MAJOR INFRASTRUCTURE PROJECTS IN MEXICO

A Resource Guide for U.S. Industry

Sponsored by the U.S. Trade and Development Agency

Prepared under contract by:

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About This Guide

The U.S. Trade and Development Agency (USTDA) helps companies create U.S. jobs through the export of U.S. goods and services for priority development projects in emerging economies. USTDA links U.S. businesses to export opportunities by funding project planning activities, pilot projects and reverse trade missions while creating sustainable infrastructure and economic growth in partner countries.

This guide has been developed to provide U.S. companies and exporters with an overview of Mexico's infrastructure sectors, the sector development plans in place through 2018, and to provide profiles of a sample of specific, upcoming projects of potential interest.

Currency amounts converted from Mexican Pesos (MXN) to United States dollars (USD) have been done so using a rate of 13.12 pesos to one dollar. Due to fluctuations in currency values, different levels of engineering and cost estimation completion for different projects, and differing timing of cost information publication, the monetary values within this report should only be considered approximate. Unless explicitly indicated otherwise, all currency values are in United States Dollars (USD).

All exhibits and images are sourced from Mexican government publications, unless otherwise indicated.

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3. Project Profiles by Sector

There are many infrastructure projects ongoing or in planning all across Mexico. The projects profiled in detail in this section were selected based on a combination of features, primary among them the potential for significant U.S. exports of goods and services, but also considering readiness and scale.

3.1 Transportation

The Secretaría de Comunicaciones y Transportes (SCT) is Mexico's federal agency responsible for the country's transportation and telecommunications systems. The SCT's mission is to develop and advance policies and programs in the transportation and telecommunications sectors that contribute to the sustainable economic growth and social development needs of Mexico. The SCT achieves this mission through area-specific administrative bodies. These administrative bodies are responsible for a given mode or group of modes of transportation, generally, and transportation statistics, information, and planning, specifically. These SCT units are covered in more detail in the background sections for each specific transportation mode.

Under the new administration, the SCT has made it their priority to provide transport infrastructure that makes the movement of products, services, and people easier, in a fast, efficient, and low cost manner. The SCT was allocated MXN $107 billion of Mexico's 2014 budget, 50 percent higher than the previous year's allocation to the agency. SCT funding accounts for 12.3 percent of the total projects to be carried out in 2015.

The administration's USD $590 billion (USD) 2014 – 2018 PNI encompasses a wide variety of projects aimed at the development of an enhanced national network of roads, ports, airports, railways and telecommunications services and infrastructure. Many of the investments identified in the PNI will be funded from an array of sources including federal resources from the Fondo Nacional de Infraestructura (FONADIN, Mexico's National Infrastructure Fund), the Banco Nacional de Obras y Servicios Públicos (BANOBRAS, the National Works and Public Services Bank), state and municipal sources, user fees, and Public Private Partnerships (PPPs). Multilateral institutions including the World Bank Group, the North American Development Bank (NADB), and the Inter-American Development Bank (IDB) continue to be active partners supporting development of transportation infrastructure in Mexico through a range of financing instruments and technical assistance.

3.1.1 Roads and Highways

Sector Background

Mexico's road and highway network measures 377,659 kilometers. It is classified into four parts: the federal network of 49,652 kilometers; the state highway feeders of 83,981 kilometers; the rural road network of 169,430 kilometers, and improved connectors of 74,596 kilometers. Within this, the strategic trunk network is composed of fourteen corridors that provide connectivity between the Atlantic and

Pacific coasts and the northern and southern borders of the country. A fifteenth strategic corridor is among the planned investments in the sector by 2018. This will connect Salina Cruz and Tepic along the Pacific Coast.

Of the federal network 40,752 kilometers are freeways and 8,900 kilometers are tolled. Of the toll roads 4,963 kilometers are operated by private concessionaires and the remaining 3,947 kilometers are managed by the Federal Roads and Bridges Agency (CAPUFE by its Spanish acronym).

Figure 6: Mexico's Strategic Trunk Road Network

Mexico's road network is the primary means of national transport by volume of both passengers (98 percent) and freight (56 percent) and is a key focus of continuing large-scale investment as part of the PNI. It is important to note that while investment continues apace in roads, the policy focus in transportation has shifted to more aggressively support multi-modalism. New investments in ports, freight rail, intercity passenger rail and urban mass transit, described in their respective sections of this report, symbolize this shift in transportation planning and spending. This is driven by strategic efforts of the government to improve energy efficiency and reduce the impacts of intensive road transportation including rising infrastructure maintenance expenditures and, especially in urban areas, severe air pollution and congestion. Traffic congestion where major roads pass through urban centers is a particular challenge.

The current Sectoral Program for Communications and Transportation sets a variety of qualitative and quantitative objectives to be achieved for each mode by 2018. For roads and highways the country seeks to:

1. Reduce logistics costs by completing and consolidating the trunk corridor network, constructing bypasses around urban centers, improving connections to logistics hubs such as ports and airports, and by applying innovative financing tools to leverage federal investment in the sector.
2. Improve the safety of roads by improving the state of repair of the network and implementing intelligent transportation systems (ITS).
3. Stimulate regional development through improvements to regional and rural roads, utilize rural labor on these works through a structured employment program, and modernize the interstate highway system.

Major quantified objectives for the roads and highways sector include reducing by ten percent the annual number of accidents per million vehicle-kilometers, shifting the national share of ton-kilometers of freight transported by rail from 25.4 percent to 27.3 percent (by diverting freight to rail from roads) and diverting 167 million-passenger-kilometers per month away from roads and onto new intercity passenger rail services.

To accomplish these goals, the government set out in the PNI a total investment target of more than USD $30.2 billion to be spent across 153 separate road and highway projects. Two of these "projects" are actually nationwide programs, one for USD $7.8 billion to perform general maintenance across the roads network, and a USD $5.4 billion program to develop and improve rural roads. Remaining projects range from mega-projects of USD $800 million to local projects of only a few million each. 54 of these projects are undertakings exceeding USD $100 million and 76 are Presidential Compromises.

Projects

Ten of the signature road and highway projects within the PNI are identified below:

1. CG-040: Construction of the Elevated Route over the Mexico – Veracruz Highway (USD $801 million)
2. CG-234: First Stage of the Modernization of the Highway from Palenque to San Cristobal de las Casas (USD $762 million)
3. CG-211: Complete the Highway between Oaxaca and the Isthmus (USD $700 million)
4. CG-023: Construction of the Highway from Tuxpan to Tampico (USD $615 million)
5. Construction of the Highway between Atizapán and Atlacomulco (USD $447 million)
6. Construction of the Guadalajara Bypass (USD $436 million)
7. CG-060: Construction of the First Stage of the Beltway of Orizaba and Córdoba (USD $424 million)
8. Construction of the Elevated Highway from Indios Verdes – Santa Clara (USD $423 million)
9. CG-213: Completion of the Highway from Oaxaca to Puerto Escondido (USD $345 million)
10. CG-022: Construction of the First Stage of the Highway from Cardel to Pozo Rico (USD $310 million)

United States Export Potential

Mexico has a sophisticated domestic industry for heavy highway materials supply and for architect/engineering and maintenance and construction contracting services. This is supplemented by a strong presence of European firms, notably Spanish companies, in professional services and provision of sophisticated systems and equipment. They also are frequent operators of infrastructure. Accordingly competition is fierce in this sector. Though U.S. firms are present, typically in association with local firms, they are not prominent in direct roles in highway project contracting or as concessionaires. There is a robust export market for U.S. firms as suppliers of heavy capital equipment for road construction and maintenance. Mexico has specifically identified greater implementation of intelligent transportation systems as a strategic goal for the sector. U.S. firms are welcome, but they face strong competition in this sector, particularly from European suppliers. Mexican buyers have expressed a preference for provision of ITS systems from larger suppliers who can provide broad integrated systems with strong back-end analytics capabilities.

Project Contacts

For more information on project opportunities in the roads and highways sector you may reach out to:

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3.1.2 Freight and Intercity Passenger Railways

Sector Background

The development of the national railway system of Mexico began in the early 1800's much as in the United States, as a number of companies competed to develop different parts of the new system under government concessions. By 1909, the majority of the railway system was consolidated under a single government-owned company, Ferrocarriles Nacionales Mexicanos (FNM), which carried 80 percent of the rail traffic and operated on 70 percent of the tracks, providing both freight and passenger services. The scale of the system increased substantially over the following decades, providing service to most parts of the country. By the 1980's the railroad suffered from major problems in competitiveness and efficiency and had become heavily indebted. Between 1997 and 1999, the government completely restructured the railroad system and dismantled FNM. This process included shutting down nearly all intercity passenger rail services and transferring operation of the network to private or public entities in vertically integrated multi-decade concessions. As of today, nine companies hold operating concessions:

Ferrocarril Mexicano and Ferrosur, combined represent the largest group operating freight concessions in Mexico. Controlling 8,600 kilometers of main lines, this group moved over 52 billion ton-kilometers of freight in 2012.

Kansas City Southern de México, the second largest freight concessionaire, operating 4,283 kilometers of main lines, KCSM transported 25.2 billion ton-kilometers of freight in 2012.

Ferrocarril y Terminal del Valle de México is a concession commonly owned between the major freight operators providing joint terminal and switching services across 297 kilometers of lines in the Valley of Mexico.

Línea Coahuila-Durango is a regional freight concessionaire operating over 974 kilometers of main line in the north central region of Mexico.

Ferrocarril del Istmo de Tehuantepec, known as FIT, is a parastatal entity that operates a short line freight corridor in southern Mexico running north from the coast at Salina Cruz.

Compañía de Ferrocarriles de Chiapas-Mayab, operated by government railroad FIT, is responsible for providing freight services on a 1,550 kilometer network in southern Mexico.

Administradora de la Vía Corta Tijuana – Tecate (ADMICARGA), a parastatal short-line freight service and tourist train operator in Baja California.

Ferrocarriles Suburbanos, S.A.P.I. de C.V. provides commuter rail service from the suburban area of Cuatitlan south to Buenavista near the center of Mexico City.

The remaining passenger service obligations on the network have focused on providing public rail transport to isolated communities that have no other mode of public transportation available to them, promoting the development of passenger rail tourist services in regions of high market potential and the operation of a commuter rail corridor service in Mexico City.

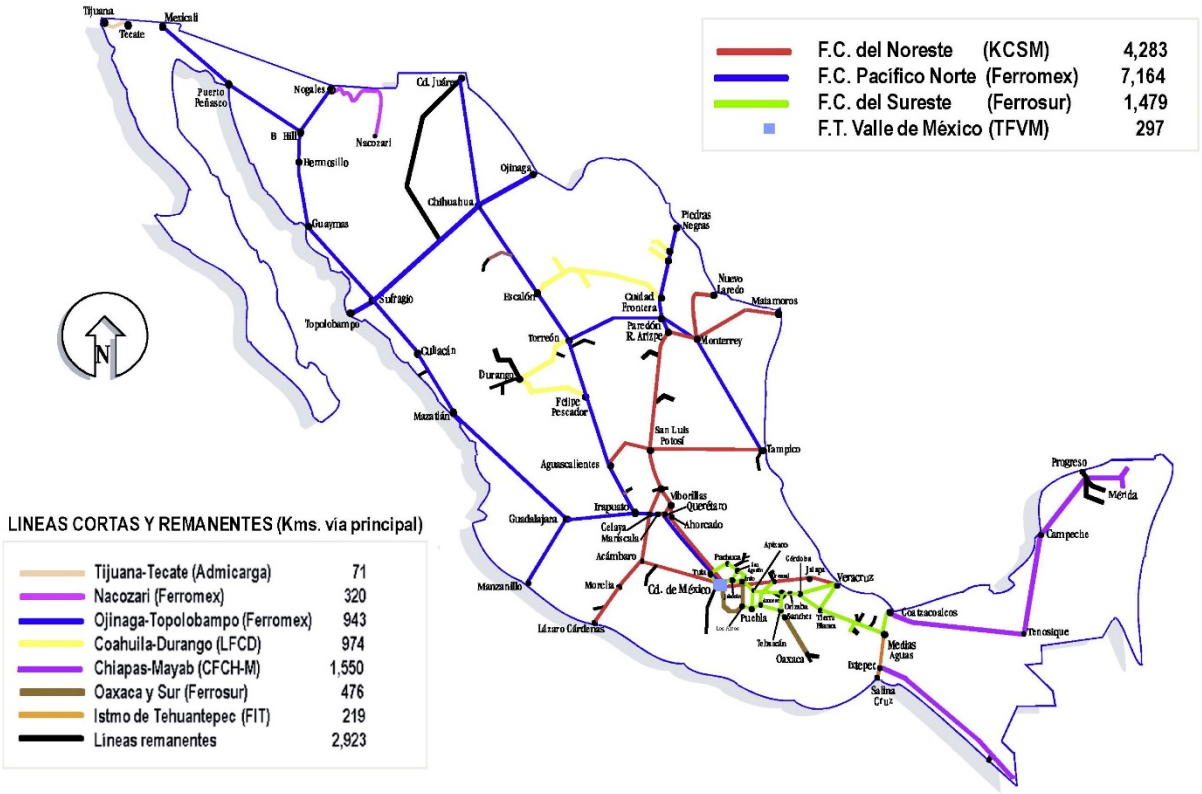

Figure 7: Mexico's National Railway Network

The restructuring and privatization has achieved many of Mexico's transportation policy objectives in the sector and established a base for future development. Both railroad tons transported and ton-kilometers transported have risen steadily. Rail's modal share of freight traffic has risen substantially, from 12.5 percent of tons and 19 percent of ton-kilometers transported in 1995 to 18 percent and 25 percent, respectively. The private concessionaires have made steady and significant investments in the rail networks they operate, increasing speeds, weight capacity and clearances on many routes. Today, Mexico's railway network consists of 26,727 kilometers of track reaching throughout the country. A total of 11.6 million tons and 79.4 million ton-kilometers of freight, and 911.6 million passenger-kilometers were transported on the network in 2012. By volume, freight rail traffic was composed of industrial products (48 percent), agricultural products (24 percent), minerals (14 percent) and petroleum and petroleum products (8 percent).

Mexico's freight rail operations are the backbone of the USD $1 billion per day trade partnership between the United States and Mexico. Rail lines link manufacturers, suppliers and consumers on both sides of the border, supporting a robust bilateral trade. In 2012, foreign trade accounted for 45.5 percent of cargo handled on the Mexican railway network. It is an essential mode for transportation of heavier, low value cargoes. As freight rail operating performance and efficiency has steadily increased, railroads are capturing a greater share of high-value and time sensitive cargoes that traditionally moved by truck, such as containerized freight.

The modern railway system of Mexico is overseen by SCT's General Directorate of Rail and Multimodal Transportation. The Directorate serves to oversee the economic functioning, operational safety and the physical development of the Mexican railway network. As such, it is an operating and economic regulator, as well as

having responsibility for carrying out strategic national development and planning responsibilities. This includes procurement of goods and services for, and management of, major federally supported railway infrastructure projects. The private concessionaires are responsible for management of operations on the lines they control, and for performing maintenance and investments in the track, structure, systems and rolling stock to maintain and improve the operations of their portions of the system.

The new presidential administration strongly believes that Mexico's productivity and global competitiveness depend upon further investment and expansion of the railroad system, including physical expansion of the network with new freight and passenger lines and services, increased multimodal connectivity and efficiency, such as between railroads and ports, and, investments to increase the capacity and efficiency of the existing tracks. Strategic national policy goals for the rail sector include reducing logistics costs for freight customers, improving the safety and efficiency of operations generally, increasing freight security, and supporting sustainable urban development and improving Mexicans' quality of life be providing new passenger rail services. Specific quantified sector goals have been set by the government. By 2018, the national score in the World Economic Forum's infrastructure and logistics competitiveness index will be increased by 0.01. Transportation modal share will be substantially increased by raising freight tons transported by rail from 25.4 percent to 27.3 percent of the total, and increasing average, monthly intercity rail passenger ridership from 4.9 million to 162 million passenger-kilometers.

To accomplish these goals the **National Infrastructure Program** has set an investment objective of more than USD $10 billion to be accomplished through execution of 13 specific major rail projects and investment programs by 2018. This funding is expected to come from a mix of public and private sources, the balance varying significantly depending upon the project. The 13 projects include constructing three brand-new intercity passenger train services, performing a program of investments in improved signaling and communications components, particularly at-grade crossings, across the national rail network, completing a program to recapitalize large sections of the Chiapas-Mayab rail network, and execution of seven strategic projects, including bypasses, tunnels and connectors that will improve freight network efficiency and remove areas of congestion, particularly at intermodal conflict points in densely populated urban areas.

The following projects are those that are underway or nearing completion at the time of this writing:

- **Construction of the Celaya Freight Bypass (CG-195):** Budgeted at USD $426 million in total investment, this project is underway in the State of Guanajuato and is nearing completion.
- **Urban Rail Signaling Investment Package:** Budgeted at USD $152 million in total investment, this project is national in scope and focuses on at-grade crossing safety improvements. It was awarded but has not begun execution due to procurement issues.
- **Freight Rail Bypass and Tunnel at Manzanillo (CG-073):** Budgeted at USD $102 million, this project improves the flow of freight rail connectivity to the port through construction of a 900-meter long tunnel and reduces multimodal conflicts. It is part of a larger initiative in the port area that includes a bypass, new rail connections and a rail yard expansion.
- **Matamoros Freight Rail Bypass and Border Crossing:** Budgeted at USD $61 million in total investment, this project is constructing a freight rail bypass and a new border crossing in the city of Matamoros, Tamaulipas.
- **Relocation and Multimodal Expansion of the Durango Freight Rail Terminal:** This project is underway and budgeted for a total investment of USD $80 million.

The following projects are yet to be initiated but are planned for completion by 2018. Insufficient planning documentation was currently available to prepare comprehensive project profiles:

- **Construction of the Freight Rail Bypass at Coatzacoalcos (CG-159):** Budgeted at USD $190 million in total investment, this project will take place in the State of Veracruz. Planning studies are underway by SCT.
- **Construction of the Connection between Aguascalientes and Guadalajara (CG-029):** Budgeted at USD $884 million in total investment, this project will take place in the states of Aguascalientes and Jalisco. Planning studies are underway by SCT.
- **Recapitalization of the Chiapas-Mayab Rail Network:** Budgeted at USD $462 million in total investment, this program will repair and improve the infrastructure of this network serving the southern states of Campeche, Chiapas, Veracruz and Yucatán. Works will include rehabilitation of 1,046 kilometers of rail lines, including bridges and drainage systems, along the corridors "FA" (Chapo, Veracruz – Mérida, Yucatán), "FL" (Campeche - Lerma, Campeche), "FD" (Mérida - San Ignacio, Yucatán), "FX" (Dzitas a Valladolid, en Yucatán) "K" (Chiapas Coast).
- **Rail-Urban Coexistence Improvements in the City of Juarez:** With a planned total investment of USD $69 million, this project in this important border city in the State of Chihuahua will invest to reduce multimodal conflicts and impacts of train traffic on the city over 19 kilometers of lines.
- **Rail-Urban Coexistence Improvements in the City of Juan Palomar:** With a total investment of USD $4 million planned, this project in this important border city in the State of Chihuahua will invest to reduce multimodal conflicts and impacts of train traffic on the city over 19 kilometers of lines.

The following projects were selected for detailed profiling on the following pages. They have either yet to begin or have significant phases of works yet to be procured, detailed planning documentation was available, and they are expected to have significant future potential for U.S. exporters. The investment programs of the two largest freight rail concessionaires have been included as a single profile.

- **Construction of the High-Speed Passenger Rail System between Querétaro and Mexico City (CG-094)**
- **Capital investments by Freight Railroad Concessionaires Ferromex and Kansas City Southern de México**
- **Construction of the Intercity Passenger Rail System between Toluca and the Valle de México (CG-263)**
- **Construction of the Trans-Peninsular Passenger Train (CG-243)**

Projects

High-Speed Passenger Train from Querétaro to Mexico City

Project Type:	Intercity Passenger Rail
State(s):	Distrito Federal, México, Hidalgo, Querétaro
Projected Investment:	USD $3.3 billion
Timeline:	2014 – 2017
Project Sponsor(s):	SCT

Project Background and Scope

This new rapid intercity passenger rail system will connect the capital of Mexico City and the city of Querétaro. The service will run from Terminal Buenavista in Mexico City, continuing to stations at Cuatitlán, Huehuetoca, Tula, San Juan del Rio, to Terminal Querétaro. The service corridor is 209.2 route kilometers of double track, including 15.6 kilometers of elevated tracks crossing 37 viaducts, and 15 tunnels totaling over 11,000 meters. Of this, 124.7 route-kilometers will be new construction.

With a planned top speed of 300 kilometers per hour, a trip between Querétaro and Mexico City will take approximately one hour. The train is projected to make 36 runs and transport over 23,000 users daily. This high-speed train will be the first of a series of passenger rail projects carried out over the next six years, including the Mexico City -Toluca passenger train which is also profiled in this Guide. This project is part of a government commitment to build infrastructure for passenger mobility that is modern, comprehensive, flexible, secure, sustainable, and inclusive.

Figure 8: Planned Route of the High-Speed Passenger Train from Querétaro to Mexico City

The passenger terminal in Querétaro will be a completely new greenfield facility covering 14,000 square meters, including two 210 meter passenger platforms, road connections, parking lots, bus and taxi areas, and drop-off lanes.

The project includes construction of three significant operating and maintenance facilities. Terminal facilities (Cabecera Buenavista and Cabecera Querétaro) will each cover over 5,500 square meters and each include 660 meters of parking tracks, a 220 meter inspection track and administrative facilities. The main workshop will be a large facility covering more than 25,000 square meters, including a rail yard with four 240 meter tracks for heavy maintenance, four 240 meter of tracks for light and preventive maintenance, one 230 meter track for train washing, two 120 meter of tracks for maintenance-of-way equipment parking, a supplies warehouse, a workshop including wheel trueing equipment and administrative buildings.

This service will be electrified, utilizing 25kV 60Hz AC power provided by overhead catenary. Portions of the line have existing traction power systems, accordingly 1 x 25 kV will be used for the first 26.5 kilometers (currently utilized by the commuter service running from Buenavista to Cuautitlan) and 2 x 25 kV for the remainder. One new traction power substation is expected to be constructed as part of this project.

The system will be fully signalized, based on ERTMS level two standards for train protection, incorporating automatic stop technology and wayside fault detection systems. The trains will operate in a centralized traffic control environment with a new control center based in the Buenavista Station. The investments will include incorporate closed-circuit video surveillance and other security measures. A centralized communication system based on GSM-R technologies will be installed to tie together all aspects of operation.

The passenger rolling stock fleet is expected to begin service with a fleet of 12 trains rising eventually to 20. Rolling stock will be procured as part of the second of three procurement phases. The basic parameters for procurement will be for high-speed electrified trainsets of 200 meters in length, capable of exceeding 250 kilometers per hour.

Other works on include: site preparation, structures, cross drainage, longitudinal drainage, replacement of tracks, replacement of easements, superstructures, signaling and communications (S&C), and electrification.

Project Status and Implementation Timeline

The environmental analysis portion of the review has been completed and construction is planned to begin in 2014. The infrastructure portion of the project is expected to take 46 months. An additional 6 months will be required to commission the new rolling stock and systems, with the first passenger revenue service planned by the end of 2017.

Project Cost, Financing and Procurement

Estimated cost of the project is USD $3.3 billion. Funding will be provided federally through the SCT.

2014	2015	2016	2017
$268,681,524	$426,657,721	$971,873,833	$1,655,242,873
Total: USD $3,322,455,950			

Table 2: Tren Rápido Ciudad México - Querétaro Projected Investment by Year

Category	Amount
Infrastructure	$2,144,572,618
Track	$348,127,082
Electrification	$175,130,948
Security and Telecommunications	$267,995,334
Mobile Material	$355,446,443
Right of Way	$31,183,525
TOTAL	**USD $3,322,455,950**

Table 3: Tren Rápido Ciudad México - Querétaro Projected Investment by Type

The project will be procured in three separate phases: 1.) construction of civil works, track and structure, 2.) rolling stock, signaling, and communications, and 3.) a long-term concession for system operations and maintenance. Procurements are published through the Mexican government's web portal, Compranet.

U.S. Export Opportunities

The potential export opportunities for U.S. companies are numerous. Large quantities of track and structure components will be purchased for this system including high-quality steel rail, rail fastening systems, signaling and communication systems, and passenger information and ticketing systems. U.S. firms are competitive for some of these materials, particularly when the operation must meet high performance standards. U.S. firms will face strong competition from both local and European firms, particularly for materials associated with the more generic civil and geotechnical works. There will also be acquisition of maintenance equipment for the track and structures as well as rolling stock, areas where there are strong U.S. providers. Electrified passenger rolling stock is not a traditional strength of the U.S. rail supply industry, however there are opportunities for foreign-owned but U.S. based manufacturing facilities to potentially perform a role. The specification of European standards for signaling and communications systems is a barrier for these systems. Indirect opportunities should still exist for firms not part of winning consortiums to provide materials and services as external suppliers. The concession to operate and maintain the system is another opportunity. The Mexican government would welcome U.S. firms' participation in operating concessions, by investors, operators, or a combination.

Project Contacts

Project Sponsor	U.S. Trade and Development Agency	U.S. Commercial Service Mexico
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Interurban Passenger Train from Toluca to Mexico City

Project Type:	Intercity Passenger Rail
State(s):	Distrito Federal, Estado de México
Projected Investment:	USD $2.9 billion
Timeline:	2014 – 2017
Project Sponsor(s):	SCT and the State of Mexico

Project Background and Scope

The project to create a new interurban passenger train system from Toluca to Mexico City will construct a new 57.7 kilometer high-speed rail line linking the cities of Toluca and Mexico City. Service will be provided to six stations: Observatorio in Mexico City; Santa Fe, Lerma, Metepec (near the Toluca International Airport), the Toluca Bus Station and Zinacantepec. The train will carry an estimated 300,000 passengers daily and travel at a top speed of 160 kilometers-per-hour, making the trip from Toluca to Mexico City in 39 minutes.

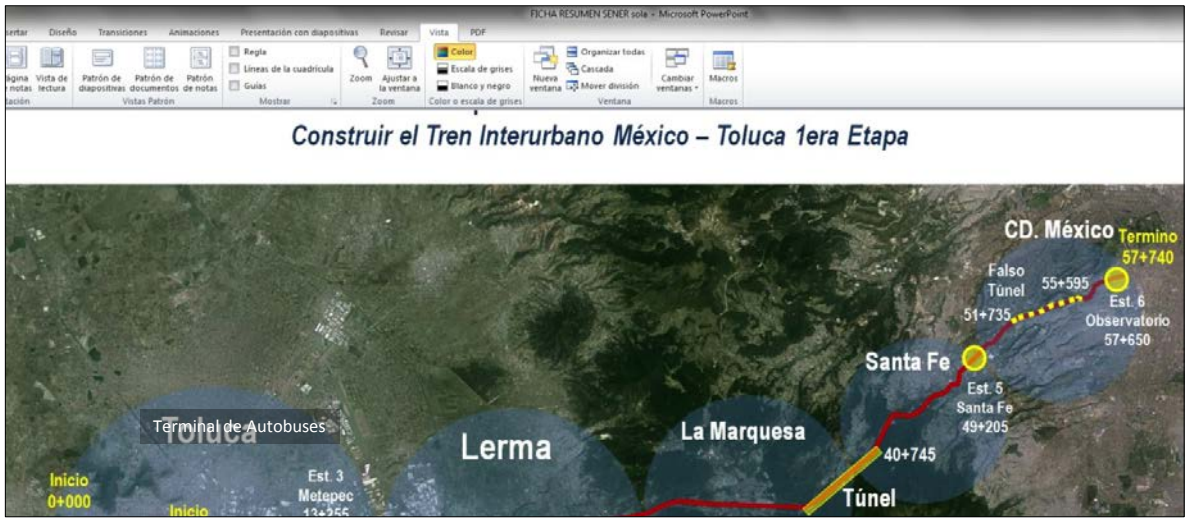

Figure 9: Interurban Passenger Train from Toluca to Mexico City Map

The Toluca to Mexico City passenger train, also known as "tren interurbano," includes the construction of six stations, including the two main terminals. The first terminal will be built in the town of Zinacantepec, following the alignment of Torres Avenue. The second terminal will be constructed at Observatorio, on the western side of Mexico City, named for the adjacent metro and the bus terminal. The Observatorio terminus will provide robust multimodal connectivity for the many thousands of people traveling between the Toluca Valley and Mexico City. This project is part of a government commitment to build infrastructure for passenger mobility that is modern, comprehensive, flexible, secure and sustainable. The new service will reduce traffic congestion that currently occurs between these two urban areas, generating a 90-minute savings in travel time per passenger, reducing deaths and injuries due to automobile accidents, reducing carbon dioxide emissions by 34,000 tons and creating

substantial employment generation in the construction phase (17,000 direct and 35,000 indirect), as well as several hundred skilled long term operating jobs.

Project Status and Implementation Timeline

The technical studies on the project were completed in November of 2013. The project has been scheduled to tender in stages beginning in June of 2014 with revenue service expected to begin in 2017.

Project Cost, Financing and Procurement

The estimated cost of the project is USD $2.94 billion. Funding will be provided federally by the SCT. The project will be procured in three separate phases: 1) construction of civil works, track and structure, 2) rolling stock, signaling, and communications, and 3) a long-term concession for system operations and maintenance. Procurements are published through the Mexican government's web portal, Compranet. The procurement for the construction of the 36.15 kilometer segment "Zinancatepec – Túnel" was released on February 28, 2014 and bids were due on May 5, 2014. The contract will be awarded on June 10, 2014. The procurement for the construction of the tunnel was released on April 15, 2014 and bids were due on June 6, 2014.

U.S. Export Opportunities

The potential export opportunities for U.S. companies are numerous. Large quantities of track and structure components will be purchased for this system including high-quality steel rail, rail fastening systems, signaling and communication systems, and passenger information and ticketing systems. U.S. firms are competitive for these materials, particularly when the operation must meet high performance standards. U.S. firms will face strong competition from both local and European firms in this area, more so for materials associated with the more generic civil and geotechnical works. There will also be acquisition of maintenance equipment for the track and structures as well as rolling stock, areas where there are strong U.S. providers. Opportunities for Should U.S. firms not be directly participating in winning consortiums for different phases of procurement, indirect opportunities should still exist for providing major contractors with materials and services to support the works and development of the new system. The concession to operate and maintain the system is another area where U.S. capability exists. The Mexican government would welcome U.S. firms' participation in operating concessions, by investors, operators, or a combination of the two.

Project Contacts

Project Sponsor	U.S. Trade and Development Agency	U.S. Commercial Service Mexico
Mr. Pablo Suarez Coello Director General Secretariat for Communications and Transportation General Directorate for Multimodal and Rail Transportation Tel. +52 (55) 5011-6476 pablo.suarez@sct.gob.mx	Mr. Keith Eischeid Country Manager for Mexico and Central America Tel. +1-703-875-4357 KEischeid@ustda.gov	Ms. Allison Mello Commercial Officer Tel. +52 (55) 5080-2206 Allison.Mello@trade.gov Mr. Adrián Orta Commercial Specialist, Transportation Tel. +52 (55) 5080-2000 ext. 5220 Adrian.Orta@trade.gov

The Trans-Peninsular Train: Yucatán-Quintana Roo

Project Type:	Intercity Passenger and Freight Rail
State(s):	Campeche, Yucatan, Quintana Roo
Projected Investment:	USD $1.4 billion
Timeline:	2014 – 2017
Project Sponsor(s):	SCT

Project Background and Scope

This new rail service is proposed to connect the cities of Mérida in Yucatán with Punta Venado in Quintana Roo. The new service would travel at an average speed of up to 160 kilometers-per-hour, and transport passengers between the terminals in less than three hours.

Figure 7: Proposed Alignment of the Tren Transpeninsular Phases 1 and 2

This new service is proposed to be implemented in two phases. In phase 1 of the project, seven passenger stations will be established at Mérida, Izamal, Chichén Itzá,Valladolid, Cobá, Punta Venado "B" and Punta Venado "A". The twin terminals in Punta Venado will be established to serve intermodal transfers from the road service to Cancún and the cruise terminal, respectively. In phase two of the project four stations will be added at Tixkokob, Calcachén, Tunkás and Chichén Itzá Airport. Station designs are proposed with careful consideration to include concepts based upon the indigenous and colonial architecture of the region. The project will involve reconstruction of 141 kilometers of existing freight rail lines and construction of 193.5 route-kilometers of brand new rail line. Within the City of Mérida, 4.19 kilometers of the line is proposed to be elevated to reduce intermodal conflicts. Numerous additional overpasses and viaducts are under evaluation for final design, to reduce at-grade conflicts, and to mitigate potential impacts on sensitive natural and historical sites along the alignment.

Terminal Mérida will include 6 parking tracks for the passenger trains, Chichén Itzá will have 14 and Punta Venado 10 parking tracks. Punta Venado will also include RIP tracks for light maintenance. This station's infrastructure will be constructed to enable future expansion of the alignment to Cancún.

A temporally separated freight rail service is planned for the new alignment. This nighttime service would link terminals in Umán and Valladolid with Mérida with improved service, including for heavy fuel oil movements to the thermal power plant at Valladolid. In Punta Venado a logistics distribution center will be established to provide freight rail service to the Riviera Maya region. Provision of this new, higher quality freight rail link is expected to incentivize substantial future rail logistics development, such as a proposed PEMEX fuels terminal, general, bulk and containerized rail cargo terminals and associated private development in the form of warehouses and manufacturing.

Concepto	Yucatán	Quintana Roo
Estaciones primera etapa	4	3
Estaciones segunda etapa	4	
Libramientos	4	
Derecho de vía existente	141.470 Km	
Derecho de vía nuevo	121.137 Km	72.340 Km

Longitudes	
Mérida Punta Venado "A"	279.190 km
Por libramiento Chichén Itzá Mérida Punta Venado "A"	299.430 km
Estado de Yucatán	262.607 Km
Estado de Quintana Roo	72.340 Km
Total	**334.947 Km**

Figure 8: Proposed New and Reconstructed Rail Lines for the Tren Transpeninsular

Workshops for heavy and routine maintenance will be established at Valladolid, roughly in the center of the alignment. This 46 acre facility will include storage and maintenance tracks; a workshop including wheel profiling equipment, work pits and a painting cabin; a wash rack, fuel station, a rolling stock parts warehouse, and tracks and facilities for maintenance-of-way equipment and supplies. The train control and dispatching center will also be housed at this facility. Administrative structures will provide space for security personnel, training, cafeteria, changing rooms and sanitary facilities.

The system will include a basic level of signalization, including at-grade crossing protection.

The motive power for the new passenger service is expected to be provided by high-performance diesel powered passenger trainsets. Trains are expected be a maximum of 250 meters with capacity for an average

load of 820 passengers. At some point in the future the passenger service could be upgraded to operate with electric traction power, however such an investment is not within the present scope of this proposed project.

Project Status and Implementation Timeline

The project is currently in the feasibility study phase and is undergoing due diligence on the final alignment, ridership and business plan and potential for environmental impacts.

Project Cost, Financing and Procurement

This project is estimated to require USD $1.4 billion in total investment to complete.

Figure 9: Transpeninsular Station Concept

U.S. Export Opportunities

The potential export opportunities for U.S. companies are numerous. Large quantities of track and structure components will be purchased for this system including high-quality steel rail, rail fastening systems, signaling and communication systems, and passenger information and ticketing systems. U.S. firms are competitive for some of the basic materials, particularly when the operation must meet high performance standards. U.S. firms will face strong competition from both local and European firms, particularly for materials associated with the more generic civil and geotechnical works. There will also be acquisition of maintenance equipment for the track and structures, as well as rolling stock, areas where there are strong U.S. providers. The choice of diesel traction power for the service potentially opens the provision of rolling stock as an opportunity for U.S. firms, which provide world class diesel motive power solutions. Indirect opportunities will exist for firms not part of winning consortiums to provide materials and services as external suppliers. The concession to operate and maintain the system is another opportunity. The Mexican government would welcome U.S. firms' participation in operating concessions, by investors, operators or a combination.

Project Contacts

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Private Freight Railroad Concessionaire Investments

Project Type:	Freight Railroad
State(s):	Multiple
Projected Investment:	USD $649 million
Timeline:	2014
Project Sponsor(s):	Ferromex/Ferrosur and Kansas City Southern de México

Projects Background and Scope

Beginning in 1997, the Mexican government engaged in a major restructuring of the railway sector that privatized operations through vertically integrated long-term concessions. The two largest concessionaires, Kansas City Southern de México and Ferromex/Ferrosur, including commonly-held terminal company Ferrovalle, today are responsible for management of over 63 percent of the railroad network infrastructure. They maintain 95 percent of the national locomotive fleet. Their operations account for 95 percent of freight rail tons transported and 98 percent of ton-kilometers transported.

Since the concessions began the companies have made significant progress in increasing network capacity through steady major investments with their private funds. Freight volumes transported have risen by 199 percent and at the same time the accident rate has dropped by 90 percent. Large parts of the network have been recapitalized with important gains in speed, weight capacity and clearances. In 2013 KCSM spent USD $238 million and Ferromex USD $422 million on capital, for a total of USD $660 million in investments improving the Mexican railway system. This included a range of investments such as new tracks (double tracking), sidings and terminals; replacement of rail, ballast and crossties across the network; and investment in maintenance-of-way equipment, locomotives and railcars.

In 2014 these two concessionaires will invest another combined USD $649 million in a range of capital projects.

Kansas City Southern de México 2014 Investments

Out of KCSM's total amount of USD $143 million to be spent in 2014, the largest single investment will be approximately USD $53 million for the rehabilitation of the Monterrey to Nuevo Laredo corridor, including installation of all new crossties and rail. Defined KCSM projects and categories of spending are as follows.

<u>Infrastructure (USD $84 million)</u>

- Capacity improvements at the border yard at Sánchez.
- New maintenance yard at San Luis Potosí.
- Extension of 3 sidings along the Mexico – Nuevo Laredo mainline.
- Expansion of the support yard in Saltillo, Coahuila.
- Installation of centralized traffic control (CTC) between B. López and Escobedo.
- Second phase of the expansion of the Vanegas Yard.
- Completion of double tracking of the corridor between Sánchez and Nuevo Laredo.

Terminals

- Infrastructure improvements to the terminals at Toluca, Celaya y SLP.
- Expansion of the cargo siding at SLP.
- Purchase of a straddle crane for the terminal at Toluca.
- Installation of a wheel truing facility at Toluca.

Systems

- Business solutions, data centers, processing and storage capacity.
- Security systems.
- Telecommunications.
- Information systems to manage logistics and Transportation operations.

Rolling Stock (USD $16 million)

- Completion of the warehouse at la Pila, San Luis Potosí.
- Replacement of control stands and air conditioning systems in locomotives.
- Installation of air conditioning systems at yard and intermodal terminal facilities.
- Installation of surveillance cameras in locomotives.

Ferromex/Ferrosur 2014 Investments

The USD $506 million to be spent includes:

Track and Structure (USD $195 million)

- Replacement of rail and crossties
- Investment in roadbed (USD $32.2 million)
- Rehabilitation of crossings, sidings and yards (USD $21 million)
- Bridge rehabilitation (USD $12.6 million)
- Improvement of cuts and fills (USD $7.9 million)

Capacity (USD $123.4 million)

- Construction and reconfiguration of yards and terminals (USD $84.4 million)
- Double tracking (USD $17.8 million)
- Extension and rehabilitation of sidings (USD $11.3 million)
- Equipment (USD $9.9 million)

Rolling Stock and Equipment (USD $59.9 million)

- Locomotive overhauls (USD $23.7 million)
- Rehabilitation of workshops and storehouses (USD $5.8 million)
- Purchase of new/rebuilding of old maintenance-of-way equipment (USD $24.9 million)
- Purchase of new/rebuilding of old freight cars (USD $5.4 million)

Signaling and Communications, Safety and Security (USD $24.6 million)

- Wayside fault detection equipment (USD $9.7 million)
- Signals (USD $4.6 million)
- Security systems, lighting, CCTV and access control (USD $7.8 million)
- Communications equipment (USD $1.4 million)

- Air conditioning equipment (USD $1 million)

Project Status and Implementation Timeline

These projects will occur throughout 2014.

Project Cost, Financing and Procurement

These projects will be financed from the internal capital funds of Kansas City Southern de México and Ferromex/Ferrosur. Procurement will occur through the established processes at the companies.

U.S. Export Opportunities

Investments by Ferromex/Ferrosur and KCSM in 2014 will create a wide range of opportunities for U.S. suppliers. Infrastructure components to be purchased will include high-quality rail, crossties, fastening systems, switches, at-grade crossing components and signaling and communications systems. Information systems for operations and business process management will be purchased. A range of freight cars and track maintenance and construction equipment will be procured and heavy overhauls of a number of U.S.-origin locomotives will create demand for parts and components.

Project Contacts

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Technical Assistance for Analysis of the Specialty Freight Railcar Market in Mexico

The U.S. Trade and Development Agency is funding a new technical assistance study to support the further development of Mexico's freight rail sector.

The selected consultant will conduct an overall examination of the supply and demand for freight cars from the perspective of the Mexican railway system as a whole, considering cross border dynamics, with an emphasis on the needs of shippers, particularly smaller and medium-sized firms. The consultant will examine national, regional and seasonal market dynamics impacting provision of wagons, bottlenecks and constraints on the efficient movement of wagons, with specific analyses by wagon types and commodities transported. The potential evolution of the leasing and private fleet market will be examined. The markets for open-top and covered hopper cars, petroleum product tank cars, and new high-capacity boxcars, including refrigerated services, will be examined in depth. The study will evaluate institutional and operational improvements that will optimize wagon supply and utilization generally, as well as recommend specific investments in systems, services, infrastructure, terminal facilities, and new railcars necessary to meet projected growth of existing traffic and new opportunities.

Project Procurement and Implementation Timeline

This study was let for bid by USTDA to a U.S. consulting firm through an open competitive bidding process. The execution of the study will be supervised by the host country sponsor, the Mexican Railway Association (Asociación Mexicana de Ferrocarriles or AMF). Founded in 2004 the AMF is the national trade association representing the passenger and freight railway operators in Mexico. From award to completion the study is expected to take approximately 8 months.

Project Contacts

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3.1.3 Ports

Sector Background

Mexico has 117 ports and terminals across its 11,122 kilometers of coastline. Of these, 71 are concessioned through 25 Administraciones Portuarias Integrales (APIs). Of these APIs, 16 are managed by SCT, 2 are managed by the Fondo Nacional de Fomento al Turismo (FONATUR), 6 are state-operated and 1 is private. Four cargo ports are considered by the government to be strategic for Mexico: Altamira and Veracruz on the east coast; and Manzanillo and Lázaro Cárdenas on the west coast. These four ports together account for 96 percent of container movements, 65 percent of bulk agricultural goods, 40 percent of bulk mineral movements and 38 percent of general cargo. In 2012, the Mexican port system transported 283 million tons of cargo and 67 percent was handled by ports managed under API concessions.

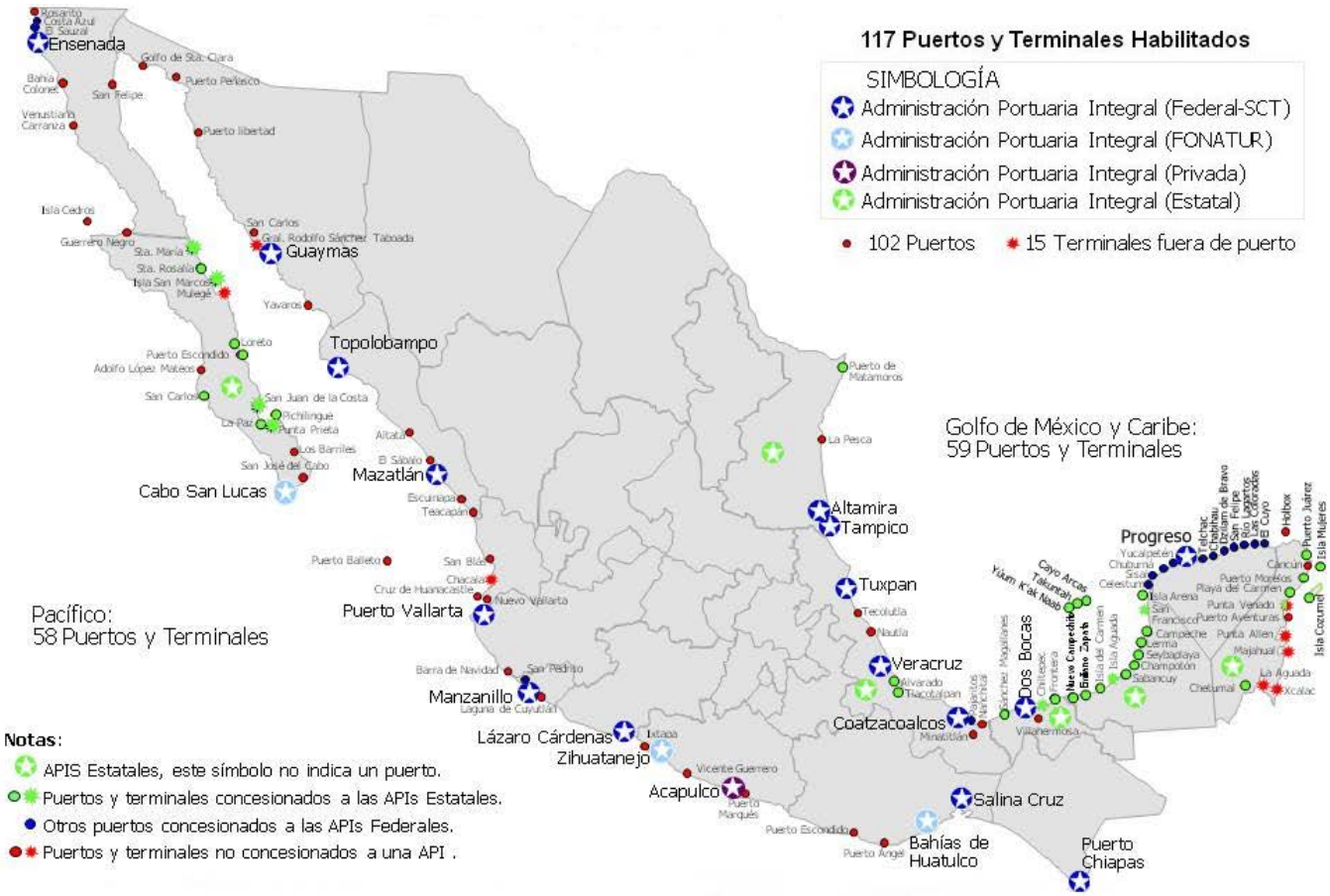

Figure 10: Mexico's Port System

The following charts provide an illustration of the relative concentration of freight and passenger activity at a small number of Mexico's ports. Cayo Arcas, the largest by volume, is a special case. It is a major terminal dedicated to petroleum, capable of exporting approximately one million barrels per day.

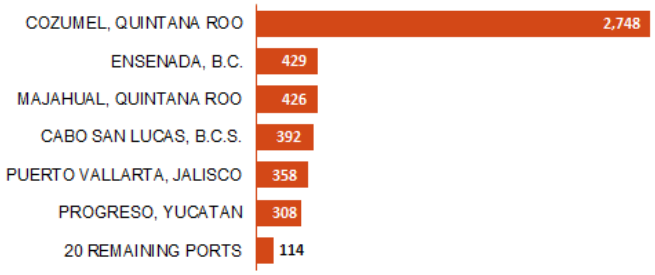

Figure 11: 2012 Passengers by Port, Thousands

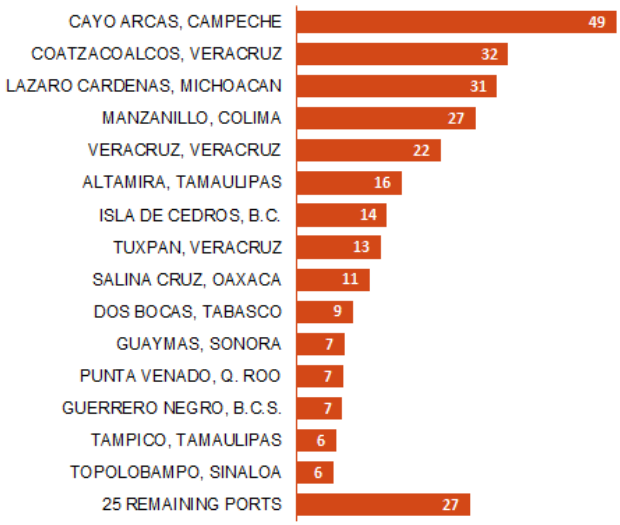

Figure 12: 2012 Cargo by Port, Millions of Tons

Mexico's port sector faces a range of challenges that the government has identified for resolution.

- **Limited Multimodal Connectivity:** A number of ports face particular constraints in their connections to freight rail service. Only 11 of the 15 APIs have rail connections. Of these, many face bottlenecks in terms of the rail infrastructure of the ports and the equipment and capacity to transload cargo efficiently between the two modes. This has caused a disproportionate amount of the terrestrial traffic to and from the ports to move by truck, relative to other industrialized countries. Accordingly, costs are higher for shippers. This truck traffic causes significant negative externalities as these heavy road freight flows move through adjacent urban areas, such as road damage, pollution and congestion. For those ports with rail service links, many of the connecting rail lines route directly through dense urban areas. Rail freight impacts on neighboring communities have also risen as the volume of rail freight has increased.
- **Efficiency of Operations:** Despite significant efforts in the area of quality of service and organizational improvements, many ports have levels of service and efficiency well below international standard. Customers face bureaucracy, limited intermodal integration, outdated customs procedures, lack of coordination between government authorities and operators, and limited implementation of modern technologies.
- **Capacity Falling Behind Demand:** As trade has grown dramatically, several categories of maritime cargo have grown at double digit rates for the past decade. Many ports in Mexico are approaching capacity limits. The ports of Veracruz and Manzanillo are at full capacity given their facilities, equipment and technology.

- **Short-Sea Shipping (Cabotage):** Mexico's extensive coastlines create great potential for shifting freight flows onto the short sea shipping mode. Due to port constraints, particularly terminal capacity for multimodal transfer, freight movements are dominated by trucks followed by rail.
- **Small Port Infrastructure:** The economies of many small riverine and coastal communities depend upon small port infrastructure to sustain the livelihoods of the people, particularly in the fishing industry. There is a significant need to address deferred maintenance and capital investments in many of these small facilities.
- **Cruise Passenger Traffic:** Cruise line passenger traffic has declined by 6 percent between 2007 and 2012. 98 percent of cruise liner traffic accrues to only six ports. Some of these main ports have outdated facilities and poor connectivity for visiting cruise passengers. There is significant potential to develop additional ports of call with great potential to draw more tourism.

Mexico has set several strategic, quantified goals to achieve relative to ports by 2018. The country's score on the World Bank's Logistics Development Index is targeted to be raised from 3.06 to 3.35 out of 5. Mexico's grade for transport infrastructure as judged by the World Economic Forum should be raised from 4.45 to 4.56 out of a possible 7 points. Authorities intend to increase the volume of cargo transported by short-sea shipping from a 2012 base of 39 million to 45 million tons per year by 2018, and they plan to reduce per container port costs from USD $18.10 in 2012 to USD $17.60 by 2018.

In order to achieve these goals the PNI includes an array of significant port investments, totaling USD $5.46 billion in total investment spread across 23 discrete projects. These projects include improvement to existing freight and passenger facilities; basic infrastructure improvements such as fills, breakwaters, and dredging; and development of completely new terminals. Many include improved multimodal connections to road and rail networks.

Northern Expansion of the Port of Veracruz: This megaproject began in 2013 and will not be completed until 2025. Through 2018 alone, investments are estimated at USD $1.8 billion. This involves the building of an additional, completely new, port facility with multiple terminals. The capacity of the entire port will be tripled, and portions of the legacy area of the port will be repurposed for integration back into the city's historic zone.

Expansion of the Port of Altamira: This project will be carried out between 2013 and 2018 and is expected to entail total investment in the amount of USD $816 million. There are several major components. Road and rail connections to the port will be improved. The port will be dredged especially to create capacity for marine oil and gas platforms. A natural gas compression station will be built at the port to take advantage of production increases expected to result from the energy reform activities.

Modernization of the Port of Mazatlán: This project will be carried out between 2013 and 2018 and is expected to entail a total investment of USD $813 million. The passenger cruise terminal will be rehabilitated, and a connection will be constructed to the Durango – Mazatlan highway. The overall configuration of the port will be reorganized and the RO-RO terminal will be relocated. Basic infrastructure works will include construction of a new breakwater and channel and turning basin dredging.

Expansion of the Port of Lázaro Cardenas: This program of four projects will add up to a total investment of USD $593 million. The largest project will be the basic infrastructure for a second container terminal which will take place between 2013 and 2019. This investment of USD $442 million will expand the Port's container capacity from 250,000 to 3 million containers annually. The equipment for this new container facility is expected to add

an additional USD $62 million in investment. A third new general cargo terminal will be added to the port, covering 21 hectares and providing 286 meters of berth space, for a total investment of USD $44 million. A new specialized auto terminal will be constructed for USD $40 million, and a new bulk grain terminal will be constructed for an estimated investment of USD $4.6 million.

Expansion of the Port of Tuxpan: Occurring between 2013 and 2018 this project will construct a new public terminal for containers and general cargo. This facility will complement the connection to the new Mexico – Tuxpan highway and enable the port to provide a capacity relief option for the congestion at the Port of Veracruz. This project is intended to stimulate merchant marine activity by serving as a base for short-sea shipping growth. The total investment is projected at USD $377 million.

Isthmus Region Logistics Platform: This program will include total investments of USD $244 million to develop a regional logistics platform.

Expansion of the Port of Manzanillo: This project will construct two new freight terminals for a total investment of USD $263 million. A new state-of-the-art container terminal will be built at the port, for which an investment of USD $197 million is envisioned. Facilities for general cargo will be expanded for an investment of USD $66 million. These projects will be completed by 2018.

Expansion of the Port of Altura en Progreso (Compromiso Gubernamental [CG]-247): This project will entail a total investment of USD $126 million for works to modernize and expand the port, including development of a logistics platform.

Expansion of the Port of Matamoros (CG-182): For a total investment of USD $81 million the port operations will be reconfigured and consolidated at this facility.

Modernization of the Port of Ciudad del Carmen (CG-063): Total investment of USD $75 million is projected.

Expansion of the Port of Tampico: This project will increase the port's capacity for bulk cargo, in particular steel and ore. The total anticipated investment is USD $70 million.

Expansion of the Port of Puerto Vallarta (CG-024): This project will construct a new cruise ship passenger terminal for a total investment of USD $54 million.

Modernization of the Port of Guaymas (CG-193): This project will entail a total projected investment of USD $33 million.

Expansion of the Port of Topolobampo: This investment of USD $37 million will develop two new terminals. A new terminal will be built to enable exports of copper concentrate, estimated to reach 360,000 tons per year within three years, a total investment of USD $32 million. A new bulk grain terminal will be built to support up to 500,000 tons per year of grain movements to and from Mexican short-sea shipping destinations and for export to other Latin American countries, a total investment of USD $4.6 million is projected.

Bulk Fluid Terminal at Laguna de Pajaritos: This project will support petrochemical movements with a total projected investment of USD $23 million.

New General Cargo Berth at Salina Cruz: Total investment of USD $18 million.

Modernization of the Port of Seybaplaya (CG-068): Total investment of USD $14 million.

Projects

Expansion of the Port of Altamira

	Project Type:	Port
	State(s):	Tamaulipas
	Projected Investment:	USD $816 million
	Timeline:	2013 – 2018
	Project Sponsor(s):	SCT, Port Authority of Altamira

Project Background and Scope

The Port of Altamira, located on Mexico's northeastern Gulf Coast, is an industrial port that handles over 15 million tons of commercial cargo per year. Nearly all the traffic handled is international and growth has been steady over time since the port was opened for operations in 1996. Import traffic accounts for approximately 69 percent of tons transported and includes liquefied natural gas, steel, coke, and chemical feedstock for polymer manufacturing (such as paraxylene and styrene). Major exports include fluorine, teraphthalic acid (TPA), polyethylene terephthalate, refined sugar, cement and steel products. Other commodities handled by this port include automobile exports and 572,000 TEU's of container traffic in 2013.

Figure 13: General Layout of the Port of Altamira

The navigable waterways of the port consist of three primary channels. A 2.2 mile east-west ocean access channel is dredged to 45' MLW and joins the other channels in a turning basin of 2,460' diameter. The northern channel is approximately 4,300' long and dredged to 28'. The southern channel is approximately one mile in length and dredged to 40'. The port features on-dock rail with direct access to major corridors of both major freight rail providers, Ferromex and Kansas City Southern de Mexico.

This port covers more than 23,000 acres. It has ample space available for future expansion and development. Unlike many other ports in Mexico this facility was constructed relatively recently and deliberately located outside of the associated urban area of Tampico-Altamira. This reduces to a degree the port-city land use and transportation conflicts that plague many historical ports. The Port currently has five petrochemical fluid terminals, two multi-purpose terminals, one agricultural and mineral bulk terminal, one ore bulk and general cargo terminal, one terminal for construction of offshore platforms, one liquid natural gas terminal, and one general cargo terminal. The Port has a robust inventory of equipment including, 94 storage tanks of different capabilities, 23 loaders, 20 clamshell bucket cranes, and 17 forklifts. Facilities include 34,720 m^2 of storage, 1,152 m^2 of sheds, 1,062,400 m^2 of yards, and 13,688 m^2 of warehouses. The port area includes an industrial park with well-known companies such as POSCO, Iberdrola, Royal Group, Mexichem and BASF among the tenants.

The strategic investments in this port are expected to total USD $816 million. There are several major components.

- **Breakwaters:** The northern and southern breakwaters will be rehabilitated and extended by a total of 4,100 feet.
- **Dredging:** Marine infrastructure will be expanded. Ultimately the second port channel will run 3.7 miles north from the ocean access channel turning basin and feature two 2,066' diameter turning basins, all of this infrastructure to be dredged to 45'. The third channel will be extended to run south for 3.1 miles, beginning at a depth of 42' decreasing to 38' at the southernmost point. This channel will be equipped with two turning basins, the first of 1,476' diameter and dredged to 42'. The southernmost turning basin will be 1,542' in diameter and be dredged to 38'.
- **Gas Pipeline Relocation:** The Cactus-Reynosa 48" gas pipeline will be relocated from its present path within the port facility to pass instead through the bordering undeveloped preserve area.
- **Road and Rail enhancements:** Road and rail connections to and from, and within, the port will be improved.
    - The intersections of Boulevard de los Rios with the Altamira Bypass and the Rio Tamesi will be grade separated.
    - A new rail line will be constructed to bypass the current route, which runs through the center of the city of Tampico, and to improve connectivity to the serving railroads.
    - The present tracks within the terminal serving the bulk minerals traffic will have their capacity expanded by constructing new lines to provide more space for loading and unloading and storage of freight railcars.
- **Gas Terminal:** A natural gas compression station will be built at the port to take advantage of production increases expected to result from the energy reform activities.
- **PEMEX Platform Shipyard and Terminal:** The port will be dredged with a specific objective to create capacity for the transit of marine oil and gas platforms used for exploration and production. PEMEX is planning to construct a new terminal at Altamira for the fabrication and service of these platforms.

- **Rail Ferry and Ro-Ro Terminal:** A new terminal to provide freight rail ferry service and handle roll-on/roll-off cargo ships will be built at the southeast corner of the central turning basin. At peak operations this terminal is expected to handle 787 rail ferry calls and 826 Ro-Ro calls per year. Mobile, Alabama is expected to be a major traffic partner.
- **Electrical Infrastructure:** Investments will include a new electrical transmission line and substation to support expansion of the port facilities.

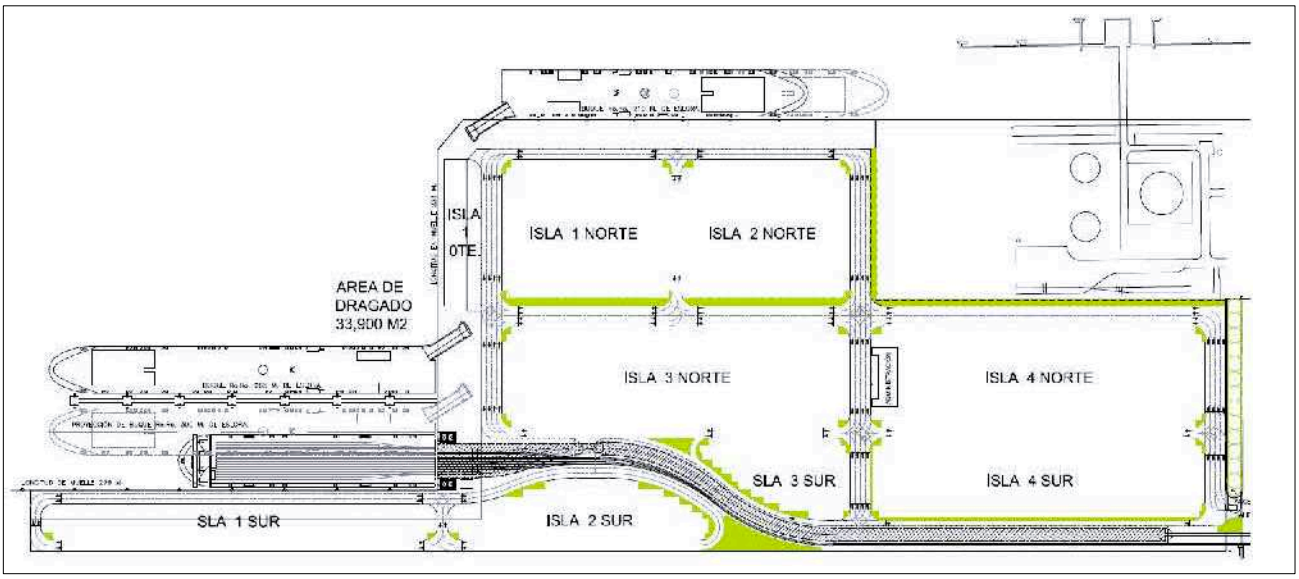

Figure 14: Plan of the New Rail Ferry Terminal at the Port of Altamira

Project Status and Implementation Timeline

This suite of multiple projects will be carried out between 2013 and 2018.

Project Cost, Financing and Procurement

The following table identifies components that have been formally budgeted by the API in consultation with SCT.

Project	Total Spent	2014	2015	2016	Total Pending	Total
Rehabilitation and extension of breakwaters	81,685,120	5,358,429	-	-	5,358,429	87,043,549
Gas pipeline relocation	49,145,496	2,008,460	-	-	2,008,460	51,153,957
Expansion of bulk minerals terminal rail infrastructure	7,639,005	2,452,040	-	-	2,452,040	10,091,044
Dredging operations	30,118,449	23,739,150	11,995,141	-	35,734,291	65,852,740
Cistern relocation	-	144,271	673,267	144,271	961,810	961,810
Gamma ray inspection equipment	-	2,104,278	-	-	2,104,278	2,104,278
Grade separation Blvd. de Los Rios/Libramiento Altamira	-	2,287,300	7,624,334	762,433	10,674,067	10,674,067
Grade separation Blvd. de Los Rios/Rio Tamesi	1,186,958	7,913,050	3,165,220	437,365	11,515,635	12,702,593
Rail Ferry and Ro-Ro Terminal	791,305	10,916,532	12,895,318	2,297,254	26,109,104	26,900,409
Totals	170,566,333	56,923,510	36,353,280	3,641,324	96,918,114	267,484,447

Table 4: Federal Funds Approved for Capital Investments at the Port of Altamira

Some of the outstanding balance will be a mix of API and federal resources to be allocated in future budget cycles, based on outcomes of feasibility and planning activities. The natural gas compression station, the

electrical infrastructure, and the marine oil and gas platform shipyard and terminal, will be developed in whole or in part by other entities, such as CFE and PEMEX.

Within the budget for the new Rail Ferry and Ro-Ro terminal the investments will include the following approximate amounts by category: dredging, USD $4.6m; docking infrastructure, USD $18.6m; rail infrastructure, USD $1.3m; equipment including a railcar puller, USD $844,000.

U.S. Export Opportunities

U.S. firms should encounter a range of export opportunities associated with this port investment program. Basic infrastructure construction will create demand for goods and services associated with significant works in infrastructure areas including dredging of marine channels; construction of breakwaters, roads, rail, electrical lines and substations, buildings, natural gas pipelines and compression stations; terminals, docks, shipyards; and acquisition of various associated systems. Loading and unloading equipment including racks and service vehicles will be an opportunity for U.S. suppliers, and a gamma ray container inspection machine will be among specialty technology to be acquired in 2014.

Project Contacts

Project Sponsor	U.S. Trade and Development Agency	U.S. Commercial Service Mexico
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Expansion of the Port of Lázaro Cárdenas

Project Type:	Port
State(s):	Michoacan
Projected Investment:	USD $592 million
Timeline:	2013 - 2019
Project Sponsor(s):	SCT, Port Authority of Lazaro Cardenas (APILAC)

Project Background and Scope

The Port of Lázaro Cárdenas is the third largest port in Mexico and the largest in terms of transportation of non-hydrocarbon products. It is located in the state of Michoacán on Mexico's Pacific coast, approximately 400 miles west of Mexico City. The port is located at the mouth of the Rio Balsas and is in a hub and spoke formation with three main channels radiating from a central turning basin and ocean access channel. The northeastern "commercial" channel further splits into northern and eastern branches at the second turning basin. The turning basins at the termination of these two channels are yet to be constructed.

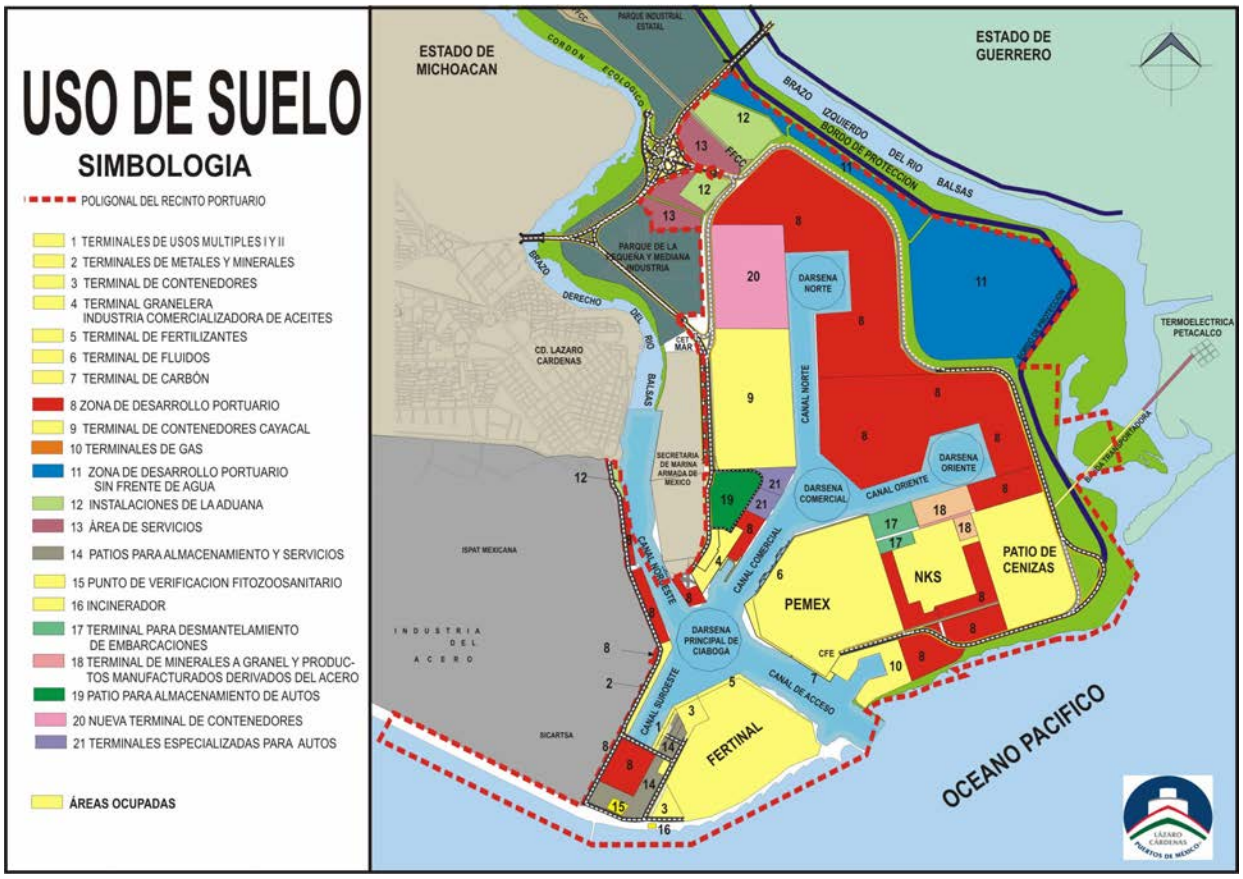

Figure 15: Layout of the Port of Lázaro Cárdenas

The port's main access channel is dredged to a depth of 59 feet, and the primary turning basin, 2,297' in diameter, is dredged to 54 feet, the deepest of any port in Mexico. The port can receive ships of up to 165,000 tons displacement. The secondary "commercial" turning basin measures 1,739 feet in diameter and is dredged to 54'. Secondary canal depths range from 47 to 54 feet. The port facility has over 13.5 miles of shoreline of which 2.4 miles is operating berth space dredged to depths ranging from 20 to 54 feet. Freight rail service is provided on the docks by Kansas City Southern de Mexico.

This port currently operates terminals specialized in handling of general cargo, metals, minerals, containers, bulk agricultural products including oils, fertilizer, fluid bulk products, coal, natural gas, steel products, and automobiles. There is also an active terminal for commercial fishing activities. In 2013, the port saw throughput of 34.9 million tons of cargo, composed of 14.1m international import (40 percent), 13.1m international export (38 percent), and 7.7m cabotage (22 percent). 10.5 million tons consisted of containerized cargo, representing 1.1 million TEU's. The largest movements by type were in the form of bulk minerals (19.4m, 55 percent) and containers (10.5m, 30 percent).

Project Status and Implementation Timeline

Multiple projects are underway or planned for this port. The largest is to be the development of a second specialized container port. It is expected to increase capacity from 250,000 TEU's to 3 million TEU's. Construction began in 2013 and will complete in 2019. A third general cargo terminal will be constructed, covering an area of 21 hectares with 286 meters of docking space. The investments will also include addition of new specialized terminals for automobiles and grain. The automobile terminal will be the most highly automated terminal of its type in Latin America.

Project Cost, Financing and Procurement

The expected investment amounts are:

Project		USD, Millions
Container Terminal II and Associated Equipment	$	504
General Cargo Terminal	$	44
Specialized Automobile Terminal	$	40
New Grain Terminal	$	5
Total	**$**	**593**

Table 5: Investments in the Port of Lázaro Cárdenas

U.S. Export Opportunities

Some export opportunities associated with these investments my include material handling systems, lighting, communication, security, access, and control systems. The investment structure will involve PPP structures, accordingly many purchases of capital goods will not necessarily occur through the API, but rather private terminal operators and subcontractors.

Project Contacts

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Expansion of the Port of Manzanillo

	Project Type:	Port
	State(s):	Colima
	Projected Investment:	USD $350 million
	Timeline:	2013 – 2018
	Project Sponsor(s):	SCT, CFE, APIMAN, IDB

Project Background and Scope

The Port of Manzanillo is the main Pacific gateway for international trade with access to Mexico's most important industrial and commercial corridor in the country's western and central regions. In 2011 the port handled a total of 26 million tons of cargo. This included 18.4 million tons of containerized traffic (1.1 million containers/1.8 million TEUs), 5.3 million tons of bulk mineral traffic, and 1.4 million tons of general cargo. The port saw 1,819 freight vessel calls and 36 cruise ships.

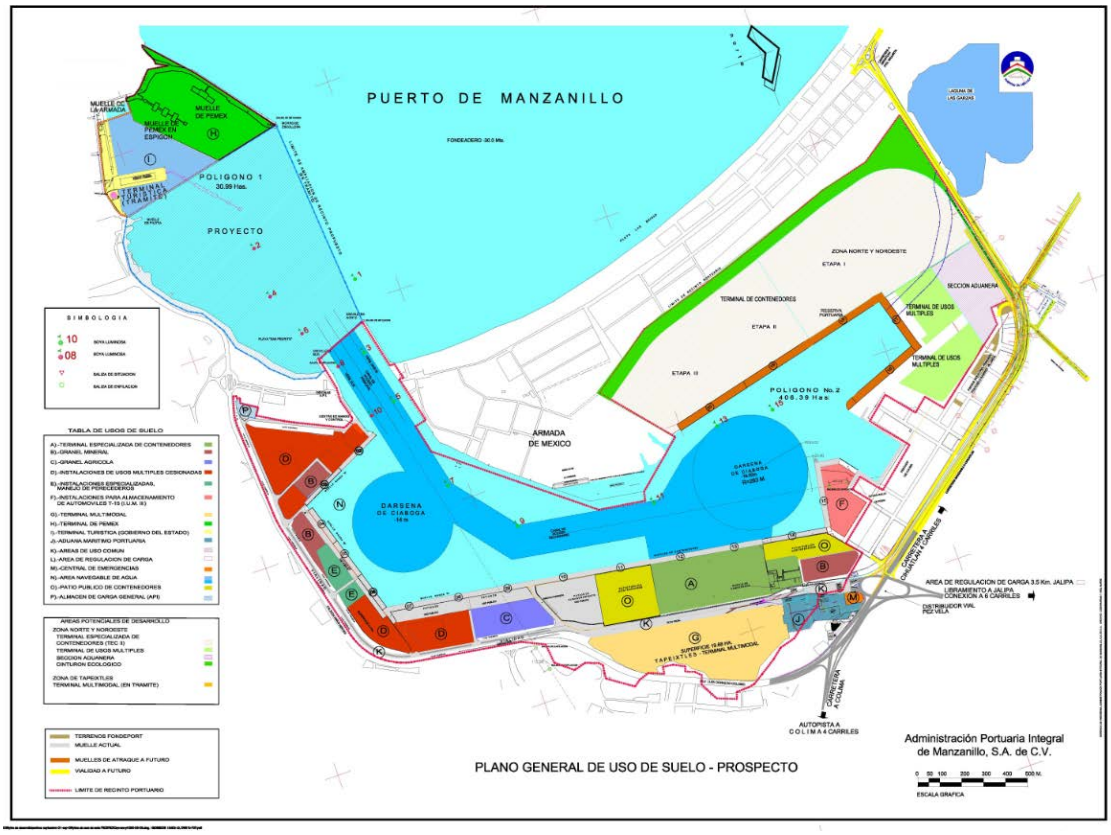

Figure 16: Port of Manzanillo Development Overview

The port covers 437 hectares, including water, docks and storage areas. The port has 19 docks, 34 acres of storage areas, over fifteen miles of railways and nearly four miles of roads. Within the port there are 19 berths in total: 14 for commercial traffic, 3 for hydrocarbons (operated by PEMEX) and 2 for cruise traffic. Private

operators run the 14 commercial terminals including dedicated facilities for commercial fishing traffic, cement, fertilizer, containers, general cargo, automobiles, bulk agricultural and mineral products, and general cargo. Berth maximum vessel drafts vary significantly: from 10 to 20' for small fishing boats; 40 to 50' for hydrocarbons tankers; 30 to 43' for passenger cruise ships; and 41 to 44' for the different types of cargo. This port has direct connections for double-stack train service.

The port will see substantial capital investments in the period through 2018 across 3 major development initiatives.

1. Construction of a New Container Terminal: This project is expected to generate at least USD $350 million in total investment. The expansion project consists of the design, construction, operation and maintenance of a new container and logistics facility at the Port of Manzanillo, including supporting infrastructure investments. The first phase of the project involves the construction of a two-berth 720 meter-long deep water quay deck to accommodate a wide range of vessels, including super post-Panamax ships (175,000 deadweight tons up to 390 meters in length), a paved container stacking area, truck entrance/exits, a rail intermodal yard, approximately 3.3 kilometers of roads, and associated facilities. Equipment to be installed includes four super post-Panamax quay cranes, ten rubber-tired gantry cranes, three reach stackers, and five empty handlers. The project will allow the terminal a yearly handling capacity of 650,000 twenty-foot equivalents (TEUs). Additional works will mostly be comprised of a new customs facility in the northern expansion zone, to be built specifically to service the new traffic generated by this terminal; an internal road network, currently under construction, to facilitate movement between the new terminal and the rest of the port; the nearly completed construction of new access roads to the port; a rail intermodal yard and associated access spurs to be built to service the Terminal; the planned digging of a railway tunnel underpass through the city of Manzanillo and harbor dredging to establish and maintain a depth of 52.5 feet.

Figure 17: Port of Manzanillo Development Phases

2. New General Cargo Terminal: This new terminal is identified in the PNI as responsible for a total investment of USD $65 million.

Project Status and Implementation Timeline

This first phase of the container terminal project began construction in late-2013. Miscellaneous capital works on the port will continue through 2018.

Project Cost, Financing and Procurement

Total project cost of the container terminal project is estimated by the IDB at USD $350 million. Of this IDB is preparing a borrowing package to refinance the developer's bridge loans in the amount of USD $172.5 million. The Government of Mexico has identified a cost of USD $192.7 million in the PNI, which appears to represent the basic and connecting infrastructure works associated with the new terminal. The newly-created China Infrastructure Fund will be providing an additional USD $50 million in financing. The remaining spending on major capital items is provided below:

Activity (USD Millions)	2012	2013	2014	2015	2016	2017	Total
Port Terminal Infrastructure	80.2	72.0	19.1	-	-	-	**171.4**
Quay Crane	14.5	14.5	9.5	-	7.0	-	**45.4**
Rubber Tired Gantry Cranes	6.7	6.7	10.4	-	3.9	-	**27.7**
Loading Equipment	2.9	2.9	0.3	-	2.8	-	**8.9**
Safety and Security Equipment	0.0	-	7.7	-	-	-	**7.7**
Multimodal Zone	-	-	2.7	-	-	-	**2.7**
Service Vehicles	0.0	0.0	0.3	-	-	-	**0.4**
Totals	**104.3**	**96.1**	**50.1**	-	**13.7**	-	**264.1**

Table 6: CONTECON Investments in the New Intermodal Terminal at Manzanillo

The port's general capital plan offers an additional USD $371.9 million in spending on a range of infrastructure through 2018, illustrated in the table below, including the "Northern Zone" general cargo terminal investments.

Activity (USD Millions)	2012	2013	2014	2015	2016	2017	Total
Northern Zone infrastructure development	26.0	25.4	4.4	6.2	-	-	**62.0**
Construction of a retaining wall to enable works on the berths at Piers C and D	-	11.6	18.2	11.6	15.4	-	**56.7**
Expansion of the access road to the Jalipa Yard	-	-	-	10.4	7.7	20.4	**38.5**
Extension of the breakwater	-	-	-	-	23.1	4.7	**27.8**
Construction of a pier for docking position #16	-	-	-	10.8	10.8	-	**21.6**
Construction of a supporting yard for dock 16	-	-	-	7.7	7.7	-	**15.4**
Constuction of a pier at docking station no. 17	-	-	-	3.9	11.6	-	**15.4**
Application of corrosion protection to the Pier A retaining wall and a drain at San Pedrito	-	-	3.5	8.1	3.9	-	**15.4**
Maintenance dredging services	-	1.5	6.5	1.5	1.5	1.5	**12.6**
Extension of the berth at docking point no. 15	-	2.3	5.7	3.9	-	-	**11.9**
Reconfiguration of the customs area and fiscal route	-	-	2.8	9.0	-	-	**11.8**
Construction of a supporting yard for pier no. 17	-	-	-	3.9	7.7	-	**11.6**
New API headquarters building	-	-	-	3.8	4.1	3.7	**11.6**
Compensating works related to the rail tunnel	-	-	11.6	-	-	-	**11.6**
Repaving of service roads in San Pedrito	-	2.3	-	5.4	-	-	**7.7**
Construction of an overpass to the Jalipa logistics yard at km 3,500 of the Manzanillo-Minatitlan highway	-	-	-	1.5	5.0	-	**6.5**
Maritime navigational signals, polygon 2	-	-	-	5.4	-	-	**5.4**
Dredging to deepen the berths at piers B, C, and D	-	-	3.7	0.8	-	-	**4.5**
Safety and security equipment	-	-	3.9	-	-	-	**3.9**
Feasibility studies for capital projects	0.3	1.0	2.3	-	-	-	**3.6**
Rehabilitation of two berths at the fishing pier	-	0.5	1.9	0.8	0.3	-	**3.5**
Modernization of the port lighting system	-	-	1.5	1.6	-	-	**3.2**
Resurfacing of the fiscal route	-	-	-	2.3	-	-	**2.3**
New rail spur construction off the east side rail line	-	-	1.5	-	-	-	**1.5**
Reinforcement of Pier A with carbon fiber	-	-	1.5	-	-	-	**1.5**
Expansion of the drainage system at the port access areas	-	-	1.5	-	-	-	**1.5**
CONTECON interchange route	-	-	1.2	-	-	-	**1.2**
Modernization of the port water system	-	-	1.1	-	-	-	**1.1**
Piers B and C potable water lines	-	-	-	0.5	-	-	**0.5**
Construction of three gatehouses for pedestrian access	-	-	-	0.4	-	-	**0.4**
Totals	**26**	**45**	**73**	**99**	**99**	**30**	**371.9**

Table 7: Port of Manzanillo General Capital Budget Forecast

U.S. Export Opportunities

Although significant spending will occur in 2014-15, opportunities associated with the new container terminal are likely to be limited for U.S. companies. The concession has been awarded to International Container Services of the Philippines (CONTECON). China Harbour Engineering Company, Ltd. is performing much of the civil construction and the major container handling equipment is being procured from CargoTec of Finland.

Opportunities are more likely to exist in the range of general investments being performed by the API in basic infrastructure, including the general cargo facility, and including marine works and dredging, road and rail line improvements, buildings and systems.

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Expansion of the Port of Guaymas

Project Type:	Port
State(s):	Sonora
Projected Investment:	USD $184 million
Timeline:	2013 –2016
Project Sponsor(s):	SCT, Port Authority of Guaymas

Project Background and Scope

The Port of Guaymas is located on the Pacific Coast approximately midway up the eastern shore of the Gulf of California. It covers 355 acres, 46 percent of which is land and 54 percent water. The port has two harbors with six berths between two piers. The navigation channel has a length of 2.6 miles and a turning basin 1,640 feet in diameter, both dredged to 50 feet. The eastern pier features 1,237 feet of berth space dredged to fifty feet for docks 3 and 4, and 656 feet of berth space dredged to 42 feet for dock 2. The southern pier has 1,178 feet of berth space dredged to 43 feet for docks 5 and 6. The port has on-dock freight rail service provided by Ferromex.

The Pacific coast of North America is a region that has experienced increased growth in world seaborne trade over the past few years. This increase is driven by the influx in demand for raw materials, especially mineral bulk for the energy sector and manufacturing in Asian countries. Bulk ore operations at the Port of Guaymas have increased by 113.8 percent annually for the past two years. The port has benefitted from the overall increase in maritime traffic of goods between Asia and the main consumer market in the United States. Total port freight throughput more than doubled from 3,794,000 tons of cargo in 2009 to 8,021,000 tons in 2013. In addition to bulk minerals, the port handles agricultural bulk, general cargo, fluids, containerized cargo, and oil. The rapid growth has brought the port to the limits of its capacity, resulting in congestion and limiting the ability of the port to meet growing demand. A range of clients in the port's hinterland and foreland in the United States have expressed interest in utilizing Guaymas for yet more traffic flows. Notably, Guaymas is the terminus for an important fiscal route (approved customs corridor for transit of goods) with southern Arizona, including the cities of Tucson and Benson. Guaymas has the potential to provide a cost effective gateway for additional international freight flows to and from U.S. industry in Arizona. Capturing such new traffic flows is contingent upon the port undertaking significant infrastructure investments, in particular for bulk agricultural movements.

Recognizing both the challenges and the opportunity, the port has planned a major capacity expansion project and they are embarking on the first phase. Support for this project includes a specific presidential commitment, number 193, with an estimated total investment amount of over USD $33 million. The new bulk terminals will be constructed along the Isla Barra Morro Ingles, a spit of land which runs east to west across the mouth of the Bay of Empalme.

Figure 18: Overview of the Long Term Expansion Areas of the Port of Guaymas

This project will be performed in two phases. The first phase includes dredging works to establish the channels, turning basins and berths. There will be a 2,297' diameter turning basin at the entrance to the Bay of Empalme and a smaller turning basin of 1,148' in diameter located at the end of the bulk materials pier. Dredged material will be used as fill to create the foundations of the new terminal area measuring approximately 180 acres. Retaining walls, piers and docks, and connections to utilities, road and rail infrastructure will be built with public funds.

It is expected that the operating infrastructure of the bulk terminals – including specific dock components, buildings and loading/unloading equipment, and the works to prepare the bulk materials storage yards - will be purchased by the operators of the terminals.

Figure 19: Diagram Illustrating Channel Works and New Bulk Agricultural Terminal

In the longer term the strategic plan for the port includes the relocation of all the present operating terminals to new facilities to be built on the western shore of the Bay of Empalme, northwest of the new bulk terminal.

Project Status and Implementation Timeline

Operations of the new bulk mineral terminals will begin progressively based on the status of the terminal construction. The project is expected to be fully completed in three years.

Project Cost, Financing and Procurement

The feasibility study for this project estimated the total cost at USD $238.9 million including both public and private investment. The components of this estimate are provided below:

Activity	Cost in USD
Public Activity	
Phase 0: Studies, Projects and Planning	**1,752,856**
Phase 1: Construction	**169,391,420**
Dredging	117,522,513
Transfer of Fill	1,296,137
Bulk Agricultural Goods Terminal	50,572,771
Retaining Wall	*19,232,175*
Pilings	-
Agricultural Terminal Equipment and Facilities	*144,100*
Yards and Paving	*31,196,496*
Total, Public Activity	**171,144,276**
+ Private Investment	67,771,935
GRAND TOTAL	**$ 238,916,211**

Table 8: Sources and Uses of Funds for the Port of Guaymas Bulk Terminals Project

The project flow of funds for the public investment portion of this project, as currently presented on the federal budget authority's website is as follows. The difference in values is due to a combination of inflation, exchange rate calculations, and the different timing of the presentations.

Year	2012	2013	2014	2015	2016
Annual	-	7,121,745	127,644,031	24,559,968	24,530,455
Total	$183,856,198				

Table 9: Projected Flow of Public Funds for the Port of Guaymas Bulk Terminals Project

This bulk terminal is only a component of a greater strategic plan for the port that ultimately involves relocation of current operating terminals to an expanded new facility along the western coast of the Bay of Empalme. This new facility would consist of two major terminal platforms linked by a connecting causeway.

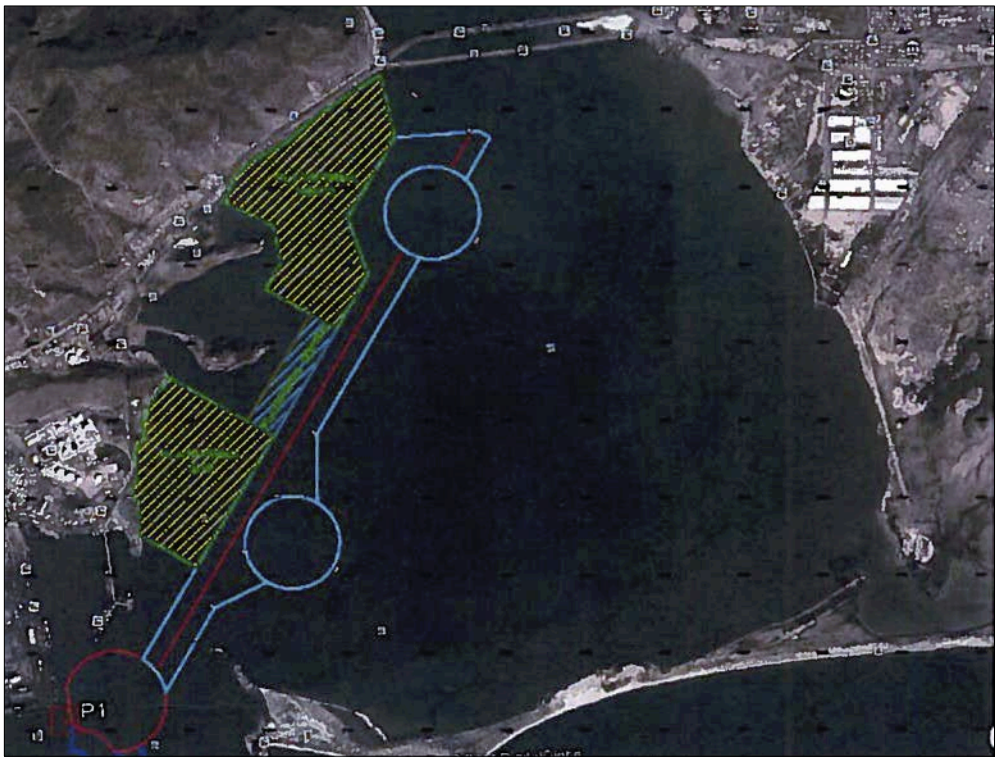

Figure 20: Concept view of the Long-Range Expansion Plan for the Port of Guaymas

Planning and budget documents for the full scope of these future investments are still in study phase.

U.S. Export Opportunities

Commercial opportunities associated with this new bulk terminal will include provision of dredging and marine and land construction works, including road and rail infrastructure, utilities and buildings, provision of loading and unloading equipment. The basic infrastructure works will be procured with public funds while the terminal plant and equipment is expected to be procured discretely by several concessionaires.

3.1.4 Aviation

Sector Background

By a count of the sheer number of aviation facilities, Mexico ranks third in the world with 1,872 facilities of one type or another. Many of these are small, general aviation facilities (referred to as aerodromes) with limited capacity. 243 facilities are more substantial and classified as airports with paved primary runways of different lengths, described below. For context, the largest passenger jets in regular commercial service, such as a Boeing 747-400, would (very roughly) require a runway length in excess of 9,000 feet for takeoff when fully loaded.

Number	Airport Primary Paved Runway Length Ranges		As percent
	From	To	
12	9,997	+	5%
32	7,999	9,997	13%
80	5,000	7,995	33%
86	2,999	4,999	35%
33	0	2,999	14%
243			**100%**

Table 10: Mexico's Airports with Paved Runways by Length

The Mexican government includes 76 major airports within the national aeronautical system. Another 1,388 facilities are classified as aerodromes and there are 408 registered heliports. Of the 76 airports in the system, 34 are concessioned to private airport operators. The major airport operating groups are:

- **ASUR:** Aeropuertos del Sureste operates 9 airports in southern Mexico:
  - Cancún, Cozumel, Huatulco, Mérida, Minatitlán, Oaxaca, Tapachula, Veracruz, Villahermosa.
- **GAP:** Grupo Aeroportuario del Pacifico operates 12 airports in western Mexico:
  - Guadalajara, Tijuana, Mexicali, Hermosillo, Los Mochis, Aguascalientes, Guanajuato, Morelia, La Paz, Los Cabos, Puerto Vallarta, and Manzanillo.
- **OMA:** Grupo Aeroportuario Centro Norte operates 13 airports in the north-central región of the country.
  - Acapulco, Ciudad Juárez, Chihuahua, Culiacán, Durango, Monterrey, Mazatlán, Reynosa, San Luis Potosi, Tampico, Torreón, Zacatecas, and Zihuatanejo.
- **ASA:** 19 airports in the system are operated exclusively by Aeropuertos y Servicios Auxiliares (ASA), a state "decentralized" entity. Another 4 are operated in partnership with ASA. In addition to airport construction and operation, ASA is a primary supplier of aviation fuel and related services through 60 nationwide locations, serves as a provider of technical assistance and consulting to the Mexican aviation industry, and provides training, research and development services. ASA serves as a technical resource to SCT for development of regulation, standards and oversight of Mexico's airports and aviation sector.
  - **Airports managed exclusive to ASA:** Ciudad Obregón, Colima, Ciudad del Carmen, Campeche, Chetumal, Ciudad Victoria, Guaymas, Loreto, Matamoros, Nuevo Laredo, Nogales, Poza Rica, Puebla, Puerto Escondido, Tehuacán, Tepic, Tamuín, Uruapan. **In partnership:** Cuernavaca, Tuxtla/Palenque, Toluca, Querétaro. On April 10, 2014 ASA was granted the 50 year concession to operate and develop the existing Hermanos Serdán International Airport, located adjacent to the city of

Tlaltenango in the state of Puebla. This is an evolution of a previous concession in which ASA was a minority partner with the state.

ASA has set quantitative performance goals in its Institutional Program for 2013 - 2018 to increase service operations from 39,000 to 43,000 and to double the number of certified civil aerodromes from 8 to 16.

- **AICM:** Mexico City's Benito Juarez International Airport (AICM) is operated by an independent state-owned company, Grupo Aeroportuario de la Ciudad de Mexico or GACM. AICM was declared an international airport in 1943. By the 1990's, the airport was facing the challenges of tremendous growth. In 1994, the general aviation operations were moved to the Toluca Airport. Beginning in 2001, SCT, AICM and ASA collaborated to undertake a wide-ranging major investment program ultimately intended to increase the airport's capacity from 20 million to 32 million annual passengers. Operating company AICM SA de CV is a sister company to Servicios Aeroportuarios de la Ciudad de Mexico SA de CV (SACM), these are both subsidiaries to the holding company GACM. GACM was founded in 1998, and is a majority state-held enterprise with the mission of carrying out a 50-year concession to administer, operate, expand and develop AICM. In 2013, GACM reported USD $319 million in operating expenses. In 2012 28.7 million passengers were transported through the airport, placing it as the 52nd largest airport in the world by passenger volume, while it ranked 22nd by number of takeoffs and landings. By 2013, passenger volume had increased to 31.5 million. AICM ranked 50th in the world by cargo volume in 2012, moving 403,885 tons of cargo. AICM is the largest of the Mexican airport operating groups as measured by total passengers per year, by number of takeoffs and landings and by tons of cargo transported.

18 other airports are managed by state or municipal governments. Mexico has organized the five airports in the vicinity of Mexico City – AICM, Toluca, Puebla, Cuernavaca, and Querétaro – into a group called the Metropolitan Airport System. This grouping was developed in the interest of managing the rising congestion at AICM by distributing some air traffic to the nearby airports with additional capacity. Mexico's system is served by 21 major international airline carriers. There are a total of 10 domestic carriers operating a fleet of 258 aircraft. The largest of these Mexican carriers are companies Aeroméxico, Interjet, VivaAerobus, and Volaris

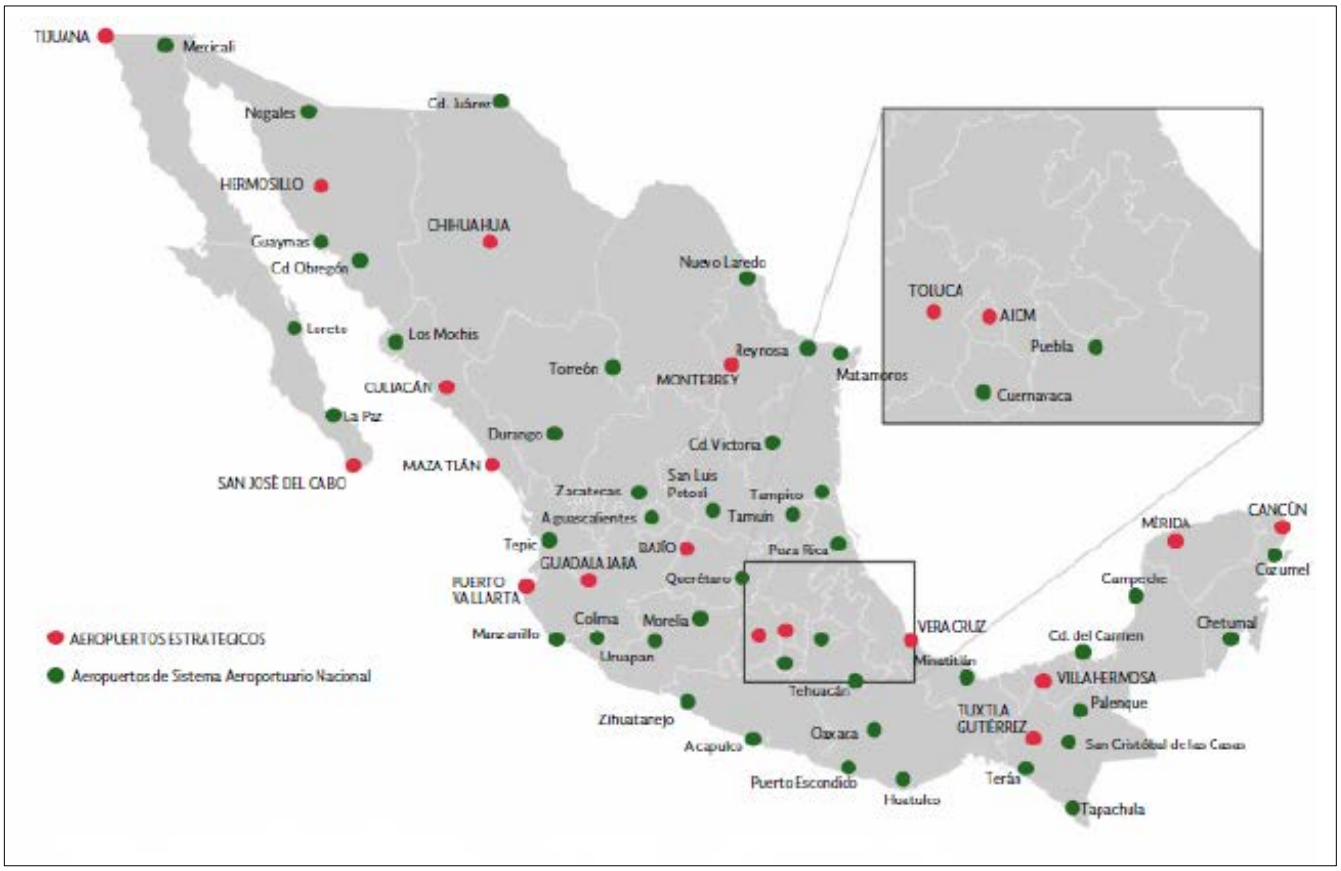

Figure 21: Map of the Mexican National Airport System

Airline traffic is heavily concentrated within the system. In 2012 88 percent of the 86.4 million passengers transported were handled by only 17 airports, and of those AICM accounted for 34 percent of passengers transported. 98 percent of 747,000 tons of cargo transported passed through these same 17 airports.

Role of SCT and DGAC

Within the Mexican government the General Directorate of Civil Aeronautics (DGAC) of the Secretariat of Transportation has held responsibility for the development and oversight of the Mexican aviation system. The Directorate has multiple divisions including airports, security, technical (standards setting), air traffic control, international, civil aviation affairs and accident investigation. Within this agency the Division of Airports has held the responsibility for development of airport infrastructure, services and aviation-sector concessions.

In 2014 the Directorate is being converted to what is referred to as a “decentralized administrative organ” that will be called the Federal Civil Aviation Agency. This new structure will give the agency some administrative autonomy in resolution of matters under its jurisdiction, such as standards setting. It will still be a component of SCT, without its own property and only shall exercise legal authority on behalf of SCT, not independently.

Air Traffic Control (SENEAM)

Within SCT, the Servicios a la Navegación en el Espacio Aereo Mexicano (SENEAM) is responsible for managing Mexico’s airspace. SENEAM operates and manages the national air traffic control system, including radars, radio

navigation aids, telecommunications networks, and provides meteorology services and a range of information products to aviators. This unit of SCT is responsible for the following specific infrastructure:

Air Navigation System Asset	#
Remote air-to-ground stations	41
Microwave channels	370
Satellite ground stations	34
VOR radio beacons	80
Distance measuring equipment (DME)	102
Non-Directional radio beacon (DME)	102
Instrument landing systems (ILS)	22
Primary radar systems	8
Secondary radar systems	28
Surface radar system	1

Control Units/Networks	#
Air traffic control centers	4
Approach control units	39
Aerodrome control towers	58
Flight information services	43
Aviation telecommunications centers	4
Subcenters	12
Weather analysis and prediction centers	1
Weather observation stations	60

Table 11: SENEAM Air Traffic Control and Communications Major Assets

In 2013, SENEAM's operating expenditures were USD $161 million. In 2014, they project USD $181.6 million in operating expenditures and an additional USD $169.5 million in capital spending. Historically 70 percent of SENEAM's capital spending has been on radar and radar data processing systems, 13 percent on radio navigation aids, and 16 percent on communications systems. SENEAM has had their program for modernization and maintenance of air traffic control systems approved by SHCP. The components are identified in the table below. Most of these items are components of SENEAM's strategic investment plan through 2025. Many are reflecting a single year of multi-year investment projects.

Investment Component	Cost, USD
Uninterruptible power supplies for systems and equipment of capacities (#): 40kVA (3); 30kVA (1), 6kVA (6)	$ 192,308
Emergency electricity generators to supply systems and equipment of various capacities.	269,231
Acquisition of a Ground-Based Augmentation System (GBAS)	4,230,769
Modernization of the secondary monopulse surveillance radar system for Cerro de las Rusias, Durango, and the Hermosillo Intl. Airport in Sonora.	2,804,308
Acquisition of two 360° air traffic control tower simulators including installation, training, an operational startup support.	2,692,308
Additional Voice Communication System stations (VCS 5.0) for the Arrival Master and Sector 8 Control Center in Mexico City.	215,385
Acquisition of 4 VOR/DME systems for the stations of Pachuca, Hidalgo; Puebla; San Jose del Cabo BCS; and Monclova in Coahuila, and two ILS system for the stations at Mexico City and Tuxtla Gutierrez.	2,800,000
Acquisition of two high frequency air-to-ground communications systems for the air traffic control centers in Mazatlán and Mérida.	269,231
Acquisition of two protective radomes for the radar antennae of the Airborne Collision Avoidance (ACA) and PVR.	753,846
Acquisition of a ground station for Torreón.	269,231
Acquisition of two Disaster Recovery Systems for the radar and flight plan data processing systems for the air traffic control centers at Monterrey and Mérida.	10,769,231
Modernization of the information technology support systems in control towers (funcionalidad de tiras electronicas)	947,692
Gate X communication systems for the Zacatecas air traffic control center.	197,223
Modernization of the primary and secondary monopulse surveillance radar systems, with meteorology channels, at the the Guadalajara airport.	2,369,231
Modernization of the data processing system for radar and flight plan data at the air traffic control center in Mexico City with functionality for automated arrival/departure management (AMAN/DEMAN) for AICM.	1,615,385
Modernization of the primary and secondary monopulse surveillance radar systems, with meteorology channels, at Cerro del Peñon in Mexico City, and the secondary monopulse radar system at Puerto Peñasco in Sonora.	2,692,308
Updating of the communications systems at the approach control centers at Hermosillo and Chihuahua.	991,238
Acquisition of three radio links.	421,077
Ground-to-air communications equipment for the control towers and service units of Culiacán, Hermosillo, and Tijuana.	538,462
Management equipment for the air traffic control and service engineering units.	269,231
Acquisition of furniture and equipment for the air traffic control and service engineering units.	269,231
Total	**$ 35,576,923**

Table 12: SENEAM 2015 Investments in Air Traffic Control and Communications Systems

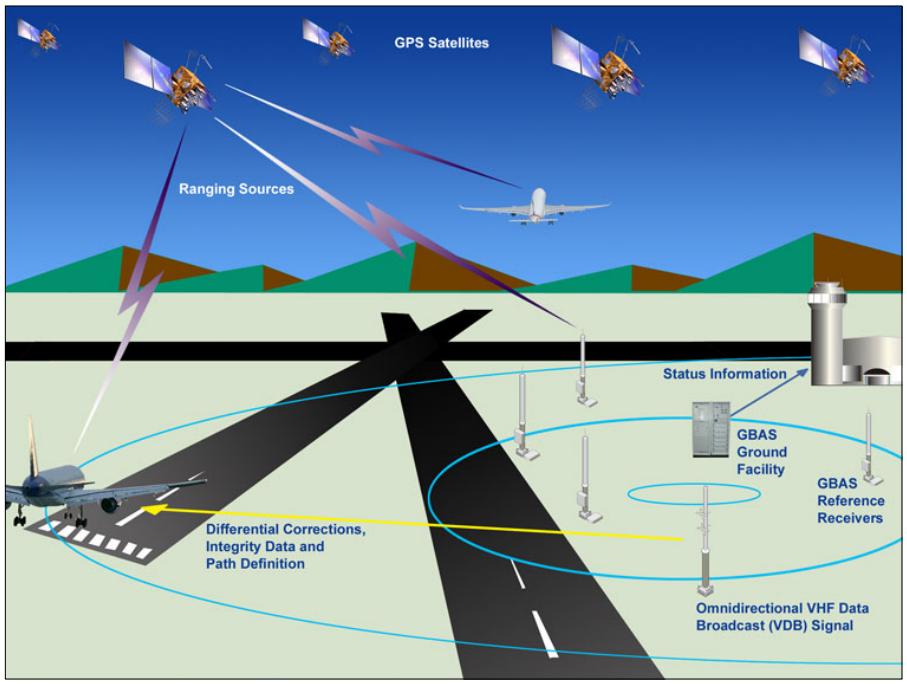

Figure 22: Configuration of a Generic GBAS System

Airport	Operator						Total	As %	Cum. %
	AICM	GAP	ASUR	OMA	SOC.	ASA			
MEXICO CITY	31,532,331						**31,532,331**	33.9%	34%
CANCUN			15,962,162				**15,962,162**	17.1%	51%
GUADALAJARA		8,104,762					**8,104,762**	8.7%	60%
MONTERREY				6,417,755			**6,417,755**	6.9%	67%
TIJUANA		4,255,235					**4,255,235**	4.6%	71%
SAN JOSE DEL CABO		3,234,287					**3,234,287**	3.5%	75%
PUERTO VALLARTA		2,591,035					**2,591,035**	2.8%	77%
MERIDA			1,316,242				**1,316,242**	1.4%	79%
HERMOSILLO		1,276,201					**1,276,201**	1.4%	80%
CULIACAN				1,252,235			**1,252,235**	1.3%	82%
TOLUCA					1,161,064		**1,161,064**	1.2%	83%
VILLAHERMOSA			1,014,445				**1,014,445**	1.1%	84%
VERACRUZ			1,010,814				**1,010,814**	1.1%	85%
BAJIO		975,873					**975,873**	1.0%	86%
CHIHUAHUA				885,659			**885,659**	1.0%	87%
TUXTLA GUTIERREZ (AAC)					855,073		**855,073**	0.9%	88%
MAZATLAN				731,297			**731,297**	0.8%	89%
CD. JUAREZ				702,904			**702,904**	0.8%	89%
ACAPULCO				617,079			**617,079**	0.7%	90%
Remaining 41 Airports	-	2,203,110	1,775,993	2,685,544	347,189	2,232,328	**9,244,164**	9.9%	100%
Subtotal	**31,532,331**	**22,640,503**	**21,079,656**	**13,292,473**	**2,363,326**	**2,232,328**	93,140,617	100%	
As %	34%	24%	23%	14%	3%	2%	100%		
Cumulative %	34%	58%	81%	95%	98%	100%			

Table 13: Mexico's Top 60 Airports by 2013 Passenger Traffic and Operator

The 17 largest airports, considered the strategic airports, are well connected to the trunk road network. The government's strategic development objectives for this sector include:

- **Capacity Expansion in the Valley of Mexico:** The country will develop long-term solutions to the steadily increasing demand for airport services in the Valley of Mexico, in particular by expanding capacity at Mexico City International Airport. AICM was declared at full capacity in 2012. This inability to handle more traffic at the country's largest airport impacts national competitiveness. The present congestion creates significant safety concerns.
- **Reducing Air Logistics Costs:** The supervision of the development of the national carriers will improve, and more bilateral international air transport agreements will be established. Generally costs should be lowered, frequency of service increased and quality of service improved.
- **Improving Safety:** This will be accomplished by aligning the certification of airports with strict international standards, improved training of pilots and air traffic controllers, investments in traffic control systems, and stricter implementation of safety procedures.
- **Support Regional Development:** This will be accomplished by investments in the network of regional airports managed by ASA and by increasing interconnections across the system.

The government has set two primary quantitative goals to be achieved by 2018. Air passenger-kilometers travelled should increase from 4.9 million per month in 2012 to 162 million. Available air seat-kilometers should increase from 1.8 billion per month to 2.2 billion per month.

Master Airport Development Programs

The three private airport groups (ASUR, OMA and GAP) are required to periodically negotiate Master Development Programs (PMD in Spanish) with SCT that outline a five-year plan of management and investment for their airport properties. These five-year plans are a component of the concession agreements with the federal government. They are based in part upon traffic projections for a fifteen year period, and set tariff levels that the operator may charge and capital investment levels that the operator is obligated to make during the period. PMD's include subsidiary development plans for each airport property and define budgets associated with the specific capital project to be performed. Generally, any major construction, renovation, or expansion of any airport must be made in accordance with the operators PMD as approved by SCT.

Airport	PMD Spending	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Aeropuertos del Sureste (ASUR)	$ 535,678,070 *										
Grupo Aeroportuario del Pacifico (GAP)	$ 457,460,029 **										
Grupo Aeroportuario del Centro Norte (OMA)	$ 239,056,717 *										

** Company release*

*** Press report*

Table 14: Timing of Private Airport Operators' 5-Year Development Plans

ASUR PMD

The ASUR Master Development Plan for 2014 – 2018 was approved in January of 2014. Total committed capital spending is planned to exceed USD $535 million, with a breakdown by airport provided in the following table:

ASUR Airport	2014	2015	2016	2017	2018	Total
Cancun	61,063,290	172,302,320	108,402,778	66,003,858	16,560,053	$ **424,332,299**
Veracruz	15,065,684	13,525,568	587,074	465,084	404,090	$ **30,047,500**
Merida	5,001,563	13,853,415	6,823,779	2,958,242	297,349	$ **28,934,347**
Cozumel	1,890,835	4,635,595	1,677,353	4,681,341	449,836	$ **13,334,960**
Villahermosa	2,699,014	3,743,548	3,926,532	426,963	892,047	$ **11,688,104**
Huatulco	4,132,389	4,170,511	449,836	571,825	487,957	$ **9,812,518**
Oaxaca	693,814	2,188,184	2,821,004	1,014,036	442,211	$ **7,159,249**
Minatitlan	3,148,850	1,860,337	785,306	144,862	312,598	$ **6,251,954**
Tapachula	1,090,280	1,928,956	175,360	327,846	594,698	$ **4,117,140**
Total	**$ 94,785,718**	**$ 218,208,434**	**$ 125,649,021**	**$ 76,594,058**	**$ 20,440,839**	**$ 535,678,070**

Table 15: ASUR Airports Projected Capital Spending 2014 -18

ASUR has made preliminary estimates of capital investment by airport through 2028:

ASUR Airport	2019-23	2024-28
Cancun	$ 110,766,322	$ 102,585,412
Merida	12,107,442	7,959,805
Huatulco	11,101,030	7,182,122
Veracruz	8,447,762	9,812,518
Oaxaca	8,028,424	6,465,435
Villahermosa	7,853,064	10,140,364
Cozumel	4,681,341	9,835,391
Tapachula	2,782,882	4,673,717
Minatitlan	2,302,549	4,932,944
Total	**$ 168,070,815**	**$ 163,587,707**

Table 16: ASUR Airports Long-Range Capital Spending Projections

GAP PMD

GAP's Master Development Plan for 2010-2014 required USD $211 million in investments. The following tables break out these investments by airport:

GAP Airports	2010	2011	2012	2013	2014	Total
Guadalajara	7,787,799.54	15,023,750	10,573,655	16,037,024	13,069,328	**62,491,556**
Los Cabos	11,530,432.53	26,102,059	14,653,970	2,898,009	2,348,295	**57,532,766**
Puerto Vallarta	8,640,505.04	14,225,711	7,052,509	1,845,089	1,662,105	**33,425,918**
Tijuana	7,374,331.92	12,771,903	2,081,748	632,820	261,667	**23,122,470**
Guanajuato	1,014,875.08	2,703,894	2,873,383	495,200	228,730	**7,316,082**
Hermosillo	1,385,570.19	1,881,304	983,539	154,926	1,014,036	**5,419,376**
Los Mochis	1,021,660.73	632,820	1,471,496	1,899,222	205,857	**5,231,055**
Manzanillo	1,163,473.34	205,933	833,340	2,682,698	127,250	**5,012,695**
La Paz	167,735.34	213,481	648,068	3,148,087	209,669	**4,387,042**
Morelia	1,075,488.53	783,019	1,026,845	210,279	48,338	**3,143,970**
Mexicali	587,073.70	526,079	556,195	814,584	128,089	**2,612,021**
Aguascalientes	482,544.09	369,475	110,553	544,682	41,934	**1,549,188**
Total	**$ 42,231,490**	**$ 75,439,428**	**$ 42,865,301**	**$ 31,362,621**	**$ 19,345,298**	**$ 211,244,139**

Table 17: GAP Airports Master Development Plan 2010 - 2014 Investments

And by type of investment:

Investment	2010	2011	2012	2013	2014	Total
Terminals	7,511,341.20	34,542,273.12	21,784,627.82	12,554,914.26	7,770,263.57	**84,163,420**
Runways and Aprons	18,412,156.24	25,013,380.71	10,730,716.15	11,017,238.62	8,045,425.78	**73,218,917**
Machinery and Equipment	8,970,409.96	6,381,567.41	4,775,120.27	2,966,018.34	2,533,184.91	**25,626,301**
Other	7,337,582.63	9,502,207.24	5,574,836.65	4,824,449.71	996,424.19	**28,235,500**
Total	**$ 42,231,490**	**$ 75,439,428**	**$ 42,865,301**	**$ 31,362,621**	**$ 19,345,298**	**$ 211,244,139**

Table 18: GAP Airports Investments by Category 2010 - 2014

The GAP Master Development Plan for 2015 – 2019 was to be presented to SCT in June of 2014 for approval, with the company anticipating completion of negotiations with SCT by the end of 2014 or early 2015. According to press quotes from company executives, the 2015 – 2019 PMD proposes investments exceeding USD $457 million, more than doubling investments under the previous PMD. Nearly USD $182 million of this is proposed for the expansion of the Miguel Hidalgo Airport in Guadalajara.

OMA PMD

OMA is in the fourth year of its Master Development Plan for 2011-2015, which obligates the company to make approximately USD $209 million worth of investments across its system of airports. The schedule of investments by airport is as follows:

OMA	2011	2012	2013	2014	2015	Total
Mazatlan	20,747,642.17	6,961,321.75	18,757,919.78	19,049,931.76	9,091,484.38	**74,608,300**
Chihuahua	4,202,609.05	4,257,123.03	7,016,293.20	5,471,679.41	4,229,751.68	**25,177,456**
Acapulco	2,355,309.20	4,584,283.20	4,404,425.16	8,900,494.82	2,427,664.13	**22,672,177**
Monterrey	1,522,045.76	2,175,908.63	3,809,117.18	7,911,085.02	2,209,989.40	**17,628,146**
San Luis Potosi	1,509,694.34	1,617,883.64	4,279,919.79	3,916,849.02	3,257,420.38	**14,581,767**
Ciudad Juarez	1,369,635.33	2,841,741.70	6,806,928.99	1,486,592.61	1,207,237.02	**13,712,136**
Zihuatanejo	1,377,412.15	3,579,700.97	2,022,049.57	3,835,344.89	2,095,319.42	**12,909,827**
Tampico	2,485,151.61	3,596,093.29	3,484,778.02	1,369,864.06	1,041,026.54	**11,976,914**
Culiacan	1,859,422.53	2,837,014.62	4,249,117.48	1,127,486.49	815,270.02	**10,888,311**
Reynosa	2,575,957.43	2,994,762.08	2,698,251.74	1,960,292.47	486,889.96	**10,716,154**
Torreon	2,428,655.30	1,055,512.77	2,758,941.44	1,954,269.25	327,312.65	**8,524,691**
Zacatecas	1,407,833.24	3,022,133.44	2,027,157.88	813,287.69	884,880.18	**8,155,292**
Durango	2,859,506.40	1,735,374.62	927,576.45	1,686,273.91	296,815.32	**7,505,547**
Total	**$ 46,700,875**	**$ 41,258,854**	**$ 63,242,477**	**$ 59,483,451**	**$ 28,371,061**	**$ 239,056,717**

Table 19: OMA Airports Master Development Plan Investments 2011-15

And by broad categories of investments:

Investment	2011	2012	2013	2014	2015	Total
Terminals	3,961,985	6,083,761	14,175,695	18,076,914	5,451,017	**47,749,373**
Runways and Aprons	5,773,679	11,888,471	22,010,308	20,028,134	11,860,109	**71,560,701**
Machinery and Equipment	12,056,207	5,813,555	14,723,122	10,637,471	4,123,545	**47,353,899**
Baggage Screening	11,429,791	1,214,175	524,859	247,257	4,206,802	**17,622,885**
Security	3,903,430	10,738,950	4,589,087	3,380,935	1,589,292	**24,201,694**
Other	9,575,782	5,519,941	7,219,405	7,112,741	1,140,295	**30,568,165**
Total	**$ 46,700,875**	**$ 41,258,854**	**$ 63,242,477**	**$ 59,483,451**	**$ 28,371,061**	**$ 239,056,717**

Table 20: OMA Airports Investments by Category 2011 - 15

PNI Projects

In support of achievement of these goals, the Government of Mexico has included 20 significant aviation projects in the National Infrastructure Plan (PNI) with an estimated total investment of USD $276 million. This amount does not include investments associated with capacity increases at AICM. The level of readiness of these projects varies.

Expansion of the Mexico City Airport

The Aeropuerto Internacional de la Ciudad de Mexico (AICM) is the primary airport in Mexico, accounting for 35 percent of air passenger trips. With two passenger terminal buildings and two non-simultaneous primary runways AICM transports 32 million travelers per year in the course of 389,000 operations (takeoffs or landings). The facility has a technical limit of 394,000 operations per year, and began reaching its saturation point dozens of times per year by 2012, forcing diversion of flights.

Figure 23: Aeromexico's inaugural operation of the Boeing 787 Dreamliner at AICM

A new airport master plan, developed by British consultancy Arup, envisions a mega-project beginning as soon as 2014, on nearby government-held land on the Texcoco Lake bed. In November of 2013, AICM and ASA began the process of selecting the architect-engineering consortium for the project. Eight Mexican and eight international companies were invited to bid, forming eight competing teams. On September 2, 2014 the team of Arq. José Fernando Romero Havaux and Foster + Partners of London was announced as the winner.

The project scope is broken into two planned phases. Phase 1 will see the construction of a new terminal building and 3 parallel runways capable of simultaneous operation. Two of the runways will be for commercial traffic and the third for non-commercial. The service apron will have 95 gates and 42 remote parking and servicing positions. Covering 10,947 acres (~17 square miles), Phase 1 will have the capacity to support 550,000 flight operations per year and a throughput of 50 million passengers. The new terminal will be of a singular design covering 5.9 million square feet. Construction of this phase is projected to be completed by 2020 and to meet traffic demand through the year 2028.

The new airport design incorporates a wide range of environmentally-friendly features, including a 100 percent sourcing of electricity from renewable sources, onsite solar and biogas energy generation (sourced from the NEZA II and III landfills just south of the project site), and advanced technologies for the efficient use and recovery of water resources. The facility structures are planned to meet the U.S. Building Council's Leadership in Energy & Environmental Design (LEED) Platinum standard.

Sources of Project Funds		Uses of Project Funds	
Federal Funds	USD $7,538,461,538	USD $361,538,462	Social Projects
		1,576,923,077	Hydraulic Works (Lakes, Tunnels, and Canals)
		1,261,538,462	Design, Engineering, and Project Management
		9,800,000,000	Airport Infrastructure (Terminal, Control Tower, Runways and Auxiliary Components)
Private Sources (Operating Cash	5,461,538,462		

Sources of Project Funds		Uses of Project Funds	
Flow, Bonded Debt)			
Total	**USD $13,000,000,000**	**USD $13,000,000,000**	**Total**

Table 21: New Mexico City Airport Sources and Uses of Funds

The terminal building itself will be the largest gridshell structure in the world, with spans exceeding 550 feet. The single structural footprint is designed to enable passenger movement without mechanisms needed to transfer between terminals, such as shuttle trains or buses. The terminal will minimize changes of level for passengers, and all service functions will occur from beneath the building. The design will be such that heating and cooling can be accomplished through displacement ventilation for the majority of the year. Rainwater collection, solar harvesting and shading are integrated into the design of the structure.

Figure 24: Gridshell Structure Planned for the New AICM Terminal Building

The water management plan is fundamentally integrated into the design to mitigate the hydrologic impact of the new facility on the region, and to address selected persistent water management and drainage problems in the airport area. This plan includes the capacity to treat 492 gallons per second of water through 24 discrete treatment plants, 90 miles of new works to control and canalize wastewater, water storage capacity of 38 million cubic meters, and 24 miles of large storm drain tunnels.

The financing plan accounts for the approximately USD $6 billion of private funding to be raised from the following sources across three phases:

- **Financing Phase 1:** Initial round of private bank financing of USD $1 billion will support construction initiation, closing in the 4th quarter of 2014 with the final disbursement occurring in the 3rd quarter of 2015.
- **Financing Phase 2:** A road show is planned to attract at least USD $1.5 billion in private equity, closing in the 2nd quarter of 2015, with the ultimate disbursement of funding in the 4th quarter of 2016.
- **Financing Phase 3:** This phase of financing will consist of debt financing split between project/facility bonding sources and loans and guarantees provided through the Inter-American Development Bank and the Overseas Private Investment Corporation (OPIC). This financing round is expected to close in the 1st quarter of 2016 with the ultimate disbursement of funds raised occurring in the 4th quarter of 2016.

Phase 2, (the maximum development of the airport site) would see an additional 3 runways added for a total of six runways capable of simultaneous operations. This full expansion would support an additional 450,000 operations per year and 70 million additional passengers per year.

Figure 25: Concept of the New Mexico City Airport and Terminal Building

The project envisions very significant development opportunities on adjacent land, including repurposing of the old airport and structures, for business, technology and research purposes. Approximately 86 miles of new construction or major rehabilitation of roads is under study to accommodate the new vehicular traffic patterns that the airport will change or create.

Opportunities for U.S. Companies

This megaproject should create significant opportunities for U.S. firms. Construction and engineering services and basic infrastructure materials are expected to have a heavy share of local content. However a wide range of

systems and sophisticated equipment can potentially be sourced from the United States, areas such as lighting, navigation, communication, and information technology will be of particular interest. Participation in financing presents a significant opportunity for the U.S. financial sector. The renewable energy generation components, and energy efficient-components of the design are an area where U.S. firms are competitive. U.S. firms are strong in the area of fuel storage and management, and this facility will require significant infrastructure in this area to power aviation assets and ground vehicles. Opportunities will exist for ground equipment and maintenance equipment and systems. The water works will present opportunities in the area of equipment for control, monitoring and sensing, pumps, and water treatment. Competition is expected to be fierce in the area of systems and equipment, with major European and Asian firms as likely actors seeking to be suppliers.

AICM maintains a formal register of pre-qualified vendors. Registration requires provision of a substantial amount of documentation including historical financial data, organization charts, lists of past and present Mexican government contracts, CV's of key personnel, equipment inventories, and documentation from the taxation authority. This project has its own website hosted by the Government of Mexico at: http://www.aeropuerto.gob.mx

Other PNI Aviation Projects

- **Expansion of general aviation facilities at the Hidalgo Airport (CG-079):** USD $90 million in projected investment. (State: Hidalgo; Operator: Ayuntamiento de Pachuca) ASA has funds budgeted to carry out the pre-investment studies for this project in 2014.
- **Runway extension at Lazaro Cardenas/New Airport:** USD $76 million in investment was projected in the PNI. (State: Michoacan) for a scope including expansion of the existing runways. Due to scope changes this number is likely to increase. ASA has budgeted USD $3.7 million in 2015 for a pre-investment study for a completely new airport in Lázaro Cárdenas. This study emerged from the agreement between the federal government and the State of Michoacán in 2013 whereby the development of a major multimodal logistics platform centered around the marine port would be developed, including investments in adjacent aviation infrastructure. The planning process was further articulated under the new "Plan Michoacán" in early 2014. Initial reconnaissance of the proposed PNI project to expand the existing airport under this mandate found numerous challenges. The present airport serviced 22,300 passenger in 2013, with a capacity of 20 landings or takeoffs per hour under VFR flight rules. The infrastructure is below standard in many respects, and the airport does not provide adequate capabilities for either current or projected traffic. Fundamental limitations on runway size, safety areas and aprons prevent the airport from handling larger aircraft. The present airport site itself is constrained from growth because it is surrounded by the urban area. The decision was made to abandon the expansion concept and focus on planning for a relocation of the airport that will allow construction of a completely new facility to modern standards and with room for future expansion. This comprehensive planning study will include the following components listed in the table provided. The point of contact at ASA for this project is Arq. Raúl Pulido Guzmán, Chief of Construction Projects at ASA, rpulidog@asa.gob.mx, telephone: +52 (55) 5133-2987. The study is planned to take place in January through November of 2015.

Study Component		Budgeted
Financial feasibility: benefit-cost analysis	$	70,948
Siting: topographic evaluation and surveys		119,725
Geotechnical studies		133,028
Hydrology		133,028
Airport Master Plan		106,422
Environmental impact study		532,110
Operating plan and facility layout		354,740
Passenger terminal study		221,713
Administrative offices study		31,040
Parking study		44,343
Road planning		133,028
Grounds and landscaping planning		88,685
Telecommunications and electrical power study		399,083
Planning of warehouses and cafeteria		44,343
Water infrastructure study		88,685
Operational lighting study		44,343
Signage and signaling study		66,514
Control tower and general aviation annex study		133,028
Fire station and equipment study		177,370
Fuel point study		221,713
Customs facilities plan		354,740
Waste management facilities study		22,171
Perimeter fencing study		44,343
Perimeter road study		133,028
Total	**$**	**3,698,165**

Table 22: 2015 Planning Study Components for the New Airport at Lázaro Cárdenas

- **Completion of the Palenque Airport including runways and terminal modernization**: USD $18 million in projected investment. This project began in 2010, the airport was inaugurated in February of 2014 and the first flight was performed on March 13, 2014. (State: Chiapas; Operator: ASA). The 20 year concession for development and operation of this airport was granted by SCT on April 28, 2014 to the joint venture of the government of the State of Chiapas (51 percent) and ASA is the shareholders in the operating company of the "Ángel Albino Corzo International Airport". This airport is classified as an aerodrome and approved for operations of jets as large as the Boeing 767-300.
- **Modernization of the Chetumal Airport (CG-164):** USD $15.5 million in projected investment, according to the PNI. (State: Quintana Roo; Operator: ASA) ASA's 2014 budget included USD $785,000 towards capital expenditures at this airport.
- **Expansion of the Monterrey Airport:** USD $15 million in projected investment.
- **Construction of a new airport in the Isthmus region (CG-210):** USD $14 million in projected investment in a new airport at Ixtepec in the Isthmus of Tehuantapec. (State: Oaxaca; Operator: ASA) ASA has funds budgeted to carry out the pre-investment studies for this project in 2014. The outcome of the study will determine the final scope, scale and schedule of this project.
- **Completion of the Nuevo Laredo cargo airport (CG-183):** USD $14 million in projected investment. (State: Tamaulipas; Operator: ASA) This project is included in ASA's budget for a pre-investment study in 2014 budgeted at USD $446,000. The outcome of the study will determine the final scope, scale and schedule of this project.

- **Rehabilitation and modernization of the Atlangatepec Airport (CG-251):** USD $9.3 million in projected investment in the State of Tlaxcala. ASA has funds budgeted to carry out the pre-investment studies for this project in 2014. The outcome of the study will determine the final scope, scale and schedule of this project.
- **Modernization of the El Lencero Airport in Jalapa (CG-220):** USD $7.6 million in projected investment. (State: Veracruz ; Operator: State Government) ASA has funds budgeted to carry out the pre-investment studies for this project in 2014. The outcome of the study will determine the final scope, scale and schedule of this project. Statements by state officials have indicated a scope and potential investment substantially larger than the amount identified in the PNI, of up to USD $75 million.
- **Expansion of the Tijuana Airport:** This investment of USD $5.7 million will expand the terminal and perimeter road. (State: Baja California; Operator: GAP)
- **Expansion of the Puerto Vallarta Airport:** This USD $5.2 million investment will expand the terminal, satellite buildings and commercial spaces. (State: Jalisco; Operator: GAP)
- **Modernization of the Bajio-Guanajuato Airport:** This USD $4.3 million investment will expand the baggage and waiting areas. (State: Guanajuato; Operator: GAP)
- **Expansion of the Chihuahua Airport:** This USD $3.8 million investment will improve the security areas and perimeter road. (State: Chihuahua; Operator: OMA)
- **Expansion of the Hermosillo Airport:** This USD $1.5 million investment will expand the terminal building. (State: Sonora; Operator: GAP)
- **Expansion of the Culiacan Airport:** This USD $1 million investment will improve illumination, security and access control systems. (State: Sinaloa; Operator: OMA)
- An additional USD $1.1 million in total investment will occur through small projects at the airports of **Mazatlan (Operator: OMA), Toluca (Operator: ASA-AMAIT), San Jose del Cabo (Operator: GAP), San Luis Potosi (Operator: OMA),** and **Merida (Operator: ASUR).** An expansion of the airport at Toluca is an option reportedly under consideration that is not included in the PNI. This would serve as an interim solution to relieve congestion at AICM, while planning and construction occur for the proposed expansion megaproject. This would reportedly involve construction of a second runway and associated facilities at a cost of over USD $60 million.

Barrancas de Cobre Regional Airport

On August 14, 2014 SCT authorized the transfer of USD $15.4. million to the Government of the State of Chihuahua to complete remaining parts of the second phase and all of third phase of the project to construct the new Barranco de Cobres Regional Airport, located in the city of Creel. This project includes:

- **Phase 2 (Completion of):** Construction of: the control tower; guard booths; entrance wall; street lighting; medium-voltage electrical network and substation; maintenance workshop; communications center; hazardous waste burning facility; terminal commercial spaces; runway navigation lights; hangars; security fencing; storage tanks for Jet A, avgas, and firefighting water; distribution piping for fuel and water; electrical connection for the VOR beacon, and a facility for activities of the Secretariat of Defense. (USD $7.6 million)
- **Phase 3 (All):** Construction/acquisition of: control tower equipment; fixed and mobile digital network communications equipment; rescue and firefighting equipment; terminal equipment including luggage conveyors, x-ray machines and fire extinguishing system; maintenance and meteorological equipment;

cyclone fencing; perimeter security road; aprons for the isolation and hangar areas; road connection to the airport; access road lighting, and; signage.

Airport operator ASA has a technical advisory role on this project.

ASA Investment Studies and Plans

As noted in the project descriptions above, several of the PNI projects announced for ASA airports are still under technical and feasibility studies. This means that a substantial degree of uncertainty exists regarding scope, scale and budget of these projects, although they were announced in the PNI with cost figures attached. In some cases, studies may return a verdict that the project should not take place at all. ASA, in its capacity as a technical center of expertise, performs many studies on behalf of SCT for airports for which it does not have an operating role.

In ASA's 2014 budget the following project pre-investment study funds are identified:

- USD $446,000 to complete studies enabling the completion and initiation of operations of the cargo airport of Nuevo Laredo.
- USD $1,400,000 total to perform studies for: the construction of the new airport in the Isthmus region (Ixtepec) in Oaxaca; rehabilitation and modernization of the Atlangatapec Airport in Tlaxcala; general aviation at the Hidalgo Airport, and; the modernization of the Lencero Airport in Jalapa. The point of contact for these and the Nuevo Laredo study is Ing. Gilberto Vázquez Alanis, ASA's Chief of Consultancies, gmvazqueza@asa.gob.mx, telephone: +52 (55) 5133-2618.

In 2013 USD $1,100,000 was budgeted for the 2014 performance of the pre-investment studies for the construction of a new fuel station in San Jose del Cabo, including technical, economic and environmental components. The point of contact for this study is Mauricio Arrellano Villavicencio, ASA's Director of Fuels, moarellanov@asa.gob.mx, telephone: +52 (55) 5133-2977.

USD $337,000 was originally budgeted for master plan developments (PMDs) for the airports at Colima, Matamoros, Ciudad Victoria, and Puebla. At Ciudad Victoria a rehabilitation of the runway is anticipated as a major PMD component. In Colima a terminal expansion is anticipated, and in Puebla there is a need to plan for installing elevators and jetways.

An additional USD $241,000 was allocated in 2014 to complete the individual Master Development Programs for three airports. At Nogales, in Sonora, plans for internal walkways and a new helicopter apron will be part of this program. At Tehuacán, in San Luis Potosi, an expansion of the terminal building and walkways is expected to be included in that PMD. The PMD for Tamuin in Puebla will include a plan for internal walkways. ASA is required by law to update each airport's PMD every five years.

ASA plans to spend USD $687,000 in 2015 for inspections and planning studies for rehabilitation and improvements to vehicle gasoline stations in Culiacán, Monterrey, Mazatlán, San Luis Potosí, Tampico, Toluca, Guadalajara, Mexicali, Puerto Vallarta, Manzanillo, Puebla, Querétaro, México, Tuxtla Gutierrez, Tehuacán, Tamuin, Matamoros, Pachuca and Nogales. This planning process will include inspections of underground tanks and piping. The point of contact for this series of studies is Mauricio Arrellano Villavicencio, ASA's Director of Fuels, moarellanov@asa.gob.mx, telephone: 51-33-29-77.

SHCP has approved funding totaling USD $879,000 for ASA to carry out the following project pre-investment studies during 2015:

- Replacement of reflective posts in the commercial aviation area of the Ciudad Victoria airport.
- Expansion of the passenger terminal at the Colima Airport.
- Construction of a fire/rescue station and new access roads and rehabilitation of the cafeteria and warehouse at Nogales Airport.
- Expansion of the general aviation facility at the Guaymas Airport.
- Development of a standardized prototype design for administrative offices for multiple ASA airports.
- Design of the workshops and sheds for the Ciudad Obregon Airport.
- Installation of new fire detection systems at the airports of Ciudad Obregon, Ciudad Victoria, Guaymas, Matamoros, Tepic, and Uruapan.
- Rehabilitation or expansion of the fire stations at the airports of Guaymas, Matamoros, Puebla.
- Replacement of electrical cable installations powering the lighting systems on the runway, taxiway and aprons at the Campeche Airport.
- Construction of an electrical substation for visual aids at the Tehuacán Airport and installation of new lighting systems for runways, taxiways and aircraft parking areas.
- Installation of a VHF omnidirectional range (VOR) and distance measuring equipment (DME) at the Tehuacán Airport to enable aircraft to operate under instrument flight rules (IFR) conditions.
- Rehabilitation of the runway, runway shoulders, taxiway ALFA, the runway safety area, and the commercial apron tarmac at the Tehuacán Airport.
- Replacement of electrical cable installations powering the lighting systems on the runway, taxiway and aprons at the Campeche Airport.

Specific dollar amounts were allocated in the 2014 budget for pre-investment studies for the following proposed future projects:

- Development of the runway safety area (overrun area) and shoulders in Chetumal. **USD $28,287.**
- Study project to determine appropriate size of the runway safety area and associated works in Colima. **USD $30,581.**
- New platform lighting system for the general aviation and cargo areas of the airports at Nuevo Laredo and Puebla. **USD $57,000.**
- New lightning arrestor system and grounding network at Puebla. **USD $22,900.**
- Rebuilding of the commercial apron, reconfiguration of signaling and roadway at the Campeche Airport. **USD $30,600.**
- Reconfiguration of passenger pedestrian flows at Poza Rica. **USD $77,439.**
- Provision of water service to the hangar area in Puebla. **USD $27,000.**
- Expansion of the general aviation area at the Loreta airport. **USD $78,000.**
- New cafeteria in Puebla. **USD $27,000.**
- New warehouse, workshop and sheds at Campeche and Guaymas. **USD $39,000.**
- New administrative offices at Colima. **USD $25,000.**
- Update of electrical systems and pneumatic equipment at Tepic. **USD $16,000.**
- Improvement and expansion of the international passenger terminal at Campeche. **USD $65,000.**

- Replacement of the reflective posts at the commercial apron at Tepic and Campeche. **USD $24,000.**

Our observation to United States companies is that identification of the pre-investment studies in progress and planned by Mexican authorities can be a useful source of intelligence on significant procurement opportunities that may emerge in the short to medium-term.

Selected ASA Budgeted Projects

New Fuel Storage Tank: In 2015, ASA will spend USD $958,500 of internal capital funds to construct a new tank for storage of Jet A fuel increasing total capacity to 500,000 liters at their San Luis Potosi fueling station. The point of contact for this project is Mauricio Omar Arrellano Villavicencio, Director of Fuels at ASA, moarellanov@asa.gob.mx, telephone: 51-33-29-77.

New Fuel Storage Tanks: The following airports will also have new fuel storage tank capacity added in the period through 2018: Cancún – 2 million additional liters; San José del Cabo – 2 million additional liters; Ciudad del Carmen – 500,000 additional liters; Ciudad Juárez – 160,000 additional liters.

New Smoke Detection System: In 2015 ASA will spend USD $113,000 to equip the Ciudad Obregón Airport with a new smoke detection system. The point of contact for this project is Gonzalo Malfavon Rivero, Chief of Works, gmalfavonr@asa.gob.mx, telephone: 51-33-10-00 ext. 2939.

New Offices and Support Buildings at AICM: Beginning in the 4th quarter of 2014 ASA will spend USD $1.4 million to construct a new fueling station operations office and maintenance workshop at the Mexico City International Airport. The point of contact for this project is Mauricio Omar Arrellano Villavicencio, Director of Fuels at ASA, moarellanov@asa.gob.mx, telephone: 51-33-29-77.

Figure 26: New ASA Fuel Equipment Maintenance Shops and Offices at AICM

New Offices and Support Buildings at the Cancún Airport: Beginning in the 4th quarter of 2014 ASA intends to undertake a project at the Cancún Airport that will involve relocation of the testing area for aviation fuel trucks, relocation of ASA's equipment maintenance workshop and parts warehouse, and rehabilitation of the ASA operations offices. This project is budgeted at USD $1.1 million. The point of contact for this project is Mauricio Omar Arrellano Villavicencio, Director of Fuels at ASA, moarellanov@asa.gob.mx, telephone: +52 (55) 51-33-29-

77. ASA's budget for 2014-2015 includes USD $3.9 million for rehabilitation and relocation of the aviation fuel storage facility at this airport, which will involve transferring at least one large storage tank from Cozumel.

Security and Safety Equipment: In 2015, ASA intends to spend USD $3.1 million on different items of equipment, spread between the airports of Campeche (CPE), Chetumal (CTM), Ciudad del Carmen (CME), Ciudad Obregón (CEN), Ciudad Victoria (CVM), Colima (CLQ), Guaymas (GYM), Loreto (LTO), Matamoros (MAM), Nogales (NOG), Nuevo Laredo (NLD), Poza Rica (PAZ) Puebla (PBC) Puerto Escondido (Oaxaca), Tamuín (TMN), Tehuacán, Tepic (TPQ), and Uruapan (UPN). Acquisitions will include: investments in CCTV and access control systems, both new systems and upgrades of existing systems; self-contained breathing apparatus; computed tomography systems for inspecting checked baggage; explosive trace detection equipment; x-ray machines; metal detectors; and hydraulic rescue equipment (cutters/spreaders). The point of contact for these purchases is Ing. Salvador María Lizana Paulín, Manager of Security at ASA, smlizanap@asa.gob.mx, telephone: +52 (55) 51-33-1000 ext. 1081.

New Fire and Rescue Vehicles: In 2015, ASA intends to spend USD $1.4 million on purchase of a truck and a specialized fire-fighting vehicle. The latter is specified as a VREI-05 as designed by the Querétaro Advanced Technology Center (CIATEQ) using ASA funding. It should be noted the vehicle was specifically designed domestically to meet Mexican government policy goals of import substitution for equipment of this type. Accordingly, the only opportunity for U.S. firm participation – if any – would potentially be as a subcontractor to a Mexican manufacturer. The point of contact for these purchases is Ing. Salvador María Lizana Paulín, Manager of Security at ASA, smlizanap@asa.gob.mx, telephone: +52 (55) 51-33-1000 ext. 1081.

Fuel Spill Containment and Recovery System: Beginning in the fourth quarter of 2014, ASA will begin a project to rehabilitate the fuel spill containment and recovery system in the fuel storage tank area of the Guadalajara Airport. This project is budgeted at USD $3 million. This fuel storage area consists of 6 large storage tanks with the capacity to store 12.6 million liters of Jet A fuel and 80,000 liters of avgas, with an average daily flow of 744,000 liters. The point of contact for this project is Mauricio Omar Arrellano Villavicencio, Director of Fuels at ASA, moarellanov@asa.gob.mx, telephone: +52 (55) 51-33-29-77.

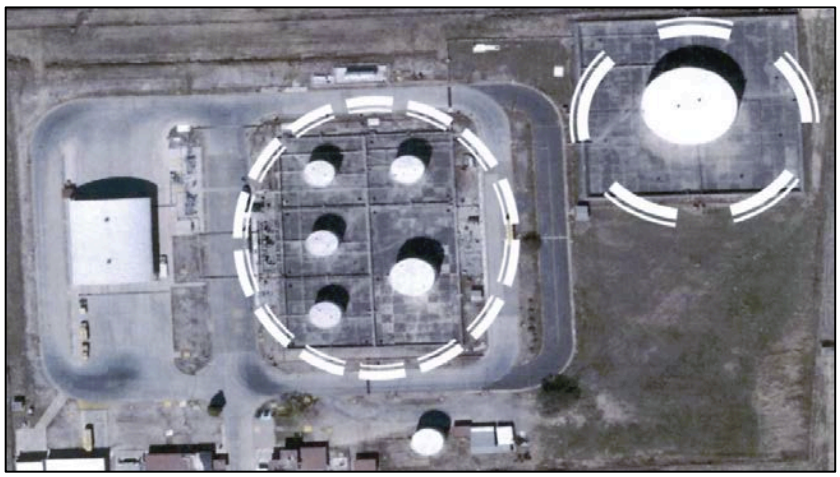

Figure 27: Overhead of ASA's Guadalajara Airport Fuel Station Containment Project Area

Implementation of an Aviation Fuel Measurement System: In 2015, ASA has budgeted USD $2.5 million to install fuel measuring systems for storage tanks and systems to detect dirt and overfilling for the lines for avgas and Jet-A fuel. These systems are to incorporate wireless communications capabilities. Measurement systems are budgeted at USD $177,000 each and will be installed in the storage tanks at the airport fueling stations at Villahermosa, Veracruz, Aguascalientes, Los Mochis, Reynosa, and Colima. Dirt and overfill sensor installations are budgeted at USD $31,000 apiece and will be installed in lines at the fueling stations at the airports of San Jose del Cabo, Mérida, Culiacán, Hermosillo, Bajío, Villahermosa, Chihuahua, Veracruz, Ciudad Juárez, Mazatlán, Tuxtla Gutiérrez, Morelia, Querétaro, Mexicali, La Paz, Acapulco, Cozumel, Aguascalientes, Huatulco, Torreón, Zihuatanejo, Puebla, Tampico, Zacatecas, Los Mochis, Reynosa, Durango, Manzanillo, Tapachula, Minatitlán, Guaymas, Nogales, Tehuacán, Pachuca, Puerto Peñasco, San Luis Potosí, Tamuin, and Colima. Technical planning documents indicate that a specific supplier's solution may have been selected for this acquisition. The point of contact for this project is Mauricio Omar Arrellano Villavicencio, Director of Fuels at ASA, moarellanov@asa.gob.mx, telephone: +52 (55) 5133-2977.

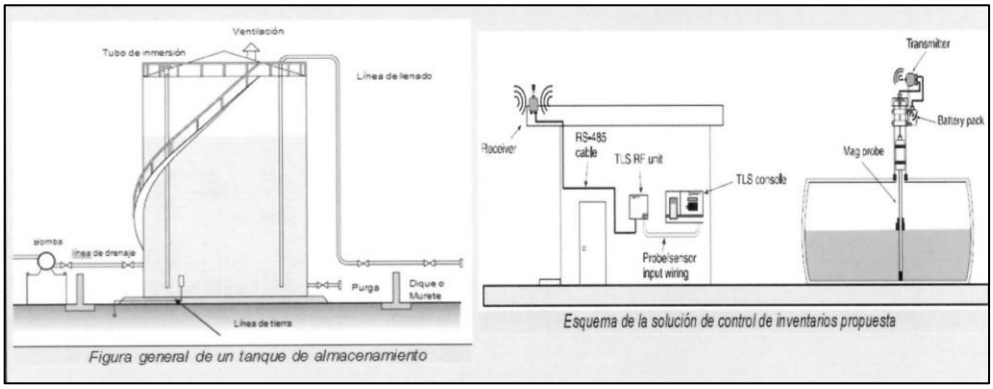

Figure 28: ASA Aviation Fuel System Upgrades Conceptual Diagram

Additional Airport Projects: At ConnectMEX, ASA presented summary budget amounts for capital investment investments as follows:

Presidential Commitments

- USD $2.9 million at El Loreto Airport between 2014 and 2015;
- USD $21 million at the Puerto Escondido Airport between 2014 and 2017;
- USD $20 million at the Ciudad del Carmen Airport between 2014 and 2017.

Presidential Instructions

- USD $19 million at the Ojinaga Airport between 2014 and 2016
- USD $19 million at the Delicias Airport between 2014 and 2016
- USD $765,000 at the San Luis Potosí Airport in 2015.

Details of the planned investments were not provided.

USTDA Projects

ASA Airport Development and Management Feasibility Study

In October of 2009, USTDA completed this advisory project for Aeropuertos y Servicios Auxiliares (ASA). The study covers four airports in Mexico: Toluca (TLC), Puebla (PBC), Cuernavaca (CVJ), and Querétaro (QRO). The study had two components. First, it identified U.S. route and carrier combinations that could be likely new service opportunities for the airports. This component included exploratory meetings with selected carriers that would potentially support and market new service. The second half of the project focused on necessary changes to equipment and procedures that would be required to support expanded service to the United States. The study included analyses and recommendations for security and included assessments of developmental and environmental impact.

San Luis Potosi International Airport Runway Expansion and Modernization Feasibility Study

In September of 2009 USTDA completed this feasibility study, prepared for concessionaire OMA as the project sponsor, and performed by a consortium of PBS&J, Infrastructure Management Group, the Texas Transportation Institute and AVILA Consultoria Ambiental. This study analyzed the feasibility to improve SLP's infrastructure in order to alleviate airport congestion, attract additional U.S. and Mexican airline and cargo service, and enhance regional growth. The study incorporated a facility assessment and analysis, a demand study, analysis of capacity expansion requirements; and environmental, financial and trade analyses. An airport development plan was produced complete with cost estimates and a proposed schedule. This study resulted in a proposal for USD $11.9 million in investments in basic infrastructure improvements, exclusive of property acquisitions and systems.

The studies above are available at USTDA's on-line library at: http://www.ustda.gov/library

Project Contacts

For more information on projects in the aviation sector, please contact:

Project Sponsor(s)	U.S. Trade and Development Agency	U.S. Commercial Service Mexico
Mr. Alejandro Argudin Director General Federal Civil Aviation Agency (fmr. DGAC) Tel. +52 (55) 5687-7660 aargudin@sct.gob.mx Ing. Jorge Nevarez Jacobo Business Unit Coordinator ASA Tel. +52 (55) 5133-1000 jnevarezj@asa.gob.mx Mr. Jesus Guajardo Briones Adjunct Director of Operations Grupo AICM Tel. +52 (55) 5802-8104 jguajardo@aicm.com.mx Mr. Miguel Aliaga Gargollo Director, Investor Relations Grupo Aeroportuario del Pacifico (GAP) Tel. +52 (33) 3810-1100 maliaga@aeropuertosgap.com.mx Ing. Porfirio Gonzalez Alvarez Director General Grupo Aeroportuario Centro-Norte (OMA) Tel. +52 (81) 8625-4311 pgonzalez@oma.aero	Mr. Keith Eischeid Country Manager for Mexico and Central America Tel. +1-703-875-4357 KEischeid@ustda.gov	Ms. Alison Mello Commercial Officer Tel. +52 (55) 5080-2206 Alison.Mello@trade.gov Ms. Silvia Cárdenas Commercial Specialist – Airports Tel. +52 (55) 5080-2000 ext. 5209 Silvia.Cardenas@trade.gov

3.15 Mass Transit and Intelligent Transportation Systems

Sector Background

Mexico's urban environments face critical transportation challenges, such as:

- Rapid, continuing urbanization. Mexico's urban population is over 78 percent and urbanization continues at a 1.2 percent rate. Mexico City by itself is the tenth largest urban area by population in the world.
- A high and rising motorization rate. Motorization is increasing in Mexican cities at rapid 10 percent per annum pace.
- Disproportionate public funding patterns that favor automobile transportation (65 percent of funding in 2012) over more sustainable mass transit and non-motorized modes.
- Low-density sprawling development patterns, leading to long transit times.
- Inefficiently allocated land and street space, discouraging public transport.
- An urban transport environment dominated by small private operators and aging, limited capacity vehicles.
- Inadequate fuel specifications contributing to inefficiency and pollution. Mexico's transport sector is highly carbon-intensive, accounting for 18 percent of greenhouse gas emissions generally, with concentrations as high as over 40 percent in cities.
- Rising public impacts, including accidents, road maintenance costs, congestion, and noise pollution.
- A particular burden is imposed on poorer segments of society who face increasing transit times and high costs associated with urban transport.

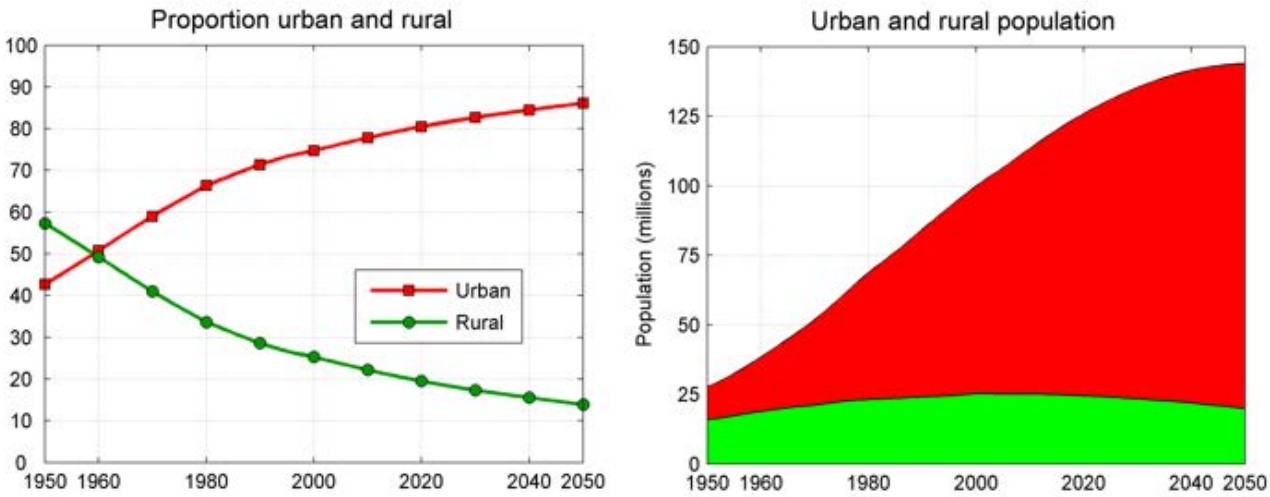

Figure 29: United Nations Projections for Urban Population Growth in Mexico through 2050

At the federal level, the **Secretariat of Social Development (SEDESOL)** is responsible for formulating the federal policies on urban development and transport. The **Secretariat of Communications and Transport (SCT)** is responsible for the development and maintenance of the federal railroad and highway network, sections of which often enter and traverse urbanizations. For many cities, the responsibility for transport matters such as short- and medium-term land use and planning is divided among agencies at the state and municipal level, between different departments within individual agencies or even between different municipalities within the same metropolitan area. In order to increase coordination of mass transit policy at the federal level, the

government has created a new **Secretariat of Agricultural, Territorial and Urban Development (SEDATU).** SEDATU will serve to coordinate the support of other Secretariats, including SCT and SEMARNAT in the area of sustainable urban development.

The strategic objectives for the urban transport sector established in the SCT's official program through 2018 include:

- Reduce urban transport costs in terms of operating costs, tariffs and lost time for users.
- Improve intermodal connections and promote integration of passenger transportation between modes.
- Reduce accidents within public transport systems.
- Incentivize a modal shift away from personal automobiles.
- Encourage more rational use of personal automobiles.
- Promote the financing and development of mass transit systems including BRT, articulated buses, light rail, non-motorized transport, and metros.
- Reduce fuel consumption and generation of greenhouse gases (GHGs).
- Promote urban transport accessibility for the elderly, handicapped and parents with children.
- Promote accessibility to low cost, efficient transport for poorer populations.
- Promote the implementation of intelligent transportation systems.
- Promote the implementation of security and surveillance systems in public transport, with a particular focus on the safety of women and children.

Mexico's government has responded to the challenges it faces with a multi-pronged approach to rationally develop and improve urban mass transit systems across the country. Mexico created the **National Mass Transit Program (PROTRAM)** in 2009 within FONADIN to improve the efficiency of the sector and steer it towards a lower-carbon development path. PROTRAM offers grants to sub-national governments to cover up to 100 percent of studies and 50 percent of infrastructure costs for public transport projects that meet certain criteria. This is the first program in Mexico that provides federal funding for urban public transit. All mass transit projects supported by PROTRAM have climate change considerations and have emission baselines. **The Center for Sustainable Transport Mexico (CTS-Mexico)** serves as the government's main advisor to PROTRAM. It has reviewed the technical and financial feasibility of 21 public transportation projects across the country and improved the quality of eight project designs in Guadalajara, Mexico City, Chihuahua, Mexicali, Tijuana, Culiacan, Monterrey and Veracruz. By providing project evaluation guidelines and assistance, CTS-Mexico not only improves individual project proposals, but also strengthens PROTRAM's institutional capacity to provide funds effectively in the future. Since PROTRAM only funds mass transit projects with private sector participation, the Mexican government has also established a National **Urban Transport Transformation Program (UTTP)**, to complement PROTRAM. UTTP emphasizes complementary measures including support for non-motorized transport, such as bicycle and pedestrian projects. Together FONADIN's PROTRAM and UTTP are the core of the government strategy to transform Mexico's urban transport to a lower carbon growth course.

The major components of this development and financing strategy include:

1. Urban Institutional Capacity Building
2. Development of Integrated Urban Mass Transit Systems
3. Project Management

The bulk of the original scope of USD $2.6 billion in funding for these program activities was shared between FONADIN (28 percent), local government contributions (27 percent) and private participation (31 percent). The World Bank Group is providing the balance of 13 percent of funding. BANOBRAS serves as the coordinating institution for these activities and investments, performing the roles of procurement and financial management oversight, credit monitoring and project evaluation.

Mexico's quantified goal for 2018 for mass transit development is to increase the number of major cities with dedicated mass transit systems from 22 percent to 47 percent. The following 34 major cities are the urbanizations being measured, each with populations that currently exceed 500,000, or that will by the year 2018.

- Valle de Mexico
- Guadalajara
- Monterrey
- Puebla-Tlaxcala
- Toluca
- Tijuana
- León
- Juárez
- La Laguna
- Querétaro
- San Luis Potosí
- Mérida
- Mexicali
- Aguascalientes
- Cuernavaca
- Acapulco
- Tampico
- Chihuahua
- Morelia
- Saltillo
- Veracruz
- Villahermosa
- Reynosa – Río Bravo
- Tuxtla Gutiérrez
- Cancún
- Xalapa
- Oaxaca
- Celaya
- Poza Rica
- Pachuca
- Puerto Vallarta
- Tepic
- Tlaxcala-Apizaco
- Matamoros

The PNI released in 2014 identifies over USD $3 billion in total investment in specific mass transit projects or programs, while total investment projected for urban mass transit projects underway and in the pipeline is estimated at over USD $6 billion by BANOBRAS, including in that number the Toluca Passenger Train project. The mass transit projects included in the PNI are:

- **Expansion of the urban light rail system in Guadalajara (CG-004):** This project will expand one existing light rail line and construct a completely new third line. The total investment is projected at USD $1.35 billion.
- **Establish a mass transit system in the eastern part of the State of Mexico (CG-133):** This project will extend line A of the Sistema de Transporte Colectivo (STC), Mexico City's metrorail system, from La Paz to Chalco de Diaz Covarrubias. With a projected total investment of USD $839 million, this project will be carried out from 2015 to 2017.
- **Expansion of the Metrorrey Rail System and Ecovía BRT (CG-033):** This project involve construction of a new Line 3, and expansion of Line 4, of the Metrorrey rail system. The Ecovía Project will implement a 30.1 kilometer BRT system with 39 stations, running between Lincoln in the northwest of the city and Valle Soleado east of the center city. The fleet of 80 initial buses will feature low-emissions engines, air conditioning, modern passenger information systems and farecards, and Wi-Fi. The total investment is projected at USD $434 million.

- **Modernize the Urban Public Transport in the Lagunera region (CG-116):** This project primarily involves development of a new 32.5 kilometer BRT corridor that will run from Lerdo, in the State of Durango, to Matamoros, in the State of Coahuila. The total investment is expected to be USD $171 million.
- **Establishment of a BRT system in Tijuana (CG-123):** This new BRT system will cover a 25 kilometer main corridor and serve 34 stations with strong integration through station connectivity to 32 feeder routes. With an estimated investment of USD $151 million, this project is to be carried out between 2015 and 2016.
- **Construction of a mass transit system in Mérida (CG-238):** This project is expected to create total investment of USD $137 million. The mode and scope are yet to be finalized. Preliminary feasibility studies found that the proposed BRT system would not be viable due to the layout and physical characteristics of the city streets.
- **Modernization of the Atlacomulco Bus Terminal (CG-174):** This project, located in the northwest of the State of Mexico, will have a total projected investment of USD $5.3 million.

As of this writing, mass transit projects in execution according to BANOBRAS included:

Project	State	PNI	CG	Total Investment (Rounded to Millions)
Metrorrey Line 3	Nuevo Leon	Yes	CG-033	USD $ 374,000,000
Expansion of Line 1 SITEUR Guadalajara	Jalisco	Yes	CG-004	103,000,000
BRT Monterrey ECOVIA 1	Nuevo Leon	Yes	CG-033	131,000,000
BRT Tijuana	Baja California	Yes	CG-123	136,000,000
BRT Chihuahua 1: North - South	Chihuahua			68,000,000
BRT Mexicali Express Line 1	Baja California			54,000,000
BRT Puebla 1: Chachapa - Tlaxcala	Puebla			112,000,000
BRT Acapulco - Ciudad Renacimiento	Guerrero			142,000,000
BRT Chimalhuacán- Pantitlán	State of Mexico			147,000,000
BRT Puebla 2 Norte-Sur (2 BRTS)	Puebla			155,000,000
BRT Pachuca Centro Téllez	Hidalgo			65,000,000
BRT Ecatepec Indios Verdes	State of Mexico			154,000,000
TOTAL				**USD $ 1,641,000,000**

Table 23: BANOBRAS - PROTRAM Mass Transit Projects in Execution

The following 12 mass transit projects were identified as in preparation by BANOBRAS:

Project	State	PNI	CG	Total Investment (Rounded to Millions)
BRT ZM de la Laguna	Coahuila-Durango	Yes	CG-116	USD $ 165,000,000
BRT Mérida	Yucatan	Yes	CG-238	249,000,000
BRT Zacatecas	Zacatecas			95,000,000
BRT Oaxaca Primary Corridor	Oaxaca			83,000,000
BRT León Optibús Third Phase	Guanajuato			60,000,000
BRT Durango	Durango			87,000,000
BRT San Luis Potosí	San Luis Potosi			34,000,000
BRT Aguascalientes	Aguascalientes			137,000,000
Tren Chalco-La Paz (Metro)	State of Mexico	Yes	CG-133	648,000,000
Línea 3 de Tren SITEUR Guadalajara	Jalisco	Yes	CG-004	1,350,000,000
Tren México-Toluca	State of Mexico			2,943,000,000
Suburbano 1 Expansion to Huehuetoca	State of Mexico			457,000,000
TOTAL				**USD $ 6,308,000,000**

Table 24: BANOBRAS - PROTRAM Mass Transit Projects in Pipeline

Projects

Expansion of the Guadalajara Light Rail System

Project Type:	Mass Transit (Light Rail)
State(s):	Jalisco
Projected Investment:	USD $1.3 billion
Timeline:	2014 - 2018
Project Sponsor(s):	SCT, BANOBRAS, SITEUR

Project Background and Scope

Guadalajara is the second most populous city in Mexico with over 1.5 million inhabitants in the city proper. The Guadalajara Metropolitan Area includes the municipalities of Zapopan, Tlaquepaque, Tonolá, El Salto and Tlajomulco de Zuñiga, with a total population of over 4.2 million persons.

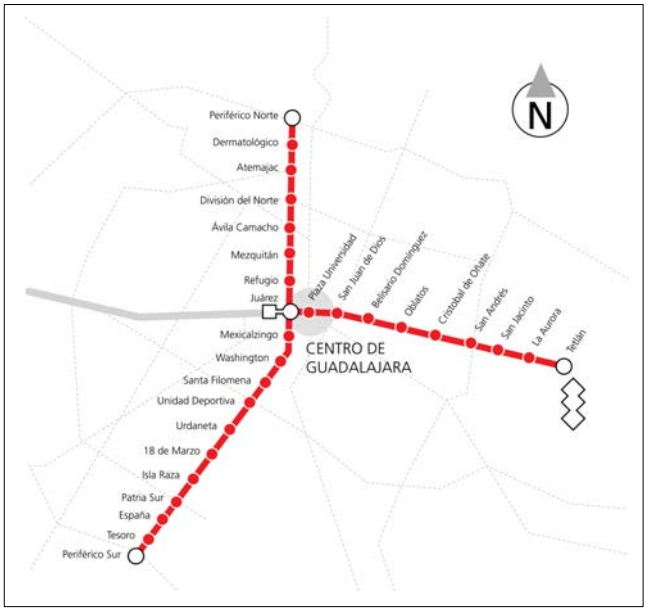

Figure 30: Present Extension of the Guadalajara Light Rail System

The Guadalajara Light Rail System (SITEUR) was inaugurated in 1989 with the construction of the first line with nineteen stations, running 15.5 kilometers from the stations Periférico Norte south to Periférico Sur. 6.6 kilometers of this alignment are underground. Line 2 was inaugurated in 1994 running 8.8 kilometers from station Juarez (interchange with Line 1) east to station Tetlán. The present fleet consists of 48 articulated electric multiple units receiving power via overhead catenary. The original suppliers for equipment and systems included Mitsubishi, Siemens and Bombardier. Today, SITEUR transports more than 240,000 passengers per day, making it the 9th largest system by ridership in Latin America.

Population growth for the area exceeds 1.5 percent. As the core of the city has shifted to more intense commercial uses, residential population has moved to the periphery, increasing demand for transportation. Motorization rates have more than doubled since 2000, to over 1.2 million automobiles. Major city corridors have witnessed a steady decline in average speed as congestion has increased, and negative impacts including road maintenance costs, pollution and accidents are a growing problem.

To address these problems the federal and local governments are planning a significant expansion of the SITEUR system, which includes a completely new line.

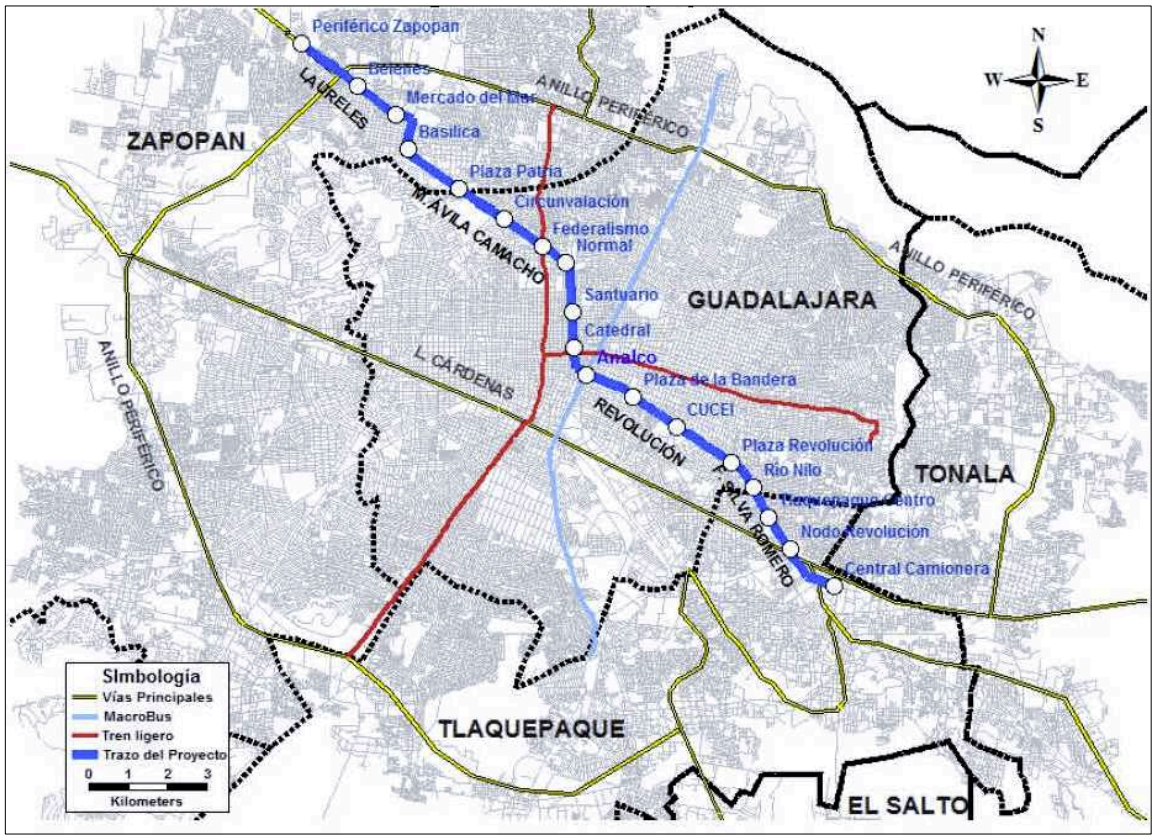

Figure 31: Guadalajara Light Rail System Line 3

The new Line 3 of SITEUR will extend from the station Periférico Zapopan in the northwest of the urban area, running 21 kilometers southeast to station Central Camionera in Tlaquepaque. This primarily double-track rail line will be at ground level on the outer extensions, on an elevated viaduct for 15.65 kilometers on either side of the city core, and underground for 3.1 kilometers within the core.

18 stations will be constructed as part of this project, 13 surface stations and 5 underground, with platform lengths of 75 meters capable of servicing consists of 3 EMUs. The infrastructure will include yards and maintenance workshops.

Figure 32: Guadalajara SITEUR Line 3 Station Concept

Planned rolling stock will be bi-directional EMU's with a length of 29.56 meters, width of 2.65 meters, height of 3.57 meters and maximum pantograph reach of between 3.868 and 6.268 meters. The trains should have a

capacity for 500 passengers each, with seating for 100. Power will be provided by 600V DC overhead catenary and the vehicle top service speed will be 70 kilometers per hour.

The system will require at least 6 substations for conversion of external AC power to DC for rolling stock operation. At least 22 substations will be built for electrical power provision for operations of the passenger stations, the ventilation system, and the maintenance facility.

Systems to be procured include a high-speed digital data network, integrated ticketing, centralized control and digital trunked radio. Centralized customer service center and a passenger information system will be part of the project, including multimedia message screens in all stations.

Project Status and Implementation Timeline

This project is in advanced planning stages with procurement expected to begin in 2014. Construction is expected to span four years.

Project Cost, Financing and Procurement

Based on the current federal presentation, the project budget is as follows:

Source	Federal	State	Private
Amount	1,081,680,771	144,685,115	122,590,081
Total	**USD $1,348,955,966**		

Table 25: Guadalajara Light Rail Line 3 Sources of Funds

Year	1	2	3	4
Amount	274,377,855	464,175,236	496,026,186	114,376,689
Total	**USD $1,348,955,966**			

Table 26: Guadalajara Light Rail Line 3 Projected Spending by Project Year

*The project cost includes the following component breakouts. These are approximate, sourced from a late 2013 technical study, at which time the project was budgeted at USD $1.16 billion.

Category	Item	Cost (Rounded, Millions)	Category Total
System Civil Works	Workshops and Yards	$33,000,000	$747,000,000
	Underground Stations	$147,000,000	
	Tunnel Track	$154,000,000	
	Transitions/Trenches	$12,000,000	
	Elevated Track	$173,000,000	
	Elevated Stations	$225,000,000	
	At-Grade Track	$3,000,000	
Complementary Works	Plaza Basilica Pedestrian Tunnels	$12,000,000	$34,000,000
	Other	$3,000,000	
	Intermodal Center	$19,000,000	
Electromechanical	Signalization	$55,000,000	$235,000,000
	Information Systems	$19,000,000	
	Electrification	$119,000,000	
	Communications	$42,000,000	
Management	Project Management	$6,000,000	$6,000,000
Land	Right of Way Acquisition	$34,000,000	$34,000,000
Rolling Stock	Electric Multiple Units	$106,000,000	$106,000,000
Grand Total*			**USD $1,162,000,000**

Table 27: Guadalajara Light Rail Line 3 Budget Breakdown

U.S. Export Opportunities

Export opportunities for U.S. firms are diverse. Track and infrastructure components are an area where U.S. firms actively export goods to Mexico. Communications and information systems, or components and subsystems of these items, are another potential market. The rolling stock will be provided by non-U.S. headquartered companies. Many of these companies have vehicle manufacturing facilities in the United States that could conceivably produce the EMU's for shipment to Mexico. Opportunities would also exist for U.S. companies to serve as suppliers to these vendors for components or sub-systems.

Project Contacts

Project Sponsor(s)	U.S. Trade and Development Agency	U.S. Commercial Service Mexico
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La Laguna Metropolitan Zone BRT

Project Type:	Mass Transit
State(s):	Coahuila and Durango
Projected Investment:	USD $165 million
Timeline:	2014 - 2015
Project Sponsor(s):	SCT

Project Background and Scope

The Metropolitan Zone of La Laguna is formed by four cities: Torreón and Matamoros in Coahuila and Gómez Palacio and Lerdo in Durango. More than 1.2 million people live in this urbanization, it is the ninth largest metropolitan region in the country.

Infrastructure and Rolling Stock

This project will include all the infrastructure, equipment and systems necessary to initiate the bus rapid transit (BRT) service along a first major corridor. This 32.5 kilometer corridor will run from Lerdo, in the State of Durango, to Matamoros, in the State of Coahuila. There will be 34 intermediate stations. Of these, 26 stations will be 5 meters wide, and 8 will be 2.5 meters wide. There will be three major terminals. Terminal Durango will be 10,850 square meters and Terminal Coahuila which will be 11,093 square meters. 30,000 square meters of bus parking will be provided at Terminal Coahuila. The Muzquiz Intermodal Center will cover 6,262 square meters and serve to link the BRT to trunk and feeder transportation connections. Between Terminals Coahuila and Durango operations will occur in dedicated BRT lanes, with mixed traffic operations occurring on the corridor segments beyond the two terminals.

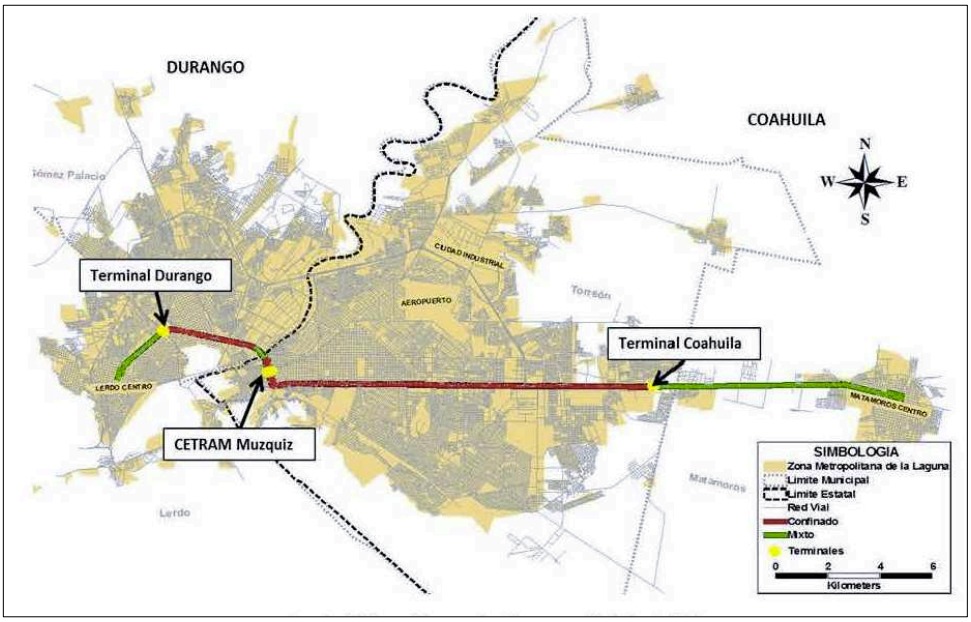

Figure 33: Map of the La Laguna BRT Corridor Project

This corridor is meant to serve as a base for future expansion of the BRT system along additional alignments, as well as to leverage and coordinate the offerings of the other multimodal transportation providers in the region. The ticketing system will be designed to integrate the BRT with future line expansion as well as other transportation service providers.

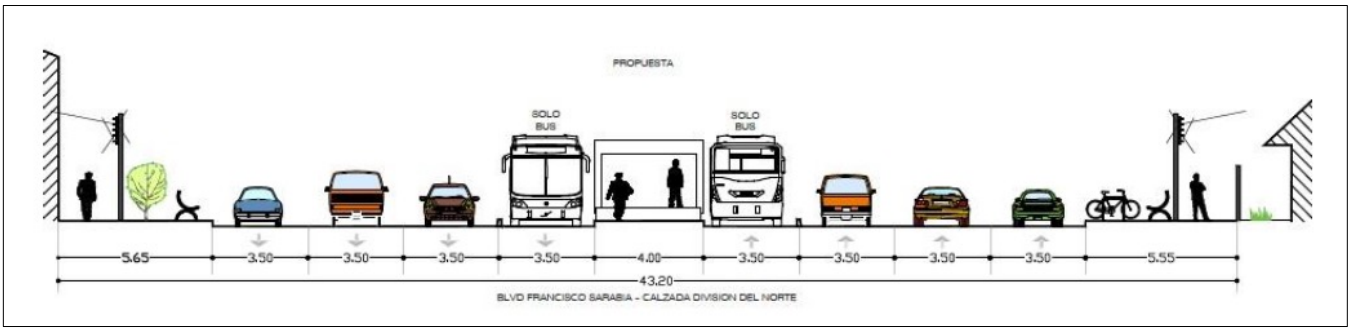

Figure 34: Laguna BRT Station Cross Section

The primary passenger vehicle for the BRT is specified as a bus 12 meters in length, with roughly 35 seats and capacity for 100 passengers, with three doors on the left and two on the right. Smaller buses - ten meters in length with capacity for 80 passengers, and 8.5 meters in length carrying 75 passengers - are envisioned as serving less dense feeder routes. A short bus for special services or low density connectors is envisioned as measuring 6 meters long and having capacity for 40 passengers. This fleet is expected to be diesel powered. This project expects to procure 184 of the 12 meter buses to initiate operations.

Information Systems

A key component of this BRT project will be investments to provide a state-of-the-art integrated intelligent transportation system providing safety, signaling, security, communications and control functions. There will be three major subsystems.

- **Ticketing System:** This system will enable the operator to control and manage all aspects of user payment; accounting; and system access, validation, and control. It will enable analysis, processing and reporting, including drilling down to individual transactions, throughout the system's operating cycle. This system will be based exclusively on smart cards for fare payment, at stations or aboard the buses, and feature equipment enabling unattended fare payment and card purchases. The system will have an analytics capability supporting operational and business planning of the service. The system selected will have a capability of accommodating future expansion of the BRT as well as integration of fare payments for connecting multimodal transportation services. It needs to be capable of dynamic adaptation of tariffs within programmable parameters. The system database needs to be based on an open and documented technology.

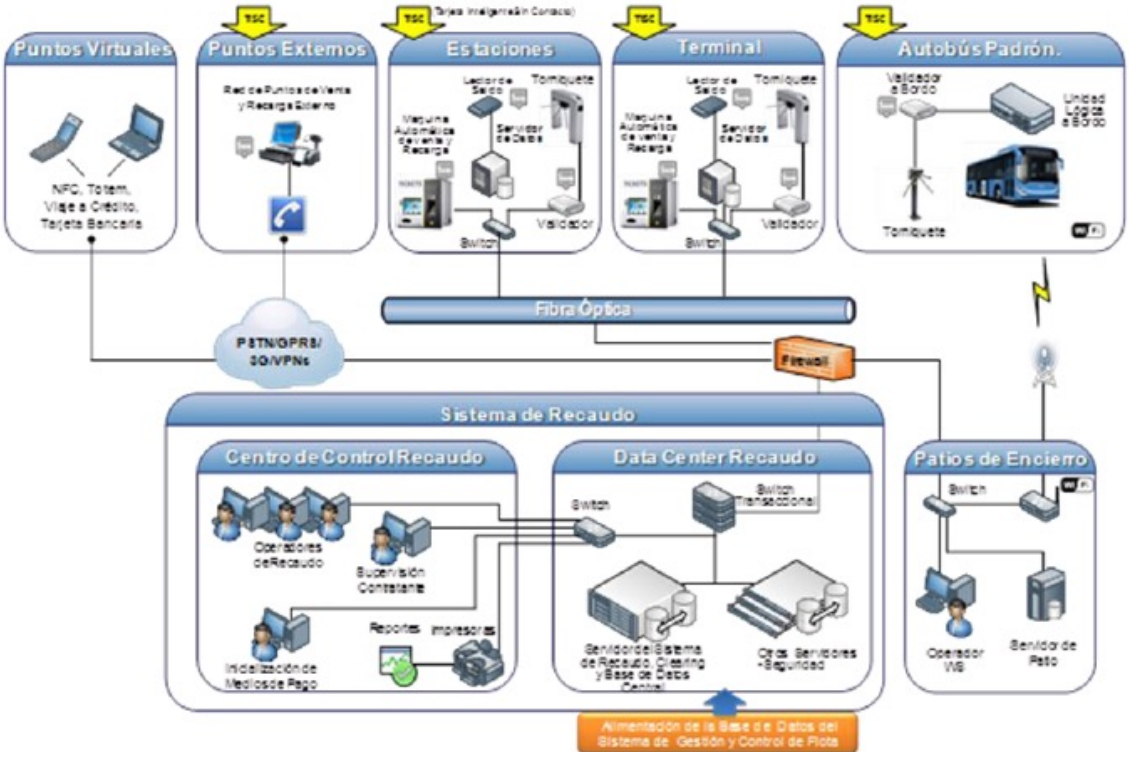

Figure 35: Laguna BRT Ticketing System Conceptual Diagram

- **Fleet Management and Control System:** This system will enable the operator and sponsoring governments to monitor and manage the system operations dynamically in real time to respond to passenger demand requirements. Bus-based GPS components will transmit real-time data to the Control Center and enable visualization and regulation of the buses. There will be a Wi-Fi based automatic data interchange capacity between the buses and the facilities systems. Communications between the Control Center and the buses, between buses and to groups of nodes within the network will be required. There will be closed circuit surveillance cameras in the stations. Buses must be equipped with onboard systems incorporating functions to include: panic buttons; open door detection; loudspeaker and intercom; passenger information displays; and onboard fare payment systems. The Control Center segments will be designed with modern technologies to manage and disseminate information in times of crisis.

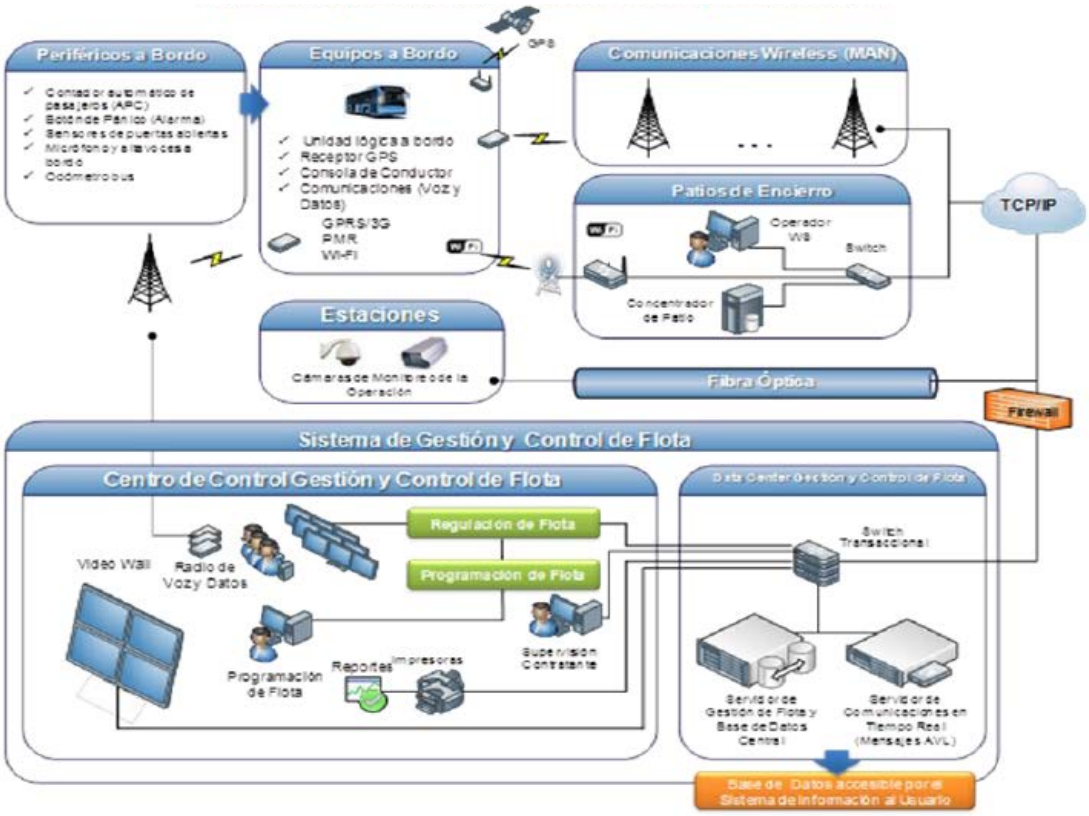

Figure 36: Laguna BRT Operations Management System Conceptual Diagram

- **Passenger Information System:** This system will enable the operator to provide users with useful and opportune information on the services offered, routes, schedules, tariffs, and special access features such as for the handicapped. Station displays will provide passengers with real time information on approaching buses and onboard systems will inform them of approaching stops. They system will integrate telephone and web based components to provide interactive passenger access to the ticketing and fare system, as well as to receive real time updates on operations.

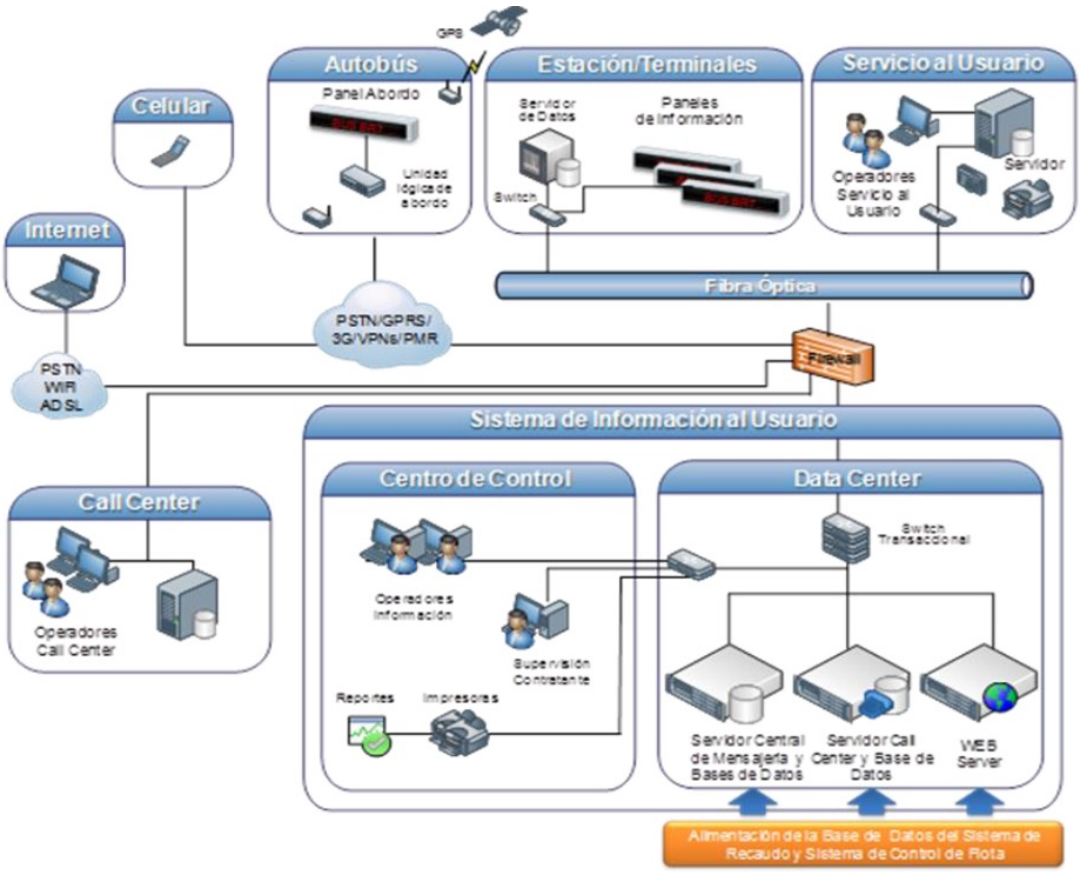

Figure 37: Laguna BRT Passenger Information System Conceptual Diagram

Project Status and Implementation Timeline

As of October 2014, the major project planning studies had been completed. Discussions between local and federal project stakeholders were underway to finalize remaining details. Procurement is expected to occur before the end of 2014, with construction beginning in 2015 and operations commencing two years later.

Project Cost, Financing and Procurement

This project is expected to be constructed with a mix of funding, including private participation. The original plan saw funds distributed by sources over time as follows:

Year	Totals	Federal Funds	Municipal Funds	Private Funds	Trust Funds
2014	**36,629,420**	24,123,087	-	4,203,763	8,302,569
2015	**28,269,164**	43,954,900	-	56,819,183	27,495,081
Total	**164,898,583**	**68,077,987**	**-**	**61,022,946**	**35,797,650**

Table 28: Lagunera Region BRT System Sources of Funds (USD)

This spending plan will shift into 2016 as the project is past the start date originally conceived in early planning. Within these amounts approximately USD $22 million is planned to be spent on information, control, safety and communications systems. USD $32.8 million will be spent on the initial fleet of 184 buses.

U.S. Export Opportunities

This project will present several opportunities for U.S. participation. U.S. companies could participate as investors or concession operating partners. The system will include procurement of four types of bus rolling stock. Information and communications systems are a key component of the BRT where there is potential for U.S.-origin software and hardware provision. Competition from European suppliers for these opportunities will be strong.

Project Contacts

Project Sponsor(s)	U.S. Trade and Development Agency	U.S. Commercial Service Mexico
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Expansion of the Metrorrey Rail and ECOVIA BRT System

Project Type:	Mass Transit
State(s):	Nuevo León
Projected Investment:	USD $434 million
Timeline:	2013 - 2018
Project Sponsor(s):	SCT, STC Metrorrey, BANOBRAS

Sistema de Transporte Colectivo (STC) Metrorrey is a public transit agency, an independent agency of the government of the State of Nuevo Leon. It was initially established in 1987 to construct, operate and maintain an urban transport system.

Metrorrey is a heavy rail passenger rail system that operates electric-multiple unit trainsets powered by overhead catenary at 1.5 kV DC. The present rail system consists of lines 1 and 2. Line 1 was initiated in 1998 and completed in 1991. It covers 18.8 kilometers, running east to west, and services 19 stations. This entire line, excepting one short segment and station, is elevated. Line 2 construction was begun in 1993 and the extension to Municipio de Escobedo completed in 2008, the total extension is 13.8 kilometers, running generally north to south. Servicing 13 stations, the segment from terminal General Zaragoza to Regina is elevated and the remainder of the line is subterranean. The lines interchange at Cuauhtemoc Station. The extension of Line 2 was performed by the consortium of Siemens, Bombardier and Grupo Garza Ponce. The system fleet of 84 articulated EMU's has been provided by CNCF, Bombardier and CAF of Spain.

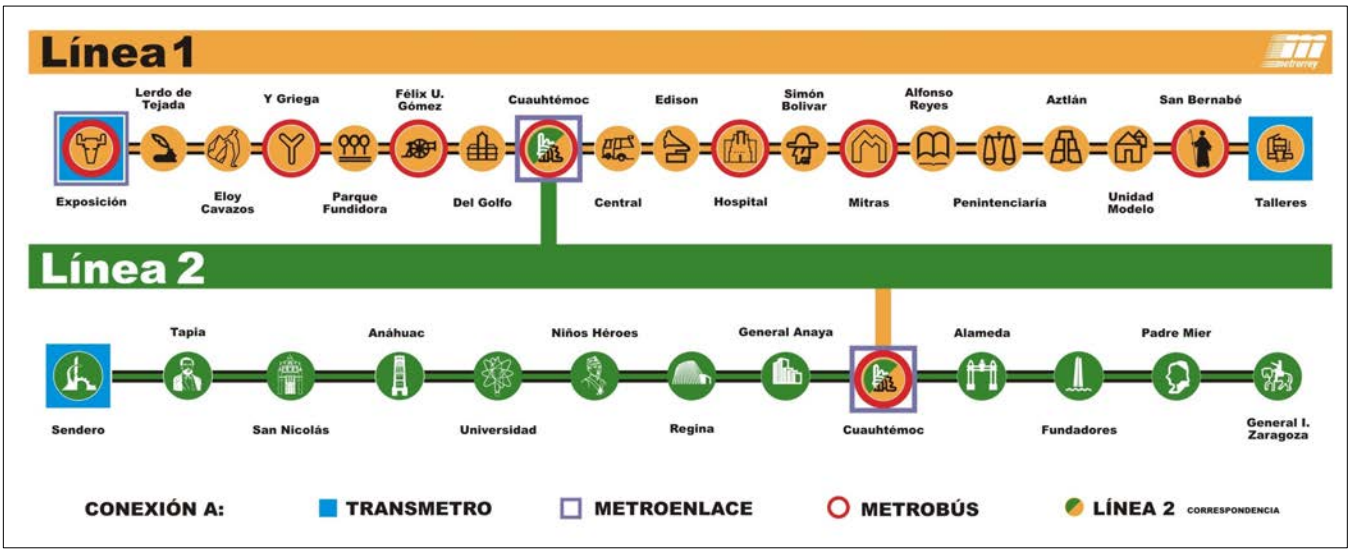

Figure 38: Current Lines of the Metrorrey Rail Transit System

Metrorrey's rail system is complemented by a bus system. MetroBús serves 22 routes with a fleet of 450 buses. Users of the Metrorrey system pay bus and train fares through a single integrated farecard system. A special service called TransMetro features high-quality bus service along priority corridors that are future extensions or

additions to the Metrorrey rail system. This service features air conditioning, dedicated stations, a fixed route of stops and schedule coordination with rail operations.

A new bus rapid transit line, Ecovía, was initiated in Spring of 2014. This service provides a fleet of 80 modern, natural gas-powered passenger buses running along a single east-west alignment, with dedicated lanes for substantial portions of the route. This line serves 43 stations including two terminals and two rail intermodal connecting stations where Ecovía passengers can connect with Lines 1 and 2 of Metrorrey. This line will connect with the new Line 3. The system operates the citywide integrated farecard system and buses feature air conditioning, passenger information systems, Wi-Fi, security cameras and handicapped accessible features.

Project Background and Scope

Metrorrey and the complementary bus systems have witnessed steady growth. Metrorrey has seen annual ridership rise from 153 million in 2011 up to 168 million in 2013. The new Metrorrey Line 3 will be 7.5 kilometers in length and serve 8 stations. 550 meters of the alignment will be underground, from Zaragoza to Barrio Antiguo Station, and 6,650 meters will be elevated between Macroplaza and Hospital Metropolitano. The original master plan for the basic network of Metrorrey envisioned four lines with a total length of 80.5 kilometers, and the government intends to have the fourth line scoped, funded, built and in operation by 2018.

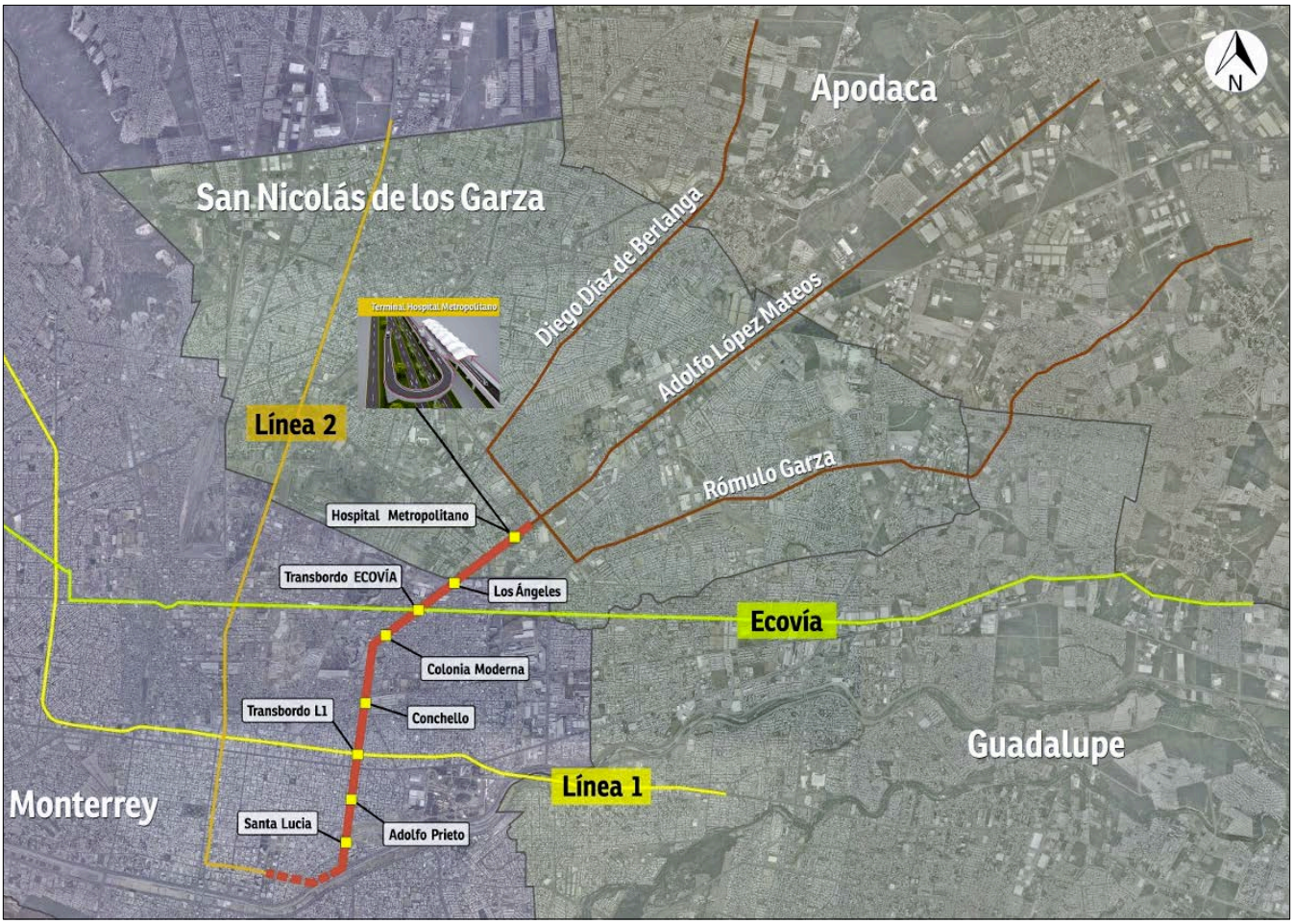

Figure 39: Map of the Planned Metrorrey Line 3 and the Present Ecovía BRT Line 1

The Ecovía system will be expanded by an additional two lines. Line 2 will run from Avenue Bonifacio Salinas in Guadalupe to Miravalle Bridge in San Pedro, generally along the alignment of Constitution Avenue. Line 3 will connect lines 1 and 2, extending south from Avenue Ruiz to Avenue Colon.

Figure 40: Map of BRT Ecovía Monterrey Proposed Lines 2 and 3

Project Status and Implementation Timeline

The contract to build the new Line 3 of Metrorrey was awarded to Siemens Mesoamerica in May of 2014. Operations are expected to begin in the fourth quarter of 2015. The feasibility study for Line 4 of Metrorrey was begun in January of 2014. It is expected to be complete by the first quarter of 2015, enabling the formal request of funds from the federal budget and for the project to go to bid. Several potential alignments are being studied.

The Ecovía Linea 1 corridor concession (construct and operate) was awarded to Servicio de Transporte Tecno Ecológico in June of 2013. As of June of 2014, 42 Hyundai natural gas buses had been purchased and service was being provided to all stations. The technical and feasibility studies are underway for the proposed Lines 2 and 3.

Project Cost, Financing and Procurement

The Ecovía Line 2 and 3 expansion is expected to be financed with a mix of federal, state and private funding. A structure similar to the 20-year concession for Line 1 (of design, project management, construction, provision of equipment, operation, and maintenance) is the probable procurement strategy.

U.S. Export Opportunities

There are expected to be numerous export opportunities between the Metrorrey Line 4 and Ecovía Lines 2 and 3 projects. For the BRT projects, this will include low-emission passenger buses, fueling stations, passenger information systems, station fittings and systems, signage, security, access control, lighting, data and electrical components, and cabling. For the rail projects, infrastructure components including track and track components are potential exports. Operations and maintenance will be an opportunity for both modes of projects. The competition for major system components and services will be challenged as established consortiums of suppliers will likely be faced, including major firms such as Siemens, Alstom, Hyundai and Bombardier, with established operations and local partners. U.S. firms may find opportunities as second tier suppliers.

Project Contacts

Project Sponsor(s)	U.S. Trade and Development Agency	U.S. Commercial Service Mexico
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Establishment of an Articulated BRT System in Tijuana

Project Type:	Mass Transit
State(s):	Baja California
Projected Investment:	USD $151 million
Timeline:	2015 – 2016
Project Sponsor(s):	SCT, BANOBRAS (FONADIN), State of Baja California, City of Tijuana

Project Background and Scope

Sharing 15 miles of international border with sister city San Diego, California, Tijuana is the capital and largest city in the Mexican State of Baja California. With a population exceeding 1.3 million, underdeveloped transport systems and infrastructure, based on automobiles and a decentralized system of buses, limit opportunities both within Tijuana and throughout the metropolitan region. Tijuana has an average population growth rate of 5 percent and is projected to reach over three million residents by 2020. The city is sprawling, expanding at more than 8 acres per day, and much of this growth is uncontrolled and informal. This growth is outstripping city services and planning capacity, and has created new origin-destination dynamics that were not anticipated. The rate of motorization is increasing rapidly, with a city average of one car for every three persons, much higher than the national average of 8 persons per car. This passenger vehicle demand is saturating the poorly connected and maintained urban road network, which lacks bypasses and hierarchies, and is also experiencing rapid growth of road freight traffic. This leads to steadily increasing congestion. Prices paid for transport are generally high for the quality of service.

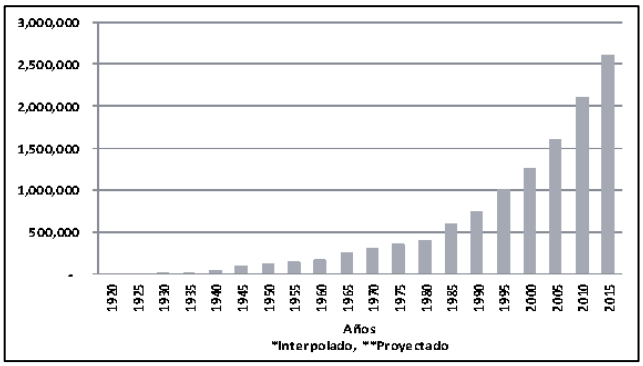

Figure 41: Historical and Projected Population of Tijuana

Tijuana is an important center for cross-border commerce between the United States and Mexico. There are three (soon to be four) ports of entry between the cities. In 2013 over 42 million persons crossed the San Ysidro border crossing (the largest by volume in the Western Hemisphere) and the Otay Mesa crossing. Otay Mesa, specialized for road freight, saw over 769,000 truck pass through in the same period. Congestion at these crossings has led over USD $500 million in public investment in expansion projects that will be completed in 2015. While the crossings are specific chokepoints, the overall quality of the transportation networks and services in the adjacent urban areas is critical to maintaining mobility for personal and commercial purposes, within, and between, these cities. In addition to congestion, pollution is a common challenge for both communities, as these cities share natural resources such as air basins and watersheds. San Diego County is an EPA-designated non-attainment or maintenance area for multiple air pollutants, with emissions on both sides of the border contributing to poor air quality.

In order to provide sustainable mobility for residents and address the environmental and commercial challenges described, Tijuana will implement the city's first bus rapid transit (BRT) system. The new BRT system will serve the city center, with initial coverage set to meet demand for 30 percent of the 250,000 daily trips taken throughout the city. This project will consist of two new BRT lines crossing the city in an "X" shape. Corridor 1, Puerta Mexico – El Florido, will be 10.6 miles long serving 22 stations. Of this alignment, 7.7 miles will operate in dedicated lanes, the rest in mixed traffic lanes. Puerto Mexico Terminal will be located nearly adjacent to the San Ysidro Port of Entry Facility. Proposed in the planning documents, although not included in the BRT Corridor budget, is a plan to construct a connecting pedestrian structure between the Puerta Mexico BRT station and the San Ysidro facility "El Chaparral" expansion. The multimodal El Florido terminal will be the site of the system bus storage lots, maintenance shop, a transfer facility for passengers transiting to and from feeder bus routes and other modes, the system control center, and administrative offices. The initial BRT corridor fleet will consist of 45 articulated passenger buses, with left hand doors, 59' in length and with a maximum capacity of 188 passengers. Buses supplied will be expected to meet stringent emissions standards, the European Union Euro V standard is identified specifically in planning documents, potentially utilizing either diesel or natural gas fuel. Over the twenty-year system forecast the fleet is expected to be expanded by an additional 23 articulated buses, added incrementally to match growth in ridership demand. Articulated buses are expected to have an operational life of 11 years. Twenty feeder bus routes will serve Corridor 1. A significant share of the feeder bus fleet is expected to be sourced from buses currently in operation on the routes, excluding some number based on age and condition. The proposed budget is sufficient to acquire approximately 100 new feeder buses. This corridor will support an estimated 109,000 trips per day at startup. This line will serve as a complement to the major investments under way at the San Ysidro Land Port of Entry (El Chaparral), and to the proposed investments by SANDAG for the San Ysidro Intermodal Transit Center project, that is proposed to improve mass transit connectivity to rail and bus on the northern side of the crossing.

As part of the Corridor 1 project a new electronic fare system will be implemented. This system will include contactless smart cards; administration/accounting/analysis and control software; operating software for fare gates and card readers in stations and buses; a flexible payment system, and; wired and wireless communications infrastructure. A key requirement for this acquisition is that the system offered shall be modular and expandable to incorporate the planned Corridor 2 BRT system expansion, as well as multimodal integration in the long-term.

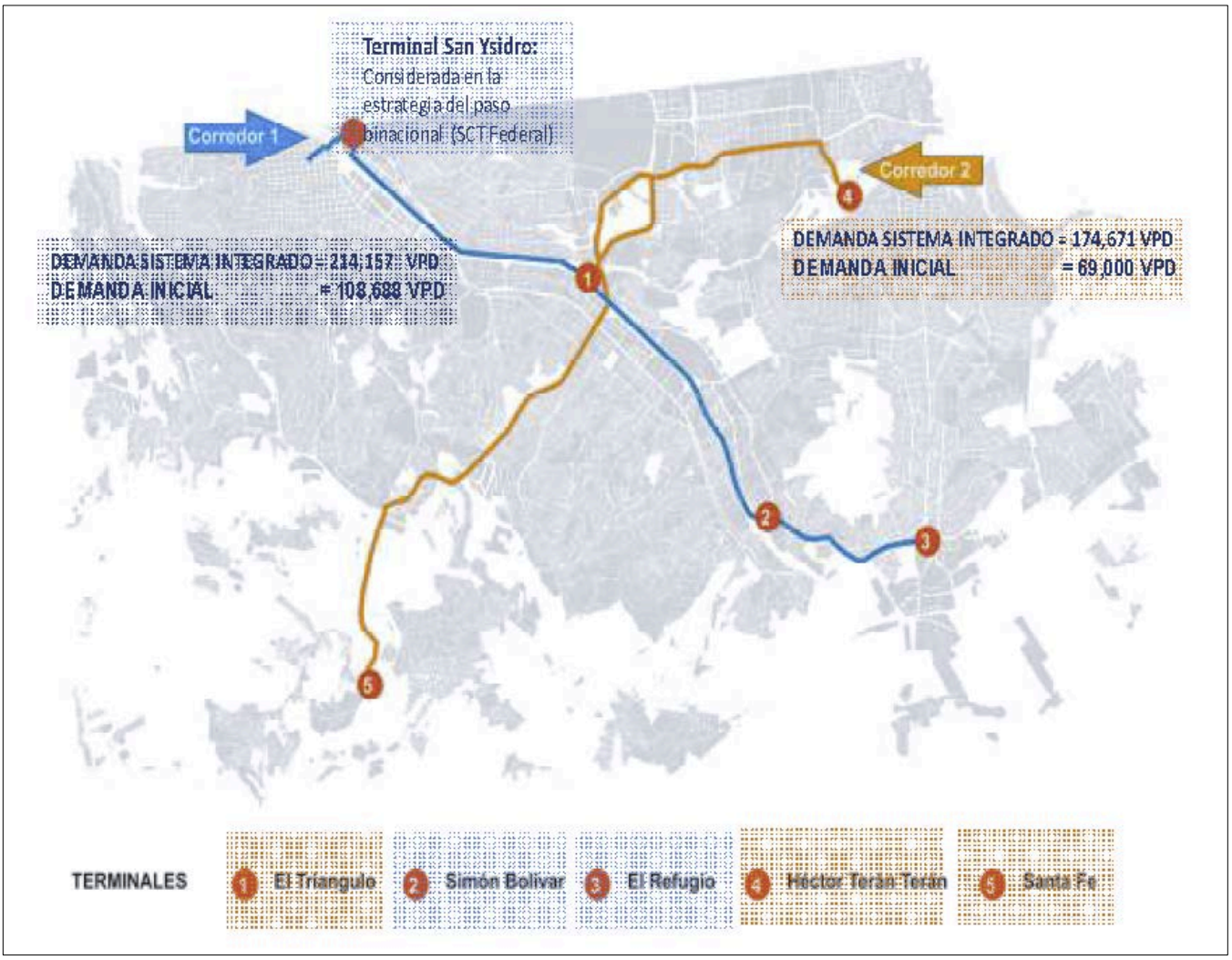

Figure 42: Map of the Planned Tijuana Bus Rapid Transit System Corridors 1 and 2

Corridor 2, Garita Otay - Santa Fe, is planned to be 11.8 miles in length. It will serve 29 stops, with major stations at Santa Fe and Terán Terán, including workshops and vehicle storage lots at both of these locations. The lanes will be a mixture of dedicated and mixed, and the central station of the line will be at El Triangulo with an intermodal transfer to Corridor 1 service. This line service, including feeders, is projected to serve an initial traffic level of 69,000 trips per day. Service on this corridor would be provided by an initial fleet of 32 articulated buses for the trunk corridor, 62 conventional buses for feeder routes and an additional 18 microbuses.

Project Status and Implementation Timeline

The federally required major feasibility, planning, and technical studies and benefit-cost analysis have been completed, and the project has been formally allocated funding in the SHCP's project portfolio for mass transit. Development of Corridor 1 is currently planned to begin in 2015, including all infrastructure construction, concession award, acquisition of rolling stock and implementation of the fare payment system. CTS-EMBARQ Mexico supported a procurement and implementation planning workshop in April of 2014 in which key local, state and federal officials participated.

Project Cost, Financing and Procurement

Based on the most recent estimate provided by the National Infrastructure Plan, the total cost to implement Corridor 1 is USD $151 million, split between federal (FONADIN), state, local and private sources of funds. The private contributions are expected to be contributed as a component of the concession structure that will be used to procure the construction and operation of the new BRT system. Concessions will be awarded in accordance with FONADIN regulations and the federal Public Works Law and Regulations. They will be for up to 20 years duration. The following table breaks down the Corridor 1 component funding based on the budgets provided in preparatory studies completed in 2012.

Major Project Component	MXN		USD		As %
Infrastructure	MXN	1,254,418,368	$	95,641,044	76%
Mainline (Corridor) Bus Fleet	MXN	225,000,000	$	17,154,751	14%
Feeder Route Buses	MXN	114,000,000	$	8,691,741	7%
Investment in Line Prepayment	MXN	62,426,900	$	4,759,635	4%
Total	**MXN**	**1,655,845,268**	**$**	**126,247,171**	**100%**

Table 29: Tijuana BRT Corridor 1 Funding by Major Category

The table below identifies selected component costs that would be potential targets for imports, and the expected sources of project financing. It is important to note that the concessionaire(s) will control or heavily influence purchasing decisions. Accordingly, interested U.S. suppliers should plan to evaluate participating as a partner or investor in a bidding team or by securing relationships as a vendor to potential winning firms.

Corridor 1: Puerta Mexico - El Florido	EXPECTED SOURCES OF FUNDS					
Selected Project Components	FONADIN		STATE/LOCAL		PRIVATE	
Intermediate Stations	$	2,830,509	$	943,503	$	-
Puerta Mexico Terminal	$	-	$	-	$	117,706
El Florido Terminal	$	-	$	-	$	7,956,206
Simon Bolivar Transfer Terminal	$	-	$	-	$	4,189,879
Mainline Corridor Bus Fleet (18M)	$	-	$	-	$	17,154,751
Feeder Route Bus Fleet (12M)	$	-	$	-	$	8,691,741
Ticketing System	$	-	$	-	$	4,912,122
Workshops and Parking Facilities	$	-	$	8,537,009	$	-
Control Center	$	-	$	1,524,867	$	-
Construction of Voice/Data Network	$	-	$	709,825	$	-
Crossing Signals	$	-	$	-	$	659,709
Total	**$**	**2,830,509**	**$**	**11,715,204**	**$**	**43,682,113**

Table 30: Tijuana BRT Corridor 1 Selected Items of Cost and Sources of Funds

U.S. Export Opportunities

This project will present several opportunities for U.S. participation. U.S. companies could participate as investors or concession operating partners. The system will include procurement of three types of bus rolling stock. Information, ticketing and communications systems are a key component of the BRT where there is potential for provision of U.S. software and hardware. Opportunities could also exist for U.S. firms indirectly in the role of vendors to the winning concessionaire and its prime contractors. Competition from European suppliers for these opportunities will be strong.

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USTDA Projects

Puebla ITS Technologies Feasibility Study

USTDA has financed a feasibility study to evaluate the BRT system in Puebla as well as the identification of new ITS technologies that are likely to improve the BRT's operational efficiency, safety, and security. Some of the technologies evaluated included Computer Aided Dispatch Systems (CAD), Automatic Vehicle Location (AVL) Systems, Advanced Communication Systems (ACS) for BRT, Safety and Security systems (BRT), Integrated Fare Collection Systems, Passenger Information Systems, Automatic Passenger Counter Systems, Radio Communication Systems, Fleet Management and Maintenance Systems, Transit Signal Priority (TSP) Systems, Traffic Control Systems, on-board technologies such as on-board passenger displays, Automatic Voice Annunciation Systems (AVAS), on-board Video Monitoring (OVM), silent alarms, Mobile Data Computers (MDCs), built-in Mobile Data, Terminals (MDTs), Global Positioning Systems (GPS), Command and Control Centers for BRT operations and other ITS technologies related to BRT systems. This feasibility study has been completed and the public version of the Feasibility Study report will be available through USTDA's online library in the fourth quarter of 2014: http://www.ustda.gov/library

Contacts

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