

# Logistics Analysis of the Port of Guaymas in the Supply Chain of Regional Companies

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## Research Team:

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**Sponsor:** Port of Guaymas

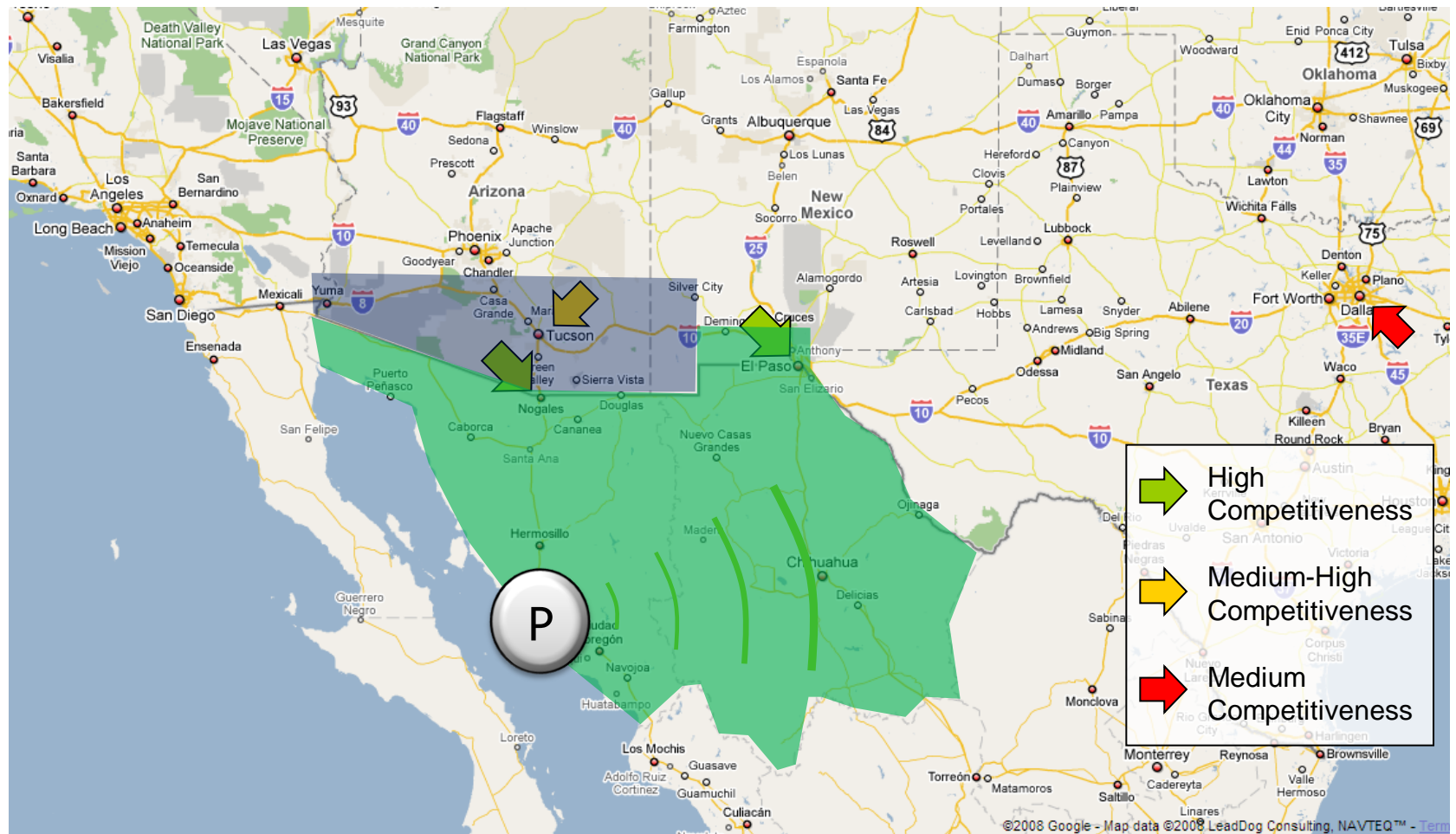


# Agenda

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- Overview
  - Current Condition
  - Problem
- Activities & Results
  - Methodology
  - Data Overview
  - Results
- Findings
- Future work

## Overview: Port Location/Influence Zone



## Overview: Current conditions

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- Guaymas is the main port of the Mexican state of Sonora, and one of the biggest Mexican port of the Pacific, and the biggest port in the Mar de Cortez.
- There's still no formal containers service at the Port since there is not a container terminal.
- Industries within the port's influence zone may not be getting an efficient container service for their import/export operations with the Far East countries.
- The ports of Long Beach/LA and Ensenada are commonly used to send/receive containers.
- Port capacity: 175k TEUs/year (Logistics Capacity Study of the Guaymas-Tucson Corridor, Arizona State University, 2006)

## Overview: Problem

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- The underlying objective is to determine under what scenarios the companies of Sonora would benefit from a regular container service in the Port of Guaymas started a regular container service.
- A secondary objective is to determine the container market for a potential shipping line to schedule a regular stop at Guaymas
  - Extrapolate the potential demand that companies in Sonora might have of the Port of Guaymas based on the results from the previous analysis.
- Use the study as a marketing tool for the Guaymas Port and the region.

# Methodology

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## 1. Data gathering:

1. Identify representative products characteristics and current logistics networks used by the representative industry.
2. Map observed variability from logistics and transportation methods currently used by industry.
3. Identify volumes of shipments.

## 2. Propose and Develop a Port Comparison Framework:

1. Provide an economic cost model for route and transportation method comparison.
2. Input observed data into proposed model.
3. Comparison based on different scenarios (part profile and receiving port segment variability)

# Methodology

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3. Extrapolate results:
  1. Provide to a specific representative company the proposed economic model for a support on logistics decisions (i.e. identify potential savings like inventory costs).
  2. Obtain from the proposed comparison a reference on variability needed by Guaymas Port to potentially integrate its operations to industry's Supply Chain.

## Data: Influence Zone S.C.

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- General sea shipments with destinations within the Port of Guaymas influence zone (Jan, 2006 to July, 2009):
  - Origin
  - Destination (within the Zone)
  - Weight
  - Transit Times
  - Product Description
- Influence Zone's industry
  - Economic Activity
  - Companies Profiles
  - Operations



## Data: Local Industry Shipments

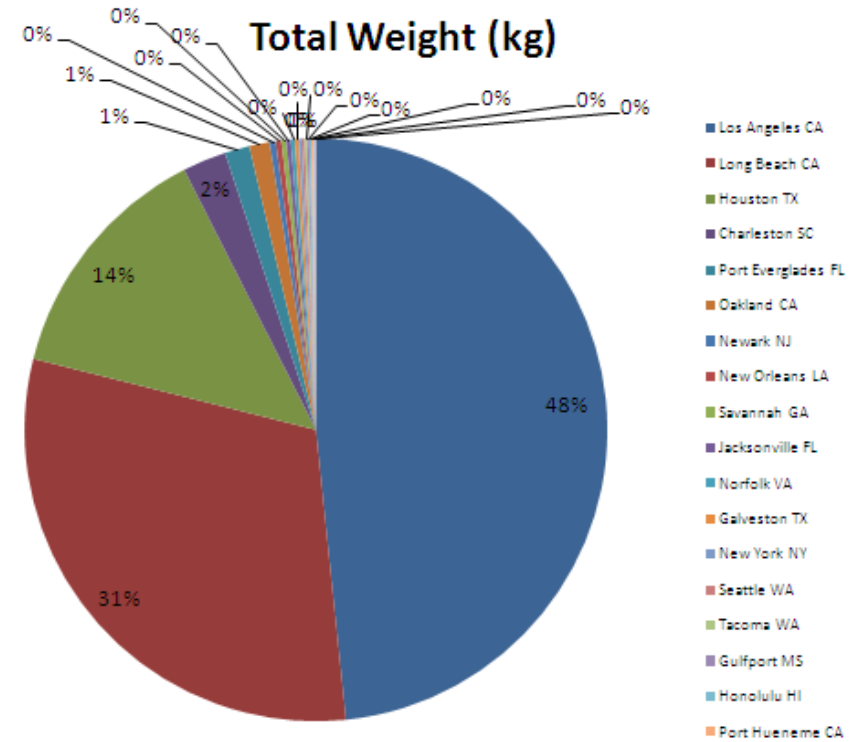
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- Shipments from Asia (Air/Sea) to a specific representative *maquiladora* company within Guaymas' influence zone (Jan, 2008 to July, 2009):
  - Transportation Mode
  - Approximated Transportation Costs
  - Origins
  - Weight
  - Transit Times
  - Product Description
  - Product Costs
  - Product Demands
  - Inventory Levels

## Guaymas IZ Bound Containers

Sea shipments with Destinations within Guaymas **Hinterland** - US Ports **2008**

US PORT	Total Weight (kg)	Total Weight (%)
Los Angeles CA	192,809,015.64	48.1935%
Long Beach CA	121,843,752.09	30.4554%
Houston TX	54,259,348.64	13.5624%
Charleston SC	9,638,066.36	2.4091%
Port Everglades FL	5,479,806.00	1.3697%
Oakland CA	4,452,739.09	1.1130%
Newark NJ	1,384,362.91	0.3460%
New Orleans LA	1,268,655.00	0.3171%
Savannah GA	1,022,787.45	0.2557%
Jacksonville FL	974,435.00	0.2436%
Norfolk VA	932,368.64	0.2330%
Galveston TX	826,082.00	0.2065%
New York NY	729,982.00	0.1825%
Seattle WA	595,628.00	0.1489%
Tacoma WA	491,508.91	0.1229%
Gulfport MS	485,663.45	0.1214%
Honolulu HI	461,368.00	0.1153%
Port Hueneme CA	383,139.00	0.0958%
Miami FL	352,344.36	0.0881%
San Juan PR	303,516.00	0.0759%
<b>Total</b>	<b>400,072,960.91</b>	<b>100%</b>



**Aprox TEU\* (Total)**

**33,350**

**Aprox TEU\* (from Asia)**

**26,220**

\* 1 TEU aprox = 12,000 kg

# Shipments Profiling

- Shipping Commodities from Asia with Destinations within Guaymas Hinterland - 2008

- General Shipments

#	Commodity	%
1	AUTOMOTIVE	18%
2	ELECTRONIC COMPONENTS	15%
3	COMPUTER PARTS	8%
4	ELECTRICAL PARTS	7%
5	ASSEMBLY PARTS	6%
6	PLASTIC DISPOSABLE	6%
7	ELECTRONICS	5%
8	HOUSEHOLD ACCS	5%
9	HARDWARE	4%
10	METAL PARTS	4%
11	CABLE	4%
12	MACHINE AND MACHINE ACCS	3%
13	AUDIO	3%
14	PLASTIC GOODS	3%
15	LEATHER	2%
16	TEXTILE FIBRES	2%
17	CHEMICAL PRODUCTS	1%
18	SECURITY SYSTEMS PARTS	1%
19	FURNITURE	1%
20	ELECTRICAL APPLIANCES	1%
<b>TOTAL</b>		<b>100%</b>

- Representative Industry Shipments

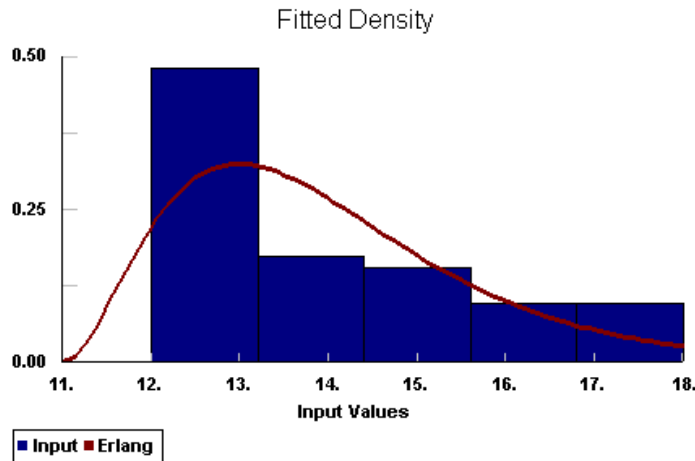
#	Commodity	%
1	SHIELD METAL	32%
2	PCB's	27%
3	INTEGRATED CIRCUITS	26%
4	CONNECTORS	8%
5	HOUSINGS	5%
6	PASIVES	1%
7	PERIPHERALS	1%
8	BATTERIES	1%
9	ELECTRONIC MODULES	1%
<b>Total</b>		<b>100%</b>

# Results: Center of Gravity (Shipments)

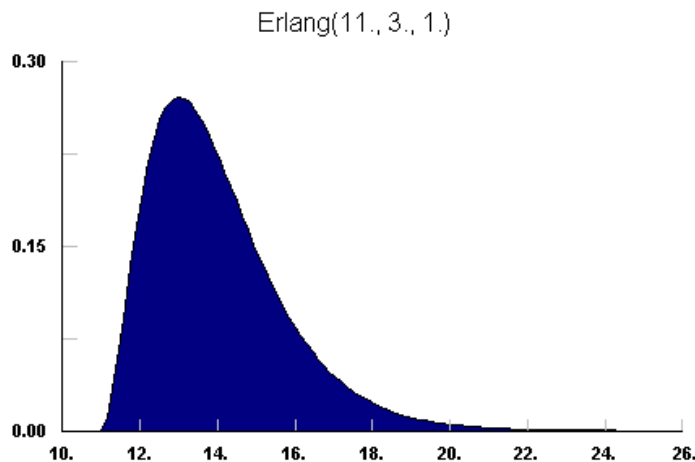


\*Used for: Shipment Analysis and Possible Routing

# Results: Port Variability (SHA - Long Beach)



- Goodness of fit
  - Data points: 52
  - Estimates: MLE
  - Accuracy of fit: 0.0003
  - Level of sign.: 0.05
- Fitted Distribution:
  - Erlang Dist.
  - Minimum: 11
  - M: 3
  - Beta: 0.999981
  - Mean: 14



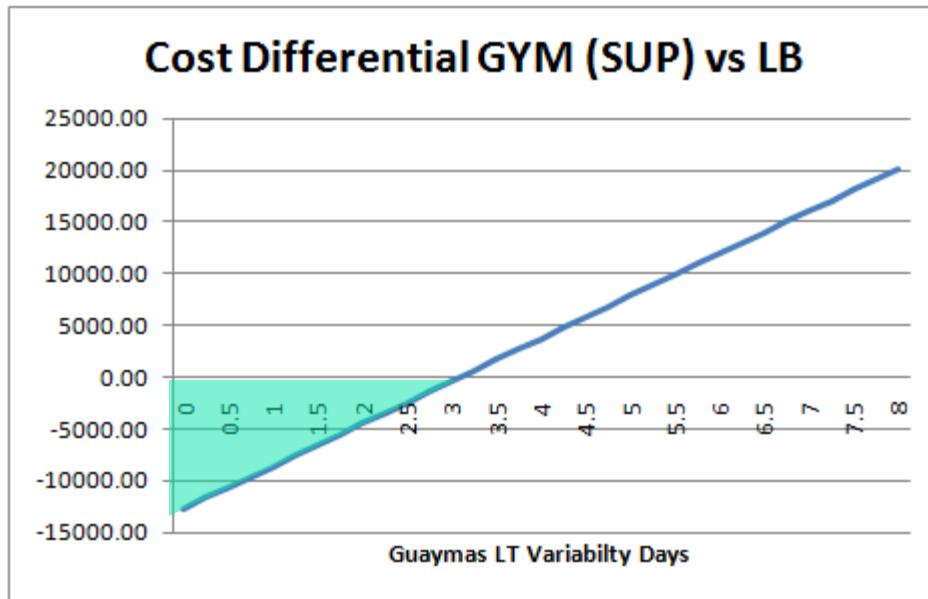
## Service Levels

<b>P(X&lt;D)</b>	<b>S.L.</b>	<b>D</b>	<b>D - Mean</b>
0.90005	90%	16.323	2.323
0.95001	95%	17.296	3.296
0.99003	99%	19.41	5.41

# Results: Total Landed Costs & Variability

- Suggested Total Landed Cost for Analysis:

$\Delta$ (Transportation Costs + Variability Costs)



\* Savings

## Cost Components

+Order:	$(D/Q) * S$
+Transportation:	$R * D$
+In transit Inventory:	$(ICDT)/365$
+Regular Stock:	$(IC'Q)/2$
+Stock Out:	$(D * Q) k * s'_d E(z)$
+Safety Stock:	$IC * s'_t$

## Conclusions: General Port

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- During research, it was found that of the consulted sources (companies, ports authorities, freight forwarders, etc), very few have actual information on variability, and up to now, none have a continuous systematic monitoring of it.
- There's enough volume of containers moving from and to the Port's influence zone to start operations as a regional port.
- With the analysis framework being developed, the Port Administration will be able to estimate the Service Level required to compete with other ports that currently cover the influence zone.

## Conclusions: Participating Companies

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- Logistics decisions regarding the choice of ports should consider the characteristics of the product –for example: cost, demand and weight.
- The observed variability in certain routes and/or ports' operations should be considered in the total landed cost calculation, and as a metric to port performance.
- Most companies rely on the service provided by LB/LA, but the capacity, environmental and cost issues currently being experienced in this port greatly affect the logistic cost for companies.
- We have developed a framework for analysis and we intend to create a tool that will aid decision making in this regard, being able to compare different ports in terms of total landed cost –dollars.



## Future Work

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- An extrapolation of the results of the representative companies, to estimate a volume based on the number of similar companies inside the influence zone is being worked.
  - The results may work as a marketing tool for the Port.
  - A potential share needs to be established.
- Port saturation analysis – data gathering and statistics analysis on port variability, including Mexican ports operations.
- Total Landed Costs for the regions' industry can be further analyzed to determine more accurate models that integrate transportation variability.