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16. Abstract

Jane Jacobs famously wrote, “The economic foundation of cities is trade.” Increased global connectivity and expanding domestic markets around major city hubs have led to a spatial reorganization of regional economies towards a higher level of scale referred to as the megaregion. These trade networks rely on a complex mix of freight and telecommunications infrastructure, low trade barriers, as well as international business and social networks. Policymakers have a responsibility to recognize the vital relationship between economies and freight, and it is imperative that national policies reflect the domestic and global environments in which megaregions must now compete. The United States (US) lacks a national freight strategy and most metropolitan areas fail to implement comprehensive trade strategies, indicating disconnect between policy and practice. In this research, we determine the status of freight planning strategies at the megaregion scale of an economically integrated section of the United States Gulf Coast.

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The Gulf Coast Megaregion: In Search of a New Scale to Understand Freight Transportation and Economic Development

by

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Peter Webb

Report Number SWUTC/15/600451-00108-1
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Southwest Region University Transportation Center
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EXECUTIVE SUMMARY

Jane Jacobs famously wrote, "The economic foundation of cities is trade." Increased global connectivity and expanding domestic markets around major city hubs have led to a spatial reorganization of regional economies towards a higher level of scale referred to as the megaregion. Though these megaregions are on a different scale than what Jacobs originally referred to, her premise is even more fitting in this new context. These trade networks rely on a complex mix of freight and telecommunications infrastructure, low trade barriers, as well as international business and social networks. Policymakers have a responsibility to recognize the vital relationship between economies and freight, and it is imperative that national policies reflect the domestic and global environments in which megaregions must now compete. The United States (US) lacks a national freight strategy and most metropolitan areas fail to implement comprehensive trade strategies, indicating disconnect between policy and practice. In this paper, we present research that seeks to determine the status of freight planning strategies at the megaregion scale of an economically integrated section of the United States Gulf Coast. How can improvements to freight transportation planning improve sustainability and raise the standard of living within a megaregion in addition to increasing economic growth? To answer this question, we utilize the case study method, widely recognized as a valid means of investigating regional economies (Yin, 2013). Our analysis of the workforce was based primarily upon census data. We found that the Gulf Coast Megaregion (GCM) has a larger Hispanic or Latino population than the US, that maladaptive Jim-Crow era racial dynamics are still problematic for the region, and that there are many employment niches requiring a skilled workforce, but not necessarily a college education. We also found that the labor pool and freight infrastructure of the GCM and have the capacity to support interstate commerce. We also attempted to compile a listing of the supply of industrial buildings on the market in the 70 counties of the GCM, and discovered the need for a centralized inventory of all industrial structures in the GCM, and that there should be a uniform definition of the term "industrial." We used the Commodity Flow Survey (CFS) to examine the freight in the GCM, and found a trend of increasing in / out flows of freight in the GMC, as well as a growing concern for the safe passage and production of hazardous materials. Our trade analysis compared freight inputs and outputs with location quotients to determine the correlation between the two data sets, revealing that, as predicted, there is a high concentration of energy industry employment in the GCM, with a heavy reliance on logistics & distribution, connected with the high volume of exports from Houston, New Orleans, and Baton Rouge. The megaregion concept is viable with a strong transportation infrastructure to connect these increasingly urban regional economies. Despite the availability of multiple transportation modes including ship, barge, and rail, megaregions are over-reliant on trucking for freight transportation (Ross & Barringer, 2008). As a result, freight corridors experience greater congestion and infrastructure damage, which adds to shipping times and reduces regional competitiveness. Understanding freight at the metropolitan and megaregion level can alleviate these problems.

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INTRODUCTION

To connect metropolitan areas and megaregions with one another, today's trade networks rely on a complex mix of freight and telecommunications infrastructure, low trade barriers, strong international business and social networks as well as multiple government agencies and jurisdictions. This rapid exchange of knowledge, goods, and services comprises the world economy. In the past two decades alone, global goods trade grew by more than 400 percent, dwarfing the growth rate of global gross domestic product (GDP). In 2012, just 300 metropolitan areas produced 51 percent of global economic output (Tomer, Kane, & Puentes, 2013). And with this expansion of global trade and sophistication of supply chains, the maintenance and management of freight transportation networks has become more costly. New mechanisms for investment in freight networks are required to sustain current economic growth rates. The logistical significance of cities is increasing due to their geo-spatial connection to transportation nodes in the supply chain. As metropolitan regions grow into megaregions, the amount of state and regional collaboration among transportation professionals, metropolitan planning organizations, and economic developers will increasingly determine which regions achieve greater economic sustainability.

Megaregions represent a new level of scale in how we understand the relationship between municipal, regional, and state economies. Ross and Barringer (2008) define a megaregion as a set of interconnected urban economies that share a common support infrastructure within a particular geographic region (Ross & Barringer, 2008). Current migration trends suggest that megaregion populations in the United States (US) are growing and that megaregions will house two-thirds of the US population by 2050 (Ross et al., 2007). A megaregion approach towards economic development seeks to increase economic competitiveness in the global market of goods and services for a major geographic region by targeting internal resources and assets. This macro-level planning approach can increase regulatory agreement within a region through inter-jurisdictional cooperation initiatives. The resulting regulatory environment can strengthen the economic competitiveness of local businesses and help address environmental degradation concerns as a result of this economic activity (McFarland, McConnell, & Geary, 2011; Ross & Barringer, 2008). The Moving Ahead for Progress in the 21st Century Act (MAP-21) is US policymakers' attempt to foster multi-jurisdictional collaboration in transportation planning through the creation of new means for investment in freight transportation networks.

The strength of freight transportation networks is directly connected to the economic health of a megaregion. According to Leigh and Blakely (2013) the purpose of economic development is to maintain and to increase a community's standard of living through investments in human capital and infrastructure in a way that reduces inequality and promotes sustainability (Leigh & Blakely, 2013). So the question becomes, how can investments in freight transportation planning improve sustainability and raise the standard of living within a megaregion in addition to increasing economic growth? This research seeks to determine the status of freight planning strategies at the megaregion scale using the US Gulf Coast as a case study. To this end the following tasks were conducted:

1. Provide a general overview of the state of freight transportation in the United States;
2. Review the relationship between megaregions and freight;
3. Conduct a Gulf Coast megaregion case study by:

I. Assessing the ability of the Gulf Coast workforce to support a megaregion's economy;
II. Identifying the major commodities being transported through the Gulf Coast region and pair this data with location quotient analysis of the megaregion,
III. Discussing the sustainability and economic development implications of these findings; and

4. Conclude with possible implications for Moving Ahead for Progress in the 21st Century Act (MAP-21) and subsequent federal regulation.

BACKGROUND

Task 1: Freight Infrastructure Analysis

Freight transportation has grown over time with the expansion of population and economic activity within the US and with the increasing interdependence of economies across the globe. The US population grew by 25 percent between 1990 and 2011, climbing to 311.6 million in 2011. The US economy, measured by gross domestic product (GDP), increased by 68 percent in real terms (inflation adjusted), while household income, another indicator of economic growth, remained unchanged between 1990 and 2011. Foreign trade grew faster than the overall economy, doubling in real value over the same period, reflecting unprecedented global interconnectivity ("Fiscal Year Annual Report", 2013).

According to preliminary estimates from the 2012 Commodity Flow Survey (CFS), nearly 11.7 billion tons of freight, valued at $13.6 trillion, was transported about 3.3 trillion ton-miles in 2012 by shippers in manufacturing, wholesale trade, and mining in the US. Said another way, on a typical day in 2012, 32.0 million tons of goods, valued at $37.3 billion, moved nearly 9.1 billion ton-miles on the Nation's transportation network. Trucking is the predominant mode in both value and tonnage of CFS shipments.

Goods moved by private truck typically travel much shorter distances than goods carried by for-hire trucks. The average miles per shipment by private truck in the 2012 CFS was 46 miles, compared to 489 miles by for-hire truck. Figure 1 shows major long-haul trucking freight corridors. Interstate highways account for over 95 percent of the total 27,500 miles. The total mileage is about 60 percent of the length of the Interstate System and less than 17 percent of the National Network designated for conventional combination trucks. In the 2012 CFS preliminary data, truck shipments accounted for:

- About $10.0 trillion worth of goods and 73.7 percent of the total value of all shipments
- About 8.2 billion tons of goods and 70.0 percent of all tonnage;
- About 1.3 trillion ton-miles, representing approximately 38.1 percent of all ton-miles; and
- An average distance of 216 miles per shipment.

Whether traveling on inland waterways, deep sea waterways, or the Great Lakes, waterborne shipments in the 2012 CFS preliminary data accounted for:

- About $280.9 billion worth of goods, 2.1 percent of the total value of all shipments;
- Approximately 510.7 million tons of goods, 4.4 percent of all tonnage;
- About 208.3 billion ton-miles, 6.3 percent of all ton-miles; and
- An average distance of 842 miles per shipment.

Based on past surveys, bulk and low-value commodities are primarily transported by rail and water modes. In 2012 water shipments were valued at an average of $550 per ton and rail shipments at $246 per ton, the two lowest modal values per ton in the 2012 CFS. The major commodity groups shipped in bulk via waterway were grains, gravel and crushed stone, coal, petroleum products, chemicals, and fertilizers.

In the 2012 CFS, rail shipments accounted for:

- $455.1 billion worth of goods, 3.3 percent of the total value of shipments by all modes;

- Almost 1.9 billion tons of goods, about 15.8 percent of the total tonnage;
- About 1.5 trillion ton-miles, 44.5 percent of all ton-miles; and
- An average distance of 811 miles per shipment, showing the long-haul nature of the rail mode (US Department of Commerce and US Census Bureau, 2012).

Based on past surveys, single-mode rail traffic is largely composed of heavy, bulk shipments, such as cereal grains, metallic ores, coal, and chemicals.

Task 2: Megaregions and Freight

Understanding how freight moves throughout the US is key to seeing the overall importance between freight infrastructure and its economic impact. Traditionally, a national level analysis of freight was the extent of our understanding; consequently megaregion leaders lack comprehensive information on what they trade, with whom, or how goods are moved from one place to another. Trade statistics are often only presented at the national level and focus solely on country-to-country trade. For example, the Federal Highway Administration's (FHWA) Freight Analysis Framework (FAF) provides data in terms of commodities moved between Origin and Destination (OD) pairs but not the "through" movements. The sole exception is for truck movements, where a FAF network database provides truck counts on national highway system links, but not at the corridor level. This data does not differentiate one truck movement from the next, meaning one truck could have completed a route trip and another truck replaced it and there is no way to use the data set to determine how many trucks are entering and exiting the corridor – just how many are using the corridor during a given time period. This not only ignores the primacy of metro-to-metro trade within megaregions on the global stage but it also fails to capture all domestic trade between metro areas within the US. As a result, the US' first attempt at freight planning is a disjointed endeavor with state governments developing planning strategies based on national data. Metropolitan leaders, particularly those in areas that make up megaregions, are unable to fully understand their role in domestic and global trade networks (US Department of Commerce, 2013*)*. Therefore, the economic development strategies often in use by metro areas are disparate and inefficient, to the detriment of America's economic competitiveness and growth potential.

Land, labor and capital are the most fundamental inputs in regional economies. However, not all commodities and economic inputs originate within a metropolitan area and those that do are limited. Therefore, the freight network must provide regional support by acquiring necessary external resources for production and in turn, shipping out the resulting commodities. The whole concept of a megaregion relies on a shared economic geography that is complementary between metropolitan markets, is easily transferable, and can take advantage of intervening opportunities. The following sections discuss the land, labor and capital resources of the Gulf Coast megaregion (GCM).

A global economy that encourages free trade will increase the demand for movements of goods and services. For example, the volume of shipments is projected to increase from 17.5 billion metric tons in 2002 to 33.7 billion metric tons in 2035 (Jones, 2007). As seen in Figure 7 and Figure 8, trade between the US and foreign countries are intensively taking place in most megaregions. In 2005, approximately two-thirds of total US trade took place in the 50 largest metropolitan areas (Puentes, 2008). To accommodate these future demands, a freight transportation policy that can direct sufficient investment towards appropriate areas should begin by identifying which transportation modes are required and where new movements will take place.

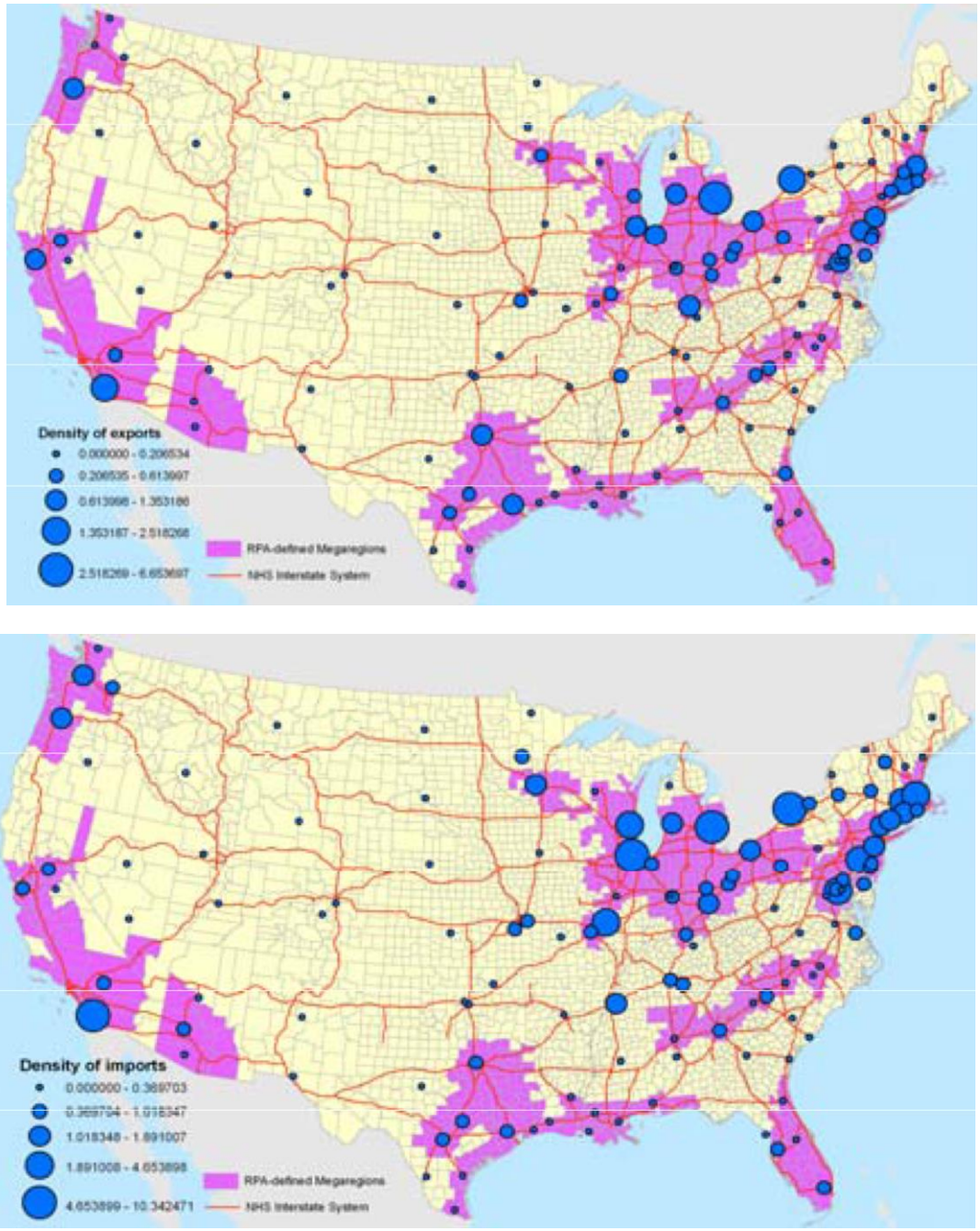


FIGURE 1: Distribution of the Volume of Trades with Canada and Mexico: 2035

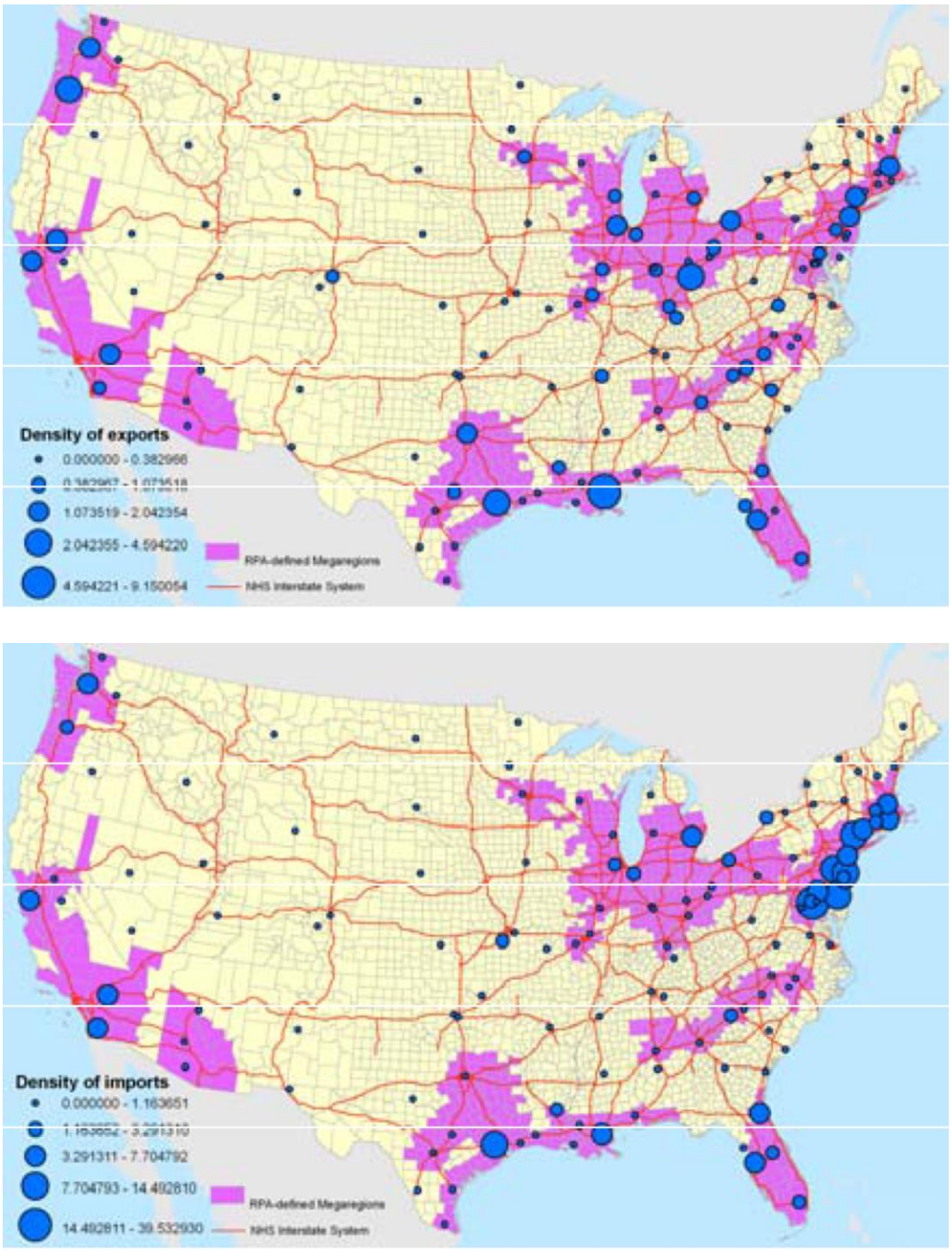


FIGURE 2: Distribution of the Volume of Trades with Overseas Countries: 2035

While the volume of shipments is projected to continually increase, its effects on the transportation system may vary. Impacts are dependent on transportation modes, properties of goods, and characteristics of geographic areas, such as origins and destinations. The freight transportation system is a complex network of land, water, and air. The FAF identifies seven modes of transportation, including air & truck, other intermodal, pipeline & unknown, rail, truck, truck & rail, and water. According to FHWA, more than half of exporting goods were carried by truck to the ports of exit along the US border. More than 60 percent of domestic commodity flows were moved by truck. On the other hand, imported goods from foreign countries were distributed more evenly across several modes. Approximately 40 percent and 25 percent of imported goods from Canada and Mexico were carried by pipeline and rail, respectively, to US destinations while 30 percent were moved by truck. Megaregions relied more on truck than non-megaregion areas for freight movements (Cortright, 2006).

More than half of commodities were carried by truck (64 percent) between domestic origins and destinations in 2002. Pipeline & Unknown mode contributed 21 percent, rail 10 percent, and water 3 percent. Specifically, more than 77 percent of commodities from megaregions were moved to domestic destinations by truck in 2002, and its portion in megaregions is projected to 80 percent in 2035, while non-megaregion areas rely less than 60 percent on truck in both 2002 and 2035 (Table 1). This means that megaregions will experience heavier freight traffic on highways compared to non-megaregion areas. Only 4-5 percent of commodities are carried by rail in megaregions, compared to 13 percent of rail usage in non-megaregion areas. Pipeline is frequently used in non-megaregion areas (approximately 26 percent in 2002) when compared to 4 percent in megaregions.

TABLE 1: Transportation Modes for Exporting Goods to Domestic Destinations between Megaregions and Non-Megaregion Areas

Modes	Megaregion		Other Areas	
	2002 (%)	2035 (%)	2002 (%)	2035 (%)
Air & Truck	0.02	0.04	0.01	0.02
Other Intermodal	0.52	0.68	1.14	0.84
Pipeline & Unknown	12.01	11.97	25.74	26.03
Rail	4.45	4.56	13.34	13.09
Truck	77.16	80.23	56.36	57.02
Truck & Rail	0.19	0.20	0.21	0.22
Water	3.63	2.31	3.20	2.77
Total	100.0	100.0	100.0	100.0

Source: (Cortright, 2006)

The average distance covered by truck freight is shorter (485 miles) than air (973 miles), rail (902 miles), and coastwise water (1,269 miles). Moreover, more than 65 percent of the tonnage of truck freight movements is estimated to move less than 100 miles (Puentes, 2008). The relatively short length of trucking implies that the freight movement policy between metropolitan areas at the megaregion level would be useful in relieving congestion caused by truck traffic on highways and ensuring just-in-time delivery of goods (Cortright, 2006).

For export goods, reliance on truck in megaregions may increase from 63 to 74 percent between 2002 and 2035 while the reliance on water, rail, and pipeline may decrease. Although freight movement by truck will increase in non-megaregions as well, other transportation modes, such as water (16 percent), rail (20 percent), and pipeline (8 percent), are expected to garner a percentage of freight movements in these regions (*ibid).*

For import goods, the 'Pipeline & Unknown' mode plays a significant role next to truck in both megaregions and non-megaregion areas. For example, approximately 37 percent of commodities are moved by this mode in megaregions, and 48 percent in non-megaregion areas. This may be due to the characteristics of imported goods, such as oil and natural gas. However, the reliance on truck may increase to 72 percent in megaregions by 2035 while the use of the 'Pipeline & Unknown' mode may decrease from 37 to 21 percent during the same period (*ibid).*

Both export and import volumes from trade with foreign countries will increase in megaregions by 2035. During this period, megaregions' export goods may increase by 134 percent and import goods by 124 percent, while nonmegaregion areas' export goods may increase by 85 percent and import goods by 76 percent. This implies that megaregions may play a more significant role in the nation's economic competitiveness over the next few decades. The freight movement by truck will increase significantly in megaregions (almost twice the amount of increase in non-megaregions for imported goods) (*ibid).*

CASE STUDY APPROACH

Task 3. The Gulf Coast as a Case Study Of a Megaregion

The term "Gulf Coast" resonates broadly. The Gulf Coast evokes images of beaches, seafood, energy, hurricanes and oil spills. Defined in relation to the Gulf of Mexico, its adjoining body of water and source of many positive and negative regional attributes, the Gulf Coast is easily identifiable geographically. Historically, this region of the US has been overlooked in the national conversation in favor of more populous regions like New York, Chicago, and California. The energy boom of the 20th century and the rise of petroleum in particular, spurred massive population and economic growth in the region. In the one hundred years from 1910 to 2010 the population of Harris County, home to city of Houston, grew by 3,430 percent to over four million people. Houston, Texas is now the fourth largest city in the US. A 2011 article in *Forbes* magazine wrote of "the rise of the Third Coast" and described the region's ascendancy to global status. Houston is supported in the megaregion by two other top 100 metropolitan areas, New Orleans and Baton Rouge. Further, the megaregion is home to the Mississippi gulf coast and Mobile metropolitan areas. This geographic position provides access to the Mississippi River and the Tennessee-Tombigbee, inland waterways that are vital to the movement of freight across the country. However, freight movements within the GCM must contend with environmental obstacles including inconsistent river drafts, annual hurricanes, rising sea levels and receding coastlines as a result of man-made climate change.

The GCM is comprised of a network of counties and parishes across Texas, Louisiana, Mississippi, Alabama, and Florida. In this paper we identify two GCM definitions developed by the Virginia Tech Metropolitan Institute (VTMI) and America 2050 organization to develop a combined GCM definition. The VTMI definition encompasses 73 counties in the region while the America 2050 definition includes 75 counties. Figure 1 presents a map of the Gulf Cost counties in these two megaregion definitions. Counties in purple (89.7 percent) are present in both megaregion definitions, counties in gold (3.8 percent) are only found in the VTMI definition, and counties in green (6.4 percent) are only found in the America 2050 definition. Despite differences in definitions, the counties within the megaregion are connected by a shared transportation infrastructure, associated economic activity, and exposure to natural hazards.

TABLE 2: VTMI and America 2050 Gulf Coast Delineations and Corresponding Populations

	VTMI	Am2050	Combined
Total Counties	73	75	78
Counties: AL	2	2	2
Counties: FL	3	4	4
Counties: LA	32	35	35
Counties: MS	6	6	6
Counties: TX	39	28	31
Total Population, 2010	13,042,443	13,204,285	13,345,037
Population: AL	590,043	590,043	590,043
Population: FL	629,714	684,023	684,023
Population: LA	3,185,725	3,393,189	3,393,189
Population: MS	462,650	462,650	462,650
Population: TX	8,174,311	8,074,380	8,215,132

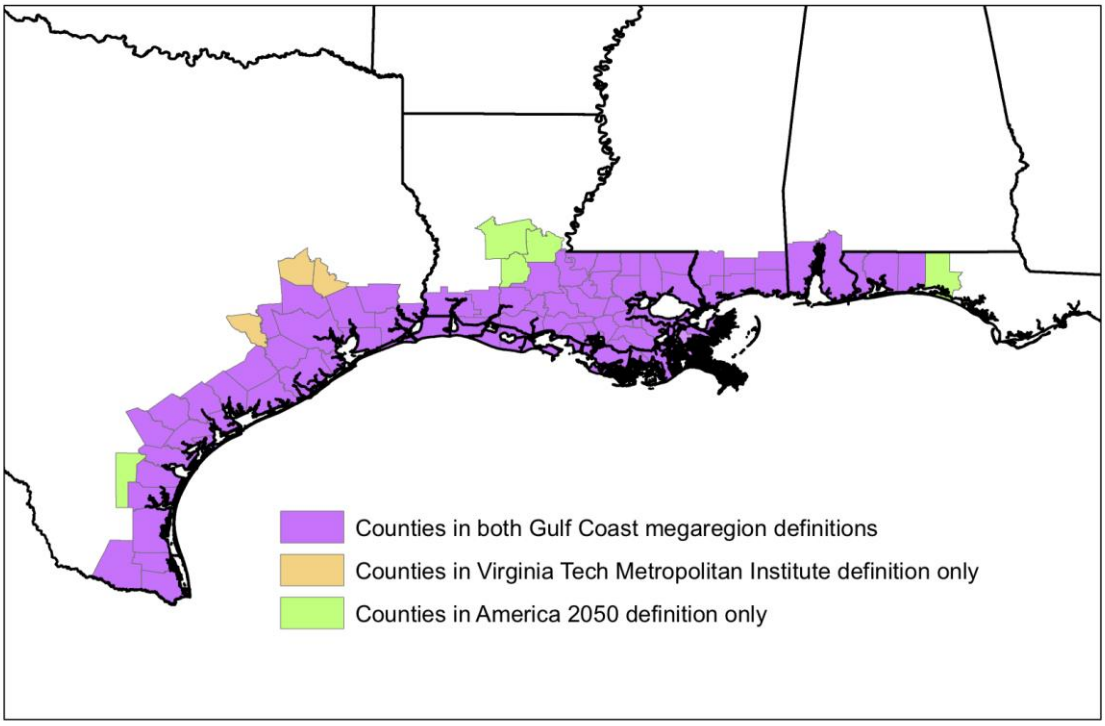


FIGURE 3: Map of United States Gulf Coast Showing Respective Counties in the Virginia Tech Metropolitan Institute and America 2050 Megaregion Definitions

This study utilizes case study methodology to examine how these processes manifest in the geography of the Gulf Coast. The case study method is widely recognized as a valid means of investigating regional economies (Yin, 2013). Specifically, we use geographic analysis, capital overview, a census-based labor overview, and a location quotient analysis. This paper seeks to inform freight corridor planning strategies at the megaregion scale of organization using the US Gulf Coast as a case study.

In support of these tasks this paper initially presents workforce analysis to characterize the GCM economy and increase understanding of what industries it might support through expanded economic development efforts. Workforce analysis included age, race and educational attainment. Of those potential industries we assess which could benefit from improved freight transportation planning throughout the megaregion. In the capital overview we use gross domestic product (GDP), median household income, unemployment rate, and annual trade volumes in size and value to characterize the Gulf Coast economy. Freight OD data is used to aid in determining the commodities that move through and within the GCM. Coupled with location quotient analysis describing industry specializations, we provide a large scale economic report. Based on these results we then address task 3.3 that focuses on economic development strategies among states in the megearegion. This requires a trade analysis of major production and consumption commodities in each state, identification of industries targeted for incentives, and investigation of delineation of the megaregion's infrastructural resources, represented by an attempt to inventory available industrial buildings. This exercise endeavored to compile a list of industrial building stock across the 70 counties of the megaregion. Our goal was to record the

structure name, square footage, zip code, county, city/town location, specific address, and sale/lease information for each building.

The industry cluster approach represents one economic development strategy for assessing industrial strengths that inform future transportation network investments. An economic cluster is defined as, "more than just the largest firms in a local area– it is the network of interrelated firms that buy and sell from the same suppliers, share markets, and are supported by a common specialized infrastructure" (Leigh and Blakely, 2013). Cluster strategies attempt to strengthen relationships between businesses and institutions within a geographic region to promote economic growth. They are classified as Type 1 (maintain/build strength of existing industry) or Type 2 (attract/create new industry) based on stated development goals (Fitzgerald & Leigh, 2002). Cortright (2006) and Leigh and Blakely (2013) highlighted the advantages of cluster analyses as the ability to identify specific infrastructure needs, identify gaps in supply chains, target workforce training programs, and consolidate marketing campaigns. Location quotients (LQ) are another valuable tool used in conjunction with cluster strategies to determine regional industry specializations.

LQs are used to describe a regional economy by identifying basic and non-basic industries and their economic contribution. Basic industries are defined by activities that produce goods and services for export outside the region, while non-basic industries provide goods and services for local consumption within the region (Leigh and Blakely, 2013). From the megaregion perspective LQs can help determine which industries are generating the most freight traffic and which industries will benefit from increased freight flows through the region. Employment-based LQ's are presented here to understand GCM labor specializations. Thorough assessment of freight movement and characterization of the economy using clusters and LQ's could result in more efficient investment of resources.

The State-level industry targets are based on information from five state economic development websites. Each website identified specific industries for growth in the state, which were combined into industry categories. States were then compared by category to determine agreement in economic development priorities. We also examined state level freight plans to assess their potential to meet MAP-21 requirements for transportation investment funds. The advantage of using secondary data sources like the US Census Bureau, CFS, and state-level freight and economic development plans is less time is spent on data collection and more time spent on data analysis, resulting in a wider scope for the study. Additionally, secondary data sources increase validity and reliability to the study by incorporating previously vetted research methods (Cresswell, 2014). The results of these analyses are used to inform recommendations on the potential for transportation investment to further strengthen the Gulf Coast economy through the megaregion level of scale.

To this end we:

3.1 Assess the ability of the Gulf Coast workforce to support a megaregion's economy;

3.2 Identify the major commodities being transported through the Gulf Coast region and pair this data with Location Quotient Analysis of employment in the megaregion; and

3.3 Discuss the sustainability and economic development implications of these findings.

Task 3.1 Gulf Coast Resources to support economic competitiveness

Labor The GCM relies on a mix of state, regional, and municipal economic development authorities to characterize the labor supply while assessing the labor demand of business to

increase economic activity. Census data on the labor pool indicate that approximately 72.7 percent of the megaregion's 13.3 million population is 18 years old and over with 8.9 percent indicating veteran status. The racial composition across both GCM definitions stands at approximately 68.6 percent White, 19.1 percent African American, 0.5 percent American Indian and Alaska Native, 3.8 percent Asian, 0.1 percent Native Hawaiian and Other Pacific Islander, 6.3 percent some other race, and 1.7 percent two or more races. By comparison, the racial composition of the US stands at 77.7 percent White, 13.2 percent African American, 1.2 percent American Indian and Alaska Native, 5.3 percent Asian, 0.2 percent Native Hawaiian and Other Pacific Islander, and 2.4 percent two or more races (US Census, 2014b). The GCM has a smaller White population, a larger African American population, and more residents identifying as some other race when compared to the rest of the nation. It also has a larger Hispanic or Latino population compared to national figures, 28.2 percent compared to 17.1 percent, respectively. Roughly 85.5 percent of the megaregion population are native, while 14.5 percent are foreign born residents. Of these foreign born residents, the majority (70.5 percent) originate from Latin America.

Racial dynamics play a significant role in discussions of the Gulf Coast's labor force, especially as these concern African-Americans. Freight movements are inherently economic processes, which in turn are intrinsically social. Racist sociopolitical structures which have been active in these portions of the old Confederacy since colonial times continue to impact African American's economic and life chances. From the institution of slavery to Jim Crow era discrimination to the civil rights struggles of the 1960s to current efforts to restrict applications of the voting rights act, African-Americans have born the brunt of ideas and practices which translate into socioeconomic and political exclusion (Wacquant 2009). Freight movements are the economic life-line for communities, and African-Americans have historically been disproportionately excluded from the benefits of such activity..

An examination of educational attainment (age 25 and over) in the megaregion shows that 9.5 percent of the population have less than a ninth grade education, 10.5 percent attended high school but never received a diploma, 28.2 percent graduated high school, 21.6 have some college experience but no degree, 6.1 percent have an associate's degree, 16.1 percent have a bachelor's degree, and 8.1 percent have a graduate or professional degree. The national educational attainment breaks down as 4.4 percent of the population with less than a ninth grade education, 7.1 percent attended high school but never received a diploma, 29.8 percent graduated high school, 16.8 have some college experience but no degree, 4.2 percent have an occupational associate's degree, 20.1 percent have a bachelor's degree, and 11.6 percent have a graduate or professional degree (United States Census Bureau, 2014b). By comparison, the GCM has a larger percentage of people who never completed high school. The percentage of high school graduates in the megaregion is comparable to national figures, but at higher levels of educational attainment the Gulf Coast has fewer people with bachelors, graduate, and professional degrees. Many skilled labor positions within the megaregion require special training but not necessarily a college education.

Capital Overview Blackwell and Duval-Diop (2008) describe the GCM as extremely vulnerable in comparison to other megaregions in the US. This characterization is due in part to (1) the high population density along the coastline in a region susceptible to storm surge and wind damage from hurricanes, (2) the lingering effects of deindustrialization in a region with an economy historically overly-dependent on the manufacturing sector to support its middle class,

and (3) the ongoing influence of Jim Crow era racial discrimination and segregation on the politics, spatial geography, and economy. Throughout the period of American industrialization during the eighteenth and nineteenth centuries, the Southern economy remained agriculturally focused. But Post World War II, the Southern economy experienced a loss of agriculture jobs with increased advancements in technology that further mechanized the industry. In an effort to avoid mass unemployment Southern states began to court manufacturing plants to the region with economic incentives, referred to as "smokestack chasing" Manufacturing proved to be a good fit for the Southern workforce and eventually came to dominate the regional economy (Leigh & Blakely, 2013). However, technological advancements in transportation, logistics and communications once again led to job losses in manufacturing, an anchor industry in the Southern economy, creating economic instability in the region.

The constant threat of economic disruption through natural hazard events in a region that comparatively has a greater percentage of African American residents, a historically marginalized group, has created an unstable environment for promoting economic growth. The result is a GCM that is seeking to re-define its economic identity to both attract/retain business in the region while raising the standard of living for its citizenry. Well-informed freight transportation investments are a vital element of larger strategies to boost economic activity.

The composition of metropolitan economies in the region is a strong indicator of trade volumes. For example, Houston has a GDP of $352,630 million, the fifth largest economy in the nation accounting for 2.7 percent of the national economic activity share. Houston is also the fourth largest metropolitan area goods trader with trade values of $511,898 and 2.5 percent of the national trade share. On the other hand, New Orleans is 46th in population but 26th in trade volume. Since GCM economies specialize in tradable goods – energy, chemicals and transportation equipment – the region has higher freight volumes than its population would suggest (Tomer et al., 2013).

From an employment and income standpoint, the averaged unemployment rate between the two megaregion definitions is 9.7 percent, which is higher than the national unemployment rate of 6.2 percent. The median household income in the megaregion is $56,511, which is higher than the national figure of $53,046 as well. In the aforementioned demographic categories the GCM is comparable to the rest of the US, and the labor pool and freight infrastructure have the capacity to support interstate commerce. However, with the exception of Houston, the rest of the megaregion lacks financial capital.

Industrial Building Narrative It is crucial for private companies seeking to compile a listing of the supply of industrial buildings on the market locate in the 70 counties of the a megaregion. We to be able to easily identify its infrastructural assets. For this industrial building audit, we began with information from the Mississippi Development Authority website. The buildings were easily located by county, and seemed to have a coherent definition when it came to "industrial", i.e. they were primarily vacant factories of various sizes or vacant former factory buildings. "Warehouses" were set aside as a distinct category from factory spaces. We tallied 19 industrial buildings in the six megaregion counties of Mississippi.

Louisiana was more difficult to work with. The linkage from the Louisiana Economic Development website to the actual inventory of buildings was not easy to locate. It was necessary to click individual counties (parishes) on a map of Louisiana in order to put them into a bin, from which the list of buildings was compiled as a whole. We could not sort by parish and building type simultaneously; all the buildings in the selected parishes were listed, after which

we sorted by building type. Despite these drawbacks, it was easy to actually copy specific text from the website to the cells on the Excel sheet we used to track building availability. The definition of "industrial" in Louisiana seemed to be more elastic than in Mississippi, as many of the buildings that were classified in Louisiana appeared as if they would be designated "warehouses' in Mississippi. Zip codes were not available for Louisiana, and to obtain these it would be necessary to plug building addresses into the Post Office website. Louisiana's 32 megaregion parishes yielded a count of 146 such buildings.

Alabama proved to be more difficult still. While navigation of the building inventory itself was relatively easy, actually viewing the information required the installation of the software plug-in Silverlight. Additionally, it was necessary to transcribe the information word for word from the website to the spreadsheet for the 38 industrial buildings.

Texas was something of a roadblock. We searched the Texas Economic Development site exhaustively and, not being able to find a link to specific building inventories, called the agency. We were informed that because industrial structures have such a high rate of turnover in the state that Texas is unable to maintain such an inventory. We were then referred to the Texas affiliate of the COSTAR commercial real estate research firm; our attempts to contact them did not bear fruit. We were also given a list of five separate regional Economic Development Corporations (EDC's) to contact which might potentially have such inventories available. Two of these EDC's, the Brownsville EDC and the Corpus Christi regional EDC, did have searchable sites. In addition, we began the process of searching county by county in the Texas portion of the megaregion for those counties with industrial building inventories. We found 30 properties in Brazoria County; 32 in Cameron County; eight in Chambers County, 36 in Fort Bend County; two in Harris County; and 18 in Nueces County. The data from these county EDC's were differential in their ease of compilation, as different EDC's had different platforms from which to operate. We were later informed – by an external reviewer – of the existence of the "State of Texas Industrial and Commercial Sites and Buildings" website, an easy to use platform which revealed that the Texas mega-region counties supposedly contain a total of 421 industrial properties (the majority of them being in Cameron, Harris, Hidalgo, and Nueces counties). It must be emphasized here that we were not directed to this web location by the Texas economic development agency itself. In addition, there were discrepancies between this site and those of the different county EDC's we investigated. For example, the Chambers County EDC listed eight industrial properties, whereas the "State of Texas" site list only one industrial property in Chambers County. We were made aware by one of our other reviewers that the(I don't believe these numbers we generated in this process for Texas appear to be artificially. They seem extremely low. This reviewer noted as a case in point that Brazoria County is a major site of industrial facilities. While as of this writing we do not have an empirical explanation for this discrepancy, it is possible that it is rooted in the original evaluation given to us by the Texas EDC; specifically, that as the types of buildings classified as industrial by the state are in such a rapid state of play on the open market, what we saw was only a snapshot of buildings which were actually for sale or lease at that time..)

Florida lacked a centralized inventory of industrial buildings. One of the three Florida megaregion counties did have an inventory, and we were able to find 12 industrial buildings in the inventory of Santa Rosa County. The other two counties – Escambia and Okaloosa – focused on cataloging their industrial parks as whole entities, so it may be possible to obtain building inventories from the management of these industrial parks.

This investigation highlights the need for a centralized inventory of all industrial structures in the GCM. Additionally, there should be a uniform definition of the term "industrial." This inventory should be easily located, containing identical categories of information for each state. It is essential that pertinent information from it be easily copied from one format to another. The difficulties we experienced during this exercise are emblematic of a lack of cross-jurisdictional coordination in the area we have defined as the Gulf Coast mega-region.

3.2 Gulf Coast Megaregion Freight Analysis

The CFS, the foundation for the FAF, includes freight characteristics of freight values, tons of shipment, and ton-miles of shipment. In 2007, seven regions in the GCM were surveyed, Houston-Baytown-Huntsville, New Orleans-Metairie-Bogalusa, Baton Rouge-Pierre Part, Beaumont-Port Arthur, Corpus Christi-Kingsville, Lake Charles-Jennings, and Mobile-Daphne Fairhope.

The outbound freight grew from 2002-2007 in Houston-Baytown-Huntsville and New Orleans-Metairie-Bogalusa (the only two areas in GCM that have both 2002 and 2007 data sets) in value, tons, and ton-miles, whereas the inbound freights only grew in tons of shipment. (See Tables 7 and 8). If these two major metropolitans can represent the whole GCM area, it is a general trend that increasing tons of freights would be originated from and delivered to the GCM area.

With freight by rail growth and the strong presence of the petro-chemical industry in the southeast, especially from Baton Rouge to New Orleans on both banks of the Mississippi River, there is concern for the safe passage and production of hazardous materials. Facilities handling and shipping hazardous materials, such as chemicals and petroleum products, may do so as long as, all facilities meet federal and state environmental regulations and adhere to proper safety standards. Most hazardous materials may be shipped and loaded through the megaregion as long as railcars adhere to USDOT standards and follow proper handling procedures. Recently, New Orleans has been experiencing significant oil-by-rail trains destined for the Gulf Gateway Terminal on the east bank of the Mississippi River downstream of New Orleans. Additionally, each state will have specific regulations, including permits and fees, when transporting hazardous materials. Specialized railcars are needed for the shipment of hazardous materials, especially liquid materials under pressure. With a rapidly growing domestic market for LNG and CNG, new safety regulations and protocols are currently being tested by the FRA the shipment of natural gas and the use of natural gas for locomotives remains uncertain.

Tables 3 and 4 provide data on the value and tons of cargo moved into and out of each major city in the megaregion; Tables 3 and 4 provide data on the percentage of freight movements by mode into and out of these same cities while Table 7 provides the origin and destination pairs of movements within the Gulf Coast Megaregion.

TABLE 3: Inbound Freight by Destination in the GCM

Destination CFS Areas	2002			2007		
	Value (mil.$)	Tons (thou.)	Ton-miles (mil.)	Value (mil.$)	Tons (thou.)	Ton-miles (mil.)
Houston-Baytown-Huntsville	199,034	462,689	87,003	137,000	985,040	146,605
New Orleans-Metairie-Bogulusa	65,860	302,747	131,878	100,928	376,588	125,025
Baton Rouge-Pierre Part				36,895	225,874	24,012
Beaumont-Port Arthur				829,980	158,674	7,711
Corpus Christi-Kingsville				41,194	65,155	4,077
Lake Charles-Jennings				35,143	64,461	3,309
Mobile-Daphne Fairhope				172,435	44,353	11,510

Source: CFS, 2002 and 2007

TABLE 4: Outbound Freight by Destination in GCM

Origin CFS Areas	2002			2007		
	Value (mil.$)	Tons (thou.)	Ton-miles (mil.)	Value (mil.$)	Tons (thou.)	Ton-miles (mil.)
Houston-Baytown-Huntsville	196,694	461,798	76,355	410,343	1,324,940	219,145
New Orleans-Metairie-Bogalusa	58,169	250,023	39,839	98,546	541,168	72,074
Baton Rouge-Pierre Part				77,631	327,128	69,570
Beaumont-Port Arthur				79,852	305,484	62,836
Corpus Christi-Kingsville				41,027	220,840	46,415
Lake Charles-Jennings				22,432	116,669	14,239
Mobile-Daphne Fairhope				15,246	44,560	12,552

Source: CFS, 2002 and 2007

TABLE 5: Inbound Freight by Mode in GCM (2007)

Destinations (CFS Areas)	Truck %	Rail %	Air %	Others %
Houston-Baytown-Huntsville	45.44	6.67	0.23	47.67
New Orleans-Metairie-Bogalusa	32.96	1.53	0.07	65.44
Baton Rouge-Pierre Part	29.74	3.47	0.01	66.78
Beaumont-Port Arthur	27.05	7.64	NA	NA
Corpus Christi-Kingsville	52.78	1.01	0.03	46.18
Lake Charles-Jennings	39.66	7.05	NA	NA
Mobile-Daphne-Fairhope	66.44	5.90	0.01	27.65

Note: NA indicates missing data.

TABLE 6: Outbound Freight by Mode in GCM (2007)

Origins (CFS Areas)	Truck %	Rail %	Air %	Others %
Houston-Baytown-Huntsville	48.30	11.88	NA	NA
New Orleans-Metairie-Bogalusa	21.74	7.53	0.28	70.45
Baton Rouge-Pierre Part	33.67	17.15	NA	NA
Beaumont-Port Arthur	25.56	16.24	0.02	58.18
Corpus Christi-Kingsville	18.68	2.38	NA	NA
Lake Charles-Jennings	29.41	19.91	NA	NA
Mobile-Daphne-Fairhope	66.13	16.59	0.24	17.03

Note: NA indicates missing data.

TABLE 7: O-D Pairs of Freight Flows between CFS areas in GCM (2007)

	Destination CFS Areas (million ton-miles)						
Origin CFS Areas	Baton	Beaumont	Corpus	Houston	Lake Charles	Mobile	New Orleans
Houston-Baytown-Huntsville	760	NA	254	8082	193	357	NA
New Orleans-Metairie-Bogalusa	1500	737	NA	3727	459	0	1353
Beaumont-Port Arthur	102	956	NA	1497	78	70	NA
Corpus Christi-Kingsville	NA	NA	433	2947	NA	NA	NA
Lake Charles-Jennings	NA	50	NA	1232	260	53	9
Mobile-Daphne-Fairhope	36	NA	NA	97	0	80	249

Note: NA indicates missing data.

Gulf Coast Trade Analysis Modern trade occurs between metropolitan areas. Clusters of firms, workers and infrastructure form the primary nodes in global value chains, and those assets are located in metropolitan areas. This is especially true in the US. The 100 largest metropolitan areas contain two-thirds of the country's population, generate 75 percent of its economic output and are its centers of advanced manufacturing, innovation, human capital, and technology (Tomer et al., 2013). Freight transportation investments are often considered to lead to higher levels of economic development and employment. In a 2012 national freight planning survey of Metropolitan Planning Organizations (MPOs), 87 percent of MPOs identified economic development as a primary motivation for conducting regional freight planning. However, freight volumes by themselves do not necessarily translate into related concentrated activity due to pass through freight volumes, which is a significant portion of the trade along the Lower Mississippi River (LMR).

For example, Detroit highlights this disconnect between freight flows and economic development activities. Two of the ten largest US freight gateways are located in the Detroit metropolitan region, but economic baseline analysis shows that related transportation industries and occupations are not concentrated in this region. The Detroit region is absorbing local negative freight transportation externalities such as noise, pollution, and congestion without the corresponding positive externalities of concentrated industry and employment. Detroit is a good example of the spatial mismatch between regional freight transportation and economic development that can occur within a region. Detroit is missing an economic opportunity to tap into the flow of goods through the region by not developing relevant value added services or secondary industries. Economic developers should use the Path of Goods Movement (POGM) theory and increase their understanding of the freight currently moving in the region (existing assets) and focus on producing commodities that support these current flows – not serve as a conduit for those products to be utilized in other areas.

The following sections compare freight inputs and outputs with location quotients to determine the correlation between the two data sets and identify how GCM can avoid the pitfalls of Detroit. Looking at trade values of the three largest metropolitan areas in the GCM, Houston, New Orleans and Baton Rouge, a clear pattern of inputs and outputs emerges (See Table 8).

TABLE 8: Gulf Coast Megaregion's Top 100 Metropolitan Areas' Trade Highlights by Value

	Houston	New Orleans	Baton Rouge
Total Goods Traded	$511.9 billion	$147.6 billion	$115.1 billion
Rank across 100 metros	4	26	36
International Trade Share (rank)	23.9% (5)	15.4% (37)	14.9% (42)
Largest export	Chemicals/Plastics $33.9 billion	Energy Products $28.9 billion	Chemicals/Plastics $20.1 billion
Largest import	Textiles & Electronics $8.7 billion	Agricultural Products $9.6 billion	Energy Products $19.0 billion
Total Trade Balance	-$2.9 billion	$14.9 billion	-$8.3 billion

Source: Tomer et al.(2013)

All three export chemicals and plastics with $33.9 billion, $5.7 billion and $20.1 billion respectively. However, chemicals and plastics are the largest export for Houston and Baton Rouge; that is not true in New Orleans. There, the largest export is energy products worth $28.9 billion. Other positive export figures include waste and scrap ($0.2 billion) in Houston and Baton Rouge and ($0.5 billion) in New Orleans; machinery and tools ($5.4 billion) and transportation equipment ($4.4 billion) in Houston; and wood products ($0.7 billion) in Baton Rouge.

Looking at imports for each location over $1 billion, for Houston: textiles ($8.7 billion), electronics ($8.7 billion), agricultural products ($7.4 billion), energy products ($5.5 billion), mixed freight ($4.2 billion), metals ($4.0 billion), wood products ($3.2 billion), precision instruments ($3 billion), and furniture ($1.8 billion); for New Orleans: agricultural products ($9.6 billion), mixed freight ($2.6 billion), machinery ($2.5 billion), electronics ($1.3 billion) and textiles ($1 billion); and for Baton Rouge: energy products ($19 billion), machinery and tools ($2.2 billion), transportation equipment ($2.2 billion), agricultural products ($1.7 billion), and electronics ($1.7 billion).

TABLE 9: Total Trade Among GCM Cities in US Dollars ($)

	New Orleans, LA	Baton Rouge, LA	Houma, LA	Lake Charles, LA	Layfayette, LA	Houston, TX	Beaumont, TX	Mobile, AL	Gulfport, MS	Pascagoula, MS	Alexandria, LA	Corpus Christi, TX
New Orleans, LA		26,475,000,000	1,936,000,000	1,060,000,000	1,117,000,000	7,752,000,000	1,829,000,000	1,197,000,000	1,068,000,000	736,500,000	371,000,000	252,700,000
Baton Rouge, LA	26,475,000,000		572,900,000	609,800,000	1,355,000,000	9,125,000,000	1,774,000,000	354,700,000	477,600,000	179,900,000	325,300,000	
Houma, LA	1,936,000,000	572,900,000		56,100,000	240,200,000	1,111,000,000	65,200,000	59,800,000	61,200,000	80,300,000	48,000,000	
Lake Charles, LA	1,060,000,000	609,800,000	56,100,000		431,200,000	5,078,000,000	917,800,000	112,500,000			131,500,000	417,500,000
Layfayette, LA	1,117,000,000	1,355,000,000	240,200,000	431,200,000		3,472,000,000	439,000,000		83,400,000	87,700,000	208,600,000	
Houston, TX	7,752,000,000	9,125,000,000	1,111,000,000	5,078,000,000	3,472,000,000		22,034,000,000	1,504,000,000	373,500,000	626,600,000	925,100,000	8,059,000,000
Beaumont, TX	1,829,000,000	1,774,000,000	65,200,000	917,800,000	439,000,000	22,034,000,000		276,000,000			69,600,000	259,600,000
Mobile, AL	1,197,000,000	354,700,000	59,800,000	112,500,000		1,504,000,000	276,000,000		736,200,000	537,600,000		281,200,000
Gulfport, MS	1,068,000,000	477,600,000	61,200,000		83,400,000	373,500,000		736,200,000		1,091,000,000		
Pascagoula, MS	736,500,000	179,900,000	80,300,000		87,700,000	626,600,000		537,600,000	1,091,000,000		34,100,000	
Alexandria, LA	341,000,000	325,300,000	48,000,000	131,500,000	208,600,000	925,100,000	69,600,000			34,100,000		
Corpus Christi, TX	252,700,000			417,500,000		8,059,000,000	259,600,000	281,200,000				

Location Quotient Analysis Land, labor, and capital are the most fundamental inputs allowing regional economies to produce goods. Economic stakeholders assess a region's economic competitiveness based on its capacity in these three areas. Furthermore, these stakeholders use economic metrics like employment-based Location Quotient (LQ) to understand a region's current industry specializations compared to the rest of the nation and to help identify emerging or declining industries.

Based on the prevalence of oil and gas industry activities in the Gulf Coast (Krauss & Martin, 2008), we expect to find a greater concentration of energy industry employment relative to the entire US. Location quotient results are commonly used to identify clusters as well as to identify exporting industries (Porter, 1990).

In order to determine the level of depth and diversity of the megaregion's job market, the research team examined the industry cluster composition. Clusters are highly integrated groups of businesses with strong vertical and horizontal linkages. To assess the strength of a cluster in the economy, the research team used LQs for each major industry present in the 75 county megaregion. After analyzing 2015 LQs the research team identified the top 10 strongest industries as seen in Table 10.

Within the GCM, the five metro areas (Houston, New Orleans, Baton Rouge, Gulfport and Mobile) have developed economic specializations, overlapping but distinct, which reinforce each other and help make the megaregion economy more than the sum of its parts. Houston specializes in industry, New Orleans is renowned for its unrivaled concentration of shipping and tourism, and the Mississippi Gulf Coast and Mobile both have strengths in shipbuilding and aerospace. Suburban areas and satellite cities also have important niches.

TABLE 10: 2015 Megaregion Location Quotients

Industry	Categor(ies)	LQ
Oil & Gas Field Machinery & Equipment Manufacturing (333132)	Advanced Technology & Manufacturing; Energy	15.21
Sugarcane Mills (311311)	Agribusiness	10.14
Navigational Services to Shipping (488330)	Logistics & Distribution	13.28
Pipeline Transportation of Crude Oil (486110)	Logistics & Distribution; Energy	10.5
Other Support Activities For Water Transportation (488390)	Logistics & Distribution	10.12
Inland Water Freight Transportation (483211)	Logistics & Distribution	8.64
Inland Water Passenger Transportation (483212)	Logistics & Distribution	8.48
Pipeline Transportation Of Natural Gas (486210)	Logistics & Distribution; Energy	6.62
Geophysical Surveying And Mapping Services (541360)	Information & Computer Technology; Energy	8.02
Industrial Building Construction (236210)	Logistics & Distribution	6.78

Source: Alabama Department of Industrial Relations; Louisiana Department of Labor; Mississippi Department of Employment Security; Texas Workforce Commission

As predicted, there is a high concentration (40 percent) of energy industry employment in the Gulf Coast Megaregion. However, note the heavy reliance on Logistics & Distribution (70 percent). This is connected with the high volume of exports from Houston, New Orleans, and Baton Rouge. The breakout is Logistics & Distribution (70 percent), Energy (40 percent), Agribusiness (10 percent), Advanced Technology & Manufacturing (10 percent), and Information & Computer Technology (10 percent). Some of the constituent industries are increasing in concentration strength at a very high rate; notable are Sugarcane Mills (329 percent), and Geophysical Surveying and Mapping Services (153 percent). Other significant rate increases are Pipeline Transportation of Crude Oil (62 percent), Navigational Services to Shipping (61 percent), and Inland Water Passenger Transportation (60 percent).

Megaregions that have less diversified industry bases and are more likely to experience booms and busts as they find themselves heavily dependent on two or three primary industries. According to the Bureau of Labor Statistics (BLS), the fastest growing industry employment bases through 2014 include Educational Services, Health Care, and Professional and Business Services. Employment in three industries is projected to decline nationally: Mining and Natural Resources, Manufacturing, and Utilities.

3.3 Economic Development Implications

State-level Industry Targets Under traditional economic theory, the GCM can be considered to be in a tenuous economic position based on its heavy reliance on two industries, Logistics & Distribution and Energy. Indeed if the Gulf Coast wants to become more economically stable, it should make a concerted effort to invest in Educational Services, Health Care, and Professional & Business Services. However, the trade data do not support this assumption. Just because some industries are declining nationally, does not necessarily mean that they are vulnerable *at the metropolitan scale*. Over reliance on national trends could lead to poor economic development strategies on a local or regional level.

Educations Services provides middle to high wage careers while developing the future local workforce, which in turn builds security for other economic sectors. Education Services are relatively stable due to their large capital investment, strong need for better education, and fiscal support by local, state, and federal governments. Depending on industry needs in the area, a vocational or industry specific education path may be developed to feed the local economy. Currently, the Port of New Orleans is seeking ways to encourage youth to pursue careers in the maritime industry.

States that invest in building Healthcare facilities create many high to low wage careers, accessible at all socioeconomic levels. Many healthcare facilities require ample amounts of middle wage earners such as technicians and assistants. These positions are filled by post-high school-educated workers. This in turn leads the region to support higher education, in order to ready the workforce. An ongoing example is the bio-medical research facility, named the BioDistrict, in New Orleans. The BioDistrict, a $2 Billion medical complex, is slated to create 34,000 new direct and indirect jobs. Another example is the long established Illinois Medical District located in Chicago just west of Downtown. This area is comprised of four major hospitals and several smaller clinics, plus supporting companies. The Illinois Medical District generates $3.4 billion in economic activity and employs nearly 30,000 people.

The Professional & Business Services sector develops predominantly high and middle wages for white collar employees. There are few support business required for this type of job creator. Many positions will require advanced education and years of experience. Also, the type of corporation or business will determine the strength of the economic impact. Attracting larger corporations or companies will create a larger economic ripple effect in the region. Securing large government offices like NASA or the USCG provides stability to the region, because federal offices rarely relocate. Also, corporate headquarters are a good entity to attract, but not nearly as stable. An example of this instability is the oil and gas company diaspora that took place in New Orleans during the 1980s.

Agreement between import/export data and LQs help characterize a megaregion's economic base. MPOs use this information to determine the allocation of resources in a given region to either maintain foundational industries or grow emerging industries. Based on the overlap of top import/export commodities and LQ analysis, it is clear the GCM is specialized in energy, specifically oil and gas, and its derivative industries including manufacturing, processing, and distribution (see Appendix A). Table 10 highlights exports of the top three largest metropolitan areas (by total trade) as chemical/plastics and energy. Eight out of the top ten most specialized industries are classified as logistics and distribution signifying the megaregion's strength in facilitating domestic and international trade. A recent phenomenon is

the emergence of industrialindoustrial plant facility expansions in the GCM due to the growth of inexpensive natural gas, a bedrock for many chemical and fertilizer plants currently being built along the LMR.

This adeptness in freight transportation combined with existing energy infrastructure can lead to stagnation in policy development due to the acceptance of the status quo based on past achievements. Economic development authorities are tasked with diversifying the Gulf Coast economy while understanding the need to support the energy industry and trade that employ large swaths of the regional population. MPOs are forced to target specific industries for support with increasingly scarce public resources, but should these target industries be a radical departure from the region's successes?

The GCM is highly specialized in the energy, petrochemical, logistics and transportation industries as evidenced by the aforementioned location quotients analysis. But how do state-level economic development priorities align with current regional strengths? Figure 4 below displays state-reported industry targets for economic development in the GCM. Industry nomenclature varied between states (this in and of itself is a hurdle to megaregion cooperative agreements), so industry categories represent a combination of multiple sub-categories organized based on definitions. See Table 11 for target industry sub-categories.

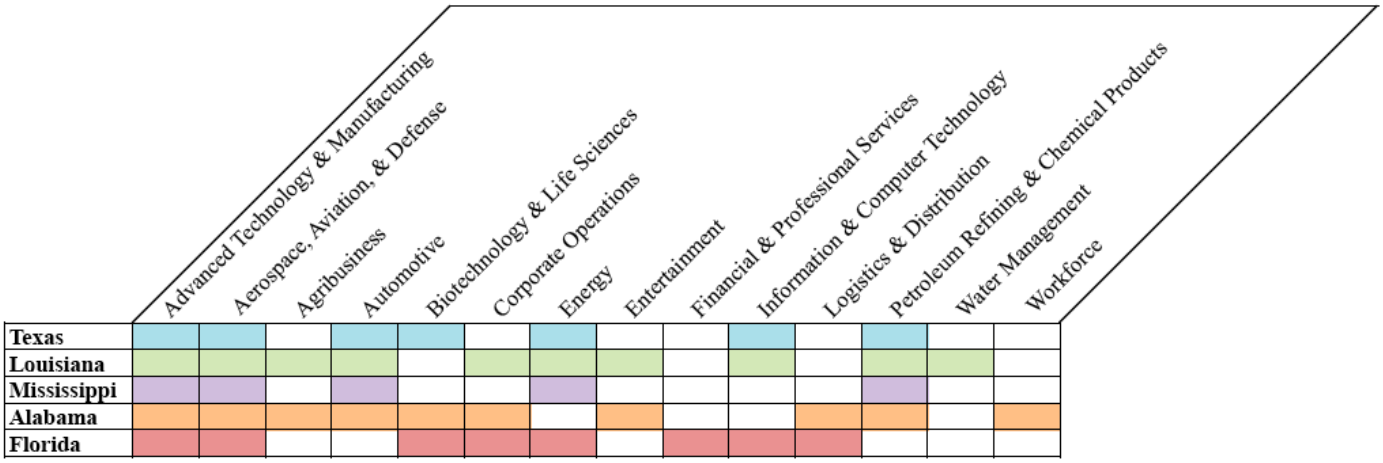


FIGURE 4: Industry Targets for Economic Development as Described on State-sponsored Economic Development Websites for Texas, Louisiana, Mississippi, Alabama, and Florida (Each Color Represents A Different State).

TABLE 11: List of Sub-categories that Comprise Combined Industry Categories

Combined Industry Categories	Sub-Categories
Advanced Technology & Manufacturing	Emerging Technology, Enabling Technology, Electronics, Manufacturing, Metal Manufacturing, Advanced Manufacturing
Aerospace, Aviation, & Defense	Aerospace, Aerospace/Defense, Aviation/Aerospace, Defense & Homeland Security
Agribusiness	Forest Products, Food Products
Automotive	N/A
Biotechnology & Life Science	Bioscience, Life Sciences
Corporate Operations	Corporate Headquarters
Energy	Cleantech
Entertainment	N/A
Financial & Professional Services	N/A
Information & Computer Technology	Information Technology, Software Development
Logistics & Distribution	N/A
Petroleum Refining & Chemical Products	Chemicals, Oil & Gas, Process Industries
Water Management	N/A

Advanced Technology & Manufacturing and Aerospace, Aviation, & Defense are two targeted industries shared across the entire region. These two industries align closely with federal spending priorities. For example, the US Economic Development Authority (EDA 2013) highlighted increased efforts to bolster American manufacturing, specifically advanced manufacturing, in their 2013 annual report. To that end the EDA stated their involvement in two separate initiatives for increasing manufacturing investment, the first of which is the Make it in America Challenge that resulted in 10 organizations in 9 states receiving a total $20.5 million to help expand business operations and attract foreign and domestic firms to their region. Mississippi State University was the sole recipient organization in the GCM. The second initiative was the Investing in Manufacturing Communities Partnership (IMCP) program that in 2013 distributed $7 million across 44 communities in support of strategies to increase economic attractiveness to outside investors. In 2010, the US Small Business Administration (SBA) instituted the Cluster Initiative aimed at increasing small business participation, encouraging innovation, and stimulating economic growth in American industry (SBA, 2012). The Gulf Coast received funds to conduct one of 10 pilot cluster projects labeled the *Enterprise for Innovation Geospatial Solutions Cluster*. The intent of this cluster was to develop geospatial technology products.

On the defense side, America has the largest military budget in the world, representing over a third of all global military expenditures (Perlo-Freeman and Solmirano, 2014). The Gulf Coast is home to two national aerospace entities, the National Aeronautics and Space Administration's (NASA) Stennis Space Center and Keesler Air Force Base in addition to regional facilities for Northrop Grumman, Lockheed Martin, and Rolls Royce.

The next most common industry targets are Automotive, Energy, and Petroleum Refining & Chemical Products. Gulf Coast states are well-equipped for energy production and chemical development after many years of infrastructure investment in oil extraction and processing. Access to inland waterways and to the Gulf of Mexico solidified southeastern Texas's and southern Louisiana's role in the energy trade. These two states are first and third, respectively in total number of petroleum refineries in the US and the industry's importance is revealed by the

megaregion export data. The region exports $82.9 billion of energy and chemical products. With regard to the automotive industry, Alabama houses manufacturing facilities for multiple international auto manufacturers including Mercedes-Benz, Honda, Hyundai, and Toyota resulting in $4.4 billion in exports and 50,485 twenty-foot equivalent units (TEUs) of automobiles and automobile parts being exported annually.

The Obama administration's development initiatives such as the Advanced Manufacturing Partnership and Right Skills Now program reflects a push to increase American manufacturing. In the GCM, state-level planners are following suit by targeting Advanced Technology and Manufacturing; and Aerospace, Aviation and Defense- a much better fit than the areas of Educational Services, Health Care and Professional & Business Service as suggested by the LQ data analysis.

Energy and chemical products remain industries of interest, yet only two of the five megaregion states are targeting Logistics & Distribution (Figure 10). The discrepancy in stated industry targets and known industry clusters exemplifies the lack of vertical and horizontal agreement between municipal, state and federal authorities that impacts regional competitiveness. However, even where there is agreement how does the megaregion market the assets of the region to private companies? Where can investments have the most impact for stakeholders in the GCM. To answer this, the research team investigated how MAP-21 funds could be leveraged for freight corridor investment.

IMPLICATIONS FOR MAP-21

In our content analyses of state freight plans in the GCM, recurrent themes were evident. Each state brought some nuances, based on their respective history, geography, and current exigencies. Louisiana, for example, addressed sever financial concerns in its ability to continually meet the requirements of "Safety, Infrastructure condition, Congestion reduction, System reliability, Freight movement and economic vitality, Environmental sustainability, [and] Reduced project delivery delays" which are incumbent upon all the states (Louisiana Department of Transportation and Development, 2003; "A Summary of Highway Provisions", 2012). Texas expressed a great deal of concern over a projected population explosion during the next 25 years (North Central Texas Council of Governments, 2009). It is at the local level, however, be it municipal, MSA, or county that each regions' specific issues become apparent.

For this portion of our study, we examined freight flows and analyses outlined by the GCMR MPOs, looking at dominant freight modes, regional issues, primary commodities, and local-level location quotients to see how the various counties in the megaregion fit in to the region as a whole.

Texas

As outlined in Figure 4, Texas' targeted industries are as follows: Advanced Technology & Manufacturing; Aerospace, Aviation, & Defense; Automotive; Biotechnology & Life Sciences; Energy; Information & Computer Technology; Petroleum Refining & Chemical Products. Of these seven industries, four - Aerospace, Aviation, & Defense, Automotive, Energy, and Petroleum Refining & Chemical Products – are freight-intensive. Advanced Technology and manufacturing has the potential for a high freight investment as well. In the megaregion counties, Texas has four primary MPOs. They are the Corpus Christi Metropolitan Planning Organization, the Houston-Galveston Area Council, the Harlingen San Benito-MPO, and the South East Texas Regional Planning Commission.

The Corpus Christi Metropolitan Planning Commission encompasses Aransas County, Bee County, Nueces County, and San Patricio County. The dominant freight modes outlined in its 2015-2040 freight plan (Corpus Christi Metropolitan Planning Organization, 2014) are truck and rail, with a major focus on intermodal connectivity with the Port of Corpus Christie via the Texas Freight Priority Network. Regional issues addressed by it Metropolitan Transportation Program (MTP) include a major expansion of industrial manufacturing activity in the energy and chemical sectors, and plans for a significant expansion of the port. The primary commodities moved through the port in FY 2007 – the most recent CFS we were able to access, were denoted not by the MPO, but by areas defined in the CFS as "Geographic Areas." The method behind this mode of analysis bears quoting at length:

> *Commodity Flow Survey (CFS) geographic areas were drawn from a subset of Combined Statistical Areas (CSAs) and Metropolitan Statistical Areas (MSAs) as defined by the Office of Management and Budget (OMB). However, CFS metropolitan areas are divided into their state parts when they include more than one state. In addition, the CFS also utilizes a unique geography referred to as, "remainder of state," to represent those areas of a state not contained within a separately published metropolitan area for the CFS (as opposed to not part of any*

Core-Based Statistical Area (CBSA) as defined by OMB). Because of the differences in the CFS geography, as compared to OMB defined geography, caution should be exercised when comparing CFS estimates to other estimates of similar geography. In addition, for purposes of this report, note that no MSAs which contained the three Florida megaregion counties of Escambia, Okaloosa, and Santa Rosa were available for analysis on the most recently accessible version of the Transportation Commodity Flow Survey (Source: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 2007 Economic Census: Transportation Commodity Flow Survey, December 2009).

Within this context, Table 12 contains the top commodities moving through the geographic area most relevant to the Corpus Christi Metropolitan Planning Commission:

TABLE 12: Top Commodity Movements in the Corpus Christi-Kingsville TX Geographic Area by Percentage of Weight

Corpus Christi-Kingsville, TX Geographic Area (contains Aransas County, Nueces County)	
COMMODITY DESCRIPTION	**% OF TOTAL WEIGHT**
Coal and petroleum products	69.9
Basic chemicals, chemical, and pharmaceutical products	12.9
Stones, nonmetallic minerals, and metallic ores	9.4
Base metal and machinery	5.4
Agriculture products and fish	1.1
Furniture, mixed freight and misc. manufactured products	0.5
Electronic, motorized vehicles, and precision instruments	0.2

The Location Quotient Analysis for the Corpus Christi MPO is detailed in Appendix B. Compared to the megaregion as a whole, the Corpus Christi MPO did not show a significant relationship. The comparison between the megaregion LQs and those of the MPOs is detailed at the end of Appendix B.

The Houston-Galveston Area Council is composed of Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Matagorda, and Montgomery counties. It is the largest of the Texas MPOs, with the greatest flow of freight, and economic activity. The dominant freight modes are by far truck and rail: "Truck freight growth is forecast to grow by 120% between 2010 and 2040. Rail freight growth is forecast to grow by 99% between 2010 and 2040" (Texas Department of Transportation, 2015). This MPOs regional issues concern the ability of policymakers to accommodate the impending population and freight booms in the next 25 years. Planners and other public officials in this MPO must contend with changing demographics as well. The primary commodities handled by the Houston-Baytown-Huntsville, TX Geographic Area (contains Brazoria; Waller; Harris counties) at the time of the last available CFS were:

TABLE 13: Top Commodity Movements in the Houston-Baytown-Huntsville TX Geographic Area by Percentage of Weight

Houston-Baytown-Huntsville, TX Geographic Area (contains Brazoria; Waller; Harris counties)	
COMMODITY DESCRIPTION	**% OF TOTAL WEIGHT**
Basic chemicals, chemical, and pharmaceutical products	29.1
Coal and petroleum products	28.7
Base metal and machinery	15.3
Electronic, motorized vehicles, and precision instruments	13.5
Furniture, mixed freight and misc. manufactured products	6.4
Grains, alcohol, and tobacco products	2.9
Agriculture products and fish	2.2
Logs, wood products, and textile and leather	1.5
Stones, nonmetallic minerals, and metallic ores	0.4

The Location Quotient Analysis detailed in Appendix B. Unlike the Corpus Christi MPO, there did seem to be some participation in the industry employment clusters of the megaregion as a whole. Brazoria County manifested on the megaregion LQ indexes of Fabricated Metal Product Manufacture and Mining; Chambers County on Fabricated Metal Product Manufacture; Fort Bend on Machinery Manufacturing and Fabricated Metal Product Mfg.; Fort Bend on Information Technology & Telecommunications; Harris on Fabricated Metal Product Mfg.; Liberty on Fabricated Metal Product Mfg. and Machinery Mfg.; and Montgomery on Machinery Mfg. and Fabricated Metal Product Mfg.

The Harlingen San Benito-MPO encompasses Cameron, Walker, Waller, and Wharton counties. Its dominant freight modes are air, truck, and rail according to its 2010-2040 Metropolitan Transportation Plan (Corpus Christi Metropolitan Planning Organization, 2009). The freight issues particular to this MPO are oriented towards general improvement of its freight infrastructure to facilitate use by local business across all modes Harlingen-San Benito Metropolitan Planning Organization, n.d.). This MPO provided a current appraisal of its primary commodities, with a specific focus on the rail mode. The commodities listed at their MTP website are as follows:

> Major commodities coming into MPO via rail in Harlingen are lumber, newspaper (print) rolls, cottonseed oil, flour, cement, and cinder (fine rock powder used to build blocks, bricks) are received by San Benito. Port of Harlingen receives poison, chlorine, fertilizer, and grain. Commodities going out of the MPO area to the McAllen-Mission-Edinburg area are grain, industrial sand, and paper roll, corn, lumber, and fertilizer products, steel. Commodities going to Brownsville are tin plates (steel form), petroleum oil, polyurethane (a plastic used to make bottles and other products), paper products, grain, scrap paper, and flour spar (to make hydrochloric acid and other chemicals). Hydrochloric acid, corrosive material (type of acid), and flammable liquids travel north from the MPO area. Commodities passing through the MPO area are petroleum, paper goods, paraffin, scrap paper, flour spar (to acid plants in

Mexico), petroleum coke (used for furnaces in industries in Mexico), industrial sand, tin plates, sulfur (mountain sulfur), lubricating oil, polyurethane, corn, wheat, chlorine, poison, cotton oil, auto racks, gravel, limestone etc. Hazardous materials moving on the railroads in the Harlingen-San Benito MPO area are chlorine, flammable liquids, corrosive material, poison, and acids hauled on the Brownsville Subdivision track; while poison and chlorine are hauled on the Brownsville Branch track.

The LQ analysis for the Harlingen San Benito-MPO is detailed in Appendix B. As with Houston-Galveston, there was a measure of correlation between the employment clusters of the MPO with the megaregion. Cameron measured on Transportation Equipment Mfg.; Waller on Machinery Mfg., Fabricated Metal Product Mfg., Agribusiness, Food Processing & Technology – as did Wharton; Wharton also measured on Machinery Mfg.

The South East Texas Regional Planning Commission covers the counties of Hardin and Orange. Its dominant freight modes are not available at the website of its MTP (South East Texas Regional Planning Commission, 2015), as its current TIP seems to be exclusively focused on transit. The regional issues of this MPO are about regional planning for efficient citizen transit. The primary commodities reported in 2007 were as follows:

TABLE 14: Top Commodity Movements in the Beaumont-Port Arthur TX Geographic Area by Percentage of Weight

Beaumont-Port Arthur, TX Geographic Area (contains Hardin, Orange counties)	
COMMODITY DESCRIPTION	**% OF TOTAL WEIGHT**
Coal and petroleum products	60.5
Basic chemicals, chemical, and pharmaceutical products	24
Base metal and machinery	2.2
Logs, wood products, and textile and leather	1.7
Grains, alcohol, and tobacco products	0.2

The Location Quotient Analyses is detailed in the appendix. As regionally small as this MPO is, Orange County had three score in common with the megaregion as a whole: Transportation Equipment Mfg., Fabricated Metal Product Mfg., and Machinery Mfg.

The Transportation Policy Council (TPC) is responsible for planning efforts in the Houston-Galveston area, a 13 county region adjacent the Gulf of Mexico. According to the regional economic development plan the key economic industries are petrochemicals, medical, and agriculture (Gulf Coast Economic Development District, 2014). A cluster analysis reveals that the more rural counties in the region have high LQs in agribusiness, for example Colorado County (6.89), Matagorda (6.30), and Wharton (9.78). The regional specialty in agribusiness is contrary to state economic development plans that lack agribusiness as an industry target. But acknowledgement of the importance of the petrochemical industry aligns with state plans. Notable absences in the TPC plan are the potential contribution of the advanced manufacturing, aerospace, aviation, and defense, biotechnology and life sciences, and information and computer technology industries. In terms of freight movements, the region houses a portion of the Intra Coastal Water Way, a major waterborne freight corridor in the US. The action plan supports

pursuit of federal funds to maintain regional infrastructure, similar to the intent of MAP-21 legislation.

The comprehensive plan developed by the Southern East Texas Regional Planning Commission (SETRPC) (2013) identifies the petrochemical, health care and education industries as major employers in the region. An examination of LQs the South East Texas region shows a specialization in chemical and chemical-based products (2.73), fabricated metal products (2.55), glass and ceramics (2.08), advanced materials (1.79), primary metals (1.74), and mining (1.31). These regional specializations agree with advanced technology and manufacturing, petroleum refining and chemical products at the state level. The region contains portions of Interstate-10 a main freight corridor running through the Gulf Coast region. The comprehensive plan also calls for improvements to capacity of truck-based freight corridors and increased access to regional ports including Port of Beaumont, Port of Port Arthur, Port of Orange, and the Sabine Pass Port Authority.

The Hidalgo County Metropolitan Planning Organization (HCMPO) highlights the impact of NAFTA legislation in increasing trade between the region and Mexico. As a result regional highways are recognized as a part of the Interstate-69 freight corridor, a crucial thoroughfare for truck movements. Municipalities have already implemented freight strategies that separate commercial truck traffic from non-commercial traffic in an effort to further facilitate trade through the region. With its close proximity to Mexico, many manufacturers locate in the region to take advantage of Mexico's lower labor costs. The metropolitan transportation plan does not discuss target industries, although based on their goals in infrastructure investment, transportation, trade, and logistics along with manufacturing are significant contributors to the regional economy. Unlike other planning organizations in Texas there appears to less of an emphasis on the energy industry and its offshoot industries like chemical products.

Alabama

The Industry Targets for Alabama are Advanced Technology & Manufacturing; Aerospace, Aviation, & Defense; Agribusiness; Automotive; Biotechnology; Corporate Operations; Entertainment; Logistics & Distribution; Petroleum Refining & Chemical Products; and Workforce. The Alabama megaregion Counties are represented by two MPOs. One of them is the Eastern Shore MPO, which contains Baldwin County. The dominant freight mode of Baldwin is truck, as evidenced by a projected increase in interstate congestion in the county as the only freight-related topic in its LRTP and TIP. The primary commodities of Baldwin County in the 2007 CFS are listed below:

TABLE 15: Top Commodity Movements in the Houston-Baytown-Huntsville TX Geographic Area by Percentage of Weight

Mobile-Daphne-Fairhope, AL Geographic Area (contains Baldwin County, Mobile County)	
COMMODITY DESCRIPTION	**% OF TOTAL WEIGHT**
Logs, wood products, and textile and leather	26.9
Base metal and machinery	26.5
Basic chemicals, chemical, and pharmaceutical products	26.1
Stones, nonmetallic minerals, and metallic ores	7.7
Furniture, mixed freight and misc. manufactured products	6.2
Grains, alcohol, and tobacco products	3.6
Electronic, motorized vehicles, and precision instruments	0.2

The Location Quotient Analysis for the East Shore MPO is as follows:

TABLE 16: Location Quotients for Eastern Shore MPO, Industry Clusters Versus Megaregion

Eastern Shore MPO LQs			
County	**Description**	**Industry Cluster Employment**	**Megaregion**
Baldwin	Forest & Wood Products	1.85	
Baldwin	Transportation Equipment Mfg.	1.58	15.78
Baldwin	Arts, Entertainment, Recreation & Visitor Industries	1.39	

U.S. Bureau of Labor Statistics, Quarterly Census of Employment & Wages (QCEW) and Purdue Center for Regional Development

Table 16 is an effective method for MPO performance comparisons to the megaregion as a whole.

Mobile County, one of the Alabama counties that comprise the GCMR, is served by the South Alabama Regional Planning Commission. Its dominant freight mode is truck, and again this is reflected in the development of freight corridors to mitigate congestion in the MPOs Unified Planning Work Program (UPWP). The regional issues seem to be primarily oriented around public transit. The primary commodities for the year 2007 are in the table below:

TABLE 17: Top Commodity Movements in the Mobile-Daphne-Fairhope AL Geographic Area by Percentage of Weight

Mobile-Daphne-Fairhope, AL Geographic Area (contains Baldwin County, Mobile County)	
COMMODITY DESCRIPTION	**% OF TOTAL WEIGHT**
Logs, wood products, and textile and leather	26.9
Base metal and machinery	26.5
Basic chemicals, chemical, and pharmaceutical products	26.1
Stones, nonmetallic minerals, and metallic ores	7.7
Furniture, mixed freight and misc. manufactured products	6.2
Grains, alcohol, and tobacco products	3.6
Electronic, motorized vehicles, and precision instruments	0.2

Location Quotient Analyses:

TABLE 18: Location Quotients for South Alabama Regional Planning Commission, Industry Clusters versus Megaregion

South Alabama Regional Planning Commission LQs			
County	**Description**	**Industry Cluster Employment**	**Megaregion**
Mobile	Primary Metal Mfg.	7.5	
Mobile	Transportation Equipment Mfg.	3.3	15.78
Mobile	Transportation & Logistics	1.58	
Mobile	Defense & Security	1.26	
Mobile	Forest & Wood Products	1.19	
Mobile	Chemicals & Chemical Based Products	1.13	
Mobile	Energy (Fossil & Renewable)	1.11	
Mobile	Mining	1.03	

Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment & Wages (QCEW) and Purdue Center for Regional Development (cluster definitions).

Florida

Florida's Industry Targets are Advanced Technology & Manufacturing; Aerospace, Aviation, & Defense; Biotechnology; Corporate Operations; Energy; Financial & Professional Services; Information & Computer Technology; Logistics & Distribution. There is one Gulf Coast megaregion-related MPO in the GCMR, the Florida-Alabama Transportation Planning Organization. It's dominant freight mode is truck, as revealed by freight corridor screening – the investigation of projected freight pathways for damage or need expansion – being the dominant topic in their freight plan (West Florida Regional Planning Council, 2012). The primary commodities that flow on this MPOs network were unavailable for analysis, as discussed at the beginning of this section.

Location Quotients for this area are shown in Table 19.

TABLE 19: Location Quotients for Florida-Alabama Transportation Planning Organization, Industry Clusters versus Megaregion

Florida-Alabama Transportation Planning Organization LQs			Megaregion
County	**Description**	**Industry Cluster Employment**	
Escambia	Biomedical/Biotechnical (Life Sciences)	1.18	
Escambia	Defense & Security	1.16	
County	**Description**	**Industry Cluster Employment LQ**	
Okaloosa	Defense & Security	2.66	
Okaloosa	Transportation Equipment Mfg.	2.35	15.78
Okaloosa	Energy (Fossil & Renewable)	1.32	
Okaloosa	Business & Financial Services	1.11	
Okaloosa	Information Technology & Telecommunications	1.02	
Okaloosa	Arts, Entertainment, Recreation & Visitor Industries	1	
County	**Description**	**Industry Cluster Employment LQ**	
Santa Rosa	Defense & Security	1.22	
Santa Rosa	Education & Knowledge Creation	1.03	
Santa Rosa	Energy (Fossil & Renewable)	0.95	

U.S. Bureau of Labor Statistics, Quarterly Census of Employment & Wages (QCEW) and Purdue Center for Regional Development

Louisiana

The Rapides Area Planning Commission (RAPC) is the main planning agency for Rapides County, which America 2050 identified as a part of the GCMR and VTMI excluded. According to the Alexandria/Pineville Metropolitan Transportation Plan (2011) the top employers in this central Louisiana region are the healthcare, utilities, government, and retail industries. Military spending plays a significant role in the local economy with Fort Polk's Joint Readiness Training Center, Louisiana National Guard in the vicinity. The importance of the defense industry aligns with state economic development plans aerospace, aviation, and defense. The major freight corridor is Interstate-49 located in close proximity the inland Port of Alexandria that handles mainly bulk commodities and military equipment. The Capital Region Planning Commission (CRPC) manages planning initiatives across 11 parishes including the state capital, Baton Rouge. Historically, the regional economy has depended on fossil fuel processing activities like petroleum refining and chemical products to support development. The current economic development strategy targets creative media and design, specialty chemicals and petrochemicals, advanced and light manufacturing, and corporate facilities as industries poised for growth (CRPC, 2014). Other major industries significant to the capital region economy are tourism, trade, agriculture and forest products, and entrepreneurship and innovation. CRPC and state plans share some target industries specifically petrochemicals,

advanced manufacturing, corporate operations, and computer technology, a reasonable outcome given the CRPC's spatial proximity with other state agencies. Baton Rouge's largest imports are chemicals/plastics and their largest exports are energy products (Table 8) so the common economic development focus on the petrochemicals industry represents an initiative to support a foundational industry. Where the two plans differ is in the state's additional industry targets, aerospace, aviation and defense, automotive, entertainment, and water management.

The South Central Planning and Development Commission (SCPDC) comprehensive development strategy identifies energy and petrochemicals as the core industries in the south central Louisiana region (SCPDC, 2009). As an economy dependent on fossil fuel commodities as both inputs and outputs (oil and natural gas), they are especially vulnerable to market volatility affecting commodity pricing. SCPDC views energy and petrochemical support industries as targets industries including maritime commerce; transportation, logistics and cargo-handling; and shipbuilding. This economic development strategy to encourage derivative industries in water transportation and logistics falls in line with state and megaregion LQ strengths. The most recent comprehensive plan's target industries are environmental and safety technology; food technologies; cultural and eco-tourism; healthcare; and information technology. The plan also mentions repair and maintenance of commercial and industrial machinery; metalworking and manufacturing; metal tanks; pumps and compressors; and imports for retail markets as past industry targets. SCPDC (2009) provides one of the more comprehensive lists of industry targets but it lacks automotive and aerospace, aviation and defense, and agribusiness found within statewide plans.

The Regional Planning Commission (RPC) serves the greater New Orleans metropolitan area and as such developed an economic development strategy based on the needs of Jefferson, Orleans, Plaquemines, St. Bernard, and St. Tammany parishes. Planners employed an industry cluster approach to characterize the economy of the region. An examination of LQs identified top ten industry clusters as water transportation (10.39), upstream chemical products (4.92), oil and gas production and transportation (3.78), fishing and fishing products (2.85), video production and distribution (2.43), construction products and services (1.84), hospitality and tourism (1.75), performing arts (1.49), environmental services (1.42), and education and knowledge creation (1.20) (New Orleans Regional Planning Commission, 2014). From a workforce perspective, the Workforce Investment Board found that the greatest labor demand will derive from construction, manufacturing, healthcare and social assistance, and retail trade industry clusters. Compared to state plans, the RPC's comprehensive plan shares a common focus on chemical products, oil and gas production and transportation, water transportation, entertainment, education and knowledge creation, and environmental services. Advanced manufacturing and aerospace, aviation and defense are notable absences in the RPC plans that are included in state industry targets. The RPC comprehensive plan also targets industries with strong megaregion specializations, in particular the water transportation industries. The regional specialization in upstream chemical products supports the export of chemical products, New Orleans' largest export commodity (Table 8).

Mississippi

The Southern Mississippi Planning and Development District (SMPDD) is the MPO representing George County in the GCM. In the most recent comprehensive economic development strategy update they identified the following seven industry clusters operating in the region: aerospace and defense, data/call centers, metal fabrication, polymers, warehouse and

distribution, energy, and healthcare. Stated industry targets included tourism, shipbuilding, marine sciences, advanced manufacturing, and food processing. SMPDD (2012) conclusions suggested that increased county collaboration could improve economic growth in the southern Mississippi region. Supportive policy should emphasize shared training facilities, increased access to venture capital, and expanded research and development activities. Mississippi state and SMPDD economic development strategies align in their identification of industry strengths like energy, advanced manufacturing, aerospace and defense, and warehouse and distribution. Where the two differ is on emerging industries. SMPDD (2012) expands their target industries to include more service-based industries like healthcare, tourism, food processing, marine sciences, and data/call centers.

The Mississippi Gulf Coast Municipal Planning Organization (MGCMPO) develops planning initiatives for Hancock, Harrison, and Jackson counties. Specified target industries include aerospace and defense, data and call centers, metal fabrication, polymers and advanced materials, warehouse and distribution, energy, marine science, and tourism (Gulf Coast Economic Development District, 2013). Over the next decade the fastest growing industries are projected to be healthcare and social assistance, arts, entertainment and recreation, administrative and support and waste management and remediation services, and educational services. MGCMPO's focus on growing the energy sector in the Plan for Opportunity, the long-range development plan, is similar to state economic development strategies but differs in its emphasis on growing the healthcare industry as well. Based on employment numbers by sector, the four largest employers currently in Hancock and Harrison counties are government, retail trade, accommodation and food service (tourism), and professional, scientific and technical services (Mississippi Gulf Coast Sustainable Communities Initiative, 2013). Large government employment originates from the Keesler Air Force Base and the Naval Construction Battalion Center. Manufacturing is the largest employer in Jackson County due to a concentration of shipyards followed by government, retail trade, and services. These findings agree with statewide LQs that highlight support activities for water transportation. Despite these high employment figures, the region is experiencing a labor mismatch in both energy and water transportation support sectors where local energy companies and shipyards are recruiting skilled labor from surrounding metropolitan areas.

As a part of Pearl River County's long-range strategic plan, the Pearl River County Department of Planning and Development (PRCDPD) (2008) identified the largest employers in the county as retail and wholesale trade, government, services, miscellaneous employment, and manufacturing. The plan mentions the John C. Stennis Space Center as another large employer despite its location outside the county. Tourism and polymer-based industries are the two target industries for economic development. A focus on growing tourism does not ally state economic development targets but interest in polymer industries does support state efforts to develop chemical products industries.

According to the Stone County Comprehensive Plan, the service sector is largest employer in the county, which includes healthcare professional and technical services, legal services, business services, personal services, and other miscellaneous services. The second largest employer is the government followed by manufacturing and retail trade (Neel-Schaffer, 2008). The over-representation in service sector jobs is contrary to the both LQs and state target industries centered on the energy, water transportation, and agribusiness.

GCMR Metropolitan Planning Organization Freight Planning

After analysis of state MPOs within the GCMR, it is clear that trucking is the dominant freight mode. The Gulf Coast states' access to multiple class 1 railroads supports rail freight movements throughout the region. In general, the most MPO plans either targeted or highlighted the importance of the energy sector and its related industries like petroleum refining and chemical products. Geographic proximity to resources and infrastructure played a major role in local economies with the influence evident in LQs, commodities moved, and economic development strategies. Beyond the energy sector, agribusiness, government agencies, and the tourism industry were major employers in the GCMR. The impact of resource and asset locations on each MPO's freight plan resulted in a wide range of variance from state-identified industry targets. Increased investment in freight corridors via MAP-21 funded projects could contribute to more MPO cooperation in identifying and encouraging both foundational and emerging industries in the GCMR.

CONCLUSION AND RECOMMENDATIONS

The megaregion concept is viable with a strong transportation infrastructure to connect these increasingly urban regional economies. Despite the availability of multiple transportation modes including ship, barge, and rail, megaregions are over-reliant on trucking for freight transportation (Ross et al. 2008). As a result, freight corridors experience greater congestion and infrastructure damage, which adds to shipping times and reduces regional competitiveness. Understanding freight at the metropolitan and megaregion level can alleviate these problems. Metropolitan trade, particularly within megaregions, is widespread in modern economies. Regions with concentrated assets depend on other areas for both production and consumption of the goods they trade. In the end, these intricate relationships enable modern global economies to grow (Tomer et al., 2013).

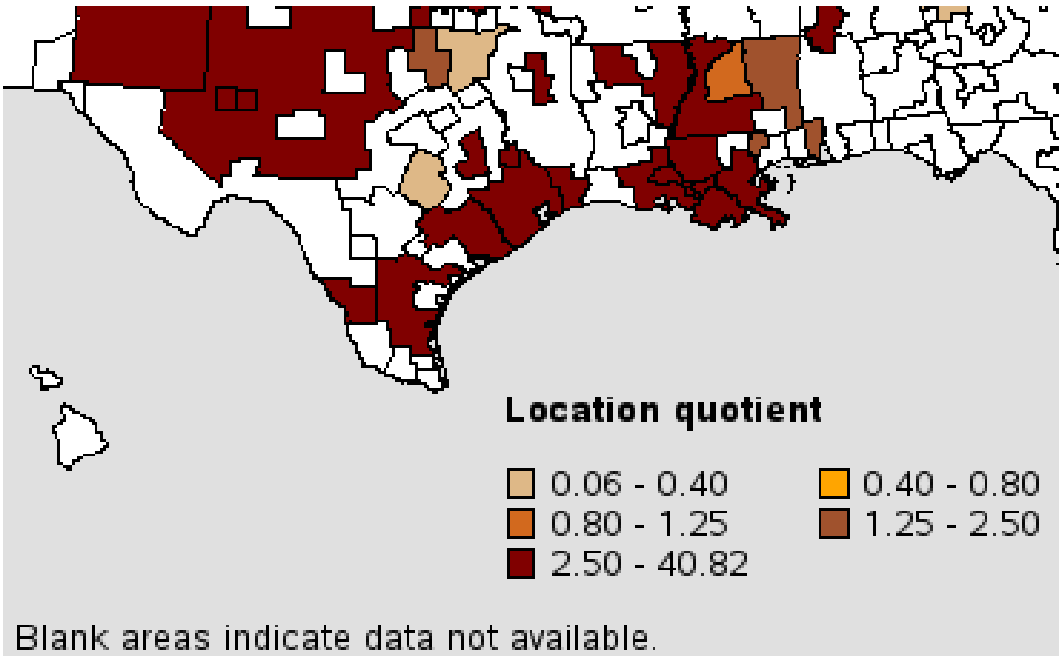
As promising as MAP-21's requirement for a national freight strategy is, the US takes the most compartmentalized approach to planning of any industrialized country. Instead the US needs a holistic strategy that incorporates all modes (public and private), expands economic connectivity, and upgrades our trade network analytics at the metropolitan level (at least for the top 100 metropolitan areas). MAP-21 requires the designation of a national freight network but this network is largely defined in terms of truck movements. While trucks transport most domestic goods, the maritime industry accounts for more than three-quarters of the weight and nearly half the value of American international goods traded. However, the river infrastructure of locks, dams, and bridges is in dire need of repair and upgrade. Additionally, the primary cost associated with river shipping is dredging by the Army Corps of Engineers to maintain channels of sufficient draft, and federal money for these dredging projects is not easily acquired. MAP-21 also requires that practitioners identify methods for reducing local traffic disruptions from freight movements yet falls short in clearly defining national freight network objectives, measures for assessment, and the federal government's role throughout the planning process. This legislative ambiguity can be attributed to the lack of viable national freight data (United States Government Accountability Office, 2014).

A national US freight plan needs to assess freight needs by identifying the infrastructure assets that facilitate goods movement or prioritize improvements based on traffic from nearby industries (*ibid*). Megaregion leaders need documented trade volumes and balances to better understand their economic starting point. Though LQ data can tell us what firms cluster across multiple industrial sectors – or do not cluster – they do not lead to a better understanding of a supply chain's complete value derived from goods trade. Hence, an economic developmental mismatch.

Leaders need to know what their surplus goods sectors are and build on those distinctive strengths. If we consider the data from the state target industries and the industrial building availability review, it is clear that leaders at the state and local level are not considering economic development strategies that incorporate trade, both domestic and international. Furthermore, these leaders are not acting regionally to pool assets and resources (land, labor and capital) to attract additional development opportunities from within the megaregion or externally. For example, the leaders should agree on the creation of a centralized database of all industrial, freight-related, and infrastructural assets (with a uniform definition) in the GCM as a whole. The inventory should be easily located and contain identical categories of information for each state. This would facilitate the Gulf Coast's global competitiveness as a region and help to overcome the current economic barriers inherent in interstate and inter-country competition. National and

state freight plans should build off these metropolitan efforts to capture the importance of freight in economic development, not the other way around. Forging stronger networks within and between megaregions that support trade can benefit the entire nation as metropolitan areas address their collective needs.

APPENDIX A



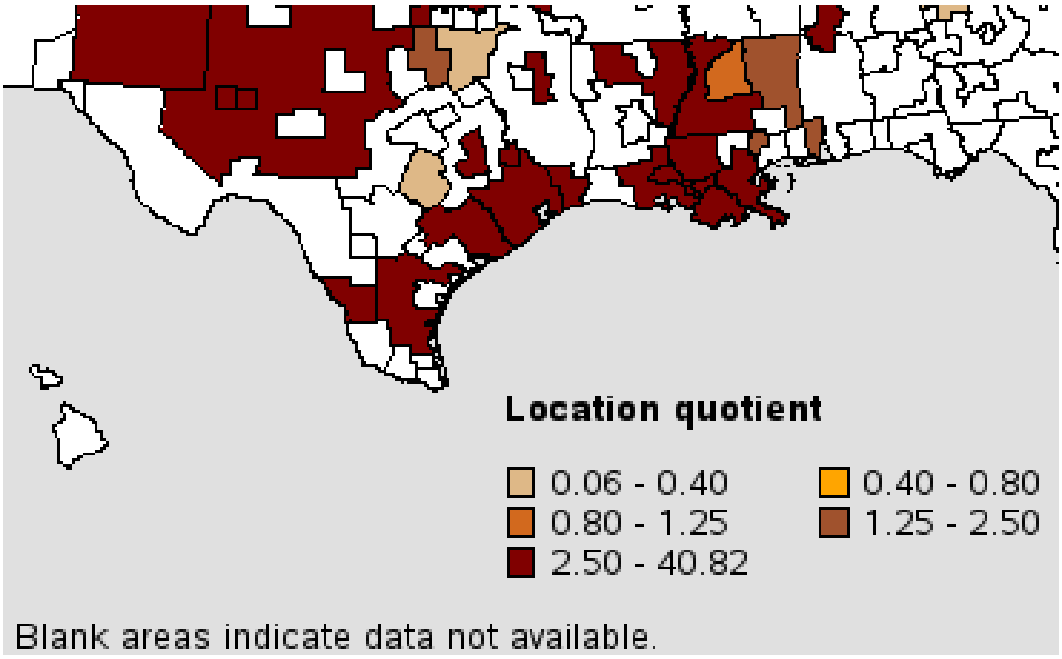


FIGURE A-1: Location Quotient of Petroleum Pump System Operators, Refinery Operators, and Gaugers by Area: May 2013 (Bureau of Labor Statistics, 2013).

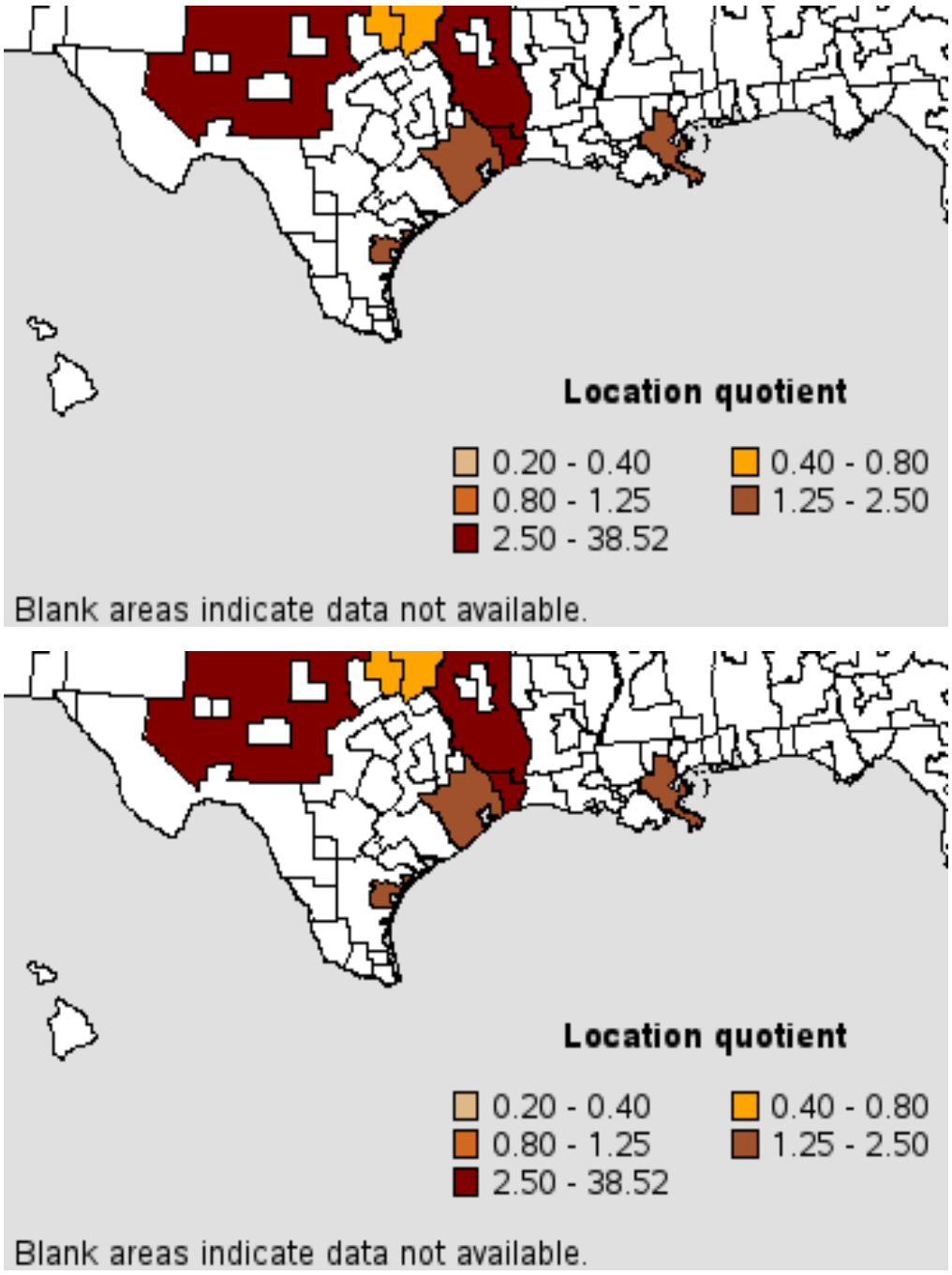
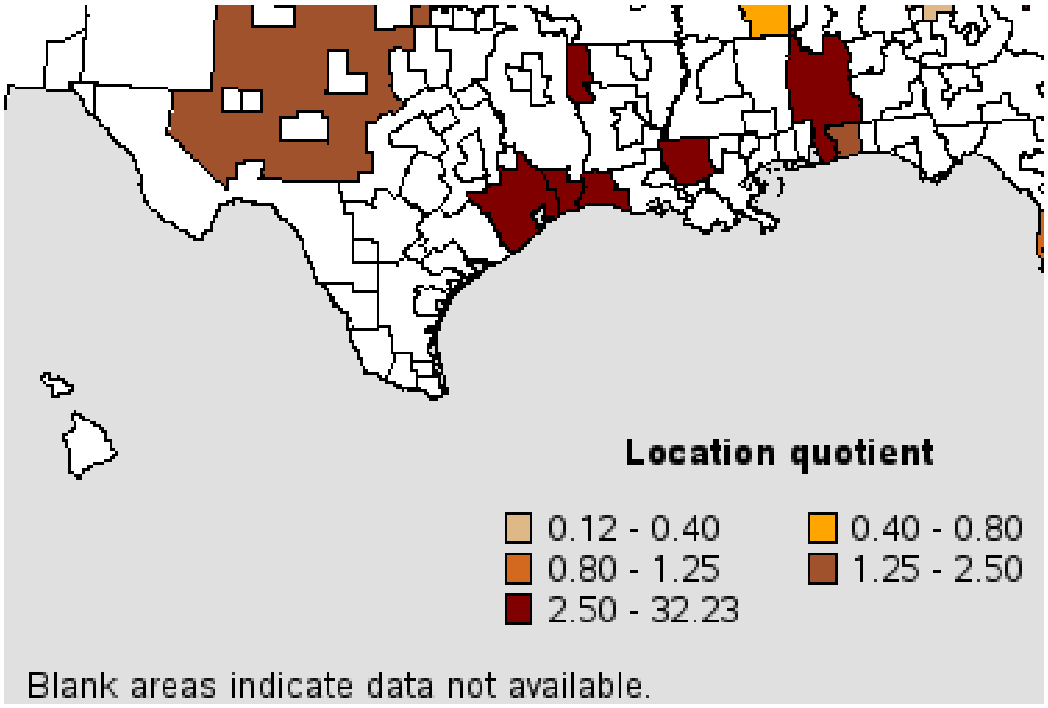


FIGURE A-2: Location Quotient of Gas Plant Operators by Area: May 2013 (Bureau of Labor Statistics, 2013).



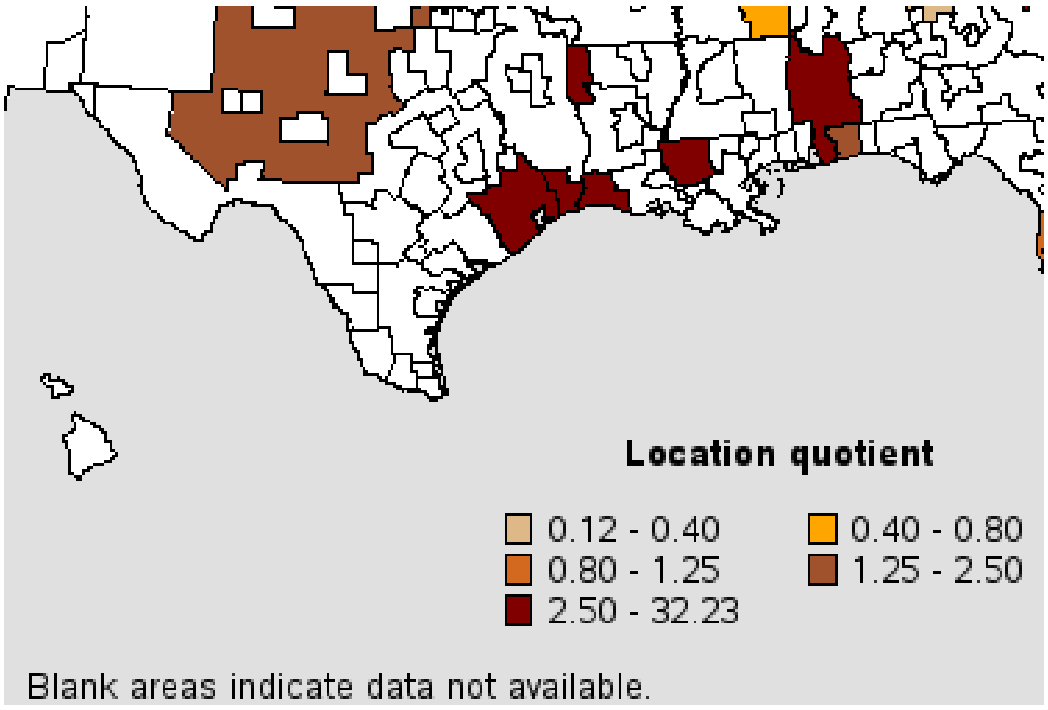


FIGURE A-3: Location Quotient of Chemical Plant and System Operators by Area, May 2013 (Bureau of Labor Statistics, 2013).

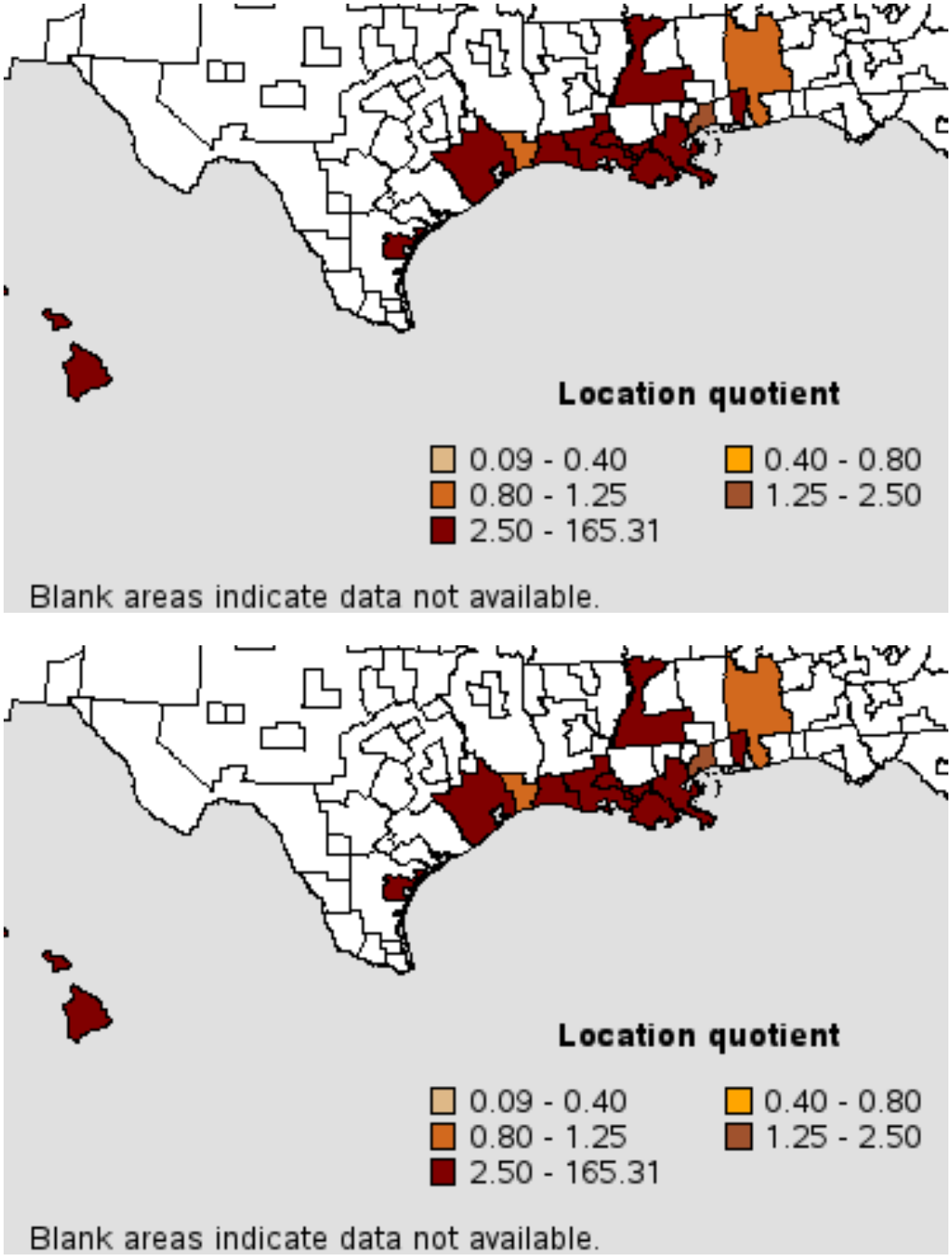


FIGURE A-4: Location Quotients of Captains, Mates, and Pilots of Water Vessels by Area: May 2013 (Bureau of Labor Statistics, 2013).

APPENDIX B

MPO LQ APPENDIX

Texas Corpus Christi Metropolitan Planning Organization

County	Description	Industry Cluster Employment LQ
Aransas	Energy (Fossil & Renewable)	2.07
Aransas	Arts, Entertainment, Recreation & Visitor Industries	1.66

County	Description	Industry Cluster Employment LQ
Bee	Mining	8.48
Bee	Energy (Fossil & Renewable)	2.37
Bee	Defense & Security	1.61
Bee	Biomedical/Biotechnical (Life Sciences)	1.38
Bee	Education & Knowledge Creation	1.01

County	Description	Industry Cluster Employment LQ
Nueces	Transportation Equipment Mfg.	2.89
Nueces	Energy (Fossil & Renewable)	2.29
Nueces	Mining	1.93
Nueces	Biomedical/Biotechnical (Life Sciences)	1.24
Nueces	Defense & Security	1.12
Nueces	Transportation & Logistics	1.01

County	Description	Industry Cluster Employment LQ
San Patricio	Transportation Equipment Mfg.	1.69
San Patricio	Chemicals & Chemical Based Products	1.6
San Patricio	Mining	1.53
San Patricio	Agribusiness, Food Processing & Technology	1.4

U.S. Bureau of Labor Statistics, Quarterly Census of Employment & Wages (QCEW) and Purdue Center for Regional Development (cluster definitions).

MPO LQ APPENDIX cont.

Houston-Galveston Area Council LQs

County	Description	Industry Cluster Employment	Megaregion
Brazoria	Chemicals & Chemical Based Products	5.41	
Brazoria	Energy (Fossil & Renewable)	3.46	
Brazoria	Advanced Materials	2.94	
Brazoria	Glass & Ceramics	2.3	
Brazoria	Fabricated Metal Product Mfg.	1.95	15.78
Brazoria	Electrical Equipment, Appliance & Component Mfg.	1.89	
Brazoria	Mining	1.67	15.78
Brazoria	Machinery Mfg.	1.2	
Brazoria	Manufacturing Supercluster	1.02	

County	Description	Industry Cluster Employment LQ	
Chambers	Primary Metal Mfg.	20.05	
Chambers	Chemicals & Chemical Based Products	6.91	
Chambers	Energy (Fossil & Renewable)	5.58	
Chambers	Advanced Materials	4.11	
Chambers	Mining	3.59	
Chambers	Fabricated Metal Product Mfg.	3.41	15.78
Chambers	Transportation & Logistics	2.02	
Chambers	Manufacturing Supercluster	1.72	

County	Description	Industry Cluster Employment LQ	
Fort Bend	Computer & Electronic Product Mfg.	2.66	
Fort Bend	Machinery Mfg.	2.45	15.78
Fort Bend	Energy (Fossil & Renewable)	2.23	
Fort Bend	Fabricated Metal Product Mfg.	2.14	15.78
Fort Bend	Manufacturing Supercluster	1.63	
Fort Bend	Advanced Materials	1.57	
Fort Bend	Chemicals & Chemical Based Products	1.28	
Fort Bend	Mining	1.28	
Fort Bend	Electrical Equipment, Appliance & Component Mfg.	1.14	
Fort Bend	Information Technology & Telecommunications	1.02	8.01

County	Description	Industry Cluster Employment LQ	
Galveston	Education & Knowledge Creation	2.07	
Galveston	Mining	2.03	
Galveston	Energy (Fossil & Renewable)	1.59	
Galveston	Arts, Entertainment, Recreation & Visitor Industries	1.24	
Galveston	Chemicals & Chemical Based Products	1.04	

County	Description	Industry Cluster Employment LQ	
Harris	Machinery Mfg.	3.22	
Harris	Energy (Fossil & Renewable)	2.93	
Harris	Fabricated Metal Product Mfg.	2.19	15.78
Harris	Transportation & Logistics	1.56	
Harris	Manufacturing Supercluster	1.43	
Harris	Chemicals & Chemical Based Products	1.4	
Harris	Glass & Ceramics	1.39	
Harris	Mining	1.23	
Harris	Business & Financial Services	1.15	
Harris	Advanced Materials	1.1	

County	Description	Industry Cluster Employment LQ	
Liberty	Advanced Materials	1.57	
Liberty	Fabricated Metal Product Mfg.	6.61	15.78
Liberty	Mining	6.01	
Liberty	Machinery Mfg.	2.48	15.78
Liberty	Manufacturing Supercluster	2.18	
Liberty	Primary Metal Mfg.	1.98	
Liberty	Energy (Fossil & Renewable)	1.85	
Liberty	Biomedical/Biotechnical (Life Sciences)	1.23	
Liberty	Defense & Security	1.21	
Liberty	Transportation & Logistics	1.13	

County	Description	Industry Cluster Employment LQ
Matagorda	Energy (Fossil & Renewable)	4.55

Matagorda	Mining		4.2	
Matagorda	Agribusiness, Food Processing & Technology		2.09	
Matagorda	Biomedical/Biotechnical (Life Sciences)		1.37	
County	**Description**	**Industry Cluster**		
Montgomery	Machinery Mfg.		3.72	15.78
Montgomery	Fabricated Metal Product Mfg.		2.22	15.78
Montgomery	Energy (Fossil & Renewable)		2.02	
Montgomery	Mining		1.56	
Montgomery	Manufacturing Supercluster		1.5	
Montgomery	Primary Metal Mfg.		1.35	
Montgomery	Chemicals & Chemical Based Products		1.26	
Montgomery	Education & Knowledge Creation		1.03	

U.S. Bureau of Labor Statistics, Quarterly Census of Employment & Wages (QCEW) and Purdue Center for Regional Development

MPO LQ APPENDIX cont.

County	Description	Industry Cluster Employment	Megaregion
Cameron	Biomedical/Biotechnical (Life Sciences)	1.69	
Cameron	Electrical Equipment, Appliance & Component Mfg.	1.47	
Cameron	Transportation Equipment Mfg.	1.42	15.78
Cameron	Defense & Security	1.19	
Cameron	Transportation & Logistics	1.11	
Cameron	Education & Knowledge Creation	1	
County	Description	**Industry Cluster Employment LQ**	
Walker	Defense & Security	5.45	
Walker	Education & Knowledge Creation	2.8	
Walker	Forest & Wood Products	1.58	
Walker	Energy (Fossil & Renewable)	1.11	
Walker	Electrical Equipment, Appliance & Component Mfg.	1.04	
County	**Description**	**Industry Cluster Employment LQ**	
Waller	Machinery Mfg.	11.62	15.78
Waller	Primary Metal Mfg.	5.53	
Waller	Fabricated Metal Product Mfg.	4.39	15.78
Waller	Chemicals & Chemical Based Products	3.04	
Waller	Energy (Fossil & Renewable)	2.26	
Waller	Agribusiness, Food Processing & Technology	2.16	14.15
Waller	Advanced Materials	1.87	
Waller	Education & Knowledge Creation	1.35	
County	**Description**	**Industry Cluster Employment LQ**	
Wharton	Agribusiness, Food Processing & Technology	6.58	14.45
Wharton	Mining	4.95	
Wharton	Chemicals & Chemical Based Products	2.93	
Wharton	Energy (Fossil & Renewable)	2.23	
Wharton	Primary Metal Mfg.	1.47	
Wharton	Advanced Materials	1.13	
Wharton	Machinery Mfg.	1	15.78

U.S. Bureau of Labor Statistics, Quarterly Census of Employment & Wages (QCEW) and Purdue Center for Regional Development

MPO LQ APPENDIX cont.

South East Texas Regional Planning Commission LQs

County	Description	Industry Cluster Employment	Megaregion
Hardin	Forest & Wood Products	3.58	
Hardin	Energy (Fossil & Renewable)	3.18	
Hardin	Glass & Ceramics	2.19	
Hardin	Biomedical/Biotechnical (Life Sciences)	1.63	
County	**Description**	**Industry Cluster Employment**	
Orange	Chemicals & Chemical Based Products	6.36	
Orange	Primary Metal Mfg.	5.46	
Orange	Transportation Equipment Mfg.	4.26	15.78
Orange	Advanced Materials	4.06	
Orange	Mining	3.69	
Orange	Fabricated Metal Product Mfg.	3.44	15.78
Orange	Machinery Mfg.	1.63	15.78
Orange	Energy (Fossil & Renewable)	1.53	
Orange	Forest & Wood Products	1.49	
Orange	Defense & Security	1.17	

U.S. Bureau of Labor Statistics, Quarterly Census of Employment & Wages (QCEW) and Purdue Center for Regional Development

MPO LQ APPENDIX cont.

South East Texas Regional Planning Commission LQs

County	Description	Industry Cluster Employment	Megaregion
Hardin	Forest & Wood Products	3.58	
Hardin	Energy (Fossil & Renewable)	3.18	
Hardin	Glass & Ceramics	2.19	
Hardin	Biomedical/Biotechnical (Life Sciences)	1.63	
County	**Description**	**Industry Cluster Employment**	
Orange	Chemicals & Chemical Based Products	6.36	
Orange	Primary Metal Mfg.	5.46	
Orange	Transportation Equipment Mfg.	4.26	15.78
Orange	Advanced Materials	4.06	
Orange	Mining	3.69	
Orange	Fabricated Metal Product Mfg.	3.44	15.78
Orange	Machinery Mfg.	1.63	15.78
Orange	Energy (Fossil & Renewable)	1.53	
Orange	Forest & Wood Products	1.49	
Orange	Defense & Security	1.17	

U.S. Bureau of Labor Statistics, Quarterly Census of Employment & Wages (QCEW) and Purdue Center for Regional Development

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