

**CBRE**

**CHANGE, INFRASTRUCTURE AND DIGITAL TECHNOLOGY:  
INDUSTRIAL REVOLUTION 3.0**

**ROBERT C. KRAMP**

*Director, Research & Analysis*


APRIL 6, 2017



An illustration of a large factory complex with multiple buildings, chimneys emitting smoke, and a network of tracks or roads. The scene is rendered in a dark, monochromatic style with a teal tint.

**First  
Industrial  
Revolution**  
(early 1800's)

Textiles, Iron,  
Steam power

A photograph of a car assembly line in a factory. Several vintage cars are lined up, with workers visible in the background. The image is tinted with a teal color.

**Second  
Industrial  
Revolution**  
(20th century)

Steel, railroads,  
petroleum, Chemicals,  
electricity and the  
assembly line

A stylized map of the world with a glowing green point on the right side, representing the Third Industrial Revolution. The map is set against a background of concentric circles and a teal tint.

**Third  
Industrial  
Revolution**  
(21st century)

Technology,  
Automation,  
Transparent info,  
Global Trade,  
E-commerce



# THIRD INDUSTRIAL REVOLUTION

## Technology and Information



Source: Lori Lewis, 2017.

# THIRD INDUSTRIAL REVOLUTION

## *Autonomous Vehicles & Electric Trucks*



Source: WSJ, 2017.

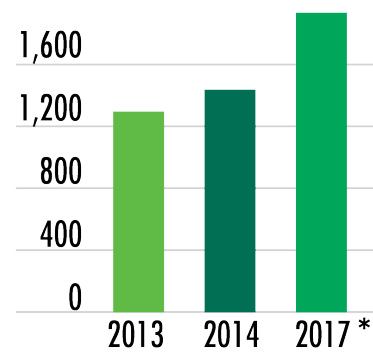


# THIRD INDUSTRIAL REVOLUTION

## Manufacturing Robots

### Taking Over

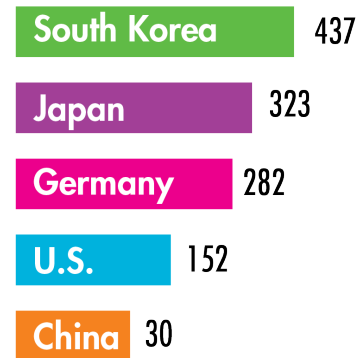
Industrial robots in operation world-wide, in thousands



\*Projected

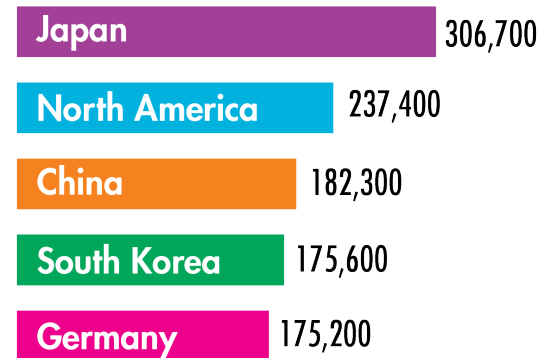
### Robot Density

Industrial robots per 10,000 manufacturing employees



### Where They Are

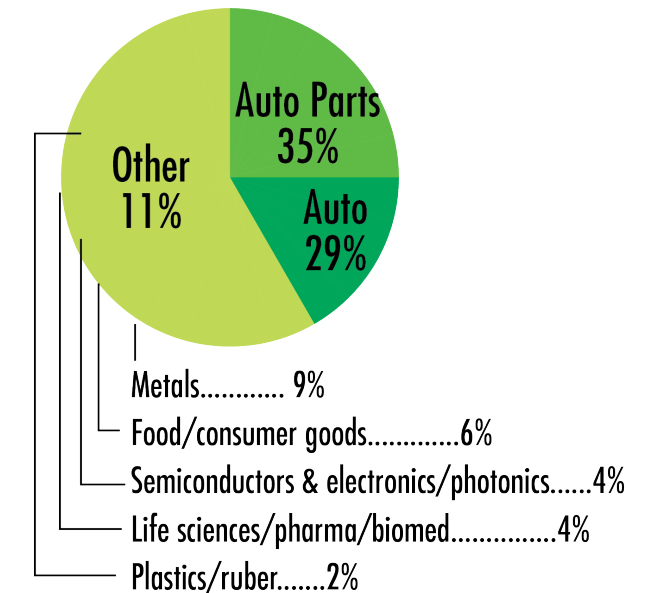
Industrial robots operating by country/region, 2014



Sources: International Federation of Robotics; Robotic Industries Association (U.S. robot orders), Wall Street Journal

### At Work in America

Robot orders in the U.S. in 2014 by industry



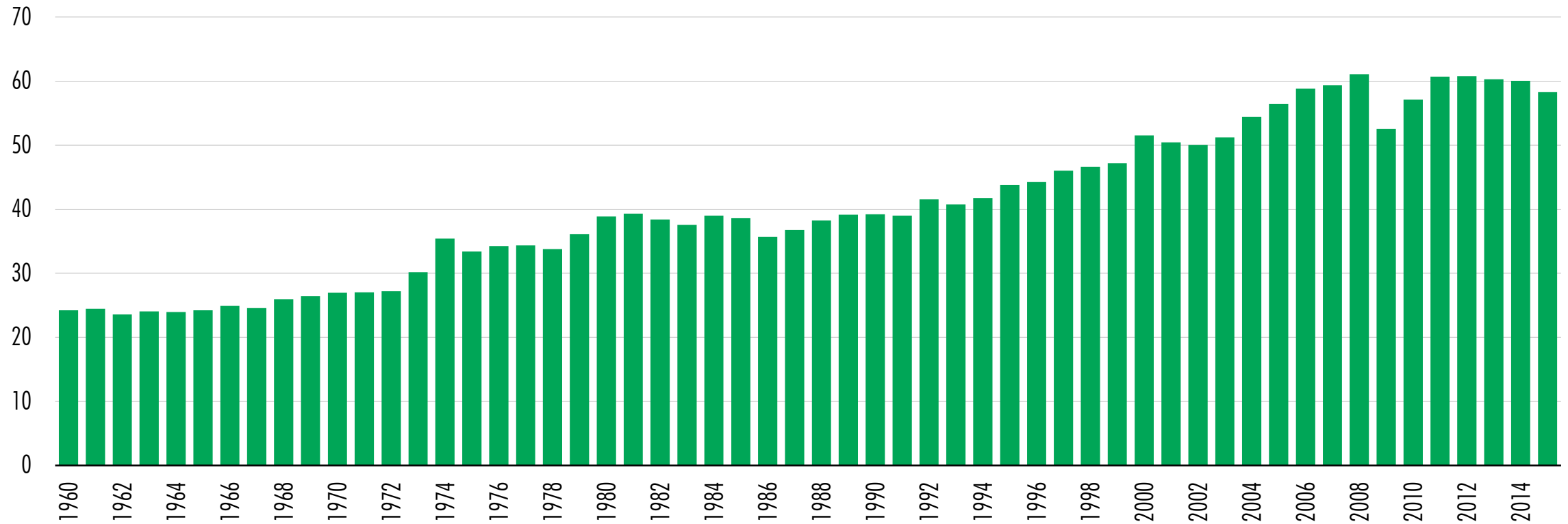
Source: WSJ, 2017.



# THIRD INDUSTRIAL REVOLUTION

## Global Trade

World Trade (% of GDP)

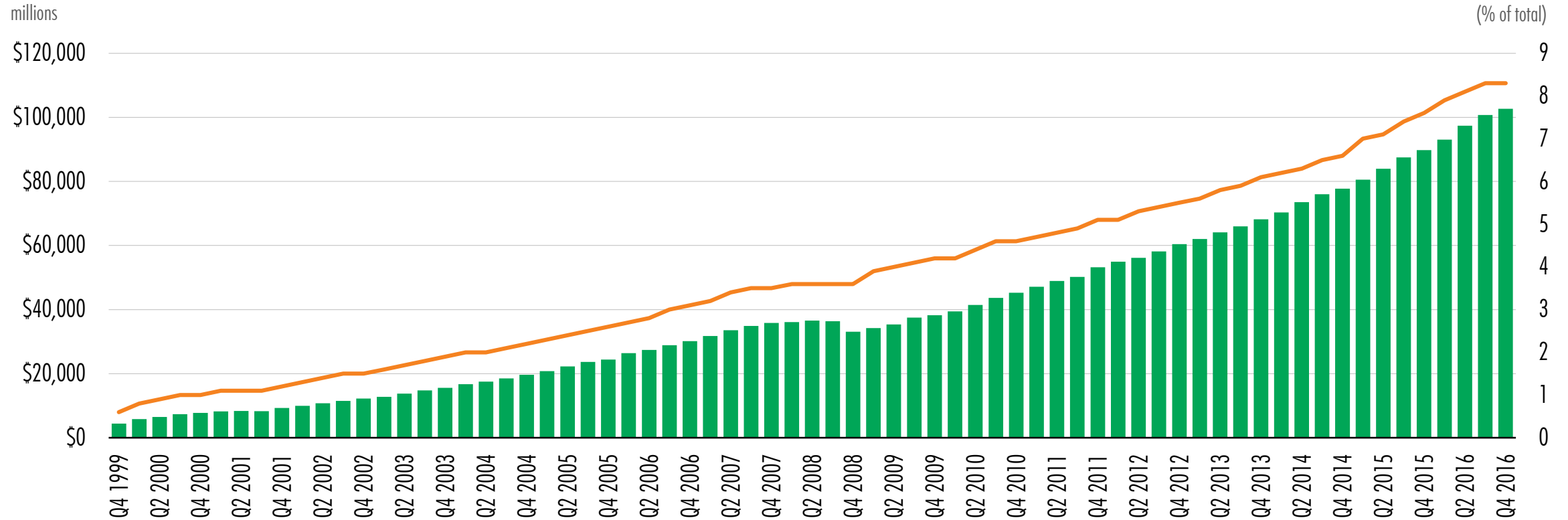


Source: World Bank, 2017.



# THIRD INDUSTRIAL REVOLUTION

## E-Commerce



Source: U.S. Census, 2017.



# How is this impacting Texas?

***“Texas Drawing Millions  
Moving from Other  
States”***

Texas Tribune, 2016.

***1.3 Million New Homes  
Permits Issued in the  
‘Texas Triangle’ Over  
Past 15 Years”***

Builder, 2016.

***“Growth in E-commerce Drives  
Strong Industrial Market  
Performance”***

NRE Investor, 2017.

***“San Antonio  
industrial market  
retains immunity from  
oil slowdown”***

San Antonio Business  
Journal, 2017.

***“Video: World’s first truly self-  
driving car took plane in  
Austin”***

Kxan Austin, 2016.

***How Dallas-Fort Worth  
became a top U.S.  
headquarters wrangling  
region”***

Dallas Business Journal, 2017.



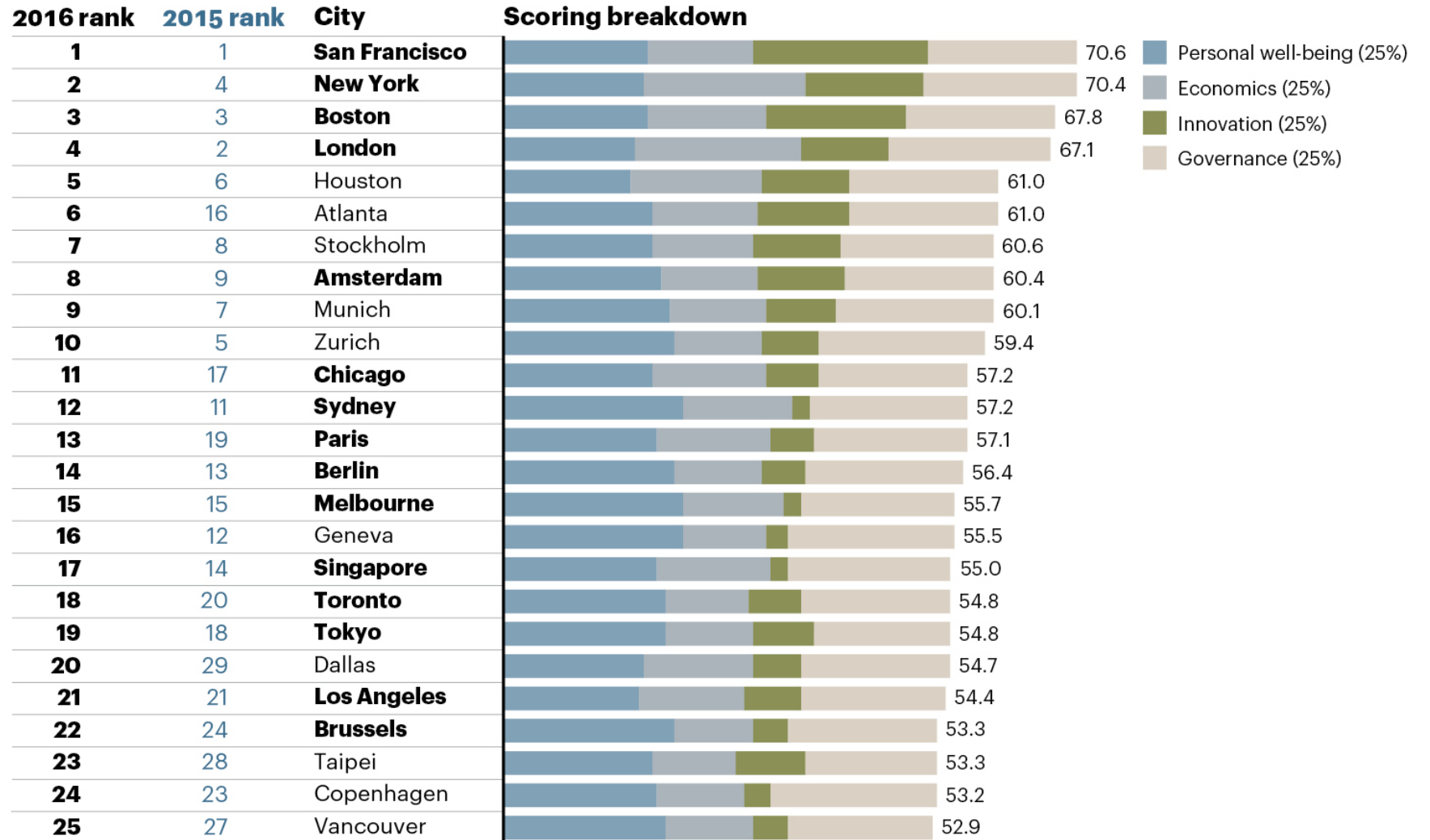
# Texas Competitive Advantage

- ✓ *Expanding demographics & talent*
- ✓ *Competitive corporate/living environment*
- ✓ *Geographic location and accessibility*
- ✓ *Technology*
- ✓ *Energy*



# TEXAS COMPETITIVE ADVANTAGE

*Texas cities are global cities*



Note: Bold city names indicate top 25 in both Index and Outlook.

Source: A.T. Kearny Global Cities

# THE 1.6 BILLION SF TEXAS INDUSTRIAL MARKET CLOSED 2016 AT RECORD LEVELS.

*Consumer goods distribution (including ecommerce) along with trade are leading industries.*

## **Major industrial industries based on 48.4 Million SF**

**Logistics/3PL (26%)**

**Wholesale (13%)**

**Food & Beverage (9%)**

## **Other notable mentions**

**Machinery, Automation & Appliances (6%)**

**E-commerce (6%)**

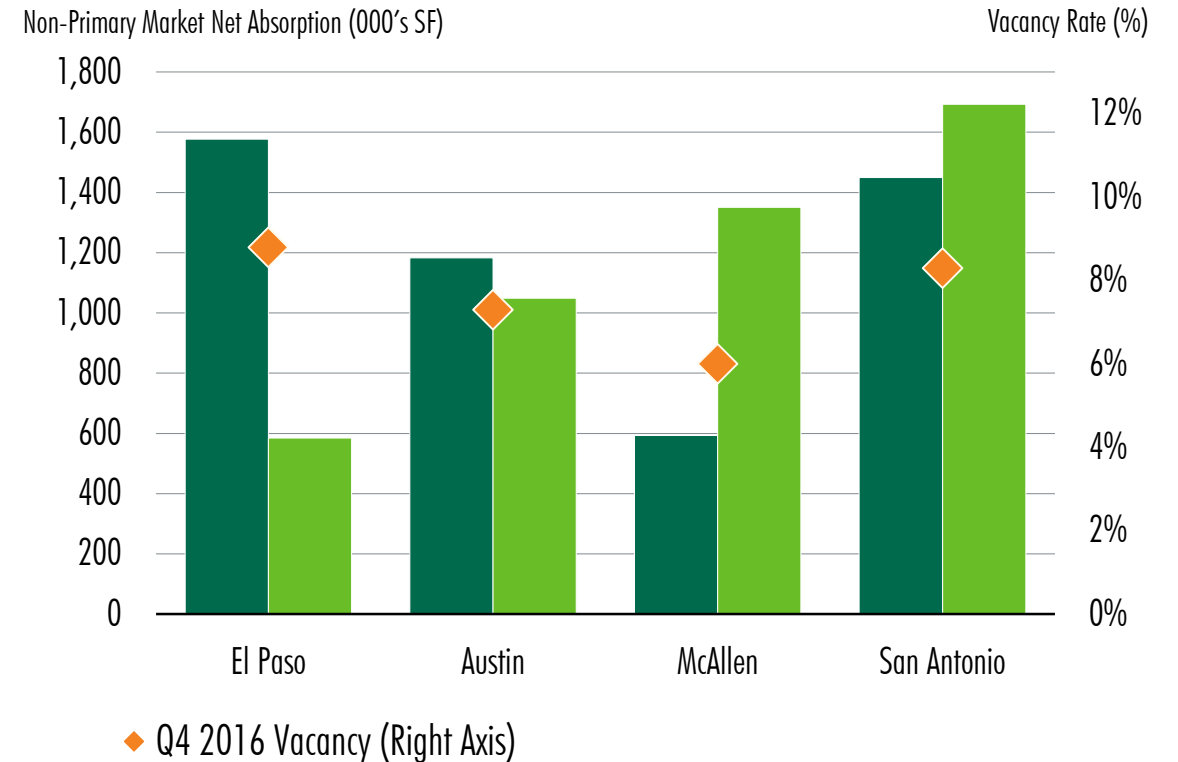
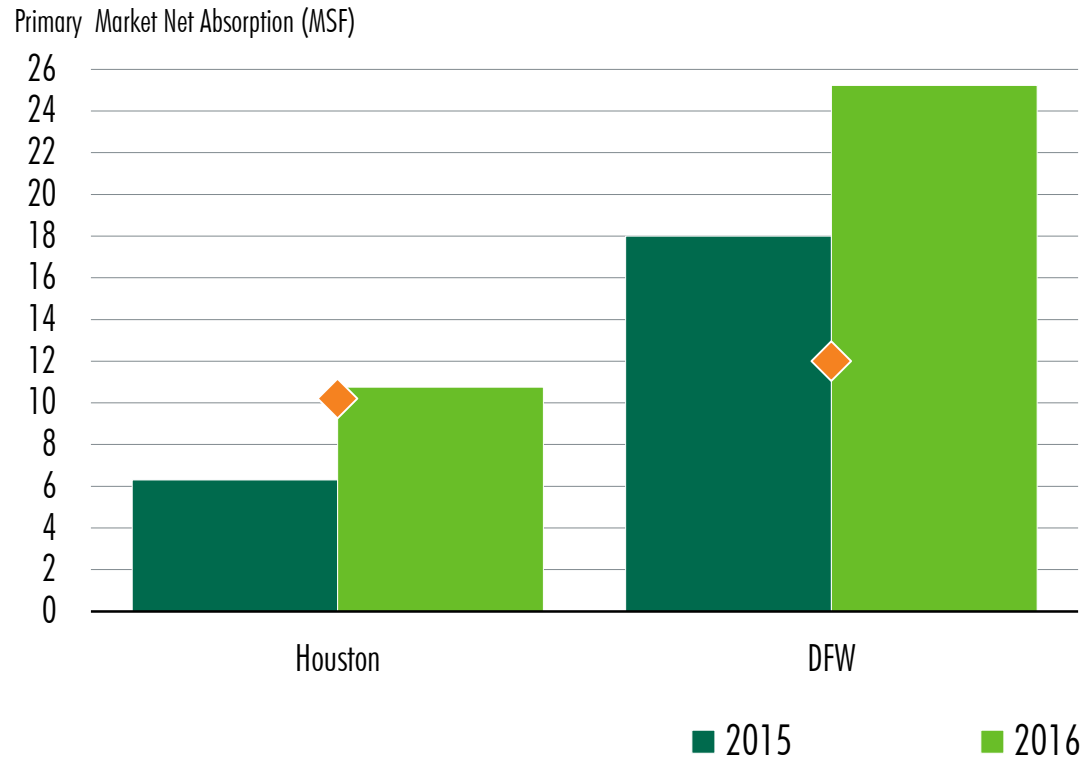
**Motor Vehicles & Parts (3%)**

Source: CBRE Research, Q4 2016.



# MOST MARKETS BEAT THEIR 2015 ANNUAL NET ABSORPTION

*Most industrial markets well-surpassed 2015 activity*



Source: CBRE Research, Xceligent, Q4 2016.







**WATERWAY INFRASTRUCTURE**



# PORT AND CANAL INVESTMENT IS DRIVEN MAINLY BY THE RISE OF MEGASHIPS USED IN GLOBAL TRADE ROUTES





# CANALS RESPOND TO SHIP AND ROUTE VOLUME GROWTH...



## *Panama Canal*

- Throughput doubled
- Now accommodates 98% of ships
- More mega ships serving Asia—expected +5% PoH volume growth



## *Suez Canal*

- Throughput doubled
- Provides Mediterranean with access to larger vessels
- Will spur additional infrastructure investment in Mediterranean ports



## ...AND PORTS INCREASE THROUGHPUT TO KEEP PACE



# GLOBAL CAPITAL INVESTMENT DRIVEN BY KEY THEMES...

## Deep dredge and canal widening required for larger ships

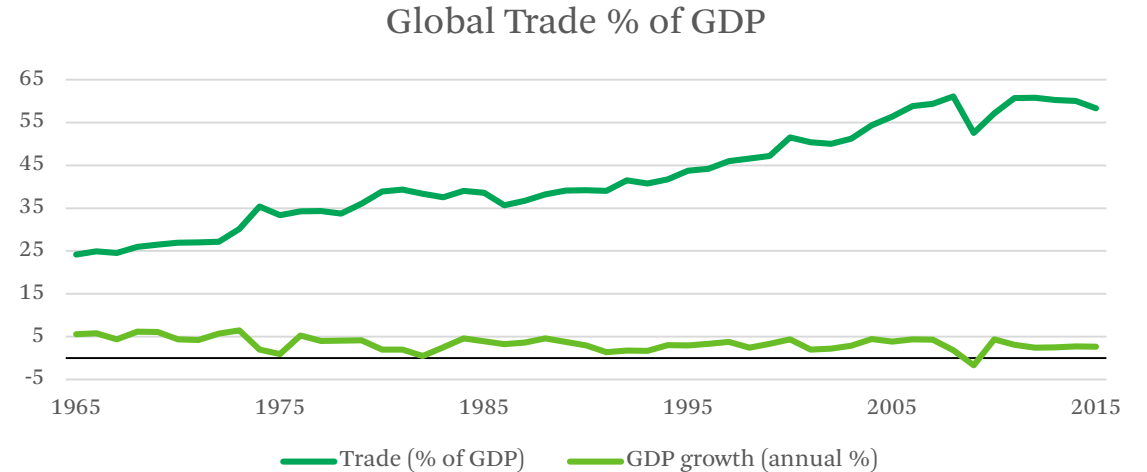
- Key trade routes as direct routes increase (decline of trans-shipment)
- Market share volumes via growing ship sizes must be accommodated or will be lost

## Falling global shipping profits

- Excess global shipping container capacity
- Modest trade growth over the past few years (Chinese slowdown)
- Corporation and route consolidation increases importance of megaships

## Global pivot to Asia

- Rebalancing of Chinese trade demand from investment/exports to consumption
- Greatest near-term consumer growth will be driven by China and India
- Rising demand for petrochemical products and energy exports (oil and LNG) to Asia





## ...WHICH ARE REFLECTED IN LOCAL PROJECTS

### *Port Houston (Completed and underway)*

- Deeper channels dredged (45 ft.) at Barbours Cut and Bayport
- Modernization programs to expand total TEU throughput by 2.7 million by 2021
- Combined capital investment of \$1.2 billion over 10 years

### *Corpus Christi (Planned)*

- More barge lanes and a deeper channel (52 feet)
- Driven by petrochemical exports

### *Sabine-Neches (Planned)*

- Deepen and widen the Sabine River along the TX-LA border
- Driven by expansions in crude and LNG trade, military cargo



## LOCAL CHALLENGES AND FUTURE NEEDS

### *Houston is primarily a truck port*

- Mobility around the city is a major challenge for logistics operators
- Grand Parkway expected to alleviate some mobility issues
- Intermodal expansions are needed in order to supported more ship-to-rail

### *Lack of heavy-haul corridor*

- Texas is one of the few states with a major port and no heavy-haul corridor
- Impacts exports in particular—redirected through DFW or directly to the West Coast
- Trucking weight limits restrict fully loading many containers

### *Tight supply of empty containers*

- Balanced imports/exports ratio, but high demand for empty containers
- Backhaul transport of containers is less profitable, making supply tighter







HIGHWAY INFRASTRUCTURE







# REGIONAL PROJECTS ALSO SEEK TO INCREASE CONNECTIVITY

## Interstate – 10

- Add capacity as needed along the 2,400 mile corridor between 8 states, particularly important for interstate movements
- Average number of lanes needed by 2025 expected to increase from 6 to 10.1 along urban sections, 4.1 to 5.2 lanes along rural sections
- Capital cost: \$26.6 billion.



Source: AECOM, CBRE Research February 2017.

## LOCAL EXPANSIONS INCLUDE TECH ADVANCES

### *Integrated Corridor Management (ICM) System*

- Implementation of ICM system currently underway on 16-mile section of I-10 in El Paso
- System combines freeway, arterial, transit, and parking management systems into a single system
- Provides accurate and up-to-date information for operation agencies and motorist



Source: CBRE Research, USDOT, AECOM, Moody's Analytics, 2017.

# INTERNATIONAL TRADE INCENTIVISES IMPROVEMENTS

## *Interstate – 35, Trade Corridor*

- Improvements along I-35 will improve travel times along the 1,600 mile corridor
- Economic impact of the project will support jobs, income, wages, and value added
- \$15.6 billion capital cost
- Directly connects 49 million residents, 22 million jobs, \$2.7B of GDP to the busiest port of trade between the U.S. and Mexico all the way to Minnesota



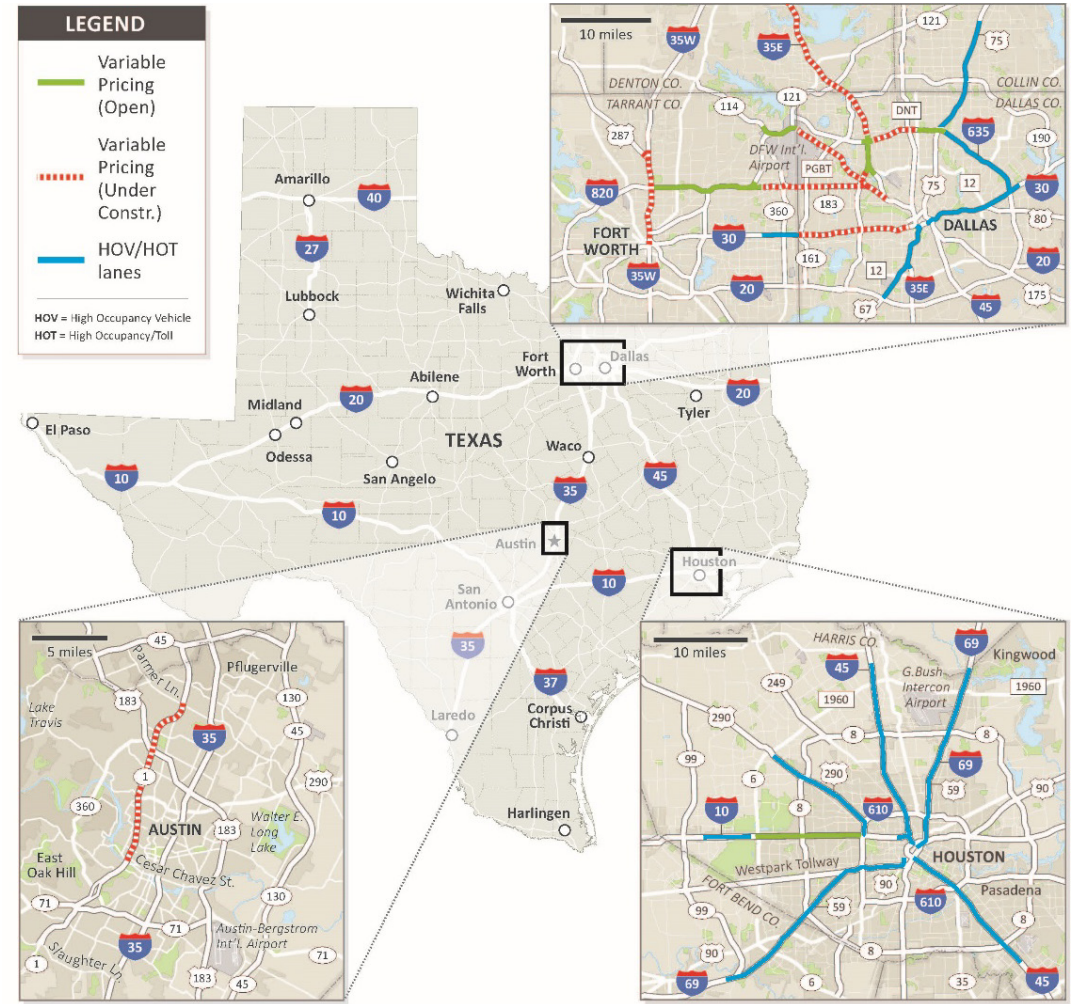
Source: AECOM, February 2017.



# IMPROVING TRAFFIC CONDITIONS HELPS FACILITATE TRADE

## Dynamic Toll Roads

- Tolls on these lanes are dynamic, changing as often as every 5 minutes, adjusting to current traffic conditions in order to keep traffic moving at a minimum of 50 mph.



Source: TXDOT, February 2017.



# TRADE CORRIDORS PLAY AN IMPORTANT ROLE IN MOVING FREIGHT

## *Interstate – 69, Trade Corridor 2*

- Extension of I-69 from Indianapolis to the Mexico border
- Connection to existing I-69 in Michigan will provide access for the auto markets between Detroit and Mexico with 1,600 miles of connections
- Highway directly connects: 56 million residents, 23 million jobs, \$2.8B of GDP
- Capital cost: \$10.5 billion

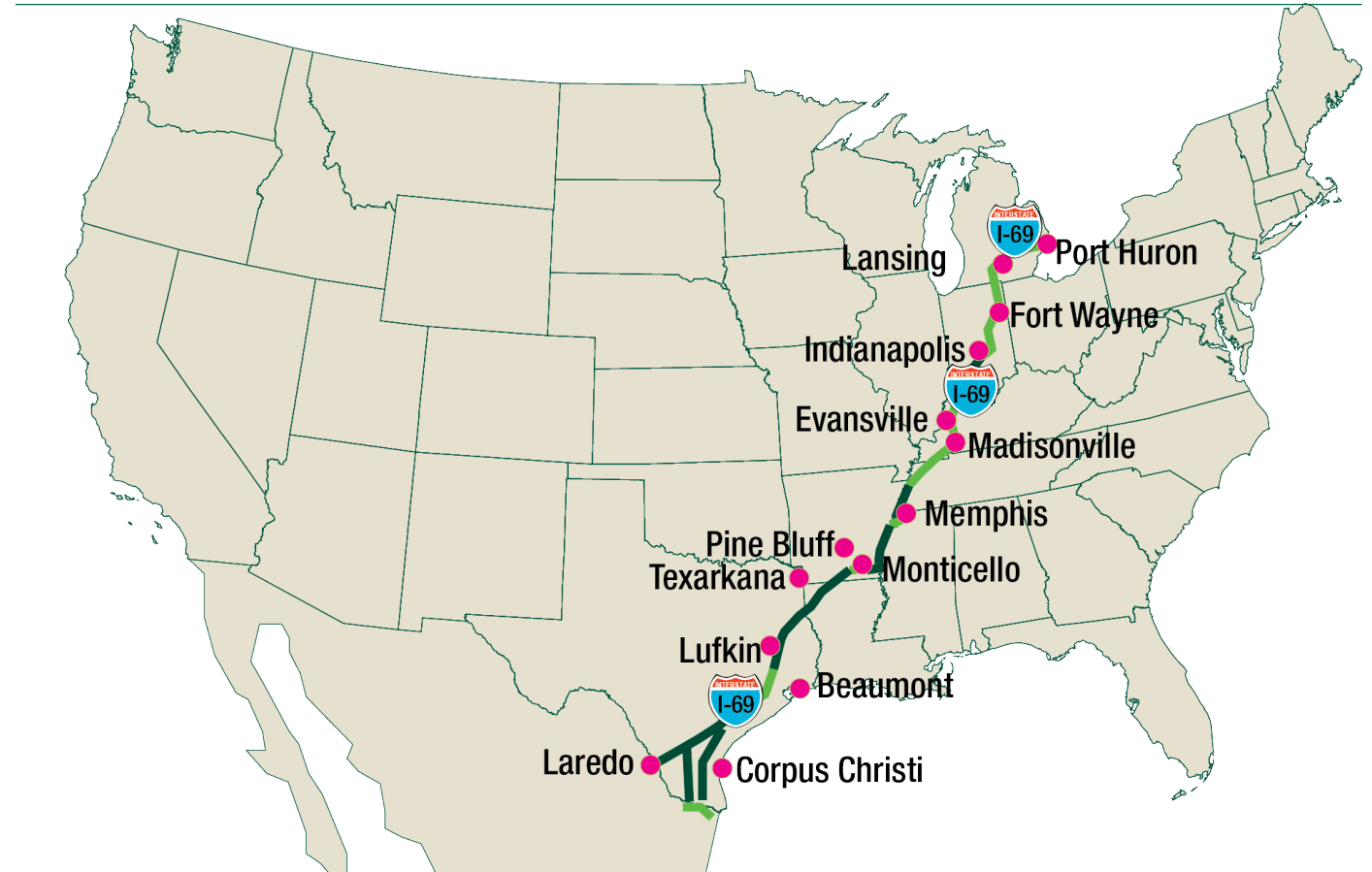


CBRE Research, AECOM, February 2017.

# THEIR IMPORTANCE IS RECOGNIZED AT THE NATIONAL, REGIONAL, AND LOCAL LEVEL

## Interstate – 69

- Corridor was designated a High Priority Corridor of National Significance in ISTEA
- Is a North American trade route, an international trade route, and a NAFTA corridor.



CBRE Research, AECOM, February 2017.



# REGIONAL HIGHWAY CONNECTIVITY PROJECT

## *Freight Shuttle*

- Up to 500 miles of electrical haul
- Lower total cost
- Will reduce border wait times at land ports
- Reduce CO2 pollution
- Could transport international cargo



Source: CBRE Research, Texas Transportation Institute, March 2017.





**AIR INFRASTRUCTURE**





## ENGINES OF CITIES AND ECONOMIES

*“Air Routes Create A Physical Internet”*

- By 2050, 6.5 billion people (two-thirds of humanity) will live in cities, according to the United Nations
- Connectivity is and will continue to be vital as cities (not nations) compete against one another for corporate relocations and talent

# ENGINES OF CITIES AND ECONOMIES

In 2015-

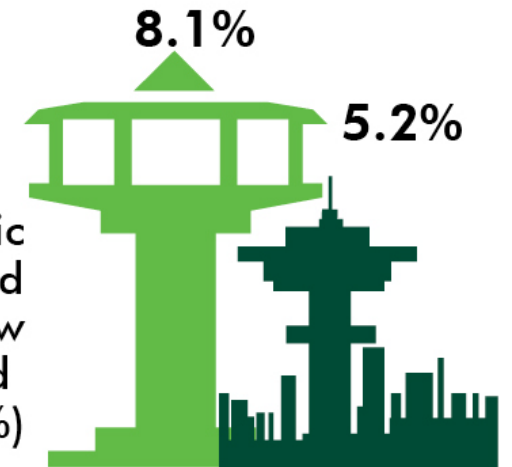


Worldwide airport passenger numbers increased to **7.2 B** (+6.4%)

Worldwide airport cargo increased to



Airport passenger traffic in emerging markets and developing economies grew faster (8.1%) than in advanced economies (5.2%)



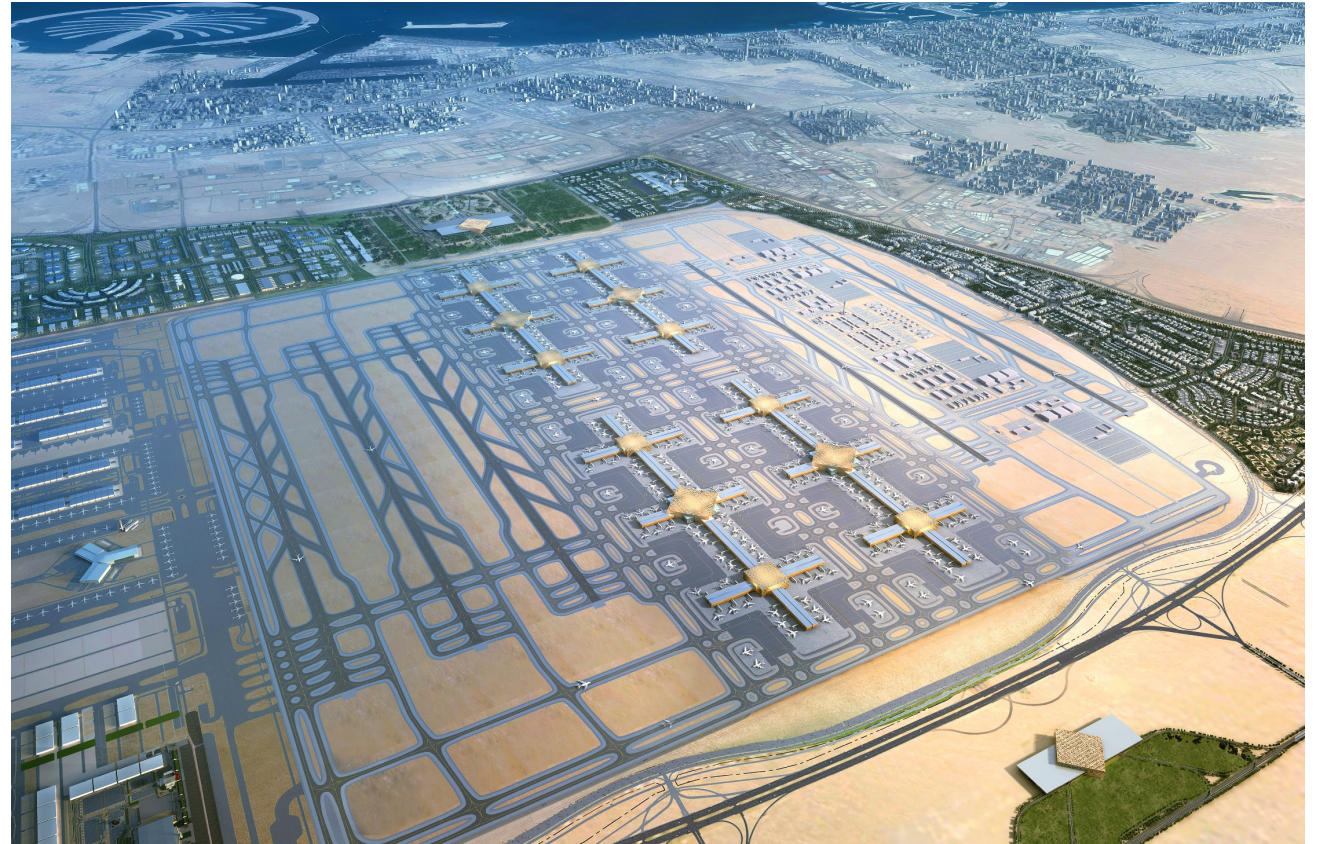
Source: Airports Council International, Q1 2017.



# GLOBAL AIRWAY CONNECTIVITY PROJECT

## *AL Maktoum International Airport (DWC)*

- With global demand increasing, Dubai Airports announced Al Maktoum International in 2004, which will be the largest airport in the world at completion. DWC is a \$32 billion dollar investment.
- Biometrics and smart passenger tracking will be used during the expansion to facilitate seamless passenger movement through the terminals.
- The cargo facilities will be able to accommodate 12 million metric tons of cargo per year at completion.



Source: CBRE Research, March 2017. Image: Dubai Airports, 2016.

# HUBS OF INNOVATION CONNECTING THE GLOBE

## DFW Terminal Upgrades

- DFW Airport covers more than 26.9 square miles and served 65.7 million passengers in 2016 and handled 668,790 metric tons of cargo

## IAH Terminal Upgrades

- Houston is the only city in the Western Hemisphere to offer nonstop service to all six inhabited continents.
- IAH served 41.5 million passengers in 2016 and handled 407,661 metric tons of air cargo
- Improvements include: Enhanced Self-Service Ticketing Areas and Highly Efficient Green Technology Implementation





# HUBS OF INNOVATION CONNECTING THE GLOBE

## *Alliance Fort Worth Runway Expansion*

- Runways are being expanded to 11,000 feet
- Increased runway lengths will allow for larger planes to call on Alliance and offer direct connections to Asia, Europe, and Latin and South America
- Project cost is \$61.9 million



## CLOSING

### *The Third Industrial Revolution Will Continue To Produce Logistical Efficiency Through Global Trade, Technology & Automation*

- Despite decreasing freight rates and falling profits for some shipping operators, the dependence of world demand on sea shipping lanes will continue to drive canal and port expansion projects worldwide.
- As traffic continues to increase along highways and interstate systems, the necessity to create new roadways and pioneering automated routes and vehicles will only increase. Through innovated technology and improvements to highway infrastructure, cities and nations will become more connected than ever.
- Air travel will become more efficient with enhances self-servicing ticket areas, increased runway lengths, and implementing efficient green technology throughout terminals.

---

### FUTURE EXPANSIONS AND LOGISTICAL EFFICIENCY

- Continued expansion of ports and canals to accommodate expanding sea operations
  - Widening of existing highways and creating new, smarter corridors to accommodate increasing traffic
  - Increasing runway length, expanding terminals and smart passenger tracking will allow for more efficient air travel
-





**CBRE**

**THANK YOU**