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- La planta inició operaciones en 1986
- La planta tiene una capacidad de producción 1 millón de toneladas anuales de fertilizantes nitrogenados y fosfatados
- El 70% de su producción es para exportación, principalmente; Australia y Chile
- Cuenta con una plantilla de 1,300 empleados

Situación infraestructura, logística y conectividad:

- Cuenta con la concesión del muelle (aprox. 500m) y un área de desarrollo de aprox. 1,000 m
- La mayoría de la mercancía para el mercado nacional (85%) sale generalmente por carretera, para servir a clientes del norte si se utiliza el ferrocarril
- El cliente decide que vía usar y paga el flete
- En términos del abasto de agua, se cuenta con recurso suficiente para abastecer a tres plantas
- No hay problemas con el abasto de energía eléctrica
- Se prevé la habilitación de un gasoducto para mejorar el abasto de gas natural
- Se prevé el desarrollo de una planta de amoníaco y una de urea dentro del mismo predio de la planta actual se cuenta con aprox. 100 ha no utilizadas

Políticas públicas:

- Se cuenta con las facilidades del programa de IMMEX
- Recientemente se aprobó la Ley de Gas Natural de Proceso, Amoníaco y Fertilizantes Nitrogenados la cual establece acciones de impulso a la productividad y competitividad como medidas de apoyo tendientes al acceso a fertilizantes químicos como insumos básicos
- Falta que el Senado apruebe la ley

Materia prima:

- La materia prima proviene de su mina de roca fosfórica ubicada en San Juan de la Costa, Baja California Sur
- Se prevé ampliar la capacidad productiva de la mina en los próximos años
- El azufre proviene de EE.UU. y Canadá
- El amoníaco lo surte Pemex desde Salina Cruz, también se importa desde Trinidad y Tobago

Capital humano:

- Existe oferta de mano de obra calificada
- La oferta educativa en el estado es adecuada (Tecnológico de Lázaro Cárdenas, Universidad Michoacana)
- La oferta de mano de obra no calificada es mayor a la demanda
- Existen una buena relación con el sindicato
- El índice de rotación es bajo: 0.6% para los de confianza y 0.1% para los sindicalizados

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Infraestructura social y urbana:

- Se identifica oportunidad para mejorar el aeropuerto y su servicio (precios altos, pocas rutas)
- Se requiere una modernización de la terminal
- EL transporte público en Lázaro Cárdenas no es adecuado, la empresa contrata el servicio de transporte colectivo para sus empleados
- La oferta de hospitalaria se considera como insuficiente
- Se vive una sensación de inseguridad: la gente no sale de noche, se exigen derechos de piso para operar negocios, en ocasiones las decisiones de contratación y de sueldos del personal están ligadas a asignaciones impuestas por el narco
- No se han sufrido de robos a mercancía

Retos:

- Faltan opciones de empleo: son 4 empresas que generan el mayor empleo en la región (ArcelorMittal, la API, Fertinal y la termoeléctrica de Petacalco)
- Existe un parque industrial que no se ha activado aún. Hay pocas empresas instaladas y terrenos desarrollados

Potencial:

- Hay potencial, porque ya hay infraestructura disponible
- Sectores que podrían instalarse son el automotriz (ensambladora), agroindustria, la maquila de electrónicos por los beneficios del recinto fiscalizado estratégico y el metalmecánico (la empresa NKS se dedicaba a la fabricación de bienes de capital pesado, actualmente la empresa no opera y su planta será desmenatada)

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TEMA: Entrevista Canieti		MINUTA No: 160913-1
LUGAR: Culiacan 71, Hipódromo, 06100 Ciudad de México, D.F.		FECHA: 13. 09. 2016
		HORA: 13:00
ANEXO:		
CÓPIAS:	BANOBRAS 1	

1. ASISTENTES

SN	Nombre	Posición	Rep.	ID
1	Mario de la Cruz Sarabia	Presidente Nacional	Canieti	
2	Alfredo Pacheco Vásquez	Director General	Canieti	
3	Guillermo González King	Director de Promoción de la Industria	Canieti	
4	Rodrigo Emiliano Calvario Ceballos	Director Técnico	Canieti	
5	Ibai Corera	Consultor	IDOM	
6	Bernardo Roth	Consultor	IDOM	

2. TEMA(S)

- Comentarios generales
- Situación infraestructura, logística y conectividad
- Políticas públicas
- Materia prima
- Capital humano
- Infraestructura social y urbana
- Retos
- Potencial

3. COMENTARIOS

Comentarios Generales

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- Se comenta es necesario que se cuente con la certidumbre de que las tierras sean propiedad del gobierno
- Se identifican las reserva territoriales de los puertos o API pudieran ser incorporadas bajo el esquema de ZEE
- Es necesario que las empresas ancla desarrollen un esquema de atracción para sus proveedores
- El esquema de shelter para el sector de electrónicos no es tan atractivo. El factor determinante que está por encima de la infraestructura y conectividad que puedan ofrecer los parques industriales que operan bajo este esquema es la mano de obra calificada
- El determinante de inversión está ligado principalmente al landing cost total, y no únicamente a los incentivos
- Para ser atractivo para un inversionista, la lógica de negocio debe implicar reducir los costos de 4 a 5% para reubicarse
- México sigue siendo 4 – 5% más caro que Asia
- Las ZEE que cuenten recursos naturales, agua, gas y energía podrán atraer industrias que son intensivas en el uso de estos insumos

Situación infraestructura, logística y conectividad:

- El costo logístico desde sureste es muy alto para llegar a EE.UU., por lo que no es una ubicación estratégica para atacar este mercado
- Desde el punto de vista de ventajas logística sería más conveniente habilitar el Puerto de Ensenada para abastecer el mercado de EE.UU.
- Atacar los mercados de América Latina pueden implicar un caso de negocios más robusto

Políticas públicas:

- Se considera que los incentivos tienen que ser muy agresivos para hacer atractivas las ZEE
- Sin embargo, los incentivos no son tan importantes si hay lógica de negocio, lo cual es factible en el largo plazo

Materia prima:

- El sourcing se hace principalmente desde Asia
- El mercado final es EE.UU.
- La manufactura está en Jalisco y Chihuahua, por lo que la ZEE de Lázaro Cárdenas podría ser un punto estratégico para abastecer a Jalisco
- Las importaciones se canalizan principalmente por Long Beach

Capital humano:

- Uno de los temas más críticos es la disponibilidad de mano de obra calificada (quizás se cuente con ella en Coatzacoalcos)
- Por temas sindicales LC no es un puerto atractivo por temas de mano de obra

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- Al contarse con mano de obra calificada se cuenta con la flexibilidad para abrir nuevas líneas de producción y atraer nuevos negocios
- La ZEE de Puerto Chiapas queda descartada, por no contar con mano de obra calificada

Infraestructura social y urbana:

- La ZEE de Lázaro Cárdenas si podría funcionar como punto de abastecimiento desde Asia para Jalisco, pero es muy importante reforzar seguridad

Retos:

- No se prevé que empresas manufactureras del sector electrónico se vaya a implantar en el corto plazo en ninguna de las ZEE, a lo mucho, se prevé que se instalen empresas de servicios de soporte relacionados con el sector

Potencial:

- El Gobierno Americano no compra equipo hecho en China, oportunidad de negocio
- Se prevé una participación indirecta a través de la utilización de las TIC para mejorar la conectividad, las telecomunicaciones y los procesos industriales/productivos

3.9.15 ANEXO 15: COST COMPETITIVENESS OF MEXICAN SEZ CITIES ANALYSIS

A continuación se incluye el análisis de costos realizado por el Banco Mundial:



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Preface

This report has been prepared by MMK Consulting Inc. in association with KPMG Cárdenas Dosal, S.C.

About MMK Consulting Inc.

MMK Consulting is an independent management and business consulting firm specializing in:

- Planning, economics and financial evaluation
- International business competitiveness
- International site location strategy
- Economic development and investment attraction strategy
- Transportation and public infrastructure.

MMK Consulting was formed in 2001 by a group of professionals formerly with KPMG Consulting. Our professional staff have an average of more than 17 years of consulting experience, with a wide variety of education and experience in a range of industries and sectors. MMK Consulting continues to associate with KPMG on a variety of projects, including the management and execution of KPMG's global study of business costs, *Competitive Alternatives* (www.CompetitiveAlternatives.com).

About KPMG Cárdenas Dosal, S.C.

KPMG Cárdenas Dosal, S.C. is the Mexican member firm of the KPMG network of independent member firms affiliated with KPMG International Cooperative ("KPMG International"), a Swiss entity. KPMG International is one of the largest global audit, tax and advisory consulting firms. Its Global Strategy Group (GSG) practice in Mexico is part of a network of professionals in 41 countries with expertise in growth strategies, business plans and market entry assistance. GSG specializes in:

- Strategic planning
- Market analysis
- Market entry
- Target screening
- Site location
- Commercial due diligence

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1

This report presents a detailed analysis of location-specific business costs in the cities proposed for the creation of Mexico's new Special Economic Zones.

Executive summary

This report has been prepared for the World Bank Group in relation to consulting assistance it is providing to the Government of Mexico on matters related to the establishment of Special Economic Zones (SEZs) in southern Mexico. In this regard, this report has also been prepared for the use of the Secretaría de Hacienda y Crédito Público (SHCP), Secretaría de Economía (SE) and Banco Nacional de Obras y Servicios Públicos (Banobras).

The objective of this report is to provide a detailed assessment and ranking of business cost competitiveness for the proposed SEZ cities, relative to a range of comparison cities in Mexico. This information is intended to help understand the likelihood of investor interest in each zone, the types of businesses that may be attracted to a given zone, and the potential need for special incentives to offset cost disadvantages that may exist in a zone.

This study compares business costs in 10 cities, including five "Zone Cities". These include four cities already announced as SEZs – Coatzacoalcas, Lázaro Cárdenas, Salina Cruz and Tapachula-Puerto Chiapas – plus Paraiso, Tab., which is under evaluation as a potential site for a possible future fifth SEZ.

The study takes the approach of a "site selection" style cost evaluation of each city, for each of 12 industry-specific business operations. The study included research in each zone city and interviews with major employers and public institutions to obtain detailed information on business operating costs for each city.

Cities and industry operations

Zone cities	Industry operations
Coatzacoalcas, Ver.	Advanced batteries
Lázaro Cárdenas, Mich.	Aircraft parts
Salina Cruz, Oax.	Auto parts
Tapachula-Puerto Chiapas	Electronics assembly
Paraiso, Tab.	Food processing
Comparison cities	Medical device manufacturing
Manzanillo, Col.	Metal machining
Silao, Gto.	Pharmaceutical products
Tampico-Altamira, Tamps.	Plastic products
Metro cities	Precision components
Ciudad de México (CDMX)	Specialty chemicals
Monterrey, NL	Telecom equipment

Executive Summary

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This analysis has been developed utilizing the general methodology and modeling tools of KPMG's global business cost study series, *Competitive Alternatives* (www.CompetitiveAlternatives.com), for which MMK Consulting coordinates the global research, methodology and model design on KPMG's behalf. All recent editions of *Competitive Alternatives* have included both Mexico City and Monterrey among the international cities compared.

This study adapts the *Competitive Alternatives* study approach to create a domestic business cost analysis within Mexico. The 12 manufacturing industries compared in this study are the same as those included in the recent 2016 edition of *Competitive Alternatives*, but the business operating parameters have been adapted (as detailed in Chapter 3) to reflect industry models that are more labor intensive and less capital intensive, and thus better reflect Mexican domestic operations found in smaller cities.

This study examines 25 individual cost factors that typically vary by location (as detailed in Chapter 5). These cost factors are grouped within the following major categories: labor, facilities, transportation, utilities, cost of capital and taxes. These location-sensitive costs typically represent between 20 and 40 percent of total operating costs for the operations examined in this study. The remaining costs are assumed not to vary by location, with commodity raw materials, parts and subcomponents, as well as major plant and equipment, being the most significant location-insensitive costs.

Costs for all cities are expressed as a percentage cost index, relative to costs in CDMX equaling 100.0. Rankings are based on ascending business costs, with the lowest cost city ranking first.

Total annual business costs, average of 12 industry operations



Four cities have business costs lower than CDMX, led by Monterrey with a business cost index of 98.7, equating to a cost advantage of 1.3 percent. Costs in Manzanillo, Tapachula and Silao are also lower than in CDMX.

Among these cities, low transportation costs to US markets form the primary cost advantage for Monterrey. For Manzanillo and Silao, moderately low labor and transportation costs are key factors. For Tapachula, very low labor costs are more than offset by high transportation costs attributable to its far southern location.

Costs in the remaining cities are all higher than in CDMX. Costs in Tampico-Altamira, Coahuila de Zaragoza and Paraiso are less than 1.0 percent higher than in CDMX, while costs in Lázaro Cárdenas and Salina Cruz are 1.4 to 1.8 percent higher than in CDMX.

The study results are intentionally based only on business operating costs for each city and industry. This ranking does not consider qualitative aspects of each city, such as the ease of hiring suitably qualified employees, availability of local suppliers, or benefits of being part of an industry cluster.

Costs: Competitiveness of Mexican Cities

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Business Community

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The cost differentials between cities presented on the previous page are very low, mainly because materials (and other costs that don't vary with location) account for about 70 percent of total business costs. As a result, a difference of 3.5 percent in location-sensitive costs only results in a 1.0 percent difference in total costs. Furthermore, each city has various cost advantages and disadvantages, with savings for one cost factor often offset by higher costs for another cost factor.

The low cost differentials identified here help to explain the reluctance of many companies to locate operations in cities that do not already have a strong economic environment for manufacturing. Costs reflect only one aspect considered by companies when choosing business locations. In the absence of a compelling cost difference between cities, many firms will choose cities where doing business is perceived as easier (recruiting workers, local suppliers, quality infrastructure, etc.), thus minimizing the risk of an adverse bottom line.

However, in competitive industries, margins are tight and even a small improvement in margin can create an advantage relative to competitors. Therefore, some companies are willing to risk moving to "untested" locations if they have the potential to provide even a marginal cost saving. Overall, however, the low cost differences among cities identified in the analysis will tend to accentuate the significance of qualitative aspects in decisions among cities.

Two key themes that emerge from the results for the zone cities are the significance of transportation costs in the analysis and the tendency for all zone cities to rate best in industries where transportation costs are less significant.

A trade-off exists among the zone cities, as those with lower labor costs are also more distant from the major markets of Central Mexico and the US. For industries that are highly sensitive to transportation costs – those producing commodity products that are either heavy or bulky for shipping – savings in labor and facility costs do not offset the additional transportation costs associated with the zone city locations. This is true for both the more distant cities – where labor costs are lowest but transportation costs are higher, and for the more proximate zone cities – where the transportation premium is less but wages are higher.

This presents a further development challenge. The industries that are less sensitive to freight costs are those producing higher value products, especially tech products such as electronics and telecom equipment. However, the skills required by potential employers in these industries are more divergent from the existing skill sets of the workforce in the zone cities.

This challenge can be seen in the table of cost results by industry. For example, Tapachula ranks third in the analysis overall, but achieves the top rating in five industries. However, these all represent industries that are relatively more technical in nature.

Cost index results and rankings by industry

	Zone cities					Comparison cities			Metro cities	
	Coahuila de Zaragoza	Lázaro Cárdenas	Salina Cruz	Tapachula	Paraiso	Manzanillo	Silao	Tampico-Altamira	Ciudad de México	Monterrey
-Advanced batteries	100.5 (5)	102.5 (5)	103.6 (10)	100.9 (7)	101.4 (8)	99.4 (2)	99.5 (3)	100.7 (6)	100.0 (4)	98.1 (1)
-Aircraft parts	99.7 (5)	100.6 (10)	100.5 (9)	98.0 (1)	100.1 (8)	98.3 (2)	99.1 (4)	99.8 (6)	100.0 (7)	99.0 (3)
-Auto parts	100.4 (7)	101.3 (9)	101.5 (10)	98.5 (2)	100.8 (5)	98.9 (4)	98.9 (3)	100.1 (6)	100.0 (5)	98.5 (1)
-Electronics assembly	98.7 (8)	99.6 (9)	98.2 (4)	94.4 (1)	96.7 (6)	96.7 (2)	97.6 (3)	96.7 (6)	100.0 (10)	98.5 (5)
-Food processing	102.8 (8)	102.3 (7)	104.0 (10)	101.6 (6)	103.1 (9)	99.5 (2)	99.7 (3)	101.3 (5)	100.0 (4)	98.7 (1)
-Medical devices	99.8 (7)	100.5 (10)	99.9 (8)	96.8 (1)	99.3 (5)	97.3 (2)	98.5 (3)	99.5 (6)	100.0 (9)	98.8 (4)
-Metal components	101.7 (7)	103.4 (9)	104.8 (10)	101.7 (6)	102.7 (8)	100.4 (4)	100.1 (3)	101.6 (5)	100.0 (2)	98.1 (1)
-Pharmaceuticals	100.0 (6)	100.8 (10)	100.7 (9)	98.1 (1)	100.1 (8)	98.6 (2)	99.4 (4)	100.0 (5)	100.0 (7)	99.1 (3)
-Plastic products	100.7 (6)	102.7 (9)	103.7 (10)	100.1 (5)	101.6 (8)	99.2 (3)	99.2 (2)	100.8 (7)	100.0 (4)	99.0 (1)
-Precision components	100.6 (6)	101.7 (9)	102.5 (10)	100.6 (5)	101.1 (8)	99.9 (3)	99.8 (2)	100.6 (7)	100.0 (4)	99.0 (1)
-Specialty chemicals	100.6 (7)	101.2 (10)	101.0 (9)	99.5 (2)	100.5 (6)	99.8 (3)	100.3 (5)	100.6 (8)	100.0 (4)	99.4 (1)
-Telecom equipment	98.9 (6)	99.8 (9)	98.6 (5)	94.9 (1)	98.2 (4)	96.8 (2)	98.0 (3)	99.0 (8)	100.0 (10)	98.0 (7)
Manufacturing average	100.5 (7)	101.4 (9)	101.8 (10)	99.1 (3)	100.8 (8)	99.0 (2)	99.3 (4)	100.3 (6)	100.0 (5)	98.7 (1)

Cost competitiveness of Mexican Zone Cities

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Summary of Findings

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The cost analysis represents the primary focus of this study. However, the study research program included extensive interviews with major local businesses, infrastructure providers and economic development officials in each of the zone cities. Those interviews identified perspectives and issues that went beyond what could be quantified in the cost analysis but which are still highly relevant to the SEZ program.

These additional observations are discussed in more detail in Chapter 4, and include transportation infrastructure challenges (of varying degrees) for each of the SEZs. However, from these observations, generally positive themes emerge for two cities:

- In **Coatzacoalcas**, the skilled/technical labor pool in the city is well developed with strong local educational institutions. The city offers a good quality of life and businesses are able to attract talent from elsewhere in Mexico and overseas. The business environment is quite dynamic, with substantial new industrial, residential and retail development in recent years. The national energy reforms are viewed as a potential business opportunity, and local business leaders have come together as a team to advance the development of the city.
- **Tapachula** is the only city where a stable security situation was widely identified as an asset. Significant attention is required for workforce development, but this investment produces workers who are generally described as creative and reliable, with excellent manual ability and very low labor costs. The fertile region shows rich potential for agriculture and food processing, although improvements in agricultural productivity are required to fully realize this potential. State and local economic leaders showed both pride and purpose in their initiatives to support economic development.

The other three cities appear to represent more challenging scenarios for advancing a major economic development initiative like the SEZ program.

- In **Lázaro Cárdenas**, large dominant employers with strong unions raise prevailing wages such that labor costs are similar to CDMX, while low quality of life means that salary premiums are often required for relocating employees. The port is a major asset for the city, but the existing airport is sub-standard. The industrial real estate market is especially illiquid, with interviews revealing instances of organized crime hindering the free operation of the market. Major problems with insecurity were raised continually by interviewees, representing the primary challenge for the city.
- For **Salina Cruz**, transportation infrastructure issues are potentially greater than in any other city, with quality issues impacting both road and rail connections, as well as the complete lack of a local airport. Labor relations represent the other major problem in Salina Cruz, with powerful unions that are a force to be reckoned with at every stage of the industrial process. Prolonged union blockades of highways are a recurring annual event, adding to logistics costs and having driven some companies away from the area. For local business leaders, their priority concern is to resolve the blockade issue and save the remaining companies in the city, ahead of trying to attract new investment.
- In **Paraíso**, the economy is entirely dependent on offshore oil exploration and production, and is strongly cyclical. The local economy is currently very depressed due to large cutbacks stemming from low oil prices and uncertainty over energy reforms. Wage rates are not low, yet workforce development is negligible beyond the needs of the oil industry and very limited amenities make it a challenge to attract qualified workers to the city. Violent crime is reported to have risen rapidly over the last year, in conjunction with job losses.

These observations go beyond the scope of this study, but are included in this report for World Bank, SHCP, SE and Banobras, as valuable insights learned from local business leaders through the study research program.

Costs of Investment in Mexican SEZ Cities

The primary objective of this study was to quantify the costs of doing business in the SEZ cities. This report achieves that objective, with detailed analysis of key cost factors for each city. The final conclusion is that Tapachula and Coatzacoalcas are the SEZs that may offer a potentially compelling case for business investment, for some industries in the case of Coatzacoalcas. In the SEZs, other significant industrial risks, such as unions, are likely to remain more of a barrier to potential investment.

2

A special economic zone (SEZ) refers to a designated area within a country with specific regulations that differ from other areas of the country, with measures that are conducive to attracting business investment.

Study background

Mexico's SEZ initiative

In 2014, the Mexican President, Enrique Peña Nieto, announced the intention to establish a legal regime for the creation of Special Economic Zones in Mexico. The objective of the SEZ initiative is to establish a separate legal framework for businesses that invest and operate within special zones, to better facilitate business investment and to foster economic development in the zone areas. This initiative is following a similar approach to other SEZs already established, or in the process of being established, in Central America, including the Pacifico and City of Knowledge SEZs in Panama and the Trujillo SEZ in Honduras. SEZs also exist in many other regions of the world.

Mexico's SEZ initiative is currently proposing to establish four SEZs, focusing on the lesser-developed southeast region of the country. To help address high levels of poverty in the region and create jobs, the SEZ strategy is focusing on nationally or regionally significant sea ports to provide a favorable investment opportunity for larger export-oriented firms. The four proposed SEZs are as follows:

- ▶ **Coatzacoalcas, Veracruz** – Primarily a bulk commodity port located approximately 250 kilometers south of Mexico's major Gulf Coast port, the Port of Veracruz.
 - ▶ **Lázaro Cárdenas, Michoacán** – Mexico's second busiest Pacific port (behind Manzanillo).
 - ▶ **Puerto Chiapas, Chiapas** – Mexico's most southern Pacific port located close to the regional city of Tapachula. The port has container and bulk facilities, but with very limited traffic and a focus on cruise ship traffic.
 - ▶ **Salina Cruz, Oaxaca** – A regional port that has both bulk and container facilities and an established cargo feeder service north to Manzanillo.
- In addition, consideration is being given to a possible future fifth zone located in Tabasco:
- ▶ **Paraíso, Tabasco** – A candidate city being considered for a possible SEZ in Tabasco state, Paraíso has a small port (Puerto Dos Bocas) that primarily serves Pemex offshore exploration and production work.

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The role of the World Bank

The World Bank Group has been consulting to the Government of Mexico on matters related to location, regulation, infrastructure and other factors that will be required for the SEZs to have the potential to succeed. The World Bank team has been considering issues related to potential investors, the competitive landscape and experiences that can be learned from the creation of SEZs in other parts of the world.

In this regard, the World Bank is working with the following agencies of the Mexican Government as partners in the SEZ initiative:

- ▶ Secretaría de Hacienda y Crédito Público (SHCP)
- ▶ Secretaría de Economía (SE)
- ▶ Banco Nacional de Obras y Servicios Públicos (Banobras).

As part of this process, the World Bank Group wanted to develop a detailed understanding of the costs of doing business in each of the SEZ cities, as relative business costs will impact the likelihood of investor interest in each zone, the types of businesses that may be attracted to a given zone, and the potential need for special incentives to offset cost disadvantages that may exist in any of the zones.

Competitive Alternatives study

Since 1996, KPMG's *Competitive Alternatives* study (www.CompetitiveAlternatives.com) has been providing independent comparisons of international business location costs in cities and countries around the world, with a special focus on locations in the NAFTA marketplace. The most recent 2016 edition of this biennial study includes two cities in Mexico – Monterrey and Mexico City. *Competitive Alternatives* also includes detailed comparisons of business costs as they apply to specific industries.

Competitive Alternatives represents a valuable reference for corporations evaluating national or international location options, and also assists economic developers and corporate site selectors in understanding cost competitiveness issues as they apply across a broad range of jurisdictions and industries. MMK Consulting manages many aspects of the *Competitive Alternatives* study on behalf of KPMG, including the coordination of global research, methodology and model design, analysis and report development.

After reviewing various studies, the World Bank Group concluded that *Competitive Alternatives* represents a "best in class" approach to assessing and comparing, in detail, business cost factors that vary by location and industry. That conclusion led to the development of this study, with the objective of applying and adapting the *Competitive Alternatives* methodology and model to a domestic study of business costs within Mexico, including the SEZ cities.

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This study compares major location-sensitive business cost factors for:

10 Mexican cities, including the four proposed SEZs, and 12 manufacturing industries.

About this study

Study objective

The objective of this report is to provide the World Bank, SHCP, SE and Banobras with a detailed assessment and ranking of business cost competitiveness for the four proposed SEZ cities, relative to a range of comparison cities in Mexico.

To achieve this objective, this study applies and adapts the methodology and model developed for the global *Competitive Alternatives* business cost study to create a domestic study of business costs within Mexico. This chapter describes key aspects of the study scope and approach, noting both aspects that are consistent with the global *Competitive Alternatives* study and aspects that required adaptation for this domestic study.

Delivering on this objective, this report provides:

- An overall business cost index for each city and an overall ranking of each city based on total business costs
- Cost index results and rankings for each of 12 individual manufacturing industries, based on model business operations that are specific to each industry
- An analysis and comparison of specific major business cost factors that both underlie the results and help explain the rankings for the cities and industries compared.

This study utilizes analytical approaches and data sources similar to those used by corporations in site selection projects and presents a comparison of relevant business costs as they may be perceived by a mid-to-large corporation (and/or its advisors) undertaking a site selection study. However, due to the potentially significant economic benefits that could accrue to zone cities and firms from the success of the SEZ initiative, we received cooperation and access to corporate data of firms operating in zone cities that would not typically be available to a corporate site selection project.

While great care has been taken in performing this analysis and developing the findings, the comparisons presented are of a general nature and should not be interpreted as a definitive or final opinion on the merits of locating any specific facility in one city over another.

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about this study - Locations

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Locations

This study includes comparisons for a total of 10 cities in Mexico, grouped in three categories as follows.

Core to the analysis are five **Zone cities**:

- Coatzacoalcas, Veracruz
- Lázaro Cárdenas, Michoacán
- Salina Cruz, Oaxaca
- Tapachula-Puerto Chiapas, Chiapas
- Paraiso, Tabasco – added to the analysis as it is being considered by SHCP, SE and Banobras as a site for a possible future fifth SEZ.

In addition, three **Comparison cities** were chosen by SHCP, SE and Banobras for benchmarking relative to the zone cities:

- Manzanillo, Colima
- Silao, Guanajuato
- Tampico-Altamira, Tamaulipas.

These cities were chosen based on similarities to one or more of the zone cities – notably all being logistics centers (including Silao's "Puerto Interior" logistics hub). These cities are also more familiar to existing business investors and represent cities with degrees of economic advancement that the zone cities may aspire to achieve through the development of the SEZs.

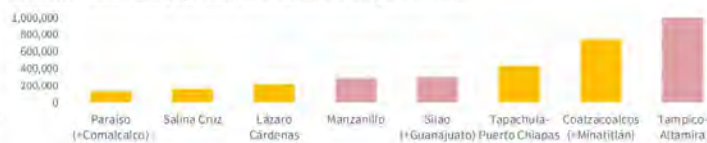
Rounding out the group of 10 cities for this study are two major **Metro cities**:

- Ciudad de México (CDMX) metro area
- Monterrey metro area.

These cities were already represented in the 2016 *Competitive Alternatives* study and provide a link to that study to enable broader international comparisons.



Estimated "urban area" populations of the Zone and comparison cities



Copyright Competitiveness of Mexican Cities

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Industries

This study includes analysis of 12 industry-specific manufacturing operations, as detailed in the table, reflecting the same 12 manufacturing industries that were compared in the global *Competitive Alternatives* study. Each industry is analyzed based on one model business operation, which defines key parameters for facilities, capital equipment, staffing, materials, utilities, logistics, financing and sales.

The industry models used in *Competitive Alternatives* are based upon typical practices of operations in the United States and other advanced economies. In *Competitive Alternatives*, these industry models are also applied to Monterrey and Mexico City. This is considered appropriate and reflective of advanced industrial facilities that exist in key centers in central and northern Mexico. Sophisticated automotive and aerospace plants in those regions are similar in many regards to equivalent plants in the US and depend on recruiting top-notch industrial staff who can be found in these large metro cities.

However, such advanced facilities represent the leading edge of the Mexican industrial economy and workforce. Even in the major Mexican cities, other manufacturing operations rely on the plentiful pools of affordable labor to staff production processes that are more labor-oriented than would be seen in the US.

For analyzing business operations in the smaller, less developed zone cities, it is both appropriate and necessary to reflect industry models that are more labor intensive and less capital intensive. Therefore, while this study compares the same industries as *Competitive Alternative*, the operating parameters for each industry have been modified in this study to better reflect typical Mexican domestic operations.

Revised operating parameters for each industry were developed utilizing industry-average data from Instituto Nacional de Estadística y Geografía (INEGI), data received from firms interviewed for this project, reviews of public project announcements for new industrial facilities established in Mexico in recent years, and data from the *Competitive Alternatives* 2012 comparison of Mexico, Brazil, China, India and Russia.

The revised industry models developed for this study are reflective of the study locations as follows:

- **Mexico City and Monterrey** - the model operations reflect older, less sophisticated (and potentially domestic) manufacturing operations

- **Comparison cities and Coatzacoalcos** - the model operations reflect more typical manufacturing operations seen in these cities, including some foreign-owned plants

- **Zone cities (except Coatzacoalcos)** - the model operations reflect the aspirations of the smaller zone cities to develop a modern industrial base.

The 2016 *Competitive Alternatives* study also included analysis of seven business-sector service operations (e.g., IT, R&D, etc.). However, this study focuses exclusively on manufacturing, given its potential for export-oriented trade and its better fit with the education levels of the workforce in the zone cities.

Industry business operations

Business operation modeled	Relevant industry
Advanced batteries	Green energy
Aircraft parts	Aerospace
Auto parts	Automotive
Electronics assembly	Electronics
Food processing	Agri-food
Medical device manufacturing	Medical devices
Metal machining	Metal components
Pharmaceutical products	Pharmaceuticals
Plastic products	Plastics
Precision components	Precision manufacturing
Specialty chemicals	Chemicals
Telecom equipment	Telecommunications

Cost factors

This study examines 25 individual cost factors that are likely to vary significantly by location. These cost factors were all considered in the global *Competitive Alternatives* study, although that study also included one additional cost category that is not relevant in this analysis (office leasing).

In the advanced economies compared in *Competitive Alternatives*, these location-sensitive cost factors generally represented between 25 and 65 percent of total operating costs for the manufacturing operations examined. However, due to lower labor costs in Mexico and differences in the operating profiles of the operations considered in this analysis, the location-sensitive cost factors only represent between 20 and 40 percent of total operating costs for the domestic manufacturing operations examined in this study.

Some significant costs do not vary by location. Costs for commodity raw materials, parts and subcomponents for manufactured products, as well as major plant and equipment, tend to be governed by world market prices or are fixed at other levels of the supply chain. Therefore, these costs do not vary substantially by location and are held constant for comparison purposes.

A number of less significant cost factors, such as advertising, accounting services and office supplies, are also location-sensitive, but do not have a material impact on the comparison of locations and are not examined in this study.

25 location-sensitive cost factors

Labor costs	Utility costs
Wages and salaries:	14. Electricity
1. Pay rates for 42 job positions	15. Natural gas
Statutory plans:	Cost of capital
2. Government pension plans	16. Financing costs (interest)
3. Public medical plans	17. Depreciation charges
4. Unemployment insurance	
5. Workers' compensation	Taxes other than income
Other employee benefits:	18. Property taxes
6. Paid time off (holidays & vacation)	19. Capital taxes
7. Private health insurance	20. Sundry local business taxes
8. Other discretionary benefits	21. Transaction and sales taxes
Facility costs	Corporate income taxes
9. Factory leasing	22. National
10. Industrial land	23. Regional (state)
11. Industrial construction	24. Local
Transportation costs	Incentives
12. Surface freight (road & sea)	25. Tax and other incentives
13. Air freight	

Study approach

Research in zone cities

Given the small size of the zone cities examined in this study, very little relevant data was available for these cities from online statistical, data and information sources commonly utilized in the global *Competitive Alternatives* study. As a result, this study included extensive field research, with a project research team from MMK Consulting and KPMG Mexico spending two full days on-site in each zone city during late-June and July of 2016. Field research included interviews with major local businesses, infrastructure providers (utilities, transportation, etc.) and local economic development officials. In total, more than 60 such interviews were completed in the five zone cities. Limited numbers of telephone interviews were also completed for the comparison cities (for which much more online data was available).

Many organizations were generous in their willingness to share confidential data related to their business operating costs in each of the study cities. In the zone cities, data were received from a majority of the major industrial employers in each city. All such data was received by the project team on a confidential basis and individual firms are not identified in this report. However, the project team wishes to express its sincere gratitude to all participating firms, without whose support this study would not have been possible.

Costs for zone cities

The Special Economic Zone initiative foresees the establishment of a SEZ in each zone city, as a secured, customs-controlled, modern industrial park with all utilities on hand for businesses that choose to invest in the SEZ. Typically, SEZs are also expected to have favorable business regulations and/or incentives that only apply to businesses located in the SEZ. For the new Mexican SEZs, such regulations or incentives are still in the design process.

Therefore, the analysis presented in this study does not attempt to forecast the costs of doing business that may ultimately apply to businesses locating in the proposed SEZs. Many variables exist that will influence those future costs. Instead, this study focuses on the current cost of doing business (as at July 2016) in each of the zone cities, with their existing labor market conditions, real estate markets, utility infrastructure and tax rules/regulations.

The resulting analysis is informative of how business costs in these cities compare at this point in time, prior to the creation of the SEZs. This analysis is intended to provide insights to the World Bank, SHCP, SE and Banobras to help move forward with various aspects of the SEZ project, including identification of industries that may be attracted to specific zone cities, design/development of the SEZ industrial parks, and also design/development of regulatory enhancements and incentives that may be useful to offset any identified cost disadvantages of specific zone cities.

Competitive Alternatives Cost Model

This study is based on the proprietary *Competitive Alternatives Cost Model* which analyzes costs for many different types of business operations across multiple geographic locations. The model applies current business cost data for each location to a set of business operating specifications that are held constant for all locations. The result is a comparison of the estimated cost of establishing and operating an equivalent facility in each location.

The model generates 10-year pro forma reports, including income statements, cash flows and detailed tax calculations. These reports form the basis of the cost comparisons presented in this study.

Income statement analysis

The comparisons presented in this report are based on income statement analysis. All items are treated on a cash basis, except for initial investments in capital assets, including land and buildings (where relevant). Capital investments are reflected in annual depreciation, as well as in interest charges on the debt associated with facility start-up. This measurement approach has been chosen due to its widespread use in business and its usefulness in highlighting the sources of cost differences among locations.

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Physical productivity

This study compares specific types of business operations from the viewpoint of a business investor. It should not be interpreted as comparing overall levels of macroeconomic productivity among locations.

Physical productivity is the result of four main factors, which are addressed in this study as follows.

Actual hours worked, including costs for paid time off (vacation and holidays), are included in the analysis on the assumption that absent workers must be covered by temporary labor, overtime or additional staffing to keep the facility running year round.

Capital and technology applied are assumed to be equal in all locations, as the model compares identical facilities in every location. The effort required to recruit workers with the required industrial skills may vary among cities, and the study research interviews confirmed this fact. Such issues are noted in the discussion of each city in this report, but could not be quantified and are not included in the cost analysis.

Core workplace training provided by a company to its employees is also assumed to be equal in all locations for this comparison of identical facilities.

Physical productivity of workers recognizes the possibility that, given the same hours, tools and training, workers in some locations may be more productive (i.e., achieve higher output per hour worked). This factor is extremely difficult to assess in an objective manner and the study does not differentiate between locations on this basis.

Business cost index

In this report, business costs are expressed as a percentage index, with Ciudad de México (CDMX) being assigned a baseline index of 100.0. An index below 100 indicates lower costs than in CDMX while an index over 100 indicates higher costs than in CDMX. For example, an index result of 95.0 represents a 5.0 percent cost advantage relative to CDMX.

Exchange rates

For this project, data were collected primarily in Mexican pesos (MXN\$) and data in this report are primarily presented in MXN\$. Where raw data was received in US dollar or other currency terms, it was converted to MXN\$ using an exchange rate relevant to the point in time to which the data related.

While the cost research was undertaken in MXN\$, the *Competitive Alternatives Cost Model* is designed for international cost comparisons and produces all reports in US dollars (USD\$). The exchange rate used for this conversion is MXN\$18.09 per USD\$, reflecting the average exchange rate of the US Federal Reserve Board for the months of April, May and June of 2016. The selection of this exchange rate has a neutral impact on the comparisons and rankings for the 10 Mexican cities included in the study.

However, exchange conversion is relevant to the broader international comparisons presented in Chapter 7 of this report and those international comparisons are sensitive to exchange rates.

Interpretation of results

While great care has been taken in performing this analysis and developing the findings, the resulting comparisons are of a general nature. All factors examined in this study are subject to change over time due to changes in local laws, regulations and/or market conditions. The results of this study should not be interpreted as a definitive or final opinion on the merits of locating any specific facility in one city over another. Further analysis is required to determine the preferred site for any specific facility or operation.

This report has been prepared for the exclusive use of the World Bank, Secretaría de Hacienda y Crédito Público, Secretaría de Economía and Banco Nacional de Obras y Servicios Públicos. MMK Consulting does not take responsibility for any distribution of this report to third parties.

This study focuses on the current cost of doing business in the communities, without accounting for infrastructure, real estate markets, quality of life, and regulatory requirements. The study effectively represents the "pre-SEC" state of these cities, as of July 2016.

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The cost of doing business in each city is calculated by assessing the impacts of 25 location-sensitive cost factors on total costs for each of 12 industry-specific business operations.

SEZ city results

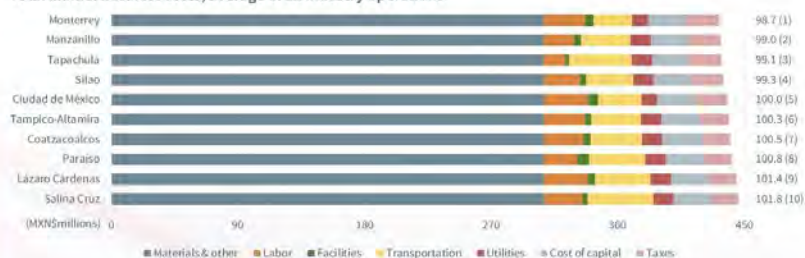
The overall results for each city, presented here, reflect the combined results for all cost factors and industries examined. Costs for all cities are expressed as a percentage cost index, relative to costs in CDMX equaling 100.0. Rankings are based on ascending business costs, with the lowest cost city ranking first.

Four cities have business costs lower than CDMX, led by Monterrey with a business cost index of 98.7, equating to business costs 1.3 percent below CDMX. Costs in Manzanillo, Tapachula and Silao are also lower than in CDMX.

Among these cities, low transportation costs to US markets form the primary cost advantage for Monterrey. For Manzanillo and Silao, moderately low labor and transportation costs are key factors. For Tapachula, very low labor costs are more than offset by transportation costs attributable to its far southern location.

Costs in the remaining cities are all higher than in CDMX. Costs in Tampico-Altamira, Coatzacoalcas and Paraiso are less than 1.0 percent higher than in CDMX, while costs in Lázaro Cárdenas and Salina Cruz are 1.4 to 1.8 percent higher than in CDMX.

Total annual business costs, average of 12 industry operations



SEZ Policy Summary

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Low cost differentials

The cost differentials between cities presented on the previous page are very low, because:

- For the manufacturing firms examined, costs for materials, parts, components and other costs that do not vary by location account for 70 percent of total business costs. Therefore, a difference of 3.5 percent in location-sensitive costs causes only a 1.0 percent difference in total costs.
- Each city has various cost advantages and disadvantages, with savings for one cost factor often offset by higher costs for another cost factor.
- Corporate income taxes also reduce the cost differentials between cities, as cities with lower business costs see higher net income, resulting in higher costs for corporate income tax.

It is important to emphasize that these results are based exclusively on estimated business operating costs for each city and industry. The rankings do not consider qualitative aspects of each city, such as the ease of hiring suitably qualified employees, the availability of local suppliers, or the benefits of being part of an industry cluster.

The low cost differentials identified here help to explain the reluctance of many companies to locate operations in cities that do not already have a strong economic environment for manufacturing. Costs reflect only one aspect considered by companies when choosing business locations. In the absence of a compelling cost difference between cities, many firms will choose cities where doing business is perceived as easier (recruiting workers, local suppliers, quality infrastructure, etc.), thus minimizing the risk of an adverse bottom line.

However, in competitive industries, margins are tight and even a small improvement in margin can create an advantage relative to competitors. Therefore, some companies are willing to risk moving to "untested" locations if they have the potential to provide even a marginal cost saving. Overall, however, the low cost differences among cities identified in the analysis will tend to accentuate the significance of qualitative aspects in decisions among cities.

Key themes for SEZ cities

This chapter presents the results of the analysis for the five zone cities – the four SEZ cities plus Paraiso as a potential future zone. Ascertaining and comparing the costs of doing business in these zone cities is primary purpose of this study.

Two key themes that emerge from the results for the zone cities are the significance of transportation costs in the analysis and the tendency for all zone cities to rate best in industries where transportation costs are less significant. A trade-off exists among the zone cities, as those with lower labor costs are also more distant from the major markets of Central Mexico and the U.S.

The analysis finds that for industries that are highly sensitive to transportation costs – those producing commodity products that are either heavy or bulky for shipping – savings in labor and facility costs do not offset the additional transportation costs associated with the zone city locations. This is true for both the more distant cities – where labor costs are lowest but transportation costs are higher, and for the more proximate zone cities – where the transportation premium is less but wages are higher.

This presents a further development challenge. The industries that are less sensitive to freight costs are those producing higher value products, especially tech products such as electronics and telecom equipment. However, the skills required by potential employers in these industries are more divergent from the existing skill sets of the workforce in the zone cities.

In addition to the detailed cost analysis, the data collection program for this study included extensive interviews with major local businesses, infrastructure providers and local economic development officials in each of the zone cities. Those interviews identified perspectives and issues that went beyond what could be quantified and captured in the cost analysis. Therefore, the summary for each city presented in this chapter includes a section for additional observations relevant to the SEZ program, as identified in the research interviews.

Results for all cities

In addition to the SEZ city summaries presented in this chapter, results for all cities (including the comparison cities and metro cities) can be found in the following chapters:

- Chapter 5 presents detailed comparisons of individual cost components for all cities.
- Chapter 6 presents results for each of the 12 industry operations examined in this study, showing results for all cities for each industry.

SEZ Policy Summary

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Coatzacoalcos

Coatzacoalcos ranks seventh among the 10 cities compared, with average total business costs 0.5 percent higher than in CDMX.

Results by industry

Among the 12 industries compared, business costs in Coatzacoalcos are lower than in CDMX (i.e., cost index <=100.0) for the following five industries:

- ▶ Aircraft parts
- ▶ Electronics assembly
- ▶ Medical devices
- ▶ Pharmaceuticals
- ▶ Telecom equipment.

These industries all have a relatively lower significance of transportation costs among total costs, with transportation costs being below the average for all industries. The products of these industries are relatively higher in value, making transportation less significant in the final cost composition of the product.

The electronics assembly, medical devices and telecom equipment industries use very limited quantities of gas, helping to contain Coatzacoalcos' cost disadvantage for utilities relative to CDMX. For these industries, utility costs in Coatzacoalcos are no more than 18 percent higher than in CDMX, as compared to cost disadvantages for utilities that can exceed 50 percent in some industries.

Finally, the pharmaceuticals and aircraft parts industries require some of the highest skilled workers among the industries compared, with over one quarter of the total workforce for these two operations falling in the top skill category for production workers. Wages in Coatzacoalcos are relatively more competitive for higher skilled positions than for lower skilled jobs, creating an advantage for these particular industries.

In addition to these industries, Coatzacoalcos also ranks well in the advanced batteries industry, ranking in fifth place among the 10 cities despite having business costs 0.5 percent higher than CDMX. Relative to its overall seventh place ranking, Coatzacoalcos moves up in the rankings for this industry due to:

- ▶ High transportation costs for a heavy/bulky product, which disadvantages Tapachula and causes it to drop behind Coatzacoalcos in the rankings.
- ▶ A highly skilled workforce with a strong complement of product engineers provides an advantage to Coatzacoalcos and allows it to move ahead of Tampico-Altamira in the rankings. Salaries for senior professional employees are relatively higher in Tampico-Altamira than in Coatzacoalcos.

It is important to emphasize that the industry results and rankings presented here are based exclusively on estimated business operating costs for each city and industry. The rankings do not consider qualitative aspects of each city, such as the ease of hiring suitably qualified employees, the availability of suppliers, or the benefits of being part of an industry cluster.

Results by industry, Coatzacoalcos

Industry	Cost index (CDMX=100)	Rank
- Advanced batteries	100.5	5
- Aircraft parts	99.7	5
- Auto parts	100.4	7
- Electronics assembly	98.7	8
- Food processing	102.8	8
- Medical devices	99.5	7
- Metal components	101.7	7
- Pharmaceuticals	100.0	6
- Plastic products	100.7	6
- Precision components	100.6	6
- Specialty chemicals	100.6	7
- Telecom equipment	98.9	6
Manufacturing average	100.5	7

Results by main cost factor, Coatzacoalcos

Cost factor	% differential (v. CDMX)	Rank
- Labor costs	-11.6%	6
- Facility costs	-24.0%	7
- Transportation costs	+18.0%	6
- Utility costs	+30.3%	4
- Financing costs	+0.5%	7
- State and local tax costs	-51.8%	8
Total costs	+0.5%	7

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Cost factors

Relative rankings for Coatzacoalcas for major cost factors are shown in the second table on the previous page.

For labor costs, Coatzacoalcos ranks sixth among the 10 cities, ahead of Tampico-Altamira, Monterrey, Lázaro Cárdenas and CDMX. However, labor cost rankings vary based on the required degree of skill in the workforce. Coatzacoalcos is relatively more competitive for higher skilled workers, but fares worse when operations require a large proportion of lesser skilled workers (e.g., for the highly manual auto parts operation. Coatzacoalcos ranks eighth labor costs).

Coatzacoalcos ranks seventh among the 10 cities for facilities costs, with industrial leasing costs that are higher than in most other cities, but lower than Monterrey, CDMX and Paraiso. Coatzacoalcos has the highest industrial land costs among the comparison cities, with significant residential and retail development in recent years pushing up general land values in the city.

Coatzacoalcas also ranks sixth for transportation costs, with the lowest freight costs among the five zone cities. This ranking reflects the geographical location of Coatzacoalcas relative to the other zone cities, with Coatzacoalcas having lower freight costs to CDMX/Central Mexico, the lowest transfer costs to both Veracruz and Altamira ports (for container traffic), and Gulf Coast highway access to the US Southeast, which reduces its distance to major destinations in the eastern US.

For utilities, Coatzacoalcos ranks fourth among the 10 cities, behind CDMX and Monterrey (which both benefit significantly from availability of natural gas pipelines, as discussed in the next chapter) and almost equal with third-ranked Salina Cruz.

For state and local taxes, Coatzacoalcos has the lowest property tax costs among the study cities, even with its relatively high real estate values. However, the salaries tax (ISN) rate for Veracruz state is equal highest among the study jurisdictions at 3.0 percent, leaving Coatzacoalcos with the eighth highest cost for that tax.

These high level conclusions are derived from the analysis of all cost factors across the 12 industry operations compared. Cost factor rankings vary by industry.

The tables on this page present the detailed values used for Coatzacoalcos for several of the main cost factors considered in the analysis. Comparisons and city rankings for these detailed cost factors can be found in Chapter 5.

Values for key labor cost factors, Coatzacoalcos

	Low	High	Final wage	Fully loaded?
Production wages				
General laborers-materials handlers	28,000	100,000	79,700	112,230
Process workers-manual	45,000	120,000	88,500	124,658
Process workers-machine tenders	57,000	145,000	116,500	163,375
Process workers-machine operators	96,000	180,000	140,200	194,843
Production supervisors	165,000	290,000	205,100	285,038
Admin and management wages/salaries				
Clerks	48,000	105,000	84,800	111,809
Admin assistants	75,000	170,000	115,300	180,523
Accountants	120,000	265,000	199,800	265,330
IT specialists	105,000	265,000	175,500	232,322
Senior managers	215,000	840,000	467,400	609,906
Top plant managers	730,000	1,220,000	922,800	1,099,605

† Includes all spouses and parents who were paid no funeral or arrangement fees but were given up for paid funeral services. This category is not reported in the region's prior year not working category because they are considered to have a paid funeral and burial to report. It is a special case of a funeral without a burial and is therefore presented separately.

Values for key other cost factors, Coatzacoalcos

	Low	(MIXIS) High	Final value
Real estate			
Industrial facility lease cost - per m ² /month	25.00	105.00	67.50
Industrial land sale price - per m ²	200	3,400	1,150
Industrial facility construction cost - per m ²	3,900	7,200	6,000
Transportation			
Full truckload cost to COMIX			22,733
Full truckload cost to Dallas			53,294
40' container cost to Rotterdam			33,910
40' container cost to Yokohama			64,451
Utilities			
LPG price - per L, exc. IVA			6.72
State and local taxes			
Tax on salaries paid (ISN)			3.00%
Tax rate for business real estate transfer			1.00%
Effective rate for property tax - % of FMV			0.0675%

Additional observations

In addition to the quantitative cost analysis presented above, study research interviews for Coatzacoalcos identified the following qualitative observations relevant to the SEZ program.

Labor:

- The skilled/technical labor pool in the city is well developed and local educational institutions maintain a good supply new workers. Naturally, the educational focus is heavily oriented towards petrochemicals, but with sufficient numbers also studying business, administration and medicine.
- Businesses in Coatzacoalcos are able to attract labor to the city from elsewhere in Mexico and even from overseas. Wages in the city are higher than in many parts of the country and the city offers a good quality of life relative to its size.
- Unions are strong in Coatzacoalcos, with Pemex' presence boosting the strength of the local unions. However, despite concerns over coordination of unions in the Isthmus region for strikes and blockades, generally productive union relations were noted by several interviewees.

Real estate:

- Suitable large land parcels exist for industrial development in close proximity to main highways and the existing petrochemical complexes. Pemex is the owner of many of these land parcels.
- The city is located in a sandy river delta region. This can lead to increased construction costs in general, and especially in certain parts of the city due to expensive land preparation work being required as part of building construction.

Transportation infrastructure:

- Freight services available at Coatzacoalcos Port include limited but direct container service to/ from Manatee, Florida and rail-car barge service to/ from Mobile, Alabama. These options could not be utilized within the freight distribution methodology of this cost analysis, but could be significant advantages for some firms.
- However, the lack of dedicated container handling equipment at the Port was noted by several interviewees as an obstacle holding back further industrial development in Coatzacoalcos.
- New shipping wharves developed in the Pajaritos petrochemicals zone provide good capacity for future expansion of bulk freight without the port becoming saturated.
- Coatzacoalcos is well connected in terms of major highways, with good accessibility to Villahermosa and Veracruz (city) being seen as strategic assets for the city. However, highway access across the Isthmus was frequently cited as being deficient.

Utilities:

- Utilities infrastructure in Coatzacoalcos is generally perceived as being quite good, with companies being satisfied with electric and water services and not reporting issues with service interruptions.
- The petrochemical complexes here provide opportunities for inexpensive electric supply from cogeneration projects and the potential to connect to natural gas by pipe. These represent significant potential advantages to energy-intensive firms.

- Coatzacoalcos was noted as being a fiber optic hub for southern Mexico, providing an advantage to firms requiring high network bandwidth.

Security situation:

- Interviewees in Coatzacoalcos expressed some concerns regarding deterioration of security and increased crime in the city, causing some people to move away from the city. However, overall concerns on this issue in Coatzacoalcos were much less than in some of the other zone cities and it was noted that the security situation here is more favorable than in Veracruz (city).

Business environment:

- The business environment of the city was observed to be much more dynamic than in the other zone cities. Substantial new industrial, residential and retail development has occurred in the last few years. In addition, development is underway for a high quality, major new industrial park, similar to major parks typically seen in northern Mexico.
- The national energy reforms are viewed with optimism in Coatzacoalcos, as a source of potential business opportunity for the city. It was noted that potential exists to combine this opportunity with the SEZ initiative, to help ensure the successful launch of the new SEZ.
- The business community in Coatzacoalcos is reported to have become more far more united in recent years, with competitor firms working together for the good of the city and to further the development of the city as an industrial center.

Lázaro Cárdenas

Lázaro Cárdenas ranks ninth among the 10 cities compared, with average business costs 1.4 percent higher than in CDMX.

Results by industry

Among the 12 industries compared, business costs in Lázaro Cárdenas are lower than in CDMX (i.e., cost index <=100.0) for the following two industries:

- ▶ Electronics assembly
- ▶ Telecom equipment.

These two industries represent the industries that have the lowest significance of transportation costs among all 12 industries compared. For these industries, their products are high value, making transportation less significant in the final cost composition of the product. This largely negates the transportation cost advantages typically held by CDMX in other industries and sees CDMX drop to last place among the cities for these two industries.

For this reason, combined with lower costs for facilities and taxes, Lázaro Cárdenas manages to rank ahead of CDMX for the electronics assembly and telecom equipment industries, despite having labor costs virtually equivalent to CDMX.

Lázaro Cárdenas also ranks well in the food processing industry, ranking in seventh place. This is the only industry where Lázaro Cárdenas achieves a ranking better than its ninth place overall.

When compared to its ninth place ranking for most industries, Lázaro Cárdenas moves up in the rankings for this industry due mainly to the impact of specific transportation costs. The food processing industry has high transportation costs due to being a relatively bulky and lower value product. In addition, for this industry product distribution is more oriented toward regional markets than overseas exports. The combined impact of these factors on total transportation costs provides a relative cost advantage to Lázaro Cárdenas and allows it to move ahead of both Coahuila de Zaragoza and Paraiso in the rankings.

While Lázaro Cárdenas ranks well in the food processing industry, its business costs in that industry are still 2.3 percent higher than CDMX. This cost disadvantage is partially attributable to Lázaro Cárdenas having higher wages than CDMX for lower skilled jobs. Total labor costs in Lázaro Cárdenas are 2.2 percent higher than CDMX for this operation – higher than in all other cities.

It is important to emphasize that the industry results and rankings presented here are based exclusively on estimated business operating costs for each city and industry. The rankings do not consider qualitative aspects of each city, such as the ease of hiring suitably qualified employees, the availability of suppliers, or the benefits of being part of an industry cluster.

Results by industry, Lázaro Cárdenas

Industry	Cost index (CDMX=100)	Rank
- Advanced batteries	102.5	9
- Aircraft parts	100.6	10
- Auto parts	101.3	9
- Electronics assembly	99.6	9
- Food processing	102.3	7
- Medical devices	100.5	10
- Metal components	103.4	9
- Pharmaceuticals	100.8	10
- Plastic products	102.7	9
- Precision components	101.7	9
- Specialty chemicals	101.2	10
- Telecom equipment	99.8	9
Manufacturing average	101.4	9

Results by main cost factor, Lázaro Cárdenas

Cost factor	% differential (v. CDMX)	Rank
- Labor costs	+1.4%	9
- Facility costs	-26.9%	5
- Transportation costs	+27.3%	7
- Utility costs	+32.2%	10
- Financing costs	+1.6%	9
- State and local tax costs	-61.6%	5
Total costs	+1.4%	9

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Cost factors

Relative rankings for Lázaro Cárdenas for major cost factors are shown in the second table on the previous page.

For labor costs, Lázaro Cárdenas ranks ninth among the 10 cities, with only CDMX having higher labor costs. Lázaro Cárdenas actually has the highest wage and salary costs of all cities, but slightly lower benefit costs allow it to maintain a slim advantage over CDMX for total labor costs. Labor cost rankings vary based on the required degree of skill in the workforce, with Lázaro Cárdenas having the highest wages of all cities for low-to-medium skill process workers and for senior managers.

Lázaro Cárdenas ranks fifth among the 10 cities for facilities costs, with industrial leasing costs that are higher than in Tapachula, Salina Cruz, Silao and Tampico-Alamirra. In addition, Lázaro Cárdenas has the highest industrial facility construction costs among the study cities, influenced by its high costs for lower-skilled labor. A lack of recent activity in the Lázaro Cárdenas industrial real estate market led to some research challenges for the city and a lower degree of confidence for real estate values than in the other cities (refer to Chapter 5 for more on this issue).

Lázaro Cárdenas ranks seventh for transportation costs, with the second lowest freight costs among the five zone cities. This ranking reflects the geographical location of Lázaro Cárdenas relative to the other zone cities. Similar to Coatzacoalcos, Lázaro Cárdenas is relatively closer to the major population centers of Central Mexico than the more southerly zone cities. In addition, direct shipping services to several major Asian ports mean that export costs from Lázaro Cárdenas to Asia are lower than for any city except Manzanillo.

For utilities, Lázaro Cárdenas ranks last among the 10 cities, with the highest cost for LPG among the study cities.

For state and local taxes, tax rates in Lázaro Cárdenas are quite low but high wage costs for ISN result in Lázaro Cárdenas ranking sixth for state and local taxes paid.

These high level conclusions are derived from the analysis of all cost factors across the 12 industry operations compared. Cost factor rankings vary by industry.

The tables on this page present the detailed values used for Lázaro Cárdenas for several of the main cost factors considered in the analysis. Comparisons and city rankings for these detailed cost factors can be found in Chapter 5.

Values for key labor cost factors, Lázaro Cárdenas

	(\$/hr per annum)			
	Low	High	Final wage	Fully loaded ¹
Production wages				
General laborers-materials handlers	48,000	110,000	72,000	96,794
Process workers-manual	51,000	150,000	89,200	119,378
Process workers-machine tenders	70,000	250,000	131,600	175,328
Process workers-machine operators	70,000	276,000	171,300	226,287
Production supervisors	180,000	380,000	276,800	364,357
Admin and management wages/salaries				
Clerks	51,000	120,000	73,700	99,166
Admin assistants	72,000	205,000	121,900	161,850
Accountants	98,000	305,000	182,300	239,698
IT specialists	96,000	270,000	150,700	198,665
Senior managers	250,000	1,200,000	626,300	774,335
Top plant managers	400,000	1,655,000	1,394,600	1,816,459

† Includes all spouses and adult children who are paid for financial assistance but have grown up in paid time roles. Includes all spouses and adult children who are paid for financial assistance but have grown up in paid time roles. Includes all spouses and adult children who are paid for financial assistance but have grown up in paid time roles.

Values for key other cost factors, Lázaro Cárdenas

	Low	High	Final value
Real estate			
Industrial facility lease cost - per m ² /month	37.50	111.00	65.00
Industrial land sale price - per m ²	130	1,500	1,040
Industrial facility construction cost - per m ²	4,700	7,050	6,400
Transportation			
Full truckload cost to COMEX			23,145
Full truckload cost to Dallas			51,669
40' container cost to Rotterdam			49,820
40' container cost to Yokohama			25,598
Utilities			
LPG price - per L, excl. IVA			7.08
State and local taxes			
Tax on salaries paid (ISN)			2.00%
Tax rate for business real estate transfers			2.00%
Effective rate for property tax - % of FMV			0.0830%

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Additional observations

In addition to the quantitative cost analysis presented above, study research interviews for Lázaro Cárdenas identified the following qualitative observations relevant to the SEZ program.

Labor:

- ▶ The development of a locally-sourced industrial-support workforce in Lázaro Cárdenas is reported to be quite advanced. Twenty-plus years ago, 80 percent of the engineering/management/administrative workforce required in Lázaro Cárdenas had to be recruited from distant locations such as Morelia and Mexico City. Today, local universities allow about 85 percent of such jobs to be filled by city residents. While this provides a good flow of qualified employees to existing industrial employers, if a major industrial expansion occurs, it will still require an influx of qualified staff from elsewhere in Mexico.
- ▶ The dominant employers in Lázaro Cárdenas are ArcelorMittal (±5,000 employees), Fertinal (1,000+ employees), the port and its terminals (1,000+ employees), CFE (±500 employees) and Pemex (100+ employees). Strong unions embedded in these firms raise prevailing wage rates for production employees.
- ▶ For engineering and management employees, salary levels are also high, in part due to the ongoing need to recruit some qualified employees from other parts of Mexico. Relatively low quality of life in Lázaro Cárdenas results in premium salaries sometimes having to be paid to relocating staff. The development of better local engineering and management talent is helping in this regard, but salary premiums still exist.

Real estate:

- ▶ The industrial real estate market in Lázaro Cárdenas appears to be especially limited and illiquid, even compared to the other zone cities. The security situation appears to be a factor, as interviews revealed some instances of organized crime or other suspicious activities hindering the free operation of the local real estate market.

Transportation infrastructure:

- ▶ The Port of Lázaro Cárdenas has the largest land area of all major ports in Mexico and was designed/constructed in the modern era to allow for very efficient operation. In this way, Lázaro Cárdenas is considered superior to the Port of Manzanillo, which faces constraints and inefficiencies from its small land area and location in the city center. The LZC port has significant capacity and capability to handle additional export traffic that may be generated by the development of the SEZ.
- ▶ The airport in Lázaro Cárdenas is sub-standard for a city of its size and industrial importance and, as a result, flights to/from CDMX are both expensive and limited (Aeromar). A modest program of renovation to the terminal was commencing in July 2016, but this will not resolve the bigger issues of a short runway, no control tower and no land for expansion. Plans are being discussed for a new airport as the long-term solution to this problem.
- ▶ The Autopista Siglo XXI provides a secure toll road route to connect to Morelia and CDMX, although it was also noted that this route is a longer and slower route to CDMX than should be available. The existence of this route is vital, given alternative free

highway routes traverse some of the least secure regions of the state. The autopista connection has allowed an increase in the road freight share of container traffic (70-80% of cargo was previously moved by rail, but road now represents 50%).

Utilities:

- ▶ The Lázaro Cárdenas area is home to significant CFE electric generation capacity, which is more than double the existing demand. Therefore, plenty of supply capacity exists for new industrial users, although work will still be required for distribution infrastructure for the new SEZ industrial park.
- ▶ Natural gas is available in Lázaro Cárdenas but the system capacity is limited and is fully utilized by existing industrial firms.

Security situation:

- ▶ Problems of insecurity were raised continually in Lázaro Cárdenas, including details of kidnapped and murdered employees and foreign nationals.
- ▶ Security on the coastal highway between Lázaro Cárdenas and Zihuatanejo is problematic due to cartel activity. Travel on this highway should be avoided at times of quieter traffic (including some daytime hours) and even at busier times using this route is considered to be risky.
- ▶ The logistics industry in Lázaro Cárdenas maintains close relations with federal police to exchange information on changes in the security situation.
- ▶ The city of Lázaro Cárdenas itself has reportedly been calm and stable in recent times (although "recent times" was not clearly defined).

SEI (city results) - Salina Cruz

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Salina Cruz

Salina Cruz ranks in last place among the 10 cities compared, with average business costs 1.8 percent higher than in CDMX.

Results by industry

Despite its low ranking overall, among the 12 industries compared there are some more favorable results for Salina Cruz. In three industries, Salina Cruz has business costs that are lower than in CDMX (i.e., cost index <=100.0) and ranks at least two places better than its overall ranking:

- ▶ Electronics assembly (ranks 4th / 10 cities)
- ▶ Medical devices (ranks 8th / 10 cities)
- ▶ Telecom equipment (ranks 5th / 10 cities).

Among all 12 industries compared, these represent three of the four industries with the lowest incidence of transportation costs among total business costs. Results for Salina Cruz are especially sensitive to transportation costs (as explained on the next page) and the products of these industries are relatively higher in value, making transportation less significant in the final cost composition of the product.

However, transportation costs are not the only driver of industry rankings for Salina Cruz. The specialty chemicals operation also has a low incidence of transportation costs, similar to medical devices. However, specialty chemicals also has a greater dependence on gas and a greater proportion of highly skilled workers, both factors which are detrimental for Salina Cruz. As a result, Salina Cruz ranks ninth for specialty chemicals, with higher costs than in CDMX.

Rankings for Salina Cruz in the electronics assembly and telecom equipment industries are especially strong, placing in the top five cities. Characteristics of these industries that fit well with the business cost structures of Salina Cruz include the following:

- ▶ These two industries both have low significance of transportation costs, as noted above. Salina Cruz ranks last (or equal last, with Tapachula) for transportation costs in these industries, but the lower significance of transportation costs means that this disadvantage does not overwhelm cost advantages that Salina Cruz holds in other areas.
- ▶ These two industries have the highest incidence of labor costs among total business costs, due to the relatively slow and careful nature of the manual assembly work required. Among the production labor categories examined, Salina Cruz is somewhat more competitive for low-to-medium skill process workers than for either general labor or highly skilled workers.
- ▶ Finally, facility costs are also more significant in these industries, representing an advantage given that Salina Cruz has relatively low facility costs.

Collectively, these factors result in Salina Cruz ranking ahead of Lázaro Cárdenas, Coatzacoalcos, Tampico, CDMX and Monterrey for both of these industries.

It is important to emphasize that the industry results and rankings presented here are based exclusively on estimated business operating costs for each city and industry. The rankings do not consider qualitative aspects of each city, such as the ease of hiring suitably qualified employees, the availability of suppliers, or the benefits of being part of an industry cluster.

Results by industry, Salina Cruz

Industry	Cost index (CDMX=100)	Rank
- Advanced batteries	103.6	10
- Aircraft parts	100.5	9
- Auto parts	101.5	10
- Electronics assembly	98.2	4
- Food processing	104.0	10
- Medical devices	99.9	8
- Metal components	104.8	10
- Pharmaceuticals	100.7	9
- Plastic products	103.7	10
- Precision components	102.5	10
- Specialty chemicals	101.0	9
- Telecom equipment	98.6	5
Manufacturing average	101.8	10

Results by main cost factor, Salina Cruz

Cost factor	% differential (v. CDMX)	Rank
- Labor costs	-13.4%	5
- Facility costs	-45.9%	2
- Transportation costs	+50.8%	10
- Utility costs	+30.2%	3
- Financing costs	+1.9%	10
- State and local tax costs	-49.2%	9
Total costs	+1.8%	10

SEI (city results) - Salina Cruz

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Cost factors

Rankings for Salina Cruz for major cost factors are shown in the second table on the previous page.

For labor costs, Salina Cruz ranks fifth among the 10 cities, behind Tapachula, Manzanillo, Paraiso and Silao, but ahead of Coatzacoalcas and Lázaro Cárdenas. Labor cost rankings vary based on the mix of employees in the workforce. Salina Cruz has relatively more competitive wages for non-production workers, ranking between second and sixth for all admin and management job categories, but has relatively higher costs for production staff with rankings that range from seventh for production supervisors to tenth for skilled machinists/technicians.

Salina Cruz ranks second among the 10 cities for facilities costs, with industrial leasing costs that are lower than in all cities except Tapachula. In addition, Salina Cruz ranks equal third (with Paraiso) for industrial construction costs and sixth among the 10 cities for industrial land costs.

For transportation costs, Salina Cruz ranks last among the cities. In 2016, the Port of Salina Cruz added a new coastal service for containers and general cargo that feeds directly to the Port of Manzanillo. This service provides interconnection to Hamburg Süd (and to Hanjin, prior to its recent bankruptcy). As a result, Salina Cruz has the fourth lowest costs for export shipments to Asia. However, Salina Cruz has the highest costs, or close to the highest costs, for road freight to all destinations. This result is impacted by high union wage rates for truck drivers, aggressive union tactics to minimize the use of non-union drivers, and the ongoing problem of union highway blockades. Local firms interviewed for this project report that blockades are a recurring long term problem that add approximately 10-15 percent to annual road freight logistics costs. This additional cost has been factored into the analysis.

For utilities, Salina Cruz ranks third among the 10 cities, behind only CDMX and Monterrey which both benefit significantly from availability of natural gas.

For state and local taxes, Salina Cruz ranks ninth, due to the state tax on salaries having a rate increase from 2.0 to 3.0 percent in 2016.

These high level conclusions are derived from the analysis of all cost factors across the 12 industry operations compared. Cost factor rankings vary by industry.

The tables on this page present the detailed values used for Salina Cruz for several of the main cost factors considered in the analysis. Comparisons and city rankings for these detailed cost factors can be found in Chapter 5.

Values for key labor cost factors, Salina Cruz

	Low	High	Final wage	Fully loaded ²
Production wages				
General laborers-materials handlers	36,000	110,000	72,300	93,990
Process workers-manual	59,000	150,000	86,300	112,190
Process workers-machine tenders	84,000	220,000	129,200	167,960
Process workers-machine operators	150,000	255,000	177,600	230,850
Production supervisors	155,000	290,000	244,800	318,240
Admin and management wages/salaries				
Clerks	38,400	85,000	72,000	93,600
Admin assistants	89,000	165,000	118,200	152,325
Accountants	96,000	270,000	172,200	220,927
IT specialists	84,000	185,000	131,000	168,444
Senior managers	265,000	590,000	432,500	567,323
Top plant managers	670,000	1,840,000	992,800	1,141,720

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Values for key other cost factors, Salina Cruz

	Low	(MX15)	High	Final value
Real estate				
Industrial facility lease cost - per m ² /month	25.00		30.00	48.00
Industrial land sale price - per m ²	150		1,500	1,000
Industrial facility construction cost - per m ²	3,300		5,650	5,000
Transportation				
Full truckload cost to COMEX				27,153
Full truckload cost to Dallas				65,536
40' container cost to Rotterdam				55,352
40' container cost to Yokohama				40,440
Utilities				
LPG price - per L, exc. IVA				6.71
State and local taxes				
Tax on salaries paid (ISN)				3.00%
Tax rate for business real estate transfers				2.20%
Effective rate for property tax - % of FMV				0.1125%

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Additional observations

In addition to the quantitative cost analysis presented above, study research interviews for Salina Cruz identified the following qualitative observations relevant to the SEZ program.

Labor:

- ▶ Local business leaders were generally positive about the quality of the workforce in the city, the ability to recruit qualified labor and local training opportunities. Employee loyalty was noted favorably by interviewees.
- ▶ Labor relations are a major problem in Salina Cruz. While some firms reported favorable relations with their local unions, in general unions are extremely powerful and represent a major challenge to be reckoned with by firms at every stage of the industrial process.

Real estate:

- ▶ The many tracts of ejidal land surrounding the city were identified as an impediment to industrial development for Salina Cruz.

Transportation infrastructure:

- ▶ The recent commencement of regular container service from Salina Cruz to Manzanillo represents a major boost for the port and the city. Previous coastal service from Salina Cruz to Manzanillo was canceled five years ago after Grupo Modelo shut down its local plant due to union blockades.
- ▶ The highway across the Isthmus is poor quality and hinders the true development of the trans-isthmus corridor. This issue was also heard from interviewees in Coatzacoalcas.

- ▶ Union highway blockades are a major challenge, causing problems both when they are short and intense (and sometimes violent) and when "low level" blockades drag on for a many months.
- ▶ The rail lines between Salina Cruz and the junction at Medias Aguas (Veracruz state) require upgrades to be more effective. It was noted that the presence of separate rail operators (Ferromex and Ferrocarril del Istmo) across the isthmus also hinders the development potential of the isthmus corridor.
- ▶ The lack of a local airport in Salina Cruz represents a major obstacle for development. Currently the nearest airport is in Huatulco, and the low grade mountainous highway means that the 155 km drive takes about 2.5 hours. Plans to upgrade a military airport in Ixtapetec (70 km away) to joint use for commercial flights would be beneficial, if a commercial airline can be attracted to the airport. However, access from Salina Cruz to Ixtapetec passes through a location of frequent highway blockades.
- ▶ Collectively, these issues make logistics efficiency a major challenge for Salina Cruz and this is evident in its high transportation costs.

Utilities:

- ▶ The Pemex refinery in Salina Cruz is a major producer of natural gas, but no gas distribution network exists in the city. However, the potential for direct access to natural gas could represent an advantage for an energy intensive operation.
- ▶ Water supply for Salina Cruz was frequently cited as being erratic, with technical, political and labor relations issues all said to be part of the problem.

Security situation:

- ▶ Insecurity typically did not come up as a subject of discussion in interviews in Salina Cruz.

Business environment:

- ▶ Fish processing is viewed locally as a development opportunity for Salina Cruz. The city has a fishing fleet (primarily for shrimp) but no value added processing is done there. Other locally-identified development opportunities include a steel mill (using locally sourced iron ore, but with some local communities opposed to the project) and production of wind turbine components (given that Oaxaca currently generates 90% of all wind power in Mexico).
- ▶ Some skepticism was expressed by local leaders about the SEZ initiative, as Salina Cruz has been the subject of many past federal development initiatives that have failed to come to fruition (e.g., duty free zones, Trans-Isthmus Corridor, new shipping terminals, etc.).
- ▶ The main concern expressed in almost all interviews in Salina Cruz was the impact of recurring annual union blockades of highways in and around the city. These blockades can last for months, sometimes lead to shortages of food and basic supplies in the city and result in higher prices for daily necessities. This issue has resulted in some companies leaving the area. The priority concern of business leaders is to resolve this issue to help save the remaining companies in the city, before of trying to attract new investment.

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Tapachula-Puerto Chiapas

Tapachula ranks third overall among the 10 cities compared, with average business costs 0.9 percent lower than in CDMX. In the overall rankings, only Monterrey and Manzanillo rank ahead of Tapachula.

Results by industry

Among the 12 industries compared, Tapachula sees its best results, ranking first or second among the cities, in the following seven industries:

- ▶ Aircraft parts (1st)
- ▶ Auto parts (2nd)
- ▶ Electronics assembly (1st)
- ▶ Medical devices (1st)
- ▶ Pharmaceuticals (1st)
- ▶ Specialty chemicals (2nd)
- ▶ Telecom equipment (1st).

Aspects of these industries that benefit from the relative cost structures of Tapachula include the following:

- ▶ Low to moderate significance of transportation costs among total costs. These industries represent the seven industries where transportation's share of total location-sensitive costs are lowest, ranging from 8 percent for telecom equipment to 31 percent for auto parts. (In the other five industries, transportation costs represent more than one third of total location-sensitive costs.)

- ▶ Higher significance of labor in the cost structure of the operation. With the exception of the specialty chemicals industry, in general these industries are at the high end of the spectrum for labor costs as a share of total business costs. Tapachula offers significantly lower wage rates than any of the other study cities, allowing it to establish a greater cost advantage for labor-intensive operations.

- ▶ Lower dependence on gas. With the exception of specialty chemicals, these industries see the lowest significance of gas costs as a share of total business costs. Tapachula ranks ninth among the cities for gas costs, thus providing greater advantage to industries with relatively low gas requirements.

For each of these seven industries, the combined business cost advantages of Tapachula allow it to move up in the rankings, generally moving ahead of both Manzanillo and Monterrey – the two cities which rank ahead of Tapachula in the overall results. For each of these industries, business costs in Tapachula are also lower than in CDMX, ranging from an advantage of 5.6 percent for electronics assembly to just 0.5 percent for specialty chemicals.

It is important to emphasize that the industry results and rankings presented here are based exclusively on estimated business operating costs for each city and industry. The rankings do not consider qualitative aspects of each city, such as the ease of hiring suitably qualified employees, the availability of suppliers, or the benefits of being part of an industry cluster.

Results by industry, Tapachula

Industry	Cost index (CDMX=100)	Rank
-Advanced batteries	100.9	7
-Aircraft parts	98.0	1
-Auto parts	98.5	2
-Electronics assembly	94.4	1
-Food processing	101.6	8
-Medical devices	96.5	1
-Metal components	101.7	6
-Pharmaceuticals	98.1	1
-Plastic products	100.1	5
-Precision components	100.6	5
-Specialty chemicals	99.5	2
-Telecom equipment	94.9	1
Manufacturing average	99.1	3

Results by main cost factor, Tapachula

Cost factor	% differential (v. CDMX)	Rank
-Labor costs	-51.7%	1
-Facility costs	-61.7%	1
-Transportation costs	+44.0%	9
-Utility costs	+31.7%	9
-Financing costs	-1.0%	3
-State and local tax costs	-79.9%	1
Total costs	-0.9%	3

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Cost factors

Relative rankings for Tapachula-Puerto Chiapas for major cost factors are shown in the second table on the previous page.

For labor costs, Tapachula has the lowest costs among the 10 cities for every job category and industry considered in the analysis. Tapachula and Silao are the only cities where wage rates for general laborers (hired by industrial firms) start at 1.0x minimum wage and Tapachula is the only city where this wage rate is also seen for manual process workers. Pay levels for specific jobs in Tapachula range from 29 to 63 percent lower than in CDMX, with an average differential of just over 50 percent.

Tapachula also has the lowest facility costs among the study cities. This is true for both industrial leasing and industrial facility construction costs. For industrial land costs, Tapachula ranks second, behind only Manzanillo.

Offsetting these strong cost advantages, Tapachula has the second highest transportation costs among the study cities. Its distant location close to the Guatemala border is the key factor behind its high transportation costs. However, freight access to/from Tapachula is more reliable than for Salina Cruz, a factor which provides Tapachula with a freight cost advantage relative to Salina Cruz.

Tapachula ranks ninth for utilities. Differences in utilities costs are attributable to gas requirements because electricity rates for primary voltage industrial users are consistent across all study cities (as explained in Chapter 5). Tapachula has higher gas costs than all cities other than Lázaro Cárdenas.

For state and local taxes, Tapachula has the lowest overall costs. The combination of its low wages and a low salaries tax (ISN) rate for Chiapas state drive this result. Local property tax costs in Tapachula are also quite low.

These high level conclusions are derived from the analysis of all cost factors across the 12 industry operations compared. Cost factor rankings vary by industry.

The tables on this page present the detailed values used for Tapachula for several of the main cost factors considered in the analysis. Comparisons and city rankings for these detailed cost factors can be found in Chapter 5.

Values for key labor cost factors, Tapachula

	(MUS per annum)			
	Low	High	Final wage	Fully loaded ¹
Production wages				
General laborers-materials handlers	22,000	47,400	32,000	47,058
Process workers-manual	22,800	55,200	38,500	57,699
Process workers-machine tenders	36,500	73,000	48,100	73,208
Process workers-machine operators	41,000	100,000	66,100	100,979
Production supervisors	72,000	192,000	110,400	145,220
Admin and management wages/salaries				
Clerks	33,600	85,000	50,000	65,260
Admin assistants	43,000	125,000	85,000	111,601
Accountants	105,000	330,000	155,000	202,573
IT specialists	84,000	135,000	122,700	173,017
Senior managers	155,000	305,000	305,100	378,495
Top plant managers	155,000	1,320,000	779,400	1,073,778

† Includes all spouses and both partners paid for funeral arrangements, but being given up for paid time not being shared equally in the region. This time not worked is only included as wages for employment, but the region does a good job of not being able to rely on it as a significant source of labor income and income. Authors' calculations based on data from the Survey of Consumer Expenditures.

Values for key other cost factors, Tapachula

	(MX\$)		
	Low	High	Final value
Real estate			
Industrial facility lease cost - per m ² /month	20.00	55.00	34.00
Industrial land sale price - per m ²	175	1,500	600
Industrial facility construction cost - per m ²	3,000	5,600	4,500
Transportation			
Full truckload cost to COMEX			28,861
Full truckload cost to Dallas			61,482
40' container cost to Rotterdam			49,340
40' container cost to Yokohama			64,742
Utilities			
LPG price - per L, exc. IVA			6.97
State and local taxes			
Tax on salaries paid (ISN)			2.00%
Tax rate for business real estate transfers			1.45%
Effective rate for property tax - % of FMV			0.1100%

Additional observations

In addition to the quantitative cost analysis presented above, study research interviews for Tapachula-Puerto Chiapas identified the following qualitative observations relevant to the SEZ program.

Labor:

- ▶ The primary advantage for Chiapas is its large pool of low cost labor, with wages 30% or more lower than in central Mexico. Interviewees indicated that workers are generally creative and reliable, with excellent manual ability.
- ▶ Employee turnover was cited as a problem among lower-paying employers. Good pay is available in the agricultural sector during harvest seasons, causing some employees to rotate to that sector. However, higher paying employers do not encounter the same challenge and praised the stability of the workforce.
- ▶ The local workforce is generally lacking in formal qualifications due to the very small industrial base. Significant attention will need to be paid to workforce development in Tapachula to meet the needs of any major new investor, even for manual processing jobs.
- ▶ The regional technical school (Instituto Tecnológico de Tapachula) was cited as being a good school, but not generating sufficient graduates in engineering and technical career streams to meet the needs of a major new industrial employer.
- ▶ In terms of basic education for the workforce, frequent school closures due to holidays and strikes were cited as areas of concern.

Transportation infrastructure:

- ▶ Puerto Chiapas industrial firms need to provide employee transportation because many workers do not come from Tapachula, but instead for more remote villages. In general, the port industrial area is poorly served by public transportation.
- ▶ Puerto Chiapas is not a natural port and frequent dredging adds to its operating costs. The port is under-utilized and infrequent/irregular shipping services limit the usefulness of the port to local businesses. Attraction of a major export-oriented manufacturer would help to address this issue.
- ▶ A multimodal logistics center and highway upgrades planned for the nearby Ciudad Hidalgo border crossing will generate additional traffic for Puerto Chiapas by allowing the port to expand its zone of influence into southern Guatemala.
- ▶ Tapachula has good infrastructure for air travel, with a small but modern international airport. Flights to/from the city are expensive, although Volaris has recently started to fly to Tapachula, creating some competition for Aeromexico.

Utilities:

- ▶ Electric power from CFE was noted to be very unreliable and inconsistent, and most local industrial firms generate their own power.
- ▶ Tapachula is intended to be a hub a proposed natural gas pipeline from Salina Cruz to Guatemala (Gasoducto México-Centroamérica). If construction of this project is completed on schedule in 2019, lower-cost natural gas could provide a competitive advantage for industrial firms in Tapachula.

Security situation:

- ▶ Security was cited as an advantage by several interviewees in Tapachula, noting a stable security situation relative to other regions of the country.

Business environment:

- ▶ The Tapachula region has the most fertile land in the country and shows rich potential for agriculture and food processing (subject to freight cost limitations noted above, based on current logistical options). However, farms in the region are generally small and unproductive. Efforts to improve the agricultural productivity would make the area more appealing to food processing firms.
- ▶ Automotive wiring harness manufacturer, Arnecom Yazaki, represents the one great success story of industrial diversification in Chiapas and is widely cited by the local business community. The company commenced operations in Chiapas in 1998 with one plant and 200 employees. Today it has more than 6,000 employees at six plants in the state (including one in Tapachula with over 2,000 staff), plus plans for a seventh plant. Arnecom Yazaki has proven that labor cost savings in Chiapas for manual process operations can more than offset the higher logistical costs of operating as a Chiapas-based supplier to industries located in central Mexico.
- ▶ While Chiapas may not be "top of mind" as a destination for business investment, it ranks fifth among Mexican states in the 2014 *Doing Business in Mexico* rankings – ahead of the other SEZ states and behind only Colima (1st) and Guanajuato (3rd) among the 10 states compared in this study.

SEZ City Profile - Paraiso

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Paraiso

Results for Paraiso are summarized here, similar to the four SEZ cities above. Paraiso is included here because it is being considered as a potential site for a possible future fifth SEZ.

Given its small size, research for Paraiso was conducted on the same basis as the four SEZ cities, with field research and in-person interviews with local business and economic leaders. The small size of the community resulted in more limited data in some areas than for other cities. However, the confidence levels for Paraiso results are acceptable due to data being received from a high proportion of the small industrial sector.

Paraiso ranks eighth among the 10 cities compared, with average total business costs 0.8 percent higher than in CDMX.

Results by industry

Among the 12 industries compared, business costs in Paraiso are lower than in CDMX (i.e., cost index <=100.0) for the following three industries:

- Electronics assembly
- Medical devices
- Telecom equipment

These industries all have a relatively lower significance of transportation costs among total costs, with transportation costs being below the average for all industries. The products of these industries are relatively higher in value, making transportation less significant in the final cost composition of the product.

These industries also use very limited quantities of gas, helping to contain Paraiso's cost disadvantage for utilities relative to CDMX. For these industries, utility costs in Paraiso are no more than 18 percent higher than in CDMX, as compared to cost disadvantages for utilities that exceed 50 percent in some industries.

In addition to these industries, Paraiso also ranks well in the specialty chemicals industry, ranking in sixth place among the 10 cities despite having business costs 0.5 percent higher than CDMX. Relative to its overall eighth place ranking, Paraiso moves up in the rankings for this industry due to:

- A relatively smaller facility, which benefits Paraiso due to it having very high facility lease costs
- Product distribution assumptions for this industry which marginally advantage Paraiso relative to Coatzacoalcos
- A workforce mix for this industry that marginally advantages Paraiso relative to Tampico-Altamira due to a high proportion of process workers in the mid-skill machine/process tenders category.

The combination of these various impacts allows Paraiso to move ahead of both Coatzacoalcos and Tampico-Altamira in the rankings for this industry.

It is important to emphasize that the industry results and rankings presented here are based exclusively on estimated business operating costs for each city and industry. The rankings do not consider qualitative aspects of each city, such as the ease of hiring suitably qualified employees, the availability of suppliers, or the benefits of being part of an industry cluster.

Results by industry, Paraiso

Industry	Cost index (CDMX=100)	Rank
- Advanced batteries	101.4	8
- Aircraft parts	100.1	8
- Auto parts	100.8	8
- Electronics assembly	98.7	5 (tie)
- Food processing	103.1	9
- Medical devices	99.3	5
- Metal components	102.7	8
- Pharmaceuticals	100.1	8
- Plastic products	101.6	8
- Precision components	101.1	8
- Specialty chemicals	100.5	6
- Telecom equipment	98.2	4
Manufacturing average	100.8	8

Results by main cost factor, Paraiso

Cost factor	% differential (v. CDMX)	Rank
- Labor costs	-23.8%	3
- Facility costs	+12.6%	10
- Transportation costs	+29.5%	6
- Utility costs	+30.3%	4
- Financing costs	+0.9%	8
- State and local tax costs	-57.5%	7
Total costs	+0.8%	8

Source: SHCP, Secretaría de Hacienda y Crédito Público

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Cost factors

Relative rankings for Paraiso for major cost factors are shown in the second table on the previous page.

For labor costs, Paraiso ranks third among the 10 cities, behind only Tapachula and Manzanillo for both wage/salary levels and total labor costs (including benefits). However, labor cost rankings vary based on the required degree of skill in the workforce. Paraiso is relatively more competitive for mid-skilled production workers, mid-level admin and professional staff, and senior managers. However, Paraiso does not fare as well when operations require a large proportion of lesser skilled workers in either production or administrative roles.

Paraiso ranks last among the 10 cities for facilities costs, with the highest industrial leasing costs among the study cities. This is not uncommon for extremely small cities, where limited industrial activity and the risk of lengthy vacancy periods between tenants leave landlords expecting a high rate of return on their properties. Paraiso ranks equal third for industrial construction costs and fifth for industrial land.

Paraiso ranks eighth for transportation costs, with generally similar advantages and disadvantages to Coatzacoalcas, but being at slightly greater distance from CDMX and the ports of Veracruz and Altamira.

For utilities, Paraiso ranks fourth among the 10 cities (equal with Coatzacoalcas), behind CDMX and Monterrey (which both benefit from availability of natural gas, as discussed in the next chapter) and marginally behind third-ranked Salina Cruz.

For state and local taxes Paraíso ranks seventh, with Tabasco state's salaries tax (ISN) rate of 2.5 percent creating a disadvantage relative to the five states in this study where the rate for this tax is only 2.0 percent.

These high level conclusions are derived from the analysis of all cost factors across the 12 industry operations compared. Cost factor rankings vary by industry.

The tables on this page present the detailed values used for Paraiso for several of the main cost factors considered in the analysis. Comparisons and city rankings for these detailed cost factors can be found in Chapter 5.

Values for key labor cost factors, Paraiso

	(\$/hr\$ per annum)			
	Low	High	Final wage	Fully loaded ^a
Production wages				
General laborers-materials handlers	30,000	110,000	67,400	87,620
Process workers-manual	48,000	110,000	76,400	99,320
Process workers-machine tenders	54,000	145,000	102,700	133,510
Process workers-machine operators	105,000	230,000	160,400	208,520
Production supervisors	112,000	265,000	231,000	300,300
Admin and management wages/salaries				
Clerks	60,000	96,000	73,700	95,810
Admin assistants	75,000	115,000	96,400	124,930
Accountants	35,000	300,000	173,300	225,290
IT specialists	87,000	200,000	132,300	171,990
Senior managers	240,000	700,000	504,900	681,125
Top plant managers	335,000	1,440,000	929,600	1,069,040

Values for key other cost factors, Paraiso

	Low	(MX\$)	High	Final value
Real estate				
Industrial facility lease cost - per m ² /month	25.00		190.00	100.00
Industrial land sale price - per m ²	120		2,000	875
Industrial facility construction cost - per m ²	3,000		5,000	5,000
Transportation				
Full truckload cost to COMX				25,172
Full truckload cost to Dallas				58,173
40' container cost to Rotterdam				40,292
40' container cost to Yokohama				63,694
Utilities				
LPG price - per L, exc. IVA				\$ 72
State and local taxes				
Tax on salaries paid (ISR)				2.50%
Tax rate for business real estate transfers				2.00%
Effective rate for property tax - % of FMV				0.2200%

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Additional observations

In addition to the quantitative cost analysis presented above, study research interviews for Paraíso identified the following qualitative observations relevant to the SEZ program.

Labor:

- Lack of educational preparation was identified as a major barrier for the workforce in Paraíso. Other than Pemex offshore operations (and its local suppliers), there is no significant industrial base.
- Higher education institutions are present in Paraíso and in neighboring Comalcalco, but their focus is almost exclusively on the needs of Pemex and its suppliers and contractors.
- The city has very few recreational or cultural amenities, making it difficult to attract staff.

Real estate:

- The administration of Puerto Dos Bocas has developed a 70 hectare industrial park close to the port, with the vision of developing a cluster of logistics operations. However, currently the park is empty and could potentially be suitable for transformation into Phase 1 of a SEZ park.



Transportation infrastructure:

- Highway access between Paraíso and Highway 180 is sub-standard. As a result, Paraíso is relatively isolated, despite theoretically being a main highway route between Coatzacoalcos and Ciudad del Carmen or Campeche.
- A more significant issue is the road to the port, which is a poor quality single lane road through about two kilometers of dense residential areas.
- Paraíso has no rail access. However reference was made to a Tabasco state initiative to bring a new branch line from Chontalpa, 100 km away.
- Puerto Dos Bocas has a multi-use terminal available for general cargo. However, this only represents a minor portion of port activity with traffic at the Pemex terminal accounting for more than 90% of all port activity.

Utilities:

- Electricity service in Paraíso is poor, with frequent interruptions and voltage fluctuations. Some local companies generate their own electricity while other firms commented on the additional costs of maintenance and equipment deterioration caused by unstable voltages.
- There is no natural gas available in Paraíso and no nearby source that could readily be accessed to bring natural gas to the city's industrial zone.
- Drainage is a problem in the city and the city center is reportedly subject to periodic flooding.

Security situation:

- The local security situation has worsened in recent years as unemployment increased due to Pemex cutbacks. Robberies, ATM robberies and kidnappings are all reported as being common problems now in Paraíso.

Business environment:

- Among all zone cities, the economy of Paraíso is the most cyclically dependent on the state of the oil industry. Pemex operations in Paraíso are primarily exploration and production, activities which get cut quickly and significantly when the price of oil drops (far more than refining). Uncertainty over the energy reform process has further compounded local cutbacks in Pemex activity. As a result, the economy of Paraíso is very depressed at this time, with several significant companies having shut down and others existing with only skeleton staff.
- The only economic growth in recent years has been the opening of several new hotels. These projects were initiated to serve the booming oil business, but were only completed and opened after oil activity had dropped away. Therefore, the future of these new hotels is uncertain.
- The local business community was described as (and found to be) very insular and not well connected with each other. There does not appear to be any coordinated group of business leaders seeking to advance the prospects of the city and strategic development leadership and interest in the potential SEZ initiative from the local authorities appeared to be lacking.

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5

Specific business cost factors represent the foundation for the analysis of cities and industries. The process for collecting cost data included field research and interviews with companies operating in each of the zone cities.

Cost factors

Significance of cost factors

The significance of the location-sensitive cost factors examined varies by location and industry.

Labor costs include wages and salaries, employer-paid statutory plans and other employee benefits. Labor costs range from 13 to 41 percent of location-sensitive costs for the operations examined, with very low labor costs in some cities driving down the relative importance of labor costs.

Facility costs for industrial leasing range from 3 to 5 percent of location-sensitive costs for the operations examined.

Transportation costs reflect the costs of moving finished goods to markets. For the operations examined, transport costs represent 8 to 48 percent of total location-sensitive costs. The significance of transport costs vary widely based on the relative values, sizes, weights and destinations for products produced by each industry.

Utility costs reflect costs for electricity and gas, and range from 5 to 21 percent of location-sensitive costs.

Costs of capital include both depreciation and interest. These can be major cost items for manufacturers, ranging from 6 to 37 percent of location-sensitive costs.

Relative significance of key location-sensitive cost factors

	Manufacturing sector ¹
Labor costs	13% - 41%
Salaries and wages	9% - 29%
Statutory plans	1% - 4%
Other benefits	2% - 8%
Lease costs (industrial facilities)	3% - 5%
Transportation costs (road, sea)	8% - 48%
Utility costs (electricity, natural gas)	5% - 21%
Cost of capital (depreciation, financing)	6% - 37%
Taxes	9% - 25%
Income taxes ²	9% - 24%
Property taxes	<1%
Other taxes	<1%

1) Range for 12 manufacturing sector operations included in the study, reflecting the average of all 10 Mayan cities for each industry.

2) Value with revenue. Most of the operations are aligned with typical industry target profit (range) as determined by income before tax.

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Taxes represent the final major category of location-sensitive costs, including income, property, transaction and other business taxes. Collectively, taxes represent 9 to 25 percent of total location-sensitive costs.

The table on the previous page summarizes the relative significance of the location-sensitive cost factors across all industries examined. It shows that labor, transportation and cost of capital can represent the most significant of the various location-sensitive costs in specific industries, each ranging up to 35 percent or more of location-sensitive costs in some industries. Of these three factors, variations in the cost of capital between locations are modest, while variations in labor and transportation costs can be dramatic. Therefore, the significance and level of labor and transportation costs for each industry have a major influence on the rankings of the cities for each industry.

This issue is further illustrated in the table on this page. This table shows that the telecom equipment and electronics assembly industries are the most labor intensive operations examined, while the food processing and advanced battery operations have the greatest significance of transportation costs.

This table also shows the influence of raw materials and components on the total cost picture. For all industries, raw materials (including all input parts, components, subcomponents and sub-assemblies) represent more than 50 percent of total business costs. The cost for purchasing materials does not vary based on the location of the operation being examined, so these costs are location-insensitive. The significance and stability of material costs in the total cost picture reduces the total variations in costs between locations, as the costs that do vary by location represent only a minority of total business costs.

Relative significance of total cost factors

	Raw materials & components	Labor	Transport	Other costs	Total costs
Advanced batteries	58.3%	5.2%	15.2%	21.3%	100.0%
Aircraft parts	66.5%	6.0%	6.0%	21.5%	100.0%
Auto parts	73.0%	6.0%	7.7%	13.3%	100.0%
Electronics assembly	54.6%	9.9%	2.5%	32.9%	100.0%
Food processing	62.5%	6.6%	15.4%	15.5%	100.0%
Medical devices	50.7%	9.1%	6.0%	34.1%	100.0%
Metal components	61.5%	5.1%	14.8%	18.6%	100.0%
Pharmaceuticals	51.0%	6.6%	5.2%	37.2%	100.0%
Plastic products	60.2%	5.9%	14.1%	19.7%	100.0%
Precision components	74.0%	3.2%	8.3%	14.5%	100.0%
Specialty chemicals	73.9%	4.0%	3.3%	18.8%	100.0%
Telecom equipment	54.2%	10.5%	2.0%	33.3%	100.0%
Manufacturing average (12 industries)	63.7%	6.0%	8.4%	21.9%	100.0%

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Labor costs

Labor costs represent the first major group of cost factors examined and include salaries and wages, employer-paid statutory plans and other benefits.

The workforce required for each business operation included in this study is built from 28 benchmark job positions, which reflect the range of skills required by the various operations examined. This page presents a high-level comparison of labor costs for the cities, across all jobs and industries examined.

In addition to the information presented here:

- ▶ The following pages present detailed comparisons of wage levels in the study cities for the most significant job positions
- ▶ Chapter 6 includes a summary of the workforce profile for each industry operation examined
- ▶ Chapter 3 includes a discussion of productivity, which is treated as standard across all locations.

Salaries and wages include regular pay, as well as any additional cash compensation customarily paid to employees (shift bonuses, incentive pay, other allowances, etc.). Tapachula has the lowest average salary/wage levels by far among the 10 cities examined with wages 31 percent lower than second-ranked Manzanillo and just over 50 percent lower than CDMX. Lázaro Cárdenas has the highest salary and wage costs, on average 3 percent higher than CDMX.

Statutory plans include employer contributions to the Mexican Institute of Social Security (IMSS) and the INFONAVIT housing program. These costs vary directly with payroll but are also impacted by how pay levels for different jobs vary relative to fixed or maximum contribution levels for statutory plan elements.

Labor cost comparison, per employee

	Salaries & wages		Statutory		Other		Benefits		Total labor	
	Average per employee ¹						Total benefits		Total labor	
	(MXN\$)	Rank	(MXN\$)		(MXN\$)		Porcentaje payroll	Rank	Average per employee (US\$)	Rank
Zone cities										
Coatzacoalcos	\$146,460	5	\$24,977		\$41,813		45.6%	9	\$213,250	6
Lázaro Cárdenas	\$171,044	10	\$24,757		\$41,998		39.0%	2	\$237,799	9
Salina Cruz	\$150,034	6	\$22,560		\$36,239		39.2%	3	\$208,833	5
Tapachula	\$78,850	1	\$13,726		\$24,040		47.9%	10	\$116,616	1
Paraiso	\$133,648	3	\$19,195		\$31,441		37.9%	1	\$184,284	3
Comparison cities										
Manzanillo	\$113,771	2	\$18,709		\$32,007		44.6%	5	\$164,488	2
Silao	\$138,135	4	\$21,693		\$36,031		41.8%	4	\$195,859	4
Tampico-Altamira	\$153,514	7	\$25,948		\$43,224		45.1%	7	\$222,686	7
Metro cities										
Ciudad de México	\$166,245	9	\$25,000		\$49,988		45.1%	8	\$241,233	10
Monterrey	\$156,289	8	\$23,485		\$46,924		45.1%	6	\$226,698	8

¹ Average for 28 benchmark job positions. Excludes overtime pay. Job locations: Coatzacoalcos, Lázaro Cárdenas, Salina Cruz, Tapachula, Paraiso, Manzanillo, Silao, Tampico-Altamira, Ciudad de México, Monterrey.

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Estimation of pay ranges and levels

Other employee benefits include a wide range of employer-paid perks, including vacation entitlements, additional retirement savings, private medical coverage and provision of company vehicles. Other employee benefit costs vary with pay levels and the benefit practices of individual companies in each location. The benefit practices of major employers in a city can influence the benefits other large firms in that city may need to offer in order to remain competitive. However, high benefit costs in some industries are industry-specific (due to high costs of employee insurance) and do not translate into higher benefit costs for other employers in the same city.

Total benefit costs, including both statutory plans and other employee benefits, are lowest in absolute terms in Tapachula and Paraiso, and are highest in Monterrey and CDMX. However, expressed as a percentage of payroll, total benefit costs are lowest in Paraiso and Lázaro Cárdenas, and highest in Coahuila and Tapachula.

Total labor costs, which combine all of the above labor-related cost elements, are lowest on average in Tapachula and Manzanillo, and are highest in Lázaro Cárdenas and CDMX.

Pay ranges (low to high) were developed for key job positions based on the following sources:

- Data received from (or in respect of) major firms which represent the majority of large employers in each zone city
- Data provided by economic development officials
- Transparency portal salary data for federal or state economic entities located in specific cities
- Salary survey data for larger cities, including data from the 2016 *Competitive Alternatives* study
- Job portal employment ads for each city (with a total of more than 1,000 job listings considered), including proprietary job portal data from Manpower Mexico. (Data obtained from all job portals were considered collectively as a single data source for the city.)

Pay ranges for specific jobs vary widely, based on the pay policies of specific firms and varying levels of qualification/experience within a job category.

For the cost analysis, a final "typical" wage level has been determined for each job position and used in the cost analysis. These final values were determined utilizing an approach frequently used for corporate site selection projects:

- The final value includes a judgment on what represents a reasonable pay level for a new industrial employer entering the job market of a given city (i.e., not just the mid-point or average of the pay range)
- The final value considers the distribution of data points within each range and the relative size of the employers represented by each data point (i.e., skew towards upper or lower end of the range)
- The final wage values do not "out-price" the top-paying employer in each location, but reflect a pay level that should be viewed as competitive in the market by well-qualified potential employees.

For key job categories, detailed comparisons of wages for the study cities are presented on the following pages. For each job category, relevant job titles are included to help the reader correctly understand the range of specific jobs within a category. Job titles are shown in both English and Spanish, as common titles for some jobs do not translate directly.

Pay levels used in this study are based on primary and secondary data from a variety of sources. If observed by a new industrial employer, the pay levels used here should be viewed as competitive and attractive by well-qualified potential employees in each study city.

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General laborers-materials handlers

This job category represents the lowest skill level for workers considered in this study. This job category covers common position titles such as:

- General Laborer (*Ayudante general*)
- Warehouse Worker (*Almacenero*)
- Stocker (*Anaquelero*)
- Packer (*Empacador*)
- Merchandise Taggers (*Etiquetadora*)

Tapachula has both the lowest wages in this job category (1.4x minimum wage) and the lowest variation in wages. This narrow pay range is likely due to the very limited base of industrial companies in Tapachula-Puerto Chiapas, with the few firms present there being attracted by the low wage levels for low-skilled labor.

Wage levels for these positions are also quite low in both Monterrey and CDMX, at close to 2x minimum wage. In both of these cities, a few job listings can be found at much higher pay, but wages for the vast majority of jobs is low, probably as a result of the huge potential labor pools available in these two cities.

Wages for this job category are significantly higher in Paraiso, Tampico-Altamira, Lázaro Cárdenas, Salina Cruz and Coatzacoalcos, with typical pay being 3.5x minimum wage in Coatzacoalcos. The common thread for all these cities is the presence of Pemex as a major employer, with interviewees in each of these cities noting on how this raises wage levels for all industrial employers. In eighth-ranked Lázaro Cárdenas, the ArcelorMittal steel mill is the predominant employer (in addition to Pemex), with similar effect.

Typical pay ranges, general laborers – materials handlers

	Rank	Low	High	Final	
Coatzacoalcos	10	28,800	100,000	79,700	
Lázaro Cárdenas	8	48,000	110,000	72,000	
Salina Cruz	9	36,000	110,000	72,300	
Tapachula	1	22,800	47,400	32,000	
Paraiso	6	30,000	110,000	67,400	
Manzanillo	4	33,600	66,000	51,500	
Silao	5	22,800	84,000	55,100	
Tampico-Altamira	7	30,000	97,000	67,600	
Ciudad de México	3	33,600	125,000	46,100	
Monterrey	2	36,000	115,000	43,000	

(MXN \$) 0 50,000 100,000 150,000

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Process workers – manual

This job category reflects production process workers skilled in primarily manual processing tasks. The specific nature of these jobs varies by industry, but they reflect similar levels of experience and education in the workers they attract. This job category covers common position titles such as:

- Process Worker (*Auxiliar de producción*)
- Sorter (*Clasificador*)
- Cutter (*Cortador*)
- Assembler (*Ensamblador*)
- Polisher (*Pulidor*)
- Bottler (*Envasador*)

Pay levels for manual production positions tend to be about 20 percent higher than for general laborers and materials handlers, with an average pay level of about 3x minimum wage.

Trends in wages among the cities for manual process workers are very similar to those for general laborers, with the top eight cities all ranking consistently for these two job categories. However, Lázaro Cárdenas has the highest wages among all cities for manual process workers (3.9x minimum wage) and it falls behind Salina Cruz and Coatzacoalcos in the rankings for this job category.

Typical pay ranges, process workers – manual

	Rank	Low	High	Final	
Coatzacoalcos	9	45,000	120,000	88,500	
Lázaro Cárdenas	10	51,000	150,000	89,200	
Salina Cruz	8	59,000	150,000	86,300	
Tapachula	1	22,800	55,200	38,500	
Paraiso	6	48,000	110,000	76,400	
Manzanillo	4	38,400	79,000	60,700	
Silao	5	43,000	84,000	67,000	
Tampico-Altamira	7	36,000	135,000	84,700	
Ciudad de México	3	30,000	125,000	56,200	
Monterrey	2	36,000	115,000	52,400	

(MXN \$) 0 50,000 100,000 150,000

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Process workers – machine tenders

This job category reflects production skilled process workers in machine-assisted processing or assembly positions that require only a moderate degree of skill in terms of machine setup or operation. Workers who use hand power tools and forklift operators are also included in this job category. The nature of these jobs can vary by industry, but they reflect similar levels of experience and education, with specific qualifications generally required for these jobs. This job category covers position titles such as:

- ▶ Forklift operator (*Montacarguista*)
- ▶ Grinder (*Talachero*)
- ▶ Turner (*Tornero*)
- ▶ Stamp operator (*Punzonador o Traquelador*)
- ▶ Various other machine operators where the machine is typically pre-configured
- ▶ System attendants (e.g., for chemical processes).

Pay levels jump significantly for these more skilled positions, with average pay levels about 50 percent higher than for manual process workers. City rankings differ significantly for these jobs when compared to the lesser skilled jobs compared on the previous pages:

- ▶ Tapachula continues to offer the lowest wages, with Manzanillo and Silao now ranking second and third
- ▶ Monterrey and CDMX drop well down the rankings for this job category, in contrast to their rankings for lower-skill jobs
- ▶ Once again, Lázaro Cárdenas has the highest wages of all cities for this job category.

Typical pay ranges, process workers – machine tenders

	Rank	(MXN \$)			
		Low	High	Final	
Coatzacoalcos	5	57,000	145,000	116,500	
Lázaro Cárdenas	10	70,000	250,000	131,600	
Salina Cruz	8	84,000	220,000	129,200	
Tapachula	1	36,500	73,000	48,100	
Paraiso	4	54,000	145,000	102,700	
Manzanillo	2	48,000	100,000	77,200	
Silao	3	54,000	125,000	94,100	
Tampico-Altamira	6	67,000	155,000	120,100	
Ciudad de México	9	61,200	160,000	129,400	
Monterrey	7	58,000	165,000	120,700	

(MXN \$) 0 90,000 180,000 270,000

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Process workers – skilled operators and technicians

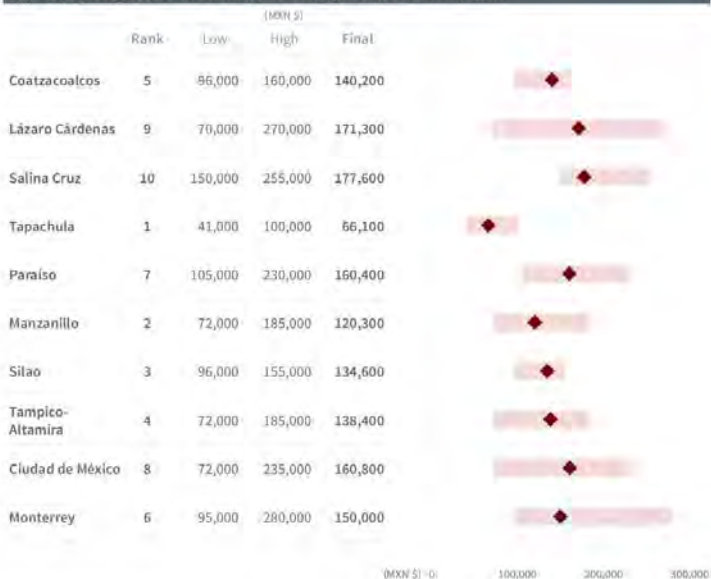
This job category reflects the highest skill levels among production process workers, reflecting skilled operators of complex machinery, skilled technicians operating complex processes or completing complex assembly tasks. The nature of these jobs vary by industry, but all require specific qualifications as well as high levels of experience and education. This job category covers common position titles such as:

- ▶ Crane Operator (*Operador de grúas*)
- ▶ Welder (*Soldador*)
- ▶ CNC Technician (*Técnico en CNC*)
- ▶ Electronics Technician (*Técnico eléctrico*)
- ▶ Electro-mechanical Technician (*Electromecánico*)
- ▶ Chemical Process Technician (*Técnico químico*)

Pay levels are higher for these highly skilled positions, with average pay levels more than 30 percent higher than for the previous job category. City rankings for this job category are as follows:

- ▶ Tapachula, Manzanillo and Silao once again offer the lowest wage levels.
- ▶ Wage levels for this job category are particularly high in Salina Cruz and Paraiso (influenced by pay levels for Pemex offshore workers based out of Paraiso). Both of these cities rank lower in this job category than any other. This fact represents a disadvantage for these cities for any business operations that require a highly skilled workforce.

Typical pay ranges, process workers – skilled operators and technicians



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Production supervisors

This job category reflects the supervisor level of the production operation, with senior production staff directing and overseeing the work of teams, groups or departments.

This position is not an engineering position, although in some cases production supervisors may be qualified industrial engineers. This position is not a management position, although in some firms the relevant position title may be "manager" or "head" of a certain production department, instead of "supervisor". Typically there will be a Manager of Production senior to several production supervisors.

Pay levels for these top production positions are, on average, almost 60 percent higher than for the skilled operators and technicians job category and almost four times higher than for general laborers. City rankings for this job category are as follows:

- Tapachula and Manzanillo once again offer the lowest wage levels.
- Silao, Tampico-Altamira and Coatzacoalcos are closely grouped in third, fourth and fifth places. Interviewees in Coatzacoalcos noted that the city has a compressed pay range across jobs, a fact borne out in the data which shows Coatzacoalcos to be the most expensive city for low skill jobs but more competitive for high skill jobs.
- Monterrey and CDMX have the highest wages for this job category. This is likely an influence of the larger, more complex production facilities present in these cities, which offer higher pay levels and cause other firms to have to increase their pay levels to retain good staff.

Typical pay ranges, production supervisors

	Rank	Low	High	Final	
Coatzacoalcos	5	165,000	290,000	205,100	
Lázaro Cárdenas	8	180,000	380,000	276,800	
Salina Cruz	7	155,000	290,000	244,800	
Tapachula	1	72,000	192,000	110,400	
Paraíso	6	115,000	265,000	231,000	
Manzanillo	2	95,000	265,000	184,300	
Silao	3	96,000	290,000	202,300	
Tampico-Altamira	4	100,000	230,000	203,300	
Ciudad de México	10	120,000	420,000	302,700	
Monterrey	9	110,000	420,000	287,900	

(MXN \$) 0 140,000 280,000 420,000

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Clerks

This job category reflects the lowest skill levels among administrative staff. This job category covers common position titles such as:

- Data Entry Clerk (*Capturista*)
- Filing Clerk (*Archivista*)
- Administrative Support (*Ayudante administrativo*)
- Receptionist (*Recepcionista*)
- Lower-level Secretary and Administrative Assistant jobs where limited/no experience is required.

Pay levels for these positions average a little under 3x minimum wage across the 10 study cities. City rankings for this job category are as follows:

- Tapachula, Monterrey and CDMX offer the lowest wage levels, at 2.2 to 2.5x minimum wage. Similar to low-skill production positions, the huge potential labor pools in the metro cities is believed to be the cause behind the low wages in these cities for lower-skill jobs.
- Wages for this job category are significantly higher in Salina Cruz, Lázaro Cárdenas, Paraíso, Tampico-Altamira, and Coatzacoalcos, with typical pay being 3.7x minimum wage in Coatzacoalcos. Once again, the influence of Pemex on wage levels, especially at the lower end, appears to be present here.

Typical pay ranges, clerks

	Rank	Low	High	Final	
Coatzacoalcos	10	48,000	105,000	84,800	
Lázaro Cárdenas	7	51,000	120,000	73,700	
Salina Cruz	6	38,400	85,000	72,000	
Tapachula	1	33,600	85,000	50,000	
Paraíso	7	60,000	96,000	73,700	
Manzanillo	4	36,000	80,000	59,100	
Silao	5	42,000	80,000	62,600	
Tampico-Altamira	9	48,000	85,000	75,700	
Ciudad de México	3	36,600	115,000	56,200	
Monterrey	2	42,000	115,000	52,400	

(MXN \$) 0 40,000 80,000 120,000

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Administrative assistants

This job category reflects the experienced, skilled administrative support staff who work in important (and more complex) departments such as billings or human resources, and/or who directly support the senior management of the firm. Most positions in this category require university or college education. Common position titles in this category include:

- Admin Assistant (*Auxiliar administrativo*)
- Admin Coordinator (*Coordinador administrativo*)
- Billing/AR Specialist (*Facturista*)
- HR Assistant (*Asistente de recursos humanos*)
- Executive Secretary (*Secretaría ejecutivo*)
- Administrator (*Administrador*)

Pay levels for these highly skilled administrative positions tend to be about 85 percent higher than for the clerks category. Across the 10 study cities, the average pay level for these positions is more than 5x minimum wage.

City rankings for this job category are as follows:

- Tapachula once again has the lowest wages
- Paraiso, Silao and Manzanillo rank in second, third and fourth place, all with very similar wage levels
- In contrast to the Clerks category, Monterrey and CDMX have the highest wages for these senior administrative jobs. In these cities, it is not uncommon to see English listed as a pre-requisite for positions at this level.

Typical pay ranges, administrative assistants

	Rank	Low	High	Final	
Coahuila de Zaragoza	8	76,000	170,000	135,300	
Lázaro Cárdenas	7	72,000	205,000	121,900	
Salina Cruz	6	89,000	165,000	118,200	
Tapachula	1	43,000	135,000	85,000	
Paraiso	2	75,000	115,000	96,100	
Manzanillo	4	58,000	155,000	97,800	
Silao	3	60,000	140,000	97,600	
Tampico-Altamira	5	76,000	120,000	107,500	
Ciudad de México	10	75,600	240,000	188,600	
Monterrey	9	82,000	230,000	179,400	

(MXN \$) 0 80,000 160,000 240,000

Accountants

This job category reflects a plant accountant for a mid-sized industrial firm. This position requires an experienced, certified public accountant capable of taking on significant responsibility. This position does not reflect a staff accountant in a large organization nor accountants in public practice.

Relevant position titles for this job category include:

- Accountant (*Contador público o Contador general*)
- Cost Accountant (*Contador de costos*)
- Tax Manager (*Jefe fiscal*)
- Finance Specialist (*Especialista de finanzas*)
- Treasurer (*Tesorero*).

Typical pay levels for these positions average almost \$200,000 pesos per year. City rankings for this job category are as follows:

- Tapachula, Salina Cruz and Silao have the lowest salaries for accountants
- Similar to the two administrative job categories above, salaries in Coatzacoalcos are notably higher than in the other zone cities
- Similar to the senior administrative category above, Monterrey and CDMX have the highest salaries for relevant accounting positions. It is not uncommon to see English listed as a pre-requisite for jobs at this level in Monterrey and CDMX.

Typical pay ranges, accountants

	Rank	Low	High	Final	
Coatzacoalcos	8	120,000	265,000	199,300	
Lázaro Cárdenas	5	96,000	305,000	182,300	
Salina Cruz	2	96,000	270,000	172,200	
Tapachula	1	105,000	230,000	155,000	
Paraiso	4	75,000	300,000	173,300	
Manzanillo	6	92,000	275,000	186,100	
Silao	3	96,000	230,000	172,500	
Tampico-Altamira	7	92,000	235,000	194,900	
Ciudad de México	10	136,800	445,000	261,100	
Monterrey	9	130,000	310,000	248,300	

(MXN \$) 0 150,000 300,000 450,000

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IT specialists

This job category reflects capable IT professionals able to handle networking, hardware and software installation and support requirements for a mid-sized industrial firm. This position requires well rounded, experienced professional – a higher level role than a basic help desk agent or programmer. An IT degree is essential for this position, but this is still a technical job, not a strategic IT leadership role.

Relevant position titles for this job category include:

- Technical Support Specialist (*Soporte técnico*)
- Support Engineer (*Ingeniero de soporte*)
- Systems Specialist (*Técnico en sistemas*)
- Systems Engineer (*Ingeniero en sistemas*)
- Server Specialist (*Especialista en servidores*)
- IT Leader (*Encargado informática*).

Typical pay levels for these positions average almost \$160,000 pesos per year. City rankings for this job category are as follows:

- Tapachula, Salina Cruz and Paraiso have the lowest salaries for IT specialists
- Similar to the administrative and professional job categories above, salaries in Coahuila are notably higher than in the other zone cities
- Similar to the previous job categories, Monterrey and CDMX have the highest salaries for relevant IT specialist positions.

Typical pay ranges, IT specialists

	Rank	Low	High	Final	
Coahuila	8	105,000	265,000	176,900	
Lázaro Cárdenas	6	96,000	270,000	150,700	
Salina Cruz	2	84,000	145,000	131,000	
Tapachula	1	84,000	135,000	122,700	
Paraiso	3	82,000	200,000	132,300	
Manzanillo	4	72,000	190,000	133,600	
Silao	5	78,000	230,000	143,200	
Tampico-Altamira	7	92,000	250,000	176,000	
Ciudad de México	10	106,800	280,000	219,500	
Monterrey	9	120,000	255,000	208,800	

(MXN \$) 0 100,000 200,000 300,000

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Senior managers

This job category reflects the management team of the firm, with senior departmental or functional managers or directors relevant to a mid-sized industrial firm. Relevant position titles for this job category include:

- Purchasing Manager (*Gerente de compras*)
- Sales Manager (*Gerente de ventas*)
- HR Director (*Director de recursos humanos*)
- Office Manager (*Jefe administrativo*)
- Operations Manager (*Gerente de operaciones*)
- Finance Manager (*Gerente financiero*).

Pay levels for these positions are high by Mexican standards, averaging almost \$500,000 pesos per year. City rankings for this job category are as follows:

- Tapachula, Paraiso and Manzanillo have the lowest salaries for senior managers. Given limited local talent pools at this level, perceived good quality of living and/or proximity to a major city (Villahermosa, in the case of Paraiso) assist these cities in attracting senior managers to relocate.
- At the other end of the range, manager salaries are highest in Lázaro Cárdenas. Interviewees there noted that issues of insecurity and distance from major cities make it challenging to recruit senior professionals to the city and can result in a salary premium relative to CDMX.
- Monterrey and CDMX show the widest ranges of salaries for these positions, with salaries of large industrial firms inflating the top end of the range. However, the final salary levels used for these cities are similar to the zone and comparison cities.

Typical pay ranges, senior managers

	Rank	Low	High	Final	
Coahuila	5	215,000	840,000	467,400	
Lázaro Cárdenas	10	250,000	1,200,000	626,300	
Salina Cruz	4	265,000	590,000	432,500	
Tapachula	1	155,000	505,000	305,100	
Paraiso	2	240,000	700,000	384,900	
Manzanillo	3	180,000	675,000	388,000	
Silao	7	240,000	840,000	575,000	
Tampico-Altamira	6	240,000	1,120,000	567,800	
Ciudad de México	9	259,200	1,910,000	622,900	
Monterrey	8	215,000	1,525,000	580,100	

(MXN \$) 0 700,000 1,400,000 2,100,000

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Top plant managers

This job category reflects the top manager of the operation, or of the top manager of the firm if it only has a single location. Relevant position titles for this final job category include:

- General Manager (*Gerente general*)
- Plant Manager (*Gerente de planta*)
- Director General (*Director general*)
- Commercial Director (*Director comercial*)
- Director of Operations (*Director de operaciones*)

Pay levels for these positions are very high by Mexican standards, averaging just over \$1,000,000 pesos per year in the zone and comparison cities. City rankings for this job category are as follows:

- Tapachula, Manzanillo and Coatzacoalcos have the lowest salaries for top plant managers. As noted above for production supervisors, Coatzacoalcos experiences a compressed pay range between jobs, which leaves it with competitive salary levels for more senior jobs despite having relatively high wages for lower-skill jobs.
- Among the zone cities, top manager salaries are highest in Lázaro Cárdenas by a wide margin. High salary levels at existing firms and challenges in recruiting senior professionals to relocate to the city are related, resulting in this situation.
- Top plant manager salaries are notably higher in Monterrey and CDMX, where the presence of very large industrial firms push up typical salary levels across the board for these top managers.

Typical pay ranges, top plant managers

	Rank	Low	High	Final	
Coatzacoalcos	3	730,000	1,220,000	922,800	
Lázaro Cárdenas	8	480,000	1,655,000	1,394,600	
Salina Cruz	5	670,000	1,840,000	992,800	
Tapachula	1	155,000	1,320,000	779,400	
Paraíso	4	335,000	1,440,000	929,600	
Manzanillo	2	420,000	1,440,000	873,100	
Silao	6	360,000	1,270,000	996,300	
Tampico-Altamira	7	370,000	1,900,000	1,273,200	
Ciudad de México	10	360,000	2,760,000	1,907,300	
Monterrey	9	360,000	2,380,000	1,813,800	

(MXN \$) 0 1,000,000 2,000,000 3,000,000

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Facility costs

Facility requirements

Among all manufacturing firms, many firms operate in leased factories while many others choose to own their premises. For owned facilities, custom-built factories potentially offer design advantages that can enhance productivity. For firms wishing to lease their premises, custom-build and lease-back is a hybrid option that allows a firm to benefit from the best of both options.

Recognizing the diversity of facility ownership strategies that exist, the scope of research for this project included gathering data on the following categories of facility costs:

- ▶ Lease costs for industrial facilities.
- ▶ Purchase costs for industrial land
- ▶ Construction costs for industrial buildings.

The research process sought data relevant to the scale of facilities required by the model business operations examined in this study. These represent mid-sized, light-to-medium industrial facilities (not heavy industry "mega facilities"). The facility assumptions for the 12 operations examined include:

- ▶ Industrial sites ranging in approximate size from 8,000 to 40,000 square meters (0.8-4.0 hectares)
- ▶ Industrial buildings ranging in approximate size from 2,800 to 15,000 square meters.

It is assumed that the model business operations require high quality, modern, efficient industrial facilities for their operations. Such buildings typically include wide column spacing, high ceilings, concrete floors with adequate load capacities, proper ventilation systems and modern power distribution systems.

The assumptions presented here provide an overall picture of the facility requirements for the model business operations and acted a guide for the real estate research program.



Facilities research approach

Due to low levels of industrial development activity, the industrial real estate markets in the zone cities are generally both limited and illiquid. Coatzacoalcos is an exception, with a more dynamic industrial sector. Lázaro Cárdenas, however, represented a particular challenge with very little market activity. The security situation in that city appears to be a factor, as field interviews revealed some instances of organized crime or other suspicious activity directly hindering the free operation of the real estate market.

This situation created some challenges for the real estate research program and resulted in limited numbers of data points in some cities, even after applying creative solutions to identifying alternate data sources. Further details of data quality are provided in each of the following sections.

Overall, more data, and more reliable data, existed for industrial leasing than for industrial construction. As a result, the study analysis all 12 business operations are assumed to operate in leased facilities. However, this section also includes data on industrial land and construction costs as well as a sensitivity analysis showing city rankings under an alternative assumption of owner-occupied industrial facilities.

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Industrial lease costs

Factory lease costs for each location are based on rental costs for prime bulk industrial space and only reflect basic net rent. Additional costs for utilities and property taxes are borne directly by the tenant.

For industrial lease costs, the research objective was a high quality modern facility. However, in some cities such buildings are not available for lease so the data ranges shown here do include some properties that are somewhat older or simpler in their construction. However, excessively old or basic properties were excluded from the data sets.

The final values shown in the table reflect the value used in the study analysis. The final values do not necessarily reflect the mid-point or average of the ranges, but rather include qualitative judgments of most likely values for suitable industrial facilities after considering the qualitative aspects of all specific properties identified in each city.

For most cities, the ranges presented here reflect data for 6 to 18 relevant industrial facilities that were available for lease as of July 2016. For Lázaro Cárdenas, only four relevant properties could be identified - resulting in a lower degree of confidence than for the other cities.

Industrial lease costs are lowest in Tapachula, Salina Cruz and Silao. While leasing costs are higher in Lázaro Cárdenas and Coatzacoalcos, both these cities still have lower leasing costs than Monterrey and CDMX.

The highest industrial lease costs are in Paraíso. This is not uncommon for extremely small cities, where limited industrial activity and the risk of lengthy vacancy periods between tenants leave landlords expecting a high rate of return on their properties.



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Industrial land costs

For land, the research objective was "serviced industrial land" but in most cities the low end of the price range reflects unserviced land with reasonable development potential (i.e., reasonable proximity to a main road and services, land that is not mountainous or swampy, etc.) Any properties known to be ejidal land were excluded during the research process.

For most cities, the ranges presented here reflect data for 5 to 15 relevant industrial properties that were available for sale as of July 2016. For Lázaro Cárdenas, only three relevant properties could be identified - resulting in a lower degree of confidence for Lázaro Cárdenas than for the other cities.

The data collected and presented here reflect asking prices for the relevant properties. Asking prices may be higher than a buyer would ultimately be willing to pay. However, in the process of assembling these listings and price ranges, some outliers were excluded where asking prices bore no relationship to market values or the asking prices of other properties on the market.

Industrial land costs are lowest in Manzanillo, by a wide margin, with a couple of prime, developed industrial sites (the best potential properties identified) being listed at prices that are competitive with listings for bare land in distant areas outside the city.

Industrial land costs are highest in Coatzacoalcos, with significant residential and retail development in recent years pushing up general land values. This is especially true in one industrial park adjacent to much of the retail growth, explaining the very high maximum land value for Coatzacoalcos. Overall, industrial land prices in Coatzacoalcos are slightly higher than in CDMX.



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Industrial construction costs

For construction, the research objective was to estimate the cost to build a modern, high-quality industrial building, including both hard and soft costs (e.g., development licenses and fees).

There has been little/no industrial construction activity in recent years in any of the zone cities except Coatzacoalcos, leaving limited sources of data for this cost factor. To obtain the estimates shown, inquiries were made with developers and realtors active in each city or nearby cities. "Tables of unitary values" for property tax (catastral/predial) purposes have also been used in areas where those table values appear to reflect current market values. Even after following this approach:

- Data sources for this factor were still very limited in Tapachula, Lázaro Cárdenas, Salina Cruz, Paraíso and Manzanillo
- Additional data for cross-validation were able to be obtained for each of Coatzacoalcos, Silao, Tampico-Altamira, CDMX and Monterrey.

Data obtained from these limited numbers of sources have been accepted because:

- Construction cost ranges are less volatile than for land or lease asking rates, making it easier to validate the reliability of data sources
- Construction costs vary somewhat with local labor costs, allowing inter-city validation of the reasonableness of construction cost estimates
- No additional qualified sources could be identified for the relevant cities.



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Finally, for both Lázaro Cárdenas and Salina Cruz, only a single value estimate for construction costs was received, not a range. The low and high values shown above for these cities have been inferred based on the construction cost estimate received and typical cost ranges observed in each of the other study cities.

Subject to all of the above limitations, construction costs for industrial facilities are estimated to be lowest in Tapachula, Salina Cruz and Paraíso.

Industrial construction costs are estimated to be highest in Coatzacoalcos and Lázaro Cárdenas, with relatively high pay levels for general labor being an influence on construction costs in these cities. For Lázaro Cárdenas, the general lack of construction activity may also be a contributing factor to its high costs, because an active construction industry develops certain efficiencies whereas, with little activity, some relevant trades or engineering specialists may have moved away due to lack of work.

Sensitivity: owned industrial facility

The main analysis presented in this report is based on the assumption that all model business operations lease their facilities, rather than owning them.

Subject to the data limitations explained on the two previous pages for industrial land and construction costs, the sensitivity case presented here compares the alternative scenario of owned industrial facilities. For this scenario, each model business operation is assumed to purchase a suitable industrial site and then build a new factory on that land.

The total required facility investment reflects the purchase price for industrial land (inclusive of land transfer taxes) plus the cost of construction for a new factory. Total investment costs for a new industrial facility are lowest in Manzanillo, Tapachula and Silao. Facility investment costs are highest in Coatzacoalcos and Lázaro Cárdenas.

Comparing rankings for facility costs under the two alternate scenarios, Paraíso and Manzanillo are the two cities that rank significantly better for facility investment than for leasing. This suggests that in these cities, facility ownership may be a more desirable strategy than leasing. The opposite is true for Lázaro Cárdenas, Salina Cruz, Coatzacoalcos and Tampico-Altamira, all of which rank significantly lower for facility investment than for leasing.

However, facility costs only represent a small fraction of total business costs. When considering the impact of the leasing/owning on total business costs:

- For Lázaro Cárdenas, Salina Cruz and Manzanillo, their changes in facility costs between the lease and own scenarios only have a limited impact on their total cost rankings
- Coatzacoalcos, Tapachula and Tampico-Altamira see their rankings drop in at least 5 of the 12 industry cases in the "own" scenario, relative to the "lease" scenario
- Paraíso and CDMX see their rankings improve in at least 6 of the 12 industry cases in the "own" scenario, relative to the "lease" scenario.

Facility investment



Rankings for alternative facility scenarios

	Facility costs		Total costs	
	Lease rank	Facility investment rank	Lease rank	Ownership rank
Zone cities				
Coatzacoalcos	7	9	1	10
Lázaro Cárdenas	5	10	9	9
Salina Cruz	2	5	10	10
Tapachula	1	2	3	3
Paraíso	10	4	8	6
Comparative cities				
Manzanillo	5	1	4	2
Silao	3	3	1	1
Tampico-Altamira	4	6	5	7
Metro cities				
Ciudad de México	9	3	5	4
Monterrey	6	7	1	1

Source: MMK, 2019. Data for facility investment costs is based on the 2019 survey data. Data for total costs is based on the 2019 survey data. Data for facility investment costs is based on the 2019 survey data. Data for total costs is based on the 2019 survey data.

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Transportation costs

The manufacturing operations examined in this study are assumed to distribute all of their production via surface freight (road, rail and/or sea) to major customers or distribution hubs.

Transportation costs are estimated based on a general practice that firms deliver product in full load or standardized less-than-full load quantities, using normal delivery schedules (i.e., no "just-in-time", "just-in-order" or other specialized delivery services which can significantly affect transportation costs). Required number of loads for each model business operation are determined based on the volume and nature of products for each operation.

The comparisons are based on costs-to-market. These reflect both transportation rates for each distribution channel and the proximity of each location to major markets for the various products, including overseas export markets. Costs for all freight modes include relevant fuel and security surcharges.

Transportation cost data were obtained as follows:

- Domestic transportation costs to major ports (by road or rail) and sea freight costs to overseas export destinations were all supplied by an international freight forwarder, working with its local agents in Mexico and major shipping lines.
- Road and intermodal freight costs to various US destinations were derived from specific quotes received for the 2016 global *Competitive Alternatives* study, with distance-based adjustments made for new origin cities.
- These rates were validated against standard tariffs for domestic road freight received from trucking organizations in Chiapas and Lazaro Cardenas.

The transportation cost results presented are based on assumed product distribution patterns for each operation, as shown below. These distribution patterns have been adapted from the 2016 global *Competitive Alternatives* study, which takes a broad global approach to product distribution because that study applies similar distribution principles to locations in many different countries. For this analysis, some Mexican domestic orientation has been overlaid onto these distribution patterns.

The transportation cost results presented here should be interpreted only as general indicators of cost relationships among cities due to the specific distribution pattern assumptions applied. Operations with different product distribution patterns may have significantly different average transportation costs.

In addition to the core distribution assumptions presented below and used in the study analysis, this section also includes some sensitivity cases which vary the focus of these product distribution assumptions.

Transportation distribution patterns used in the analysis

Distribution pattern:	Personal-use products (or inputs)		Industrial-use products	
	Typical end uses:	Typical end uses:	Typical end uses:	Typical end uses:
	Electronics assembly Medical devices Pharmaceuticals Specialty chemicals Microelectronics	Food processing Household appliances	Auto parts Metal components Plastic products Precision components	Auto parts Metal components Plastic products Precision components
Destinations:				
Domestic:				
Mexico City	10.2%	10.4%	12.0%	9.4%
North America:				
Atlanta	10.2%	-	-	-
Dallas	10.2%	12.7%	24.0%	6.4%
Los Angeles	10.2%	32.7%	24.0%	6.4%
New York City	10.2%	-	-	-
Seattle	-	-	-	8.4%
Toronto	-	-	-	8.4%
Overseas:				
Australia	1.0%	0.5%	-	3.0%
China	6.0%	3.7%	-	3.0%
Europe	26.0%	3.5%	29.0%	21.0%
Japan	1.0%	1.5%	-	3.0%
Middle East	4.0%	1.2%	3.0%	3.0%
South America	7.0%	4.3%	8.0%	22.0%
Southeast Asia	4.0%	3.5%	-	3.0%
Total	100.0%	100.0%	100.0%	100.0%

Freight cost comparison

Based on the research approach and methodology outlined on the previous page, this analysis includes estimates for transportation costs for each city and industry, as well as overall average costs for each city (across all industries).

City rankings for transportation costs, together with observations on key factors influencing the rankings, are as follows:

- **Monterrey** has the lowest overall freight costs, due to its advantageous location for distribution north to the United States. Monterrey also has efficient connections and low costs for transferring goods to the Gulf Coast ports in Altamira and Veracruz, which is advantageous for any freight destined to Atlantic destinations.
- **CDMX** ranks second for total freight costs. Its immediate access to a large portion of the Mexican populations creates an advantage for domestic distribution, while good rail connections to both Manzanillo and Veracruz provide cost efficient channels for overseas exports.
- **Silao** ranks in third place among the 10 cities. It is also well situated for domestic distribution and offers shorter distances (and less congestion) than CDMX for product heading north to the US.
- **Manzanillo** ranks fourth for total freight costs. As Mexico's major Pacific Coast port, Manzanillo has low costs for westbound exports, plus both sea and road options for exports destined to the US west coast.
- **Tampico-Altamira** ranks in fifth place, with the Altamira port representing an advantage for freight destined to Gulf and Atlantic ports.

The rankings discussed above include all of the metro and comparison cities. This means that all of the zone cities are at a relative disadvantage for transportation costs at this time. However, if the SEZ program is successful in attracting new investment to the zone cities, transportation connections should improve and cost savings may be realized as a result. Rankings for the zone cities are as follows:

- **Coatzacoalcos** ranks sixth for total freight costs. Relative to the other zone cities, Coatzacoalcos benefits from the lowest freight costs to CDMX/ Central Mexico, the lowest transfer costs to both Veracruz and Altamira ports (for container traffic), and Gulf Coast highway access to the US Southeast, which reduces its distance to major destinations in the eastern US.

Limited container service to Manatee, Florida and rail-car barge service to Mobile, Alabama are other freight options available from Coatzacoalcos, but these options could not be utilized within the freight distribution methodology of this analysis.

- **Lázaro Cárdenas** ranks seventh among the cities. With direct service to various ports in Asia, freight costs for trans-Pacific freight from Lázaro Cárdenas are second only to Manzanillo. In addition, for any Pacific destinations not served directly, Lázaro Cárdenas has lower costs for inland transfer to Manzanillo than any of the other zone cities.

- **Paraíso** ranks eighth for total freight costs, with generally similar advantages to Coatzacoalcos, but being at slightly greater distance from CDMX, Veracruz and Altamira.

Transportation costs, per load

Zone cities	Global distribution (Surface freight cost per load ¹)	
	MXN\$	Rank
Coatzacoalcos	\$47,189	6
Lázaro Cárdenas	\$50,392	7
Salina Cruz	\$59,768	10
Tapachula	\$57,389	9
Paraíso	\$51,688	8
Comparison cities		
Manzanillo	\$44,612	4
Silao	\$43,155	3
Tampico-Altamira	\$45,613	5
Metro cities		
Ciudad de México	\$39,756	2
Monterrey	\$35,761	1

¹ Based on 2010 Mexican freight rates for a 40' container, 20' container, and 10' truckload.

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Sensitivity: alternate destinations

- **Tapachula** ranks ninth place among the 10 cities. It has the greatest distance and highest freight costs for goods destined to Central Mexico, to Manzanillo's port, or north to the US. However, Tapachula ranks third among the zone cities (behind only Coatzacoalcas and Paraíso) for inland transfer costs to both Veracruz and Altamira ports.

Lack of regular traffic at Puerto Chiapas meant that this port offered no advantages in the study analysis. However, for freight bound to Asia, the study analysis reflects firms in Tapachula taking advantage of the new container service available from Salina Cruz, as discussed next.

- **Salina Cruz** ranks in 10th place for total freight costs. In 2016, the Port of Salina Cruz added a new coastal service for containers and general cargo that feeds directly to the Port of Manzanillo. This service provides interconnection to Hamburg Sud (and to Manjin, prior to its recent bankruptcy). This new service gives Salina Cruz the fourth lowest costs for shipments to Asia, behind only Manzanillo, Lázaro Cárdenas and CDMX.

However, Salina Cruz has the highest costs, or close to the highest costs, for all road freight – to Central Mexico, to other Mexican ports, or to the United States. This result is impacted by the ongoing problem of union highway blockades in Salina Cruz. Local firms interviewed for this project report that this has been a recurring problem for many years, has resulted in some firms leaving Salina Cruz and Tehuantepec, and adds approximately 10-15 percent to annual logistics costs for moving road freight in or out of the city. This additional cost has been factored into the analysis.

The main analysis presented in this report is based on the assumptions of broad global distribution of products, as described above.

Given the significance of transportation costs in the calculation of total business costs and the sensitivity of transportation costs to distribution assumptions, this section presents a series of sensitivity cases to assess the impact on study results of alternative product distribution assumptions. Five alternative distribution scenarios are compared:

- **Scenario 1 – Domestic**
100 percent of production is assumed to be distributed to one of five regions within Mexico, based on the proportion of the national population living in each region:
 - Central – 36 percent
 - South – 20 percent
 - West – 18 percent
 - Northeast – 15 percent
 - Northwest – 11 percent
- **Scenario 2 – Eastern US**
100 percent of production is assumed to be destined to markets in the eastern US. Based on relative populations, products are assumed to be delivered to four major distribution hubs:
 - New York/New Jersey – 35 percent
 - Atlanta – 32 percent
 - Indianapolis – 17 percent
 - Chicago – 16 percent

- **Scenario 3 – Western US**
100 percent of production is assumed to be destined to markets in the western US. Based on relative populations, products are assumed to be delivered to three major distribution hubs:
 - Los Angeles – 47 percent
 - Dallas-Fort Worth – 38 percent
 - Seattle – 15 percent

- **Scenario 4 – Europe**
100 percent of production is assumed to be destined to European markets, with all freight shipped to the port of Rotterdam

- **Scenario 5 – Asia**
100 percent of production is assumed to be destined to Asian markets, with all freight shipped to the port of Yokohama (Tokyo).

For each of these five scenarios, the same product distribution assumptions are applied to all of the 12 manufacturing industry operations. Average transportation costs and total business costs (average of the 12 operations) are then recalculated to reflect the impact of each scenario. Results for these sensitivity scenarios are presented on the following page.

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Rankings for alternative product distribution scenarios

	Rank for transportation costs					
	Base analysis (global)	1. Domestic	2. US East	3. US West	4. Europe	5. Asia
Zone cities						
Coatzacoalcos	8	5	5	7	8	8
Lázaro Cárdenas	7	3	6	6	9	10
Salina Cruz	10	10	10	10	10	4
Tapachula	9	9	9	9	9	9
Paraiso	8	8	8	8	2	10
Comparison cities						
Manzanillo	4	3	7	4	4	1
Silao	9	3	8	2	6	5
Tampico-Altamira	5	4	2	3	7	6
Metro cities						
Ciudad de México	2	1	4	5	2	3
Monterrey	1	6	1	1	1	7

	Rank for total costs					
	Base analysis (global)	1. Domestic	2. US East	3. US West	4. Europe	5. Asia
Zone cities						
Coatzacoalcos	7	7	6	7	6	10
Lázaro Cárdenas	9	9	9	9	10	2
Salina Cruz	10	10	10	10	9	4
Tapachula	8	4	5	4	8	6
Paraiso	8	8	7	9	7	9
Comparison cities						
Manzanillo	2	1	3	2	3	1
Silao	4	1	4	3	3	5
Tampico-Altamira	6	5	2	5	4	8
Metro cities						
Ciudad de México	3	4	5	6	4	3
Monterrey	1	6	1	1	1	7

1. Ranking changes are highlighted in bold text in scenarios 2 through 5 compared to the base analysis.

The tables presented here summarize city rankings for transportation costs and total business costs under each of the five alternative distribution scenarios. The tables highlight instances where city rankings change by more than one place relative to the base analysis, as presented previously.

Of note in the results is the general lack of impact for the domestic distribution scenario relative to the global base analysis. Under the domestic scenario, only Monterrey sees a significant impact on its ranking, dropping from first to sixth place as it loses its advantage of being a gateway to US markets and instead is shipping products to markets that are more heavily concentrated (based on population) in central, western and southern Mexico. The limited impact on rankings for other cities is explained by the fact that:

- Each city has advantages and disadvantages of distance and access regardless of whether products are destined for Mexico or beyond its borders. (Costs beyond Mexico's borders are relatively fixed, regardless of origin.)
- Domestic freight movement can be more costly than international exports, due to the efficiencies of sea freight. For example, from Lázaro Cárdenas to Yokohama costs approximately \$25,600 pesos for a 40' container, which is less than the cost of transferring the same container by truck to either Veracruz or Altamira.

Beyond this notable result, the impacts of the other distribution scenarios are relatively predictable based on geography:

- For distribution only to the Eastern US, Tampico, Paraiso and Coatzacoalcos see improved rankings, because of the relatively shorter route to the eastern US that these Gulf Coast cities enjoy.
- For distribution only to the Western US, impacts are relatively minor. Overall, the Gulf Coast cities see some advantage for shipments to Texas but this is largely balanced out by the advantage of the Pacific Coast cities for shipments to California.
- For distribution to Europe, Coatzacoalcos and Paraiso fare significantly better in the rankings, due to their relative proximity to the Port of Veracruz. Tampico-Altamira slips in the rankings despite its advantages for trans-Atlantic freight, due to Coatzacoalcos and Paraiso seeing greater improvements than Tampico under this scenario.
- The scenario for distribution to Asia shows strong improvements for those cities with the most efficient connections to Asian ports – Manzanillo, Lázaro Cárdenas, Salina Cruz and CDMX (via rail to Manzanillo).

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Air freight

The transportation cost analysis presented in this report is based on 100 percent of production for all industries being moved by surface freight channels – road, rail and/or sea.

Air freight costs represent one of the cost factors included in the scope of this study because air freight is used by some of the study industries in the global *Competitive Alternatives* report from which this study has been adapted. However, in the process of adapting this study to the nature of the Mexican market and the zone cities, the use of air freight has been excluded.

This decision is based on the following facts identified during the course of the study research:

- The commercial flights that serve the airports of the SEZ and comparison cities are generally only Aeromexico Connect regional jets. Because of the small size of these planes:
 - Aeromexico does not have capacity to accept significant quantities of freight on these flights
 - Freight must be in boxes or bags – pellets or air cargo containers cannot be accepted
 - Aeromexico will not guarantee the timely delivery of freight other than courier parcels, as passenger baggage always receives priority.
- Airports in the zone and comparison city are not certified as origination points for international freight, because they do not have required security and screening equipment and systems in place. International freight would need to move via a major airport, most likely by truck given the restrictions on air freight on the regional jets.

Utilities

The scope of utilities research for this cost analysis included both electricity and natural gas.

Water represents another important utility service in Mexico given the frequently dry climate. However, water consumption requirements for the 12 model business operations could not be readily determined and the underlying cost model used for this study does not include any parameters for water consumption. Therefore, water costs are not included in this analysis.

Electricity

Until recently, all electric production and sales in Mexico were through the monopoly Comisión Federal de Electricidad (CFE). Recent energy reforms have started to open the electric market to greater competition and medium/large industrial electric users now have more options for purchasing electricity.

Given the early stages of the energy reform, evolution that is continuing to occur as the newly competitive electric market develops and matures, and the focus of this study on mid-sized manufacturing operations, this analysis continues to use CFE rate schedules as the basis for electricity pricing.

Under CFE rate schedules for industrial firms, electricity prices only vary by region for small users of secondary voltage power (rate schedules OM and HM). For such users, electricity costs are highest in the Central region (CDMX), approximately three percent lower in the South region (which includes the SEZ cities, Manzanillo and Silao), and approximately seven percent lower in the Northeast region (Monterrey and Tampico-Altamira).

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However, typical of mid-sized and large manufacturing operations, all 12 model business operations compared in this study use electricity delivered at higher voltages, with customer-owned transformers handling voltage step-downs for machinery, equipment, lighting and ventilation loads in the plant.

As a result, all model business operations are purchasing electricity under CFE rate schedules where there is no variation in price between regions and electricity costs are identical in all cities.

Gas

All 12 model business operations are assumed to use some gas for process heat or other purposes.

The summary table on this page compares gas costs by city and shows large differences between cities, due to the availability (or not) of natural gas in each city. Where natural gas is not available, liquid petroleum gas (LPG), fuel oil and electricity all represent possible alternative fuel sources. Study research interviews confirmed that LPG is the most common alternative fuel source and this approach is applied in the analysis.

Gas costs are lowest in Monterrey and CDMX, with both large cities having relatively extensive distribution networks for piped natural gas, including in some key industrial areas. Therefore, natural gas pricing is applied in this analysis for both metro cities.

For all other cities, gas costs presented here represent costs for LPG, calculated based on the energy equivalence between natural gas and LPG. LPG costs reflect the official authorized prices established by the Comisión Reguladora de Energía (CRE) for various regions of the country.

LPG costs are lowest in Salina Cruz and highest in Lázaro Cárdenas. However, the variation in cost among the eight cities using LPG is only about five percent and this is minor relative to the large difference in cost between natural gas and LPG. Typical costs for LPG are 5.5 to 6.0 times higher than for natural gas.

Among the zone and comparison cities, specific assumptions or observations in respect of gas include:

- Coatzacoalcos and Salina Cruz are both major sources of natural gas, produced in the Pemex refineries there. However, piped natural gas is not generally available in either city. Even some private firms operating within the Pajaritos petrochemical complex in Coatzacoalcos receive truck-delivered LPG instead of natural gas.
- Lázaro Cárdenas has natural gas available by pipe, but the capacity of the system is limited and is fully committed to existing industrial users.
- Engle MaxiGas provides piped natural gas in many residential areas of Tampico-Altamira, but the distribution network does not extend to the main industrial areas of the city.
- Gas Natural Fenosa holds the rights to distribute piped natural gas in the Bajío region, including Silao. At this time the company's distribution network provides service in Irapuato, León, Celaya and Salamanca, but has not yet reached Silao.
- Igasamex delivers piped natural gas in some parts of the country, including Silao, but only in very specific local distribution areas to a small number of very large gas users.

Utility costs: electricity and gas

Zone cities	Electricity ¹		Natural gas ²	
	USD per kWh	Rate	USD per GJ	Rate
Coatzacoalcos	\$1.47	1	\$252.98	4
Lázaro Cárdenas	\$1.47	1	\$266.26	10
Salina Cruz	\$1.47	1	\$252.43	3
Tapachula	\$1.47	1	\$262.36	9
Parícut	\$1.47	1	\$252.98	4
Comparison cities				
Manzanillo	\$1.47	1	\$256.70	8
Silao	\$1.47	1	\$255.49	7
Tampico-Altamira	\$1.47	1	\$255.21	6
Metro cities				
Ciudad de México	\$1.47	1	\$46.31	2
Monterrey	\$1.47	1	\$43.71	1

¹ Based on the 12-month average electricity rates for industrial users in the respective cities, as published by the Comisión Reguladora de Energía (CRE).

² Based on the 12-month average natural gas rates for industrial users in the respective cities, as published by the Comisión Reguladora de Energía (CRE).

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Financing costs

For the purposes of financial modeling of cash flows, this study includes assumptions for typical interest rates for corporate borrowing and cash deposits for mid-sized manufacturing firms. These assumptions are the same as those used in the *Competitive Alternatives* 2016 global cost study.

The interest rates used in this study represent typical cash deposit rates and mid-class commercial bond/secured loan rates as of Q4 2015. Interest rates have changed little, if at all, during the first half of 2016.

In Mexico, the borrowing rate reflects a mix of lending in local currency and US dollars, which tends to reduce the total cost of borrowing. Any substantial cash holdings are assumed to be kept in US dollars, a common business practice for larger Mexican firms.

Based on these assumptions, the interest rates used in this analysis are 1.55 percent for cash deposits and 8.79 percent for secured commercial borrowing.

For operations in volatile industries or with limited fixed assets to offer as security, additional interest rate premiums may be added to the base borrowing rates as appropriate for each industry.

Taxes and incentives

The analysis of taxes includes all material business taxes in each study location. All taxes are classified into one of the following five categories, based on the substance of the tax rather than its specific name:

- ▶ Property taxes
- ▶ Capital taxes
- ▶ Sundry business taxes
- ▶ Transaction and sales taxes
- ▶ Income taxes (national, state and/or local).

Generally-accessible tax incentives with clearly defined eligibility criteria are also included in the analysis. Such incentives are limited in Mexico (where incentives tend to be more discretionary) but are relevant in respect of the US comparisons presented in Chapter 7.

Within Mexico, incentives included in the analysis are limited to abatements on the state salaries tax (ISN) for new firms in CDMX and Monterrey. For the smaller cities, major new investments are too infrequent to identify a "typical" approach to abatements. For the SEZ cities, the analysis does not include any incentives, but instead focuses on current tax costs for business in these cities, reflecting their "pre SEZ" state.

For the US cities compared in Chapter 7, relevant incentives include certain tax abatements, favorable interstate income apportionment rules, investment tax credits and job tax credits as applicable in the various jurisdictions compared.

In the study analysis, incentives are netted off directly against the taxes for which they represent a saving.

IN THE US STATES, THIS ANALYSIS DOES NOT INCLUDE ANY FORMERLY ESTABLISHED INCENTIVES. INSTEAD, THE STUDY FOCUSES ON CURRENT TAX COSTS FOR BUSINESSES IN THESE STATES, INCLUDING "PRE-SEZ" STATES.

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Property taxes

Property taxes (*predial* o *impuesto catastral*) include taxes levied on the value of both land and buildings. Property taxes paid in each city are compared in the cost analysis on the basis of pesos of tax paid per square meter of building space.

The process for estimating property taxes for each location included the following steps:

- Review of current municipal tax laws for each city to determine current tax rates, calculation approach, and the availability of any discounts for timely payment of the annual tax
- Review of current state catastral valuation laws and tables of unitary values (where relevant) to correctly understand the approach to property valuation in each location
- Calculation of a property tax rate for each city as an effective percentage of fair market value, incorporating the current predial tax rate, any adjustments required due to catastral values differing significantly from market values, and the effect of any discounts for timely tax payment
- For each city, estimating the fair market values of the facilities required by each of the model business operations, using the land and construction costs presented earlier in this chapter to determine market values for new, high quality industrial facilities
- For each city, applying the effective property tax rate to the fair market values of the facilities required by each of the 12 model business operations included in the study.

The calculation of property tax is the same regardless of whether a model business operation is assumed to own or lease its facility. As the facility lease costs presented previously only reflect basic rent, it is assumed that the tenant is responsible for paying property taxes in addition to rent.

Overall, property taxes are very low in most of the study cities. Among the cities compared, the four SEZ cities have the lowest property taxes, with Coatzacoalcos, Tapachula, Lázaro Cárdenas and Salina Cruz being the four lowest cost cities. Property taxes in these cities are only a minor cost item for businesses, representing less than 1 percent of total location-sensitive costs.

While property values in CDMX are relatively high and its property tax rates are significantly higher than in any of the other study cities, property taxes still represent less than 1 percent of total location-sensitive costs. Furthermore, the 2016 *Competitive Alternatives* study shows that property taxes in CDMX are still quite low by international standards.

The property tax costs shown here mean that any potential abatement of property taxes (if considered under the SEZ or another incentive program) would have only a minimal impact on the bottom lines of firms operating in these cities.

Total property taxes

	Estimated effective rate ^a		Total tax cost ^b	
	% of FMV	Ratio	MXN's per m ²	Rank
Zone cities				
Coatzacoalcos	0.068%	1	\$6.81	1
Lázaro Cárdenas	0.083%	2	\$7.62	3
Salina Cruz	0.113%	5	\$8.76	4
Tapachula	0.110%	3	\$7.14	2
Paríaiso	0.220%	9	\$17.03	9
Comparison cities				
Manzanillo	0.172%	6	\$8.92	6
Silao	0.204%	8	\$14.76	7
Tampico-Altamira	0.112%	4	\$8.76	4
Metro cities				
Ciudad de México	1.160%	10	\$97.65	10
Monterrey	0.200%	7	\$16.87	8

^aBased on the estimated fair market value of the facility, the estimated effective rate is calculated as the ratio of the property tax paid to the fair market value of the facility. ^bBased on the estimated fair market value of the facility, the total tax cost is calculated as the ratio of the property tax paid to the fair market value of the facility.

Sundry business taxes

Sundry business taxes take a variety of forms, including taxation based on employee headcount, total payroll and/or gross receipts.

Within the context of the Mexican tax system, the state tax on salaries (*Impuesto sobre nómina - ISN*) is included in this tax category. Costs for this tax reflect the combination of average annual salary costs for each city and the relevant tax rate for each state, as shown in the following table.

Costs for ISN are lowest in Tapachula, Manzanillo and Silao, due to the generally low wages that apply in each of these cities and all three cities having the same low ISN tax rate.

ISN tax costs in Monterrey are relatively low, due to the application of significant abatements that typically apply to new firms. Over the 10-year study analysis period, this results in a reduction of about 40 percent in ISN costs for Monterrey.

CDMX has the highest ISN costs among the study cities, consistent with it having both the highest overall salary costs and the equal highest ISN tax rate. Abatements typically available to new firms in CDMX are limited, and have only a modest impact on its tax calculation.

Capital taxes

Capital taxes include all taxes levied on business financial capital, including long term debt, share capital, reserves and/or retained earnings. Capital taxes can include taxes levied annually and/or one-time taxes levied at the time debt or shares are issued.

Capital taxes do not apply in Mexico, but are calculated, where relevant, for the US cities compared in Chapter 7.

Tax on salaries

	State tax rate	Total tax cost ¹	
	% of FNV	MXN\$ per year	RANK
Zone cities			
Coatzacoalcas	3.00%	\$572,850	8
Lázaro Cárdenas	2.00%	\$441,698	7
Salina Cruz	3.00%	\$569,433	9
Tapachula	2.00%	\$211,050	1
Parícut	2.50%	\$432,653	6
Comparison cities			
Manzanillo	2.00%	\$298,485	2
Silao	2.00%	\$361,800	3
Tampico-Altamira	2.00%	\$399,488	5
Metro cities			
Ciudad de México	3.00%	\$637,673	10
Monterrey	3.00%	\$376,383	4

¹ Source: SHCP, *Impuesto sobre nómina - ISN*, average annual (2010-2019) estimate of total tax cost for each city, based on average salary and employee headcount data.

Transaction taxes

Refundable value-added taxes (VAT/IVA) have been excluded from the analysis since their refundable nature means there is no net cost to a business once input tax credits (refunds) have been claimed. These taxes do impose a cost on companies in terms of administration and cash flow timing, but such costs are not material to this study.

Non-refundable sales taxes do not apply in Mexico, but apply in all US states compared in Chapter 7. Where non-refundable sales taxes apply, exemptions are generally available for many of the costs incurred by manufacturers to avoid the compounding of taxes into the price of goods at each stage of production.

Gross receipts taxes do not apply in Mexico, but apply in a small number of US jurisdictions including at least one of the cities compared in Chapter 7.

Corporate income taxes

Corporate income taxes are included in the calculation of total business costs for each city. Margins for net profit before tax vary with total operating costs in each location because revenues are assumed to be constant for all cities.

In the context of the Mexican tax system, corporate income tax represents a federal tax. A comparison of income taxes for the study cities is not presented here because the effective rate of corporate income tax is similar in all study cities.

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The analysis for this study is based on comparisons of costs for each of 12 standardized, industry-specific manufacturing business operations.

Industry results

The overall results for each of the study cities, as presented in Chapter 4 and on the following page, represent the combined results from all 12 manufacturing business operations compared in this study.

The 12 manufacturing industries represented here are the same as those compared in the global *Competitive Alternatives* study. These reflect manufacturing industries that are regularly seen making site selection decisions through the assessment of multiple jurisdictions.

Each industry is analyzed based on a model business operation, which defines key parameters for facilities, capital equipment, staffing, materials, utilities, logistics, financing and sales. In this study, the operating parameters for each industry operation have been adapted from those of the *Competitive Alternatives* study to reflect more labor intensive and less capital intensive operations typical of businesses operating in Mexico. Therefore, while this study compares the same industries as *Competitive Alternatives*, the industry operations in this study have been modified to better reflect Mexican domestic conditions.

This chapter summarizes the business cost results for each of the 12 industry operations, for all cities, together with some details on the nature of the industries and the main operating parameters of the standardized model business operations.

Industry business operations

Business operation modeled	Relevant industry
Advanced batteries	Green energy
Aircraft parts	Aerospace
Auto parts	Automotive
Electronics assembly	Electronics
Food processing	Agri-food
Medical device manufacturing	Medical devices
Metal machining	Metal components
Pharmaceutical products	Pharmaceuticals
Plastic products	Plastics
Precision components	Precision manufacturing
Specialty chemicals	Chemicals
Telecom equipment	Telecommunications

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Overall results

Previous chapters of this report, as well as this chapter, make frequent reference to the overall results for each city. Those overall results (or "manufacturing average" results) represent the combined results based on all 12 industry-specific manufacturing business operations compared in this study.

Prior to presenting results for each of the 12 business operations, this page presents the overall results in the same format, for ease of comparison.

The table of operating parameters presented here reflects the average parameters for the 12 representative industry operations modeled and provides a physical context to the comparison of business costs reflected in the overall results. As shown in the operating parameters table, the average manufacturing operation is characterized by:

- ▶ A factory of just over 6,600m² with approximately USD\$8.3 million in machinery and equipment
- ▶ A workforce of just under 135 employees that is weighted toward manual process workers and mid-skill process workers such as machine tenders
- ▶ Moderate energy requirements
- ▶ Annual sales at full production of USD\$28.3 million with input raw materials, parts and components equaling 55.8 percent of sales.

Based on these average operating parameters, and as presented in previous chapters, overall business costs are lowest in Monterrey, Manzanillo and Tapachula, while overall costs are highest in Lázaro Cárdenas and Salina Cruz.

City rankings			Operating parameters	
Rank	City	Index	Facility and capital investment	
1	Monterrey	98.7	Site size - m ²	18,549
2	Manzanillo	99.0	Factory size - m ²	6,654
3	Tapachula	99.1	Machinery and equipment - USD\$'000	8,325
4	Silao	99.3	Workforce ¹	
5	Ciudad de México	100.0	Management	6.4
6	Tampico-Altamira	100.3	Production staff	
7	Coatzacoalcos	100.5	- General labor-materials handler	16.9
8	Paraiso	100.8	- Process workers-manual	29.7
9	Lázaro Cárdenas	101.4	- Process workers-machine tenders	26.8
10	Salina Cruz	101.8	- Skilled operators & technicians	17.5
			- Production supervisors	5.7
			- Engineering and other technical staff	11.0
			Administrative and other staff	
			- Clerks and admin assistants	12.0
			- Other admin & sales staff	4.1
			- Maintenance staff	4.9
			Total Employees	134.9
			Energy requirements	
			Electricity monthly consumption - kWh	604,325
			Gas monthly consumption - m ³	35,874
			Other annual operating characteristics	
			Sales at full production - USD\$'000	28,308
			Materials & other direct costs - % of sales	55.8
			Other operating costs - % of sales	6.8
			Freight delivery loads - full containers	531
			Freight delivery loads - LTL ² loads	2,586

¹ A second employment estimate is also provided, which reflects the average (excluding general labor) 12 industry business operations.

² Less than truckload (LTL) freight.

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Advanced batteries

Advanced battery manufacturers produce advanced batteries and energy storage products, utilizing technologies such as lithium ion, nickel metal hydride, or polymer lithium-ion, among others. Significant and ongoing product development is typical in this industry due to continual demand for improved power-to-weight/size ratios for batteries used in automobiles, electronics, and advanced technology applications. Advanced batteries can also provide storage capacity for renewable energy systems and as part of electric grid management systems.

The representative operation modeled is a small-sized manufacturer of advanced batteries and energy storage products. As shown in the operating parameters table, this operation is characterized by:

- Significant facility and equipment requirements
- A workforce strongly weighted toward engineering and technical staff
- Moderate energy requirements
- High transportation costs due to very heavy products with special handling requirements.

For this model business operation, costs are lowest in Monterrey, Manzanillo and Silao. Low transportation costs are the key advantage for Monterrey, while Manzanillo and Silao benefit from moderately low costs for both labor and transportation.

Silao, CDMX and Coatzacoalcos all rank higher in this industry than in their overall results. Transportation cost advantages explain the gain in rankings for Silao and CDMX, while the importance of highly qualified technical staff for this operation creates an advantage for Coatzacoalcos.

City rankings

Rank	City	Index
1	Monterrey	98.1
2	Manzanillo	99.4
3	Silao	99.5
4	Ciudad de México	100.0
5	Coatzacoalcos	100.5
6	Tampico-Altamira	100.7
7	Tapachula	100.9
8	Paraiso	101.4
9	Lázaro Cárdenas	102.5
10	Salina Cruz	103.6

Operating parameters

Facility and capital investment	
Site size - m ²	20,235
Factory size - m ²	8,083
Machinery and equipment - USD\$'000	12,000
Workforce	
Management	7
Production staff	
- General labor-materials handler	8
- Process workers-manual	8
- Process workers-machine tenders	18
- Skilled operators & technicians	11
- Production supervisors	3
- Engineering and other technical staff	23
Administrative and other staff	
- Clerks and admin assistants	11
- Other admin & sales staff	7
- Maintenance staff	4
Total Employees	100
Energy requirements	
Electricity monthly consumption - kWh	412,200
Gas monthly consumption - m ³	31,161
Other annual operating characteristics	
Sales at full production - USD\$'000	36,100
Materials & other direct costs - % of sales	52.5
Other operating costs - % of sales	3.0
Freight delivery loads - LTL ¹ loads	5,320

¹ LTL = Less Than Truckload

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Aircraft parts

The aerospace industry produces commercial and military aircraft and parts, military weapons, space rockets, and satellites. This analysis focuses on aircraft components and sub-assemblies, which may comprise a complex mix of elements, including precision metal components, electronic assemblies and plastics components.

The representative operation modeled, a manufacturer of sub-assembly aircraft components, is based on a mix of mechanical and electrical production elements. As shown in the table of operating parameters table, this operation is characterized by:

- Moderate facility and equipment requirements
- A workforce with a high proportion of skilled operators and technicians
- Moderate energy requirements
- Moderate transportation requirements.

For this model business operation, costs are lowest in Tapachula, Manzanillo and Monterrey. Low labor costs are the primary driver of the favorable rankings for Tapachula and Manzanillo, while both Manzanillo and Monterrey benefit from relatively low freight costs.

Tapachula, Coatzacoalcos and Salina Cruz all rank higher in this industry than in their overall results:

- Moderate freight requirements for this operation allow Tapachula's wage advantage across all job categories to come to the fore and diminishes the freight disadvantage of Salina Cruz, allowing it to move into ninth place
- The importance of skilled operators/technicians for this operation is a benefit for Coatzacoalcos.

City rankings

Rank	City	Index
1	Tapachula	98.0
2	Manzanillo	98.3
3	Monterrey	99.0
4	Silao	99.1
5	Coatzacoalcos	99.7
6	Tampico-Altamira	99.8
7	Ciudad de México	100.0
8	Paraiso	100.1
9	Salina Cruz	100.5
10	Lázaro Cárdenas	100.6

Operating parameters

Facility and capital investment	
Site size - m ²	20,235
Factory size - m ²	7,107
Machinery and equipment - USD\$'000	7,000
Workforce	
Management	5
Production staff	
- General labor-materials handler	4
- Process workers-manual	9
- Process workers-machine tenders	26
- Skilled operators & technicians	28
- Production supervisors	5
- Engineering and other technical staff	15
Administrative and other staff	
- Clerks and admin assistants	7
- Other admin & sales staff	3
- Maintenance staff	4
Total Employees	106
Energy requirements	
Electricity monthly consumption - kWh	430,300
Gas monthly consumption - m ³	21,813
Other annual operating characteristics	
Sales at full production - USD\$'000	27,200
Materials & other direct costs - % of sales	58.8
Other operating costs - % of sales	5.0
Freight delivery loads - full containers	440

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Auto parts

The global automotive industry is dominated by the major global auto assemblers. These manufacturers outsource much of their parts production to large "Tier 1" suppliers, who then subcontract elements of production to smaller "Tier 2/3" manufacturers. Manufacturers may also supply parts directly to the replacement parts market.

The representative operation modeled is a "Tier 2/3" supplier of auto assemblies with a focus on products with highly manual assembly processes, such as wiring harnesses or vehicle seats. As shown in the operating parameters table, this operation is characterized by:

- Significant facility requirements but limited equipment requirements
- A workforce that is highly oriented towards manual process workers
- High energy requirements (relative to the other industry operations compared)
- Moderate transportation requirements.

For this model business operation, costs are similarly low in Monterrey and Tapachula, and also in Silao and Manzanillo. Low transportation and utility costs allow Monterrey to hold the top ranking, despite ranking sixth among the cities for labor costs.

Relative to Monterrey, varying degrees of lower labor costs in Tapachula, Silao and Manzanillo are offset by higher utility and transportation costs. Among the 10 study cities, Tapachula and Silao are the only ones that rank higher in this industry than in their overall results.

City rankings

Rank	City	Index
1	Monterrey	98.5
2	Tapachula	98.5
3	Silao	98.9
4	Manzanillo	98.9
5	Ciudad de México	100.0
6	Tampico-Altamira	100.1
7	Coahuila	100.4
8	Paraiso	100.8
9	Lázaro Cárdenas	101.3
10	Salina Cruz	101.5

Operating parameters

Facility and capital investment	
Site size - m ²	40,470
Factory size - m ²	14,864
Machinery and equipment - USD\$'000	5,000
Workforce	
Management	9
Production staff	
- General labor-materials handler	38
- Process workers-manual	102
- Process workers-machine tenders	23
- Skilled operators & technicians	17
- Production supervisors	8
- Engineering and other technical staff	12
Administrative and other staff	
- Clerks and admin assistants	26
- Other admin & sales staff	6
- Maintenance staff	14
Total Employees	255
Energy requirements	
Electricity monthly consumption - kWh	940,100
Gas monthly consumption - m ³	34,278
Other annual operating characteristics	
Sales at full production - USD\$'000	41,000
Materials & other direct costs - % of sales	67.0
Other operating costs - % of sales	2.0
Freight delivery loads - full containers	980

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Electronics assembly

The electronics assembly industry manufactures both finished electronic devices and electronic sub-assemblies for brand-name manufacturers and distributors of electronic equipment, as well as for manufacturers in many other industries who install electronic devices into their own products.

The representative operation modeled is an electronics sub-assembly plant. As shown in the table of operating parameters, this operation is characterized by:

- Significant facility requirements but limited equipment requirements
- A workforce that is highly oriented towards manual process workers but still with a notable complement of skilled technicians
- Utility requirements that are moderate for electricity but low gas
- Very low transportation requirements.

For this model operation, business costs are lowest in Tapachula, Manzanillo, Silao and Salina Cruz. Below-average labor costs benefit the top three cities, while for Salina Cruz moderate labor costs combined with low facility costs allow it to place in the top four. For all these cities, the very low significance of transportation costs is a key advantage for this business operation.

Tapachula, Silao, Salina Cruz and Paraíso all rank higher in this industry than in their overall results. Paraíso manages to achieve an exact tie with Tampico-Altamira in sixth place this industry. The required mix of workers for this industry marginally benefits Paraíso and, combined with very low transportation costs, creates an advantage for Paraíso despite its very high facility costs for this industry.

City rankings

Rank	City	Index
1	Tapachula	94.4
2	Manzanillo	96.7
3	Silao	97.6
4	Salina Cruz	98.2
5	Monterrey	98.5
6 (tie)	Paraíso	98.7
6 (tie)	Tampico-Altamira	98.7
8	Coatzacoalcas	98.7
9	Lázaro Cárdenas	99.6
10	Ciudad de México	100.0

Operating parameters

Facility and capital investment	
Site size - m ²	24,282
Factory size - m ²	8,919
Machinery and equipment - USD\$'000	3,000
Workforce	
Management	0
Production staff	
- General labor-materials handler	7
- Process workers-manual	50
- Process workers-machine tenders	13
- Skilled operators & technicians	13
- Production supervisors	7
- Engineering and other technical staff	11
Administrative and other staff	
- Clerks and admin assistants	10
- Other admin & sales staff	3
- Maintenance staff	5
Total Employees	127
Energy requirements	
Electricity monthly consumption - kWh	580,500
Gas monthly consumption - m ³	11,048
Other annual operating characteristics	
Sales at full production - USD\$'000	16,400
Materials & other direct costs - % of sales	48.5
Other operating costs - % of sales	14.0
Freight delivery loads - full containers	130

Food processing

The agri-food industry encompasses the production of food, beverage, and tobacco products. The industry is highly fragmented, with thousands of small independent food processors competing for market share with some of the world's largest conglomerates.

The representative operation modeled is a small independent food processor, producing medium-value, non-perishable products, such as packed, dried, or canned foods, or confectionery products. As shown in the operating parameters table, this operation is characterized by:

- ▶ Limited facility and equipment requirements
- ▶ A workforce that is highly oriented towards general labor and manual process workers
- ▶ Significant gas consumption for the heating of vats, ovens and/or steamers
- ▶ The highest transportation requirements of all industries due to bulk production of a relatively lower value product.

For this model business operation, costs are lowest in Monterrey, Manzanillo and Silao. Low transportation costs are the key advantage for Monterrey. Manzanillo benefits from very low labor costs, while Silao has moderately low costs for both labor and transportation.

Silao, CDMX, Tampico-Altamira and Lázaro Cárdenas all rank higher in this industry than in their overall results. Product distribution for this industry is more oriented toward regional markets in Central Mexico and the western US. This provides a relative cost advantage to Lázaro Cárdenas and allows it to move ahead of both Coahuila and Paraíso in the rankings.

City rankings		
Rank	City	Index
1	Monterrey	98.7
2	Manzanillo	99.5
3	Silao	99.7
4	Ciudad de México	100.0
5	Tampico-Altamira	101.3
6	Tapachula	101.6
7	Lázaro Cárdenas	102.3
8	Coahuila	102.8
9	Paraíso	103.1
10	Salina Cruz	104.0

Operating parameters	
Facility and capital investment	
Site size - m ²	12,141
Factory size - m ²	3,716
Machinery and equipment - USD\$'000	2,000
Workforce	
Management	7
Production staff	
- General labor-materials handler	42
- Process workers-manual	40
- Process workers-machine tenders	22
- Skilled operators & technicians	2
- Production supervisors	5
- Engineering and other technical staff	5
Administrative and other staff	
- Clerks and admin assistants	10
- Other admin & sales staff	3
- Maintenance staff	4
Total Employees	140
Energy requirements	
Electricity monthly consumption - kWh	289,600
Gas monthly consumption - m ³	54,674
Other annual operating characteristics	
Sales at full production - USD\$'000	21,000
Materials & other direct costs - % of sales	57.2
Other operating costs - % of sales	4.8
Freight delivery loads - full containers	1,290

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Medical devices

Medical device manufacturing represents one component of the broader medical equipment, technology and supplies industry. Medical device manufacturers produce a wide range of medium- and high-technology products, such as prosthetics, artificial joints, implants, stents and braces.

The business operation modeled is a manufacturer of mechanical medical devices, such as prosthetics. As shown in the table of operating parameters, this operation is characterized by:

- Moderate facility and equipment requirements
- A workforce with concentrations of both manual assemblers and also skilled operators/technicians
- Low energy requirements
- Moderate transportation requirements.

For this model operation, business costs are lowest in Tapachula, Manzanillo and Silao. Below-average labor costs benefit all of these cities and the moderate transportation requirements mean that their labor cost advantages are not overwhelmed by high transportation costs.

Tapachula, Silao, Paraiso and Salina Cruz all rank higher in this industry than in their overall results. Among the production labor categories examined, Salina Cruz is somewhat more competitive for low-to-medium skill process workers than for either general labor or highly skilled workers, thus creating a modest advantage for Salina Cruz in this industry.

City rankings			Operating parameters	
Rank	City	Index	Facility and capital investment	
1	Tapachula	96.5	Site size - m ²	16,188
2	Manzanillo	97.5	Factory size - m ²	5,203
3	Silao	98.5	Machinery and equipment - USD\$'000	11,000
4	Monterrey	98.8	Workforce	
5	Paraiso	99.3	Management	7
6	Tampico-Altamira	99.5	Production staff	
7	Coatzacoalcas	99.5	- General labor-materials handler	11
8	Salina Cruz	99.9	- Process workers-manual	40
9	Ciudad de México	100.0	- Process workers-machine tenders	8
10	Lázaro Cárdenas	100.5	- Skilled operators & technicians	20
			- Production supervisors	7
			- Engineering and other technical staff	10
			Administrative and other staff	
			- Clerks and admin assistants	13
			- Other admin & sales staff	3
			- Maintenance staff	4
			Total Employees	125
			Energy requirements	
			Electricity monthly consumption - kWh	325,000
			Gas monthly consumption - m ³	7,649
			Other annual operating characteristics	
			Sales at full production - USD\$'000	19,300
			Materials & other direct costs - % of sales	42.8
			Other operating costs - % of sales	9.0
			Freight delivery loads - full containers	370

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Metal components

The fabricated metal products industry encompasses both a wide range of products and production techniques, producing metal components for applications such as building products (hardware), automotive, agricultural, drilling/mining, transportation, appliances and others.

The business operation modeled is a small producer of machined metal building products. As shown in the table of operating parameters, this operation is characterized by:

- Significant facility requirements and moderate equipment requirements
- A workforce that is highly oriented towards mid-skill process workers such as machine tenders
- High energy requirements (relative to the other industry operations compared)
- High transportation requirements due to bulk production of a heavy product with a relatively low unit value.

For this model business operation, costs are lowest in Monterrey, CDMX and Silao. Low transportation costs represent the key advantage for all three cities, given the high significance of freight costs for this operation.

CDMX, Silao and Tampico-Altamira all rank higher in this industry than in their overall results. Meanwhile, the lower half of the city rankings for this industry include all of the five zone cities.

City rankings

Rank	City	Index
1	Monterrey	98.1
2	Ciudad de México	100.0
3	Silao	100.1
4	Marizanillo	100.4
5	Tampico-Altamira	101.6
6	Tapachula	101.7
7	Coatzacoalcos	101.7
8	Paraiso	102.7
9	Lázaro Cárdenas	103.4
10	Salina Cruz	104.8

Operating parameters

Facility and capital investment	
Site size - m ²	20,235
Factory size - m ²	7,432
Machinery and equipment - USD\$'000	6,000
Workforce	
Management	5
Production staff	
- General labor-materials handler	19
- Process workers-manual	14
- Process workers-machine tenders	49
- Skilled operators & technicians	6
- Production supervisors	4
- Engineering and other technical staff	6
Administrative and other staff	
- Clerks and admin assistants	15
- Other admin & sales staff	3
- Maintenance staff	7
Total Employees	128
Energy requirements	
Electricity monthly consumption - kWh	1,493,100
Gas monthly consumption - m ³	81,020
Other annual operating characteristics	
Sales at full production - USD\$'000	26,700
Materials & other direct costs - % of sales	57.6
Other operating costs - % of sales	2.0
Freight delivery loads - full containers	1,260

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Pharmaceuticals

The pharmaceuticals industry represents a mix of operations, with production facilities owned by major pharmaceutical firms and independent firms producing generic products and/or brand-name drugs (under license).

The representative operation modeled is an independent plant producing prescription drugs on behalf of brand-name and/or generic distributors. As shown in the operating parameters table, this operation is characterized by:

- Moderate facility requirements and significant equipment requirements
- A workforce weighted toward skilled technical employees, but also including significant numbers of lesser skilled staff
- Limited energy requirements
- Low transportation requirements.

For this model business operation, costs are lowest in Tapachula, Manzanillo and Monterrey. Low labor costs are the primary driver of the favorable rankings for Tapachula and Manzanillo, while both Manzanillo and Monterrey benefit from relatively low freight costs.

Tapachula, Tampico-Altamira, Coatzacoalcas and Salina Cruz all rank higher in this industry than in their overall results. Tapachula and Salina Cruz benefit primarily from the lower significance of freight costs for this operation. Low transportation costs also allow wages to have a greater impact in the final rankings, and both Tampico-Altamira and Coatzacoalcas are more competitive with wages for the highly skilled process workers required by this industry.

City rankings

Rank	City	Index
1	Tapachula	98.1
2	Manzanillo	98.6
3	Monterrey	99.1
4	Silao	99.4
5	Tampico-Altamira	100.0
6	Coatzacoalcas	100.0
7	Ciudad de México	100.0
8	Paraiso	100.1
9	Salina Cruz	100.7
10	Lázaro Cárdenas	100.8

Operating parameters

Facility and capital investment	
Site size - m ²	16,188
Factory size - m ²	5,203
Machinery and equipment - USD\$'000	18,000
Workforce	
Management	8
Production staff	
- General labor-materials handler	20
- Process workers-manual	15
- Process workers-machine tenders	19
- Skilled operators & technicians	51
- Production supervisors	7
- Engineering and other technical staff	14
Administrative and other staff	
- Clerks and admin assistants	15
- Other admin & sales staff	3
- Maintenance staff	5
Total Employees	157
Energy requirements	
Electricity monthly consumption - kWh	403,000
Gas monthly consumption - m ³	30,595
Other annual operating characteristics	
Sales at full production - USD\$'000	33,100
Materials & other direct costs - % of sales	45.8
Other operating costs - % of sales	16.0
Freight delivery loads - full containers	590

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Plastic products

The plastic products industry encompasses a wide range of products, including bags, films, pipes, bottles, coverings, foam products, and more. Typical firms range from large high-volume manufacturers of standard products, to small-volume contract manufacturers.

The representative operation modeled is an independent plastic products manufacturer. As shown in the table of operating parameters, this operation is characterized by:

- Significant facility requirements and moderate equipment requirements
- A workforce that is highly oriented towards mid-skill process workers such as machine tenders
- High energy requirements (relative to the other industry operations compared)
- High transportation requirements due to bulk production of a heavy product with a relatively low unit value.

For this model business operation, costs are lowest in Monterrey, Silao and Manzanillo. Low transportation costs are especially important for both Monterrey and Silao, while Manzanillo's rating is based on low labor costs and moderate transportation costs.

Silao, CDMX and Coatzacoalcos all rank higher in this industry than in their overall results. The mix of freight destinations and loading issues (high volume but low weight) for this industry create a marginal advantage for Coatzacoalcos, which ranks fourth among the 10 cities for transportation costs - better than the sixth place it sees in many other industries.

City rankings

Rank	City	Index
1	Monterrey	98.0
2	Silao	99.2
3	Manzanillo	99.2
4	Ciudad de México	100.0
5	Tapachula	100.1
6	Coatzacoalcos	100.7
7	Tampico-Altamira	100.8
8	Paraiso	101.6
9	Lázaro Cárdenas	102.7
10	Salina Cruz	103.7

Operating parameters

Facility and capital investment	
Site size - m ²	20,235
Factory size - m ²	7,432
Machinery and equipment - USD\$'000	8,000
Workforce	
Management	4
Production staff	
- General labor-materials handler	19
- Process workers-manual	12
- Process workers-machine tenders	52
- Skilled operators & technicians	6
- Production supervisors	3
- Engineering and other technical staff	4
Administrative and other staff	
- Clerks and admin assistants	9
- Other admin & sales staff	3
- Maintenance staff	4
Total Employees	116
Energy requirements	
Electricity monthly consumption - kWh	788,900
Gas monthly consumption - m ³	25,779
Other annual operating characteristics	
Sales at full production - USD\$'000	21,000
Materials & other direct costs - % of sales	55.6
Other operating costs - % of sales	2.0
Freight delivery loads - full containers	1,190

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Precision components

Precision manufacturing is a process-related concept, rather than being defined by specific industry definitions or products. Applications that require precision manufacturing exist in many industries and operations, including aerospace (aircraft parts and engines), R&D (laboratory and testing equipment) and automotive (auto engine parts).

The representative operation modeled is a small-volume manufacturer of high-value metal products with very low tolerance (e.g., a producer of precision components, casings, and housings). As shown in the table of operating parameters, this operation is characterized by:

- ▶ Limited facility requirements but significant equipment requirements
- ▶ A workforce with a mix of skills, with mid-skill CNC machine tenders, highly skilled machine operators and manual workers completing finishing details
- ▶ Moderate energy requirements
- ▶ Moderate transportation requirements due to the higher value nature of the products.

For this model business operation, costs are (again) lowest in Monterrey, Silao and Manzanillo. Low freight costs are the key advantage for Monterrey, while Manzanillo and Silao benefit from moderately low costs for both labor and transportation.

Silao, CDMX and Coatzacoalcos (again) rank higher in this industry than in their overall results. For Silao and Coatzacoalcos, more competitive wage rates for mid and high skill process workers drive their improved rankings, while the advantage for CDMX is due to its competitive transportation costs.

City rankings		
Rank	City	Index
1	Monterrey	99.0
2	Silao	99.8
3	Manzanillo	99.9
4	Ciudad de México	100.0
5	Tapachula	100.6
6	Coatzacoalcos	100.6
7	Tampico-Altamira	100.6
8	Paraiso	101.1
9	Lázaro Cárdenas	101.7
10	Salina Cruz	102.5

Operating parameters	
Facility and capital investment	
Site size - m ²	8,094
Factory size - m ²	2,787
Machinery and equipment - USD\$'000	11,100
Workforce	
Management	1
Production staff	
- General labor-materials handler	1
- Process workers-manual	16
- Process workers-machine tenders	45
- Skilled operators & technicians	10
- Production supervisors	4
- Engineering and other technical staff	6
Administrative and other staff	
- Clerks and admin assistants	2
- Other admin & sales staff	1
- Maintenance staff	1
Total Employees	89
Energy requirements	
Electricity monthly consumption - kWh	541,800
Gas monthly consumption - m ³	30,595
Other annual operating characteristics	
Sales at full production - USD\$'000	32,600
Materials & other direct costs - % of sales	68.6
Other operating costs - % of sales	1.5
Freight delivery loads - LTL ¹ loads	17,120

1. LTL = Less Than Truckload

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Specialty chemicals

The chemicals industry encompasses the production of basic organic and inorganic chemicals, synthetic rubber and fibers, pesticides and fertilizers, paints and adhesives, soaps, and cleaning compounds.

The representative operation modeled is a small producer of specialty chemicals in limited volumes for niche markets, such as the production of consumer or industrial cleaning products, solvents, adhesives, or fragrances. As shown in the operating parameters table, this operation is characterized by:

- ▶ Limited facility requirements but significant equipment requirements
- ▶ A workforce that is highly oriented towards skilled process technicians and operators
- ▶ High energy requirements (relative to the other industry operations compared)
- ▶ Relatively low transportation requirements.

For this model business operation, costs are lowest in Monterrey, Tapachula and Manzanillo. Low costs for natural gas allow Monterrey to hold the top ranking, despite ranking eighth among the cities for labor costs. Relative to Monterrey, lower labor costs in Tapachula and Manzanillo are offset by higher utility and transportation costs.

Among the 10 study cities, Tapachula, CDMX, Paraiso and Salina Cruz all rank higher in this industry than in their overall results. CDMX ranks well due to its low costs for natural gas (similar to Monterrey). Among the cities that use LPG, Salina Cruz and Paraiso have the lowest gas costs – helping their rankings for this energy dependent operation.

City rankings

Rank	City	Index
1	Monterrey	99.4
2	Tapachula	99.5
3	Manzanillo	99.8
4	Ciudad de México	100.0
5	Silao	100.3
6	Paraiso	100.5
7	Coatzacoalcos	100.6
8	Tampico-Altamira	100.6
9	Salina Cruz	101.0
10	Lázaro Cárdenas	101.2

Operating parameters

Facility and capital investment	
Site size - m ²	12,141
Factory size - m ²	4,645
Machinery and equipment - USD\$'000	14,000
Workforce	
Management	6
Production staff	
- General labor-materials handler	13
- Process workers-manual	10
- Process workers-machine tenders	33
- Skilled operators & technicians	26
- Production supervisors	3
- Engineering and other technical staff	14
Administrative and other staff	
- Clerks and admin assistants	9
- Other admin & sales staff	8
- Maintenance staff	2
Total Employees	124
Energy requirements	
Electricity monthly consumption - kWh	773,100
Gas monthly consumption - m ³	104,533
Other annual operating characteristics	
Sales at full production - USD\$'000	46,000
Materials & other direct costs - % of sales	66.9
Other operating costs - % of sales	4.0
Freight delivery loads - LTL ¹ loads	8,590

¹ LTL = Less Than Truckload

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Telecom equipment

The telecommunications industry includes both service providers and equipment manufacturers, with equipment manufacturers producing both transmitting and receiving equipment for traditional wired networks and modern optical and wireless networks.

The representative operation modeled is a manufacturer of specialized telecom equipment in either a wired or a wireless environment. As shown in the table of operating parameters, this operation is characterized by:

- ▶ Limited facility and equipment requirements
- ▶ A workforce that is highly oriented towards manual process workers but still with a notable complement of skilled technicians
- ▶ Low energy requirements
- ▶ Very low transportation requirements.

For this model operation, business costs are lowest in Tapachula, Manzanillo, Silao and Paraiso. Below-average labor costs benefit each of these cities, while for Paraiso the low significance of facility costs (a factor for which Paraiso has a cost disadvantage) allows it to place in the top four.

Tapachula, Silao, Paraiso, Salina Cruz and Coatzacoalcos all rank higher in this industry than in their overall results. For all these cities, the very low significance of transportation costs for this operation help to explain their more favorable rankings for this industry.

City rankings			Operating parameters	
Rank	City	Index	Facility and capital investment	
1	Tapachula	94.9	Site size - m ²	12,141
2	Manzanillo	96.8	Factory size - m ²	4,459
3	Silao	98.0	Machinery and equipment - USD\$'000	2,800
4	Paraiso	98.2	Workforce	
5	Salina Cruz	98.6	Management	8
6	Coatzacoalcos	98.9	Production staff	
7	Monterrey	98.9	- General labor-materials handler	19
8	Tampico-Altamira	99.0	- Process workers-manual	40
9	Lázaro Cárdenas	99.8	- Process workers-machine tenders	13
10	Ciudad de México	100.0	- Skilled operators & technicians	20
			- Production supervisors	12
			- Engineering and other technical staff	12
			Administrative and other staff	
			- Clerks and admin assistants	17
			- Other admin & sales staff	6
			- Maintenance staff	5
			Total Employees	152
			Energy requirements	
			Electricity monthly consumption - kWh	274,300
			Gas monthly consumption - m ³	9,348
			Other annual operating characteristics	
			Sales at full production - USD\$'000	19,300
			Materials & other direct costs - % of sales	48.0
			Other operating costs - % of sales	18.0
			Freight delivery loads - full containers	120

7

The focus of this study has been on the domestic cost analysis for 10 cities in Mexico. This chapter looks beyond the border to compare costs for those cities to the US Southeast.

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International comparisons

The main focus of this study is to ascertain the level of business costs in each of the Mexican SEZ cities and to compare costs for those cities to a range of domestic cities that are generally larger, more economically dynamic and/or more familiar to prospective business investors.

This chapter expands the analysis and compares business costs between the 10 domestic cities and six cities located in the US Southeast. The Southeast was chosen for this comparison both due to its geographic proximity to Mexico and because it exhibits the lowest business costs among all regions of the US, as seen in the KPMG's 2016 study, *Competitive Alternatives*.

The six US cities chosen for comparison are:

- **Houma and Shreveport** in Louisiana are the lowest cost cities among a group of 80 US cities in *Competitive Alternatives 2016*
- **Montgomery**, Alabama, has the third lowest costs among the among the same group of 80 US cities
- **Savannah**, Georgia, ranks fifth among 80 US cities in *Competitive Alternatives* and represents a major port
- **Gulfport-Biloxi**, Mississippi and **Mobile**, Alabama are included due to being major Gulf Coast ports, although with costs that are marginally higher than in the other cities.



International Business Services

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Business costs for the six US cities are based on the same 12 industry-specific business operations discussed throughout this report. The operating parameters for these business operations include modifications made in this study to better reflect typical Mexican domestic operations. Therefore, the cost analysis presented here reflects business costs for US cities, but business models that are typical for Mexico.

Business costs index results for all 16 cities – 10 in Mexico and six in the US – are presented in the first table. Business costs in all US cities are higher than in any of the Mexican cities for every industry, with an average cost gap of about 11 percent separating Salina Cruz (highest in Mexico) and Montgomery (lowest in the US).

The table also compares the cost differentials calculated in this study to those of *Competitive Alternatives 2016* for cities included in both studies. *Competitive Alternatives* identified typical cost differentials of about 10 percent between CDMX and the US Southeast, while in the current study that differential increases to about 14 percent. This change in relative costs between Mexico and the US Southeast is primarily attributable to labor costs and differences in the quantity and mix of labor examined in this study as compared to the global *Competitive Alternatives* study.

In this study, all industry operations reflect more labor intensive production processes with relatively higher numbers of lesser skilled general laborers and manual process workers in the mix of employees. In addition, the labor research for *Competitive Alternatives* reflected cost values for very well qualified employees suitable for employment in sophisticated modern manufacturing operations. In contrast, the research for this study reflects more typical levels of pay, qualification and experience in each city.

Pay differences between Mexico and the US tend to be relatively greater for lesser skilled workers. As a result, in the *Competitive Alternatives* study, labor costs in the US Southeast were typically 1.9 to 2.0 times higher than in CDMX. In this study, with a lower average skill level in the labor mix, that differential increases, with labor costs in the US Southeast being about 2.8 times higher than in CDMX.

It is also noteworthy that in this analysis only four of the 12 industries examined manage to achieve profitability in the US – advanced batteries, aircraft parts, precision components and specialty chemicals – all being industries with relatively highly skilled employees. After applying operating parameters and revenue levels based on Mexican domestic conditions, operations in the other eight industries all report negative net margins in the US locations compared.

Comparison to cities in the US Southeast, total cost index

Rank	City	This study		Competitive Alternatives ¹	
		Manufacturing cost index	% Differential (v. CDMX)	Manufacturing cost index	% Differential (v. CDMX)
1	Monterrey	98.7	-1.3%	85.3	-1.8%
2	Manzanillo	99.0	-1.0%		
3	Tapachula	99.1	-0.9%		
4	Silao	99.3	-0.7%		
5	Ciudad de México	100.0	-	86.9	-
6	Tampico-Altamira	100.3	+0.3%		
7	Coatzacoalcas	100.5	+0.5%		
8	Paraiso	100.8	+0.8%		
9	Lázaro Cárdenas	101.4	+1.4%		
10	Salina Cruz	101.8	+1.8%		
11	Montgomery, AL	113.1	+13.1%	95.4	+9.9%
12	Houma, LA	113.7	+13.7%	95.1	+9.5%
13	Shreveport, LA	113.7	+13.7%	95.1	+9.5%
14	Gulfport-Biloxi, MS	114.0	+14.0%	95.9	+10.4%
15	Savannah, GA	114.2	+14.2%	95.6	+10.0%
16	Mobile, AL	114.3	+14.3%	96.0	+10.5%

¹ Manufacturas con base 2010 (PMS) para Competitiva Alternativa (base de 100=100)

Comparison to cities in the US Southeast, labor costs

Rank	City	This study		Competitive Alternatives ¹	
		Manufacturing labor costs (USD\$'000)	% Differential (v. CDMX)	Manufacturing labor costs (USD\$'000)	% Differential (v. CDMX)
1	Monterrey	1,634	-6.0%	2,469	-6.1%
5	Ciudad de México	1,739	-	2,630	-
11	Montgomery, AL	6,513	+274.6%	7,748	+194.0%
12	Houma, LA	6,554	+277.0%	7,641	+190.5%
13	Shreveport, LA	6,525	+275.3%	7,607	+189.2%
14	Gulfport-Biloxi, MS	6,393	+267.7%	7,554	+187.2%
15	Savannah, GA	6,669	+283.6%	7,886	+199.9%
16	Mobile, AL	6,583	+278.7%	7,803	+196.7%

¹ Manufacturas con base 2010 (PMS) para Competitiva Alternativa (base de 100=100)

Fase 2 Propuesta de Estudios de Prefactibilidad

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3.9.16 ANEXO 16: MATRIZ DE COMPATIBILIDAD DE USOS DE SUELO

A continuación se presenta la matriz de compatibilidad de usos de suelo entre las vocaciones productivas del escenario desarrollista y del escenario ajustado de la ZEE de Lázaro Cárdenas:

Desarrollista Ajustado				
	Aceero	Agroindustria	Automotor	Metalmecánica
Aceero				
Automotor				
Metalmecánica				

Compatible

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