"The dark side of data centres", Financial Times, Alphaville, 9 September 2014,* https://ftalphaville.ft.com/2014/09/09/1960891/the-dark-side-of-data-centres/

321 **International Energy Authority (IEA),** *"Tracking Buildings", Paris, 2019,* https://www.iea.org/reports/tracking-buildings

322 **Kaminska, I.,** *"The dark side of data centres", Financial Times, Alphaville, 9 September 2014,* https://ftalphaville.ft.com/2014/09/09/1960891/the-dark-side-of-data-centres/

323 **Kaminska, I.,** *"The dark side of data centres", Financial Times, Alphaville, 9 September 2014*, https://ftalphaville.ft.com/2014/09/09/1960891/the-dark-side-of-data-centres/

324 **Hughes, B.,** *The Bleeding Edge: why technology turns toxic in an unequal world, New Internationalist Publication Ltd, Oxford, 2016.*

325 **Harris, J.,** *"Our phones and gadgets are now endangering the planet", The Guardian, 17 July 2018,* https://www.theguardian.com/commentisfree/2018/jul/17/internet-climate-carbon-footprint-data-centres

326 **Quito, A.,** *"Every Google search results in CO_2 emissions. This real-time data viz shows how much", Quartz, 7 May 2018,* https://qz.com/1267709/every-google-search-results-in-co2-emissions-this-real-time-dataviz-shows-how-much/

327 **Kelly, J.,** *"AI: not so benevolent after all", Financial Times, Alphaville, 20 June 2019,* https://ftalphaville.ft.com/2019/06/20/1561003239000/AI--not-so-benevolent-after-all-/

See also:

Strubell, E., Ganesh, A. and McCallum, A., *Energy and Policy Considerations for Deep Learning in NLP, College of Information and Computer Sciences, University of Massachusetts Amherst, 5 June 2019,* https://arxiv.org/pdf/1906.02243.pdf

Lu, D., *"Creating an AI can be five times worse for the planet than a car", New Scientist, 6 June 2019,* https://www.newscientist.com/article/2205779-creating-an-ai-can-be-five-times-worse-for-the-planet-than-a-car/

328 **Mora, C., Rollins, R. L., Taladay, K., Kantar, M. B., Chock, M. K., Shimada, M. and Franklin, E. C.,** *"Bitcoin emissions alone could push global warming above 2°C", Nature Climate Change, Volume 8, 14 November 2018,* https://www.nature.com/articles/s41558-018-0321-8

329 **Hildyard, N. and Lohmann, L.,** *Energy, Work and Finance, Corner House, 27 March 2014,* http://www.thecornerhouse.org.uk/sites/thecornerhouse.org.uk/files/EnergyWorkFinance%20%282.57MB%29.pdf

330 **Hildyard, N. and Lohmann, L.,** *Energy, Work and Finance, Corner House, 27 March 2014,* http://www.thecornerhouse.org.uk/sites/thecornerhouse.org.uk/files/EnergyWorkFinance%20%282.57MB%29.pdf

331 **Hildyard, N. and Sol, X.,** *How Infrastructure is Shaping the World: A Critical Introduction to Infrastructure Mega-Corridors, Counter Balance, December 2017,* http://www.thecornerhouse.org.uk/sites/thecornerhouse.org.uk/files/Mega%20Corridors.pdf

332 **Convention on Biodiversity,** *Mainstreaming of Biodiversity in the Infrastructure Sector, 18 May 2018,* https://www.cbd.int/doc/c/8298/46cb/5db39f803634f17b7abf45d2/sbi-02-04-add5-en.pdf

333 **del Carmen Vera-Diaz, M., Kaufmann, R. K. and Nepstad, D.C.,** *The Environmental Impacts of Soybean Expansion And Infrastructure Development in Brazil's Amazon Basin, Tufts University, May 2009,* https://core.ac.uk/download/pdf/6397236.pdf

334 **Jun, M. and Zadek, S.** *(lead authors), Decarbonizing the Belt and Road: A green Finance Roadmap, Tsinghua University, Vivid Economics and Climateworks Foundation, September 2019,* https://www.vivideconomics.com/casestudy/decarbonizing-the-belt-and-road-initiative-a-green-finance-roadmap/

335 **Tsinghua University and Vivid Economics and Climateworks Foundation,** *"Five-point green finance roadmap proposed for decarbonizing countries involved in Belt & Road Initiative, as report shows investment decisions made now could make or break Paris Agreement targets", Press Release, 2 September 2019,* https://www.vivideconomics.com/wp-content/uploads/2019/09/Decarbonizing-the-Belt-and-Road-%E2%80%93-Press-Release-English.pdf

336 **PriceWaterhouseCoopers,** *"Securing the Supply Chain: Transportation & Logistics 2030", Volume 4, 2011,* https://www.pwc.com/gx/en/transportation-logistics/pdf/tl2030_vol.4_web.pdf. *Cited in* **Cowen, D.,** *"Disrupting Distribution: Subversion, the Social Factory, and the 'State' of Supply Chains", Viewpoint Magazine, Issue 4, 29 October 2014,* https://www.viewpointmag.com/2014/10/29/disrupting-distribution-subversion-the-social-factory-and-the-state-of-supply-chains/

337 **Bai Ruixue and Au Loong Yu,** *"Worker Militancy and Strikes in China's Docks". In* **Alimahomed-Wilson, J. and Ness, I.,** *(eds), Chokepoints: Logistics Workers Disrupting the Global Supply Chain, Pluto Press, London, 2018.*

338 **Bai Ruixue and Au Loong Yu,** *"Worker Militancy and Strikes in China's Docks". In* **Alimahomed-Wilson, J. and Ness, I.,** *(eds), Chokepoints: Logistics Workers Disrupting the Global Supply Chain, Pluto Press, London, 2018.*

339 **Benvegnù, C. and Cuppini, N.,** *"A Dissonant Italian Symphony. Struggles and Grassroots Organizing in an Extended European Choke-point", Into the Black Box, 7 March 2019,* http://www.intotheblackbox.com/articoli/a-dissonant-italian-symphony-struggles-and-grassroots-organizing-in-an-extended-european-choke-point/#_edn3

340 **Panalpina,** *2013 Third-Party Logistics Study: The State of Logistics Outsourcing,2012,* https://www.capgemini.com/wp-content/uploads/2017/07/2013_Third-Party_Logistics_Study.pdf. *Cited in* **Cowen, D.,** *"Disrupting Distribution: Subversion, the Social Factory, and the 'State' of Supply Chains", Viewpoint Magazine, Issue 4, 29 October 2014,* https://www.viewpointmag.com/2014/10/29/disrupting-distribution-subversion-the-social-factory-and-the-state-of-supply-chains/

341 **Wypijewski, J.,** *"The Cargo Chain", CounterPunch, 17, no.5, 2010,* https://cpdev1-wpengine.netdna-ssl.com/wp-content/uploads/2018/05/vol-17-no-5.pdf. *Cited in* **Cowen, D.,** *"Disrupting Distribution: Subversion, the Social Factory, and the 'State' of Supply Chains", Viewpoint Magazine, Issue 4, 29 October 2014,* https://www.viewpointmag.com/2014/10/29/disrupting-distribution-subversion-the-social-factory-and-the-state-of-supply-chains/

342 **Brodie, P.,** *"A Conversation on Logistics and Media with Deborah Cowen and Kay Dickinson", Synoptique: An Online Journal of Film and Moving Image Studies, 2019,* https://www.academia.edu/38576686/A_Conversation_on_Logistics_and_Media_with_Deborah_Cowen_and_Kay_Dickinson

343 **Chua, C.,** *"Logistical Violence, Logistical Vulnerabilities: Review Article of Deborah Cowen (2014), The Deadly Life of Logistics: Mapping Violence in Global Trade, Minneapolis: University of Minnesota Press", Historical Materialism, 25.4, 2017,* https://www.academia.edu/28138711/_Logistical_Violence_Logistical_Vulnerabilities._2018._Review_Article_of_Deborah_Cowen_2014_The_Deadly_Life_of_Logistics_Mapping_Violence_in_Global_Trade_Minneapolis_University_of_Minnesota_Press._In_Historical_Materialism

344 **Chua, C.,** *"Logistical Violence, Logistical Vulnerabilities: Review Article of Deborah Cowen (2014), The Deadly Life of Logistics: Mapping Violence in Global Trade, Minneapolis: University of Minnesota Press", Historical Materialism, 25.4, 2017,* https://www.academia.edu/28138711/_Logistical_Violence_Logistical_Vulnerabilities._2018._Review_Article_of_Deborah_Cowen_2014_The_Deadly_Life_of_Logistics_Mapping_Violence_in_Global_Trade_Minneapolis_University_of_Minnesota_Press._In_Historical_Materialism

345 **Chua, C.,** *"Who is the 'we' that the supply chain brings into relation? Questions on solidarity and disruption after the logistics revolution". In* **Mann, G., Chua, C., Kanngieser, A., Labban, M. and Cowen, D.,** *"Reading Deborah Cowen's The Deadly Life of Logistics: Mapping Violence in Global Trade", Political Geography, 61, 2017,* https://www.academia.edu/35103382/Reading_Deborah_Cowens_The_Deadly_Life_of_Logistics_Mapping_Violence_in_Global_Trade

346 **Harvey, D.,** *"David Harvey on the geography of capitalism: understanding cities as polities and shifting imperialisms", Theory Talks #20: David Harvey, 2008,* http://www.theory-talks.org/2008/10/theory-talk-20-david-harvey.html

347 **Cowen, D.,** *"Disrupting Distribution: Subversion, the Social Factory, and the 'State' of Supply Chains", Viewpoint Magazine, Issue 4, 29 October 2014,* https://www.viewpointmag.com/2014/10/29/disrupting-distribution-subversion-the-social-factory-and-the-state-of-supply-chains/

348 **Cowen, D.,** *"Disrupting Distribution: Subversion, the Social Factory, and the 'State' of Supply Chains", Viewpoint Magazine, Issue 4, 29 October 2014,* https://www.viewpointmag.com/2014/10/29/disrupting-distribution-subversion-the-social-factory-and-the-state-of-supply-chains/

349 **Harvey, D.,** *"Realization Crises and the Transformation of Daily Life", Presentation at the Korea Press Center in Seoul, South Korea, 21 June 2016,* http://magazine.changbi.com/en/articles/89062?board_id=2492

350 **Harvey, D.,** *"Realization Crises and the Transformation of Daily Life", Presentation at the Korea Press Center in Seoul, South Korea, 21 June 2016,* http://magazine.changbi.com/en/articles/89062?board_id=2492

351 *Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU, Eur-Lex,* https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32013R1315

352 **European Commission,** *"Trans-European Transport Network (TEN-T)", undated* https://ec.europa.eu/transport/themes/infrastructure/ten-t_en
The nine corridors are: Atlantic, Baltic-Adriatic, Mediterranean, North Sea-Baltic, North Sea-Mediterranean, Orient-East Med, Rhine-Alpine, Rhine-Danube, Scandinavian-Mediterranean. In addition, there is a "Motorway of the Sea" programme.

353 **European Commission,** *"TEN-Tec Interactive Map", undated,* https://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/map/maps.html

354 *"Why the TEN-T should be extended to Northern Sweden", Railfreight, 7 October 2019,* https://www.railfreight.com/corridors/2019/10/07/why-the-ten-t-should-be-extended-into-northern-sweden/

355 **European Commission,** *"Infrastructure and Investment", undated,* https://ec.europa.eu/transport/themes/infrastructure_en

356 **European Investment Bank,** *"Loans to Transport Sector",* https://bit.ly/31RSVqK

357 **European Investment Bank,** *Better infrastructure, better economy, 2016,* https://www.eib.org/attachments/thematic/better_infrastructure_en.pdf

358 **European Investment Bank,** *The Route Map to a Connected Europe, 15 June 2016,* https://www.eib.org/attachments/thematic/the_route_map_to_a_connected_europe_en.pdf

359 **European Investment Bank,** *"Rotterdam: a port for the economy of the future", undated,* https://www.eib.org/en/projects/regions/european-union/netherlands/project-rotterdam-a-port-for-the-economy-of-the-future.htm

360 *"Swedish Container Terminal Receives Investment Boost", Port Technology, 11 March 2019,* https://www.porttechnology.org/news/swedish_container_terminal_receives_investment_boost/

361 **Schwerdtfeger, M.,** *"Mombassa to Undertake Major Berth Modernization", Port Technology, 24 October 2019,* https://www.porttechnology.org/news/mombassa-to-undertake-major-berth-modernization/

362 **European Investment Bank,** *Better infrastructure, better economy, 2016,* https://www.eib.org/attachments/thematic/better_infrastructure_en.pdf

363 *"China, Greece agree to push ahead with COSCO's Piraeus Port investment", Reuters, 11 November 2019*, https://www.reuters.com/article/us-greece-china/china-greece-agree-to-push-ahead-with-coscos-piraeus-port-investment-idUSKBN1XL1KC

364 *" Why the TEN-T should be extended to Northern Sweden", Railfreight, 7 October 2019,* https://www.railfreight.com/corridors/2019/10/07/why-the-ten-t-should-be-extended-into-northern-sweden/

365 **European Investment Bank,** *"Euro-Mediterranean Logistic Network (LOGISMED) T1", 14 November 2011,* https://www.eib.org/en/publications/euro-mediterranean-logistic-network-logismed

European Investment Bank and Center for Mediterranean Integration, *"EuroMed Transport Logistics Project* (LogisMed TA)", 2010, https://www.eib.org/attachments/country/euro_mediterranean_logistic_network_en.pdf

European Investment Bank, *FEMIP, A Euro-Mediterranean network of logistics platforms, 2010,* https://www.eib.org/attachments/country/logismed_en.pdf

European Commission, *"EuroMed Transport Logistics Project (LogisMed TA)", EU Neighbours south, undated,* https://www.euneighbours.eu/en/south/stay-informed/projects/euromed-transport-logistics-project-logismed-ta

366 **Bottalico, A.,** *"Across the Chain: Labor and Conflicts in the European Maritime Logistics Sector". In* **Alimahomed-Wilson, J. and Ness, I.** *(eds.), Choke Points: Logistics Workers Disrupting the Global Supply Chain, Pluto Press, London, 2018.*

367 **European Transport Workers' Federation,** *"ITF/ETF dockers take actions to back Spanish colleagues," Dockers Section News, 9 June 2017,* http://mail.statik.be/t/ViewEmail/r/0A2C2C54BBB162082540EF23F30FEDED/A4DBAF6EBADB6BDD6B5BE456C00C2519