

URBANISM NEXT WAREHOUSING

Galen Carlson and Nico Larco



SUSTAINABLE CITIES INITIATIVE



For more information on Urbanism Next, Please contact:
Nico Larco (nlarco@uoregon.edu)



WAREHOUSING

GALEN CARLSON AND NICO LARCO | URBANISM NEXT | SPRING 2017

EXECUTIVE SUMMARY

- The size and location of warehouses in the U.S. is rapidly changing
- Historically, warehouses tended to be smaller buildings located near central business districts

Today, warehouses are transforming into massive “mega-distribution centers” located in increasingly suburban areas

- This shift is being caused by advances in warehousing technology that are only cost-effective when implemented at a large scale
- The rise of Autonomous Vehicle technology will continue this trend towards mega-distribution centers
- E-commerce trends will also increase the demand for larger warehouses

However, the rapid delivery expectations of E-commerce will also perpetuate the need for a network of local, smaller-scale supply points

- The rapid globalization of the supply chain will also affect distribution strategies, suggesting a possible return to warehouse locations with port access



1: WHAT EXISTS NOW

Historically, the size and location of warehouses in the United States has been directly linked to the population of metropolitan areas. The larger the developed area of the city, the larger the number and scale of warehouses serving that region. As reported by Glasmeier and Kibler in their 1996 report, the determining criteria for warehousing is similar to that of any other industry:

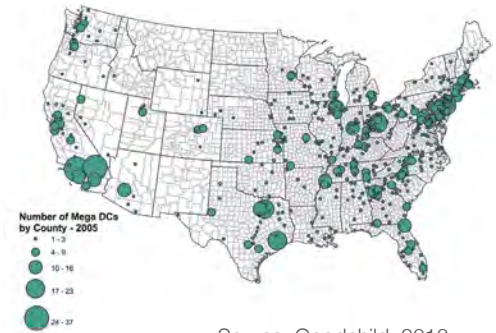
- proximity to customers/clients,
 - reasonable real estate costs,
 - access to interstate highways,
 - availability of appropriately skilled workers,
 - and reasonable costs of doing business"
- (Cidell, 2009)

Because of this, warehouses have traditionally been located near to the central business districts (CBDs) of downtown regions, as well as transportation infrastructure such as railways, rivers, and highways.

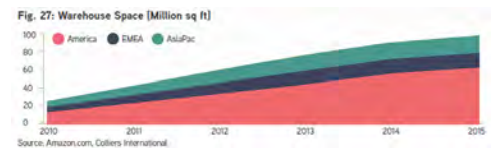
However, as city centers transitioned from production hubs to consumer hubs, the role of warehouses likewise transitioned, from goods storage and product finishing to intermediate distribution centers (DCs). This shift perpetuated an increase in the square footage needs of warehouses, causing warehouse locations to shift toward more suburban sites where cheaper land prices allowed for the expansion of facility footprints.

More recently, changes in freight and warehousing technology have further encouraged the square footage expansion and suburbanization of distribution centers. Glasmeier and Kibler maintain that these technological advancements:

"including containerization and supply chain management, have led firms to consolidate their activities in one place, which generally means a larger footprint (especially as requirements have changed from multi- to single-story buildings) and a correspondingly greater distance from downtown" (Cidell, 2009)



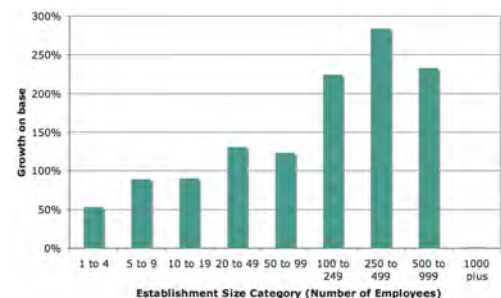
Source: Goodchild, 2010



Source: Colliers International

"Rather than congested dockside or central city facilities, new distribution centers are springing up on the outer edges of metropolitan areas while old, centrally-located warehouses are converted to loft-style condos and art galleries."

- Julie Cidell, 2009 -



Source: Goodchild, 2010

WAREHOUSING

GALEN CARLSON | URBANISM NEXT | SPRING 2017

2: PERTINENT PARAMETERS

AUTONOMOUS VEHICLE TECHNOLOGY:

Across the board, experts in the field agree that the trucking and freight industry will be the first place to see significant change due to Autonomous Vehicle technology. (Kitroeff, 2016) (Healey, 2017)

The biggest impact will be an increase to the catchment area of large-scale distribution centers. Autonomous trucks will be able to travel faster, at all hours of the day, and for longer stretches of time.

Because of the increased travel efficiency of autonomous trucks, large-scale distribution centers can be located even farther from city centers and service more metropolitan areas per location while still operating within a one-day range.

“ ‘The most near-term significant game changer is the idea you can have trucks running a lot longer than you have right now... You can handle freight over longer distances.’ That means more consumers will be within a one-day range of a distribution center.”

- David Egan, Head of Industrial & Logistics Research in the Americas at CBRE, 2016

Traditional logistics model
Single channel to consumer



Source: Matthews, 2014



2: PERTINENT PARAMETERS (CONTINUED)

E-COMMERCE:

E-commerce (online sales) and M-commerce (mobile sales) will continue to have an ever-increasing impact on logistics and warehousing trends.

This impact is two-sided:

First, the continued rise of E-commerce will perpetuate the increase of very large-scale distribution centers, or “mega-DCs” (over 500,000sf).

- This is primarily due to an increase in inventory capacity. Online sales are typically provided by a direct-to-consumer service - meaning merchandise is skipping over retail locations to be delivered directly to the consumer.
- This requires both an enormous amount of inventory capacity and sophisticated technology systems - such as automated picking and sortation systems. The up-front costs of these investments can only be accommodated by these large-scale warehouses and mega-DCs.
- This portion of the supply chain is known as the “first mile” of distribution.

Secondly, the reason for the increasing desirability of E-commerce services is the appeal of shortened delivery times.

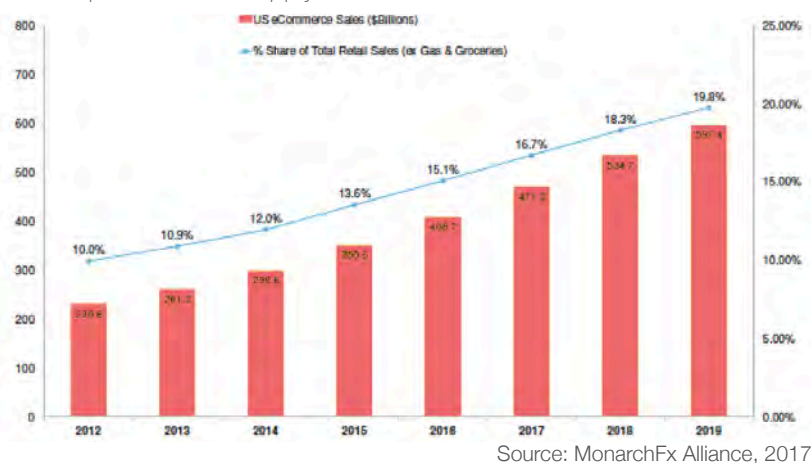
- Next-day or same-day deliveries are quickly becoming the expected norm by E-commerce consumers. This need for quick-turnaround deliveries to consumers is often referred to as the “Amazon Effect”.
- In order to facilitate fast delivery times, more local, small-scale distribution points are required.
- This portion of the supply chain is known as the “last mile” of distribution.

“There’s a bigger need for one-day delivery centers tied into the bigger DCs and scattered across the country... You’ve got to do that from a lot of locations if you want to service the entire country. It’s a fairly new paradigm.”

- David Egan, 2016 -

“We have an expectation in this digital age of more instantaneous delivery... A lot more people today are shopping this way. It takes away from the brick-and-mortar storefront and makes more demands on the warehouse space.”

- Dwight Hotchkiss, 2015 -



WAREHOUSING

GALEN CARLSON | URBANISM NEXT | SPRING 2017

2: PERTINENT PARAMETERS (CONTINUED)

Dwight Hotchkiss, president of brokerage services with real estate services firm Colliers, states that there are two strategies for timely delivery emerging:

- The first is: "A focus on expanding the "first mile" of distribution, such as building massive distribution centers with advanced robotics and RFID technology..."
- The second is a focus on "the "last mile," where e-commerce retailers are leasing up older or smaller warehouses near urban centers to shorten delivery routes." (Hotchkiss, 2015)

FOREIGN MARKETS:

Kris Bjorson, International Director and Head of Retail/e-commerce Distribution at Jones Lang LaSalle, indicated that **retailers are "looking to overseas markets for growth"**. (Bjorson, 2013) Not only will this require the development of highly complex supply chain strategies, but it could also shift distribution center location needs based on inbound freight.

Thus, as distribution chains become more and more globalized, access to inbound freight from foreign markets could indicate a shift back toward DC locations catered to port access.

"If you're a large manufacturer that used to make product in Ohio, your DC network will be configured around a Midwest center... If you outsource production to Asia, suddenly your DC in Ohio doesn't look so good. Your inbound freight is coming in through the Port of Long Beach, and you have to truck or rail it 2,000 miles across the United States just to get to your DC. It makes much more sense to reconfigure your DC network in proximity to your ports of entry."

- Michael Jones, Partner of
Strategic Logistics Service,
St. Onge Co. 2004 -



3: OUTCOME SCENARIOS

Mega-DCs: Due to the increased efficiencies of autonomous trucking, distribution strategies will continue to consolidate into reliance on mega-DCs, placed in centralized rural locations that can service a multitude of metropolitan regions.

Port Access: Due to an increasingly globalized supply chain, distribution strategies will relocate back to coastal regions with key access to seaports and inland riverways.

Local Supply Points: Due to the on-time delivery demands of increased E-commerce, distribution strategies will filter through many small-scale distribution points located intermittently throughout all major metropolitan regions.

4: LOGISTICS

Example 1: Suburban areas with strategic access to multiple metro regions become mega-DC hubs that service several nearby cities.

±1,000,000 sf Mega-DCs

Example 2: Waterfront regions with port access become key distribution points, channeling inbound freight from foreign markets through mid-size warehouses located near ports or inbound rivers.

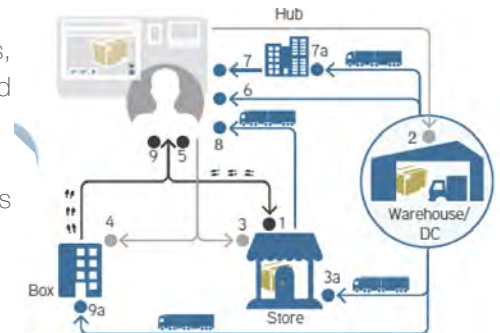
±100,000 sf Mid-size DCs

Example 3: Specific sites within downtown centers and developing suburban nodes are chosen as local distribution points for e-commerce delivery.

±10,000 sf Urban Supply Centers

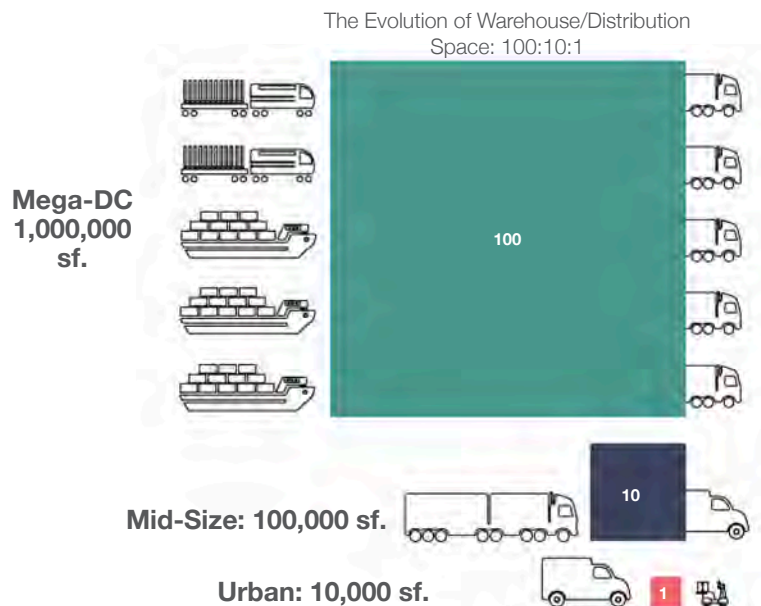


Evolution of Urban Logistics Needs
'Traditional' Shopping/Delivery Methods



'Evolving' Shopping/Delivery Methods

Source: Colliers International



Source: Colliers International

5: TRANSITION PERIOD CONSIDERATIONS

AUTONOMOUS TRUCK ACCOMMODATIONS:

As autonomous trucks first become readily available, they will mainly serve as highway convoys, and won't be able to navigate the complexities and challenges of the "last mile" of distribution. Until they can, they will **most likely be gathered at freight hubs just outside the city, where local drivers will take over the responsibility of guiding the truck to its final destination.**

- Where would these local "freight hubs" be located? What would they look like?
- How will autonomous trucks change the physical characteristics/arrangement of warehouse destinations? Loading dock courts for truck convoys? Automated truck receiving and unloading?
- Will the final destinations change in location due to these changes?
- Where are they located now?

E-COMMERCE IMPACTS:

If the rise of E-commerce shifts distribution to direct-to-consumer strategies, what happens to existing retail spaces?

- What types of retail can't/won't rely on E-commerce services (i.e. pharmacies, farmer's markets, etc.)? How will the location and arrangement of these retailers compare to others that shift to online-focused markets?



6: RELATED ISSUES AND EXTERNALITIES

Drone & AV Deliveries: How will drone deliveries or AV delivery cars/robots change distribution strategies? Will the need for local supply points disappear? Will they simply become “loading zones” for automated delivery vehicles that can deliver packages straight to the doorstep?

Highway and Street Design: How will autonomous freight trucks change road design? Will there be dedicated “freight” lanes for platooning trucks to travel at higher speeds? Will there be “delivery” lanes in cities for AV delivery cars and bots?

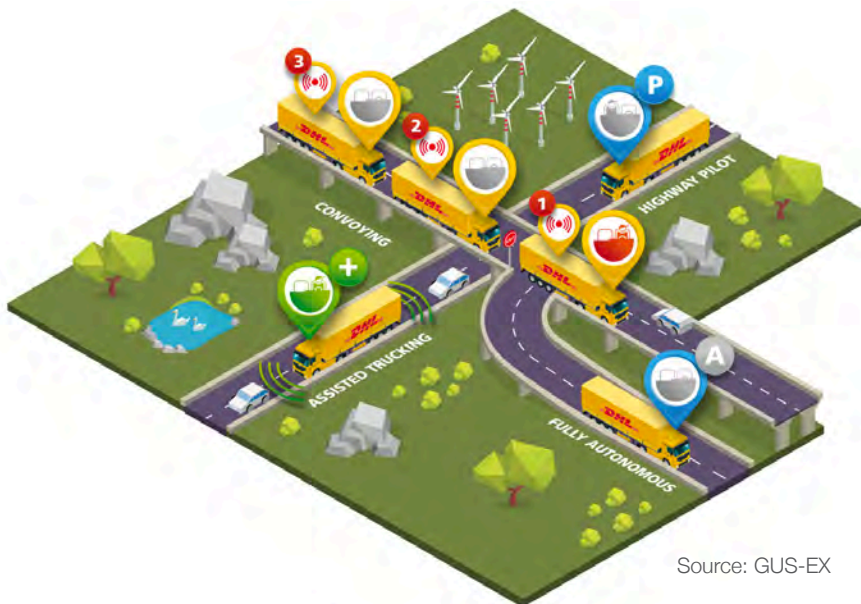
Traffic Patterns: How will traffic flows shift based on increased numbers of autonomous freight carriers?

Drop-Off/Curb Space:

- Commercial Districts: Will the “loading dock” be replaced with curbside drop-off zones for the continuous stream of packages been shipped to businesses and building occupants?
- Residential Zones: Will the “driveway” be replaced with drop-off zones for direct-to-consumer packages? Will the “garage” transform from a car-storage space to a package-storage space?



Fig. 20: Mega Warehouse and Cross Dock
Source: GUS-EX



Source: GUS-EX

WAREHOUSING

SOURCES:

1. Andreoli, D., Goodchild, A., & Vitasek, K. (2010). The rise of mega distribution centers and the impact on logistical uncertainty. Retrieved from https://depts.washington.edu/pcls/documents/research/Goodchild_RiseOfMegaDCs.pdf
2. Cidell, J. (2009). Concentration and Decentralization: The New Geography of Freight Distribution in U.S. Metropolitan Areas . Retrieved from <https://www.ideals.illinois.edu/bitstream/handle/2142/50763/FinalFinal.pdf?sequence=2>
3. Harrington, L. (2004, July). Mega DCs: How Big is Big Enough? Retrieved from <http://www.inboundlogistics.com/cms/article/mega-dcs-how-big-is-big-enough/>
4. Carr, R. (2015, October 30). Retailers Focus on Large Distribution Centers, Small Urban Warehouses for Fast Delivery. Retrieved from <http://nreionline.com/industrial/retailers-focus-large-distribution-centers-small-urban-warehouses-fast-delivery>
5. Cassidy. (2016). Automated trucks, warehouses seen transforming distribution. Retrieved from http://www.joc.com/trucking-logistics/trucking-equipment/automated-trucks-warehouses-seen-transforming-distribution_20160914.html
6. Kitroeff, N. (2016, September 25). Robots could replace 1.7 million American truckers in the next decade. Retrieved from <http://www.latimes.com/projects/la-fi-automated-trucks-labor-20160924/>
7. Healey, J. R. (2017, January 17). Self-Driving Trucks Could be on the Road in Five Years. Retrieved from <https://www.trucks.com/2017/01/10/self-driving-trucks-soon/>
8. <http://www.areadevelopment.com/logisticsInfrastructure/March2013/e-commerce-distribution-center-site-requirements-26281443.shtml>

University of Oregon | Portland, OR
Sustainable Cities Initiative
Urbanism Next
BLOG: urbanismnext.uoregon.edu

