

BINATIONAL BORDER TRANSPORTATION PLANNING AND PROGRAMMING STUDY

Task 2:

Mexican Inventory of Existing and Programmed Binational Transportation Facilities

*La Empresa
Barton-Aschman*

March 13, 1998

Preface

U.S./Mexico Binational Border Transportation Planning and Programming Study implements a significant binational policy making document entitled "Memorandum of Understanding on the Planning Process for Land Transport on Each Side of the Border" signed by the federal governments of Mexico and the United States at the first "NAFTA Transportation Summit" held in Washington, D.C., April 29, 1994.

The purpose of this study is to provide policymakers with information needed to establish a continuous, joint, binational, transportation planning and programming process. A goal of this study is to improve the efficiency of the existing binational policy making planning procedures and funding criteria affecting our Border Land Transportation Systems (BLTS). The BLTS should be seen as a binational transportation system made of international bridges and border crossings and land connections to major urban and/or economic centers, principal seaports, airports and multimodal/transfer stations, and, ultimately, to national transportation facilities.

Disclaimer

The purposes of the Binational Planning and Programming Study and all of its reports were: to investigate current state and national transportation planning processes in both the United States and Mexico, to review available data on border transportation infrastructure and goods movement, and to recommend an ongoing, binational planning and programming process. The information contained in these reports was not developed to serve as the basis for making funding allocation or distribution decisions at either the federal or state level in the United States.

**BINATIONAL BORDER TRANSPORTATION PLANNING AND PROGRAMMING STUDY
TASK 2 REPORT: INVENTORY OF EXISTING AND PROGRAMMED
BINATIONAL TRANSPORTATION FACILITIES**

International trade across the border travels by several different modes of transport on various land and sea facilities. This report is an overview of the border transportation facilities located on the Mexican side of the border. The inventory of binational transportation facilities considers five modes of transportation: roadways, railroads, seaports, airports, and pipelines. In addition, the inventory documents the socioeconomic and demographic characteristics of the border region. Two other documents were prepared in conjunction with Task 2. One is a similar detailed inventory report prepared for the U.S. side of the border. The other is an executive summary which combines both U.S. and Mexican information into a single summary report

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2.1 Introduction

Binational Mexico—U.S. trade is primarily transported overland across the extensive border between both countries. Of the total goods moved across the border in both directions, 98.2 percent, by value, is transported by land and the remaining 1.8 percent, by value, is transported by other modes. According to 1995 data, 87.5 percent of the land transport was moved by highway and the remaining 12.5 percent by railroad.

This document refers to the inventory of the infrastructure that facilitates the commercial exchange between Mexico and the United States (U.S), considering the following five modes of transportation: highway, railroad, air, maritime, and pipeline.

For these five modes, available information regarding the physical infrastructure and available pertinent statistical data was compiled focusing on obtaining the tonnage values for the transportation movements. Further data regarding monetary values are provided in Task 8.

Demographic and socioeconomic data reflecting the border region of Mexico is also included. Land use data corresponding specifically to the six border city pairs selected as case study locations is addressed in Task 3.

It is important to clarify that environmentally related impacts resulting from transportation, including air quality and right-of-way plans in border crossings, are not discussed in this report due to the lack of sufficient information and the inability to obtain detailed right-of-way data.

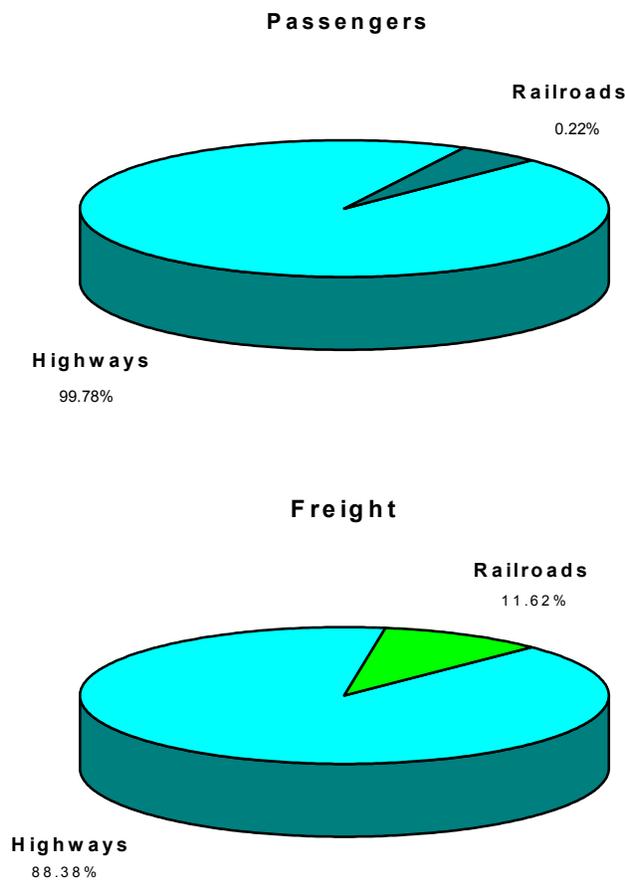
Highways, railroad, airports, and maritime port networks are included in the Geographical Information System (GIS) that is operated by the Secretaria de Comunicaciones y Transportes. Continuous effort is being expended in order to create a binational GIS that will contain the already completed products of the Secretaria de Comunicaciones y Transportes and the Federal Highway Administration.

2.2 Highways

2.2.1 General Data

In Mexico, the national road network serves as the primary surface transport for passenger and freight movement. Road transport provides 99.78 percent of interurban passenger movement while the remaining 0.22 percent utilize the railroads. Domestic freight movement transported 88.38 percent via the roadways and the remaining 11.62 percent utilized rail services. (Figure 2.1, Ref. 11, page 5)

Figure 2.1 National Breakdown of Surface Transport



The national road network maintains a total of 303,261 kilometers (Figure 2.2), including 94,527 kilometers of paved facilities and 208,734 kilometers of unpaved facilities, classified as follows, in Table 2.1 (Ref. 11, page 6).

Table 2.1
National Road Network

Type of Network	Paved	Unpaved	Total (km)
Federal	43,832	74,279	118,111
Federal operated by CAPUFE	1,420		
Concessions operated privately	3,167		3,167
State	45,553	38,730	84,283
Trails and Country Roads operated by others	555	95,725	96,280
Total (km)	94,527	208,734	306,261

Federal highways are of national interest and could be free highways or toll highways. The free highways are planned, constructed and maintained by the Secretaria de Comunicaciones y Transportes (SCT). In the case of toll highways they could be handled in two different ways: in the first one, highways are planned and constructed by the SCT, and they are maintained and operated by Caminos y Puentes Federales de Ingresos y Servicios Conexos (CAPUFE), a division of the SCT; in the second case, they are planned by the SCT and are constructed, maintained, and operated by private concessionaires, during the time frame of the concession.

State highways are of regional interest and they are planned, constructed, maintained and operated by the state government. Some states use the private concession highway scheme to construct, maintain and operate toll highways which are turned back to the state at the end of the concession period.

In the case of state highways, financing formulas are employed to include the state and beneficiary participation. When just the federal and state governments participate it is called a two-party highway and when the beneficiary also participates it is called three-party highway.

Farm-to-market roads (caminos rurales) are low specification roads that are built to link far away places to allow the distribution of their products and to receive the services they require. These roads are built and maintained either by the federal or state government.

In addition, International Financial Organizations like Inter-American Development Bank and the World Bank provide loans that support the construction and modernization programs for either federal, state or farm-to-market roads.

On Figure 2.2 the National Highway Network is shown, highlighting the main highways that in fact constitute the 10 transportation routes that have been defined for Mexico and which are detailed on Figure 2.11.

Figure 2.2 National Highway Network

2.2.2 Border Network

Information presented in Task 3 of this study identified 43 border crossings along the Mexico-U.S. border. Further research selected 21 crossings for detailed study that, when considered as systems, comprise six border ports. The selection process is described in greater detail in the Task 3 Report, *Inventory of Selected Port of Entry Systems on the U.S.-Mexican Border*. These ports connect the country's road network, utilized for the transport of goods and merchandise, making binational trade possible between the two countries.

Figures 2.3 through 2.8 illustrate the highway network that serves binational commerce in the border states of Baja California, Sonora, Coahuila, Chihuahua, Nuevo Leon and Tamaulipas. This inventory includes all roadways that are paved and connect the border crossings with the road network. Roadways are differentiated by classification type (A4, A2, B4, B2, C, D) by the Secretariat (Ministry) of Communications and Transport (Spanish acronym: SCT) in accordance with their geometric features. (Ref. 12, page 50)

Figure 2.3 Baja California

Figure 2.4 Sonora

Figure 2.5 Chihuahua

Figure 2.6 Coahuila

Figure 2.7 Nuevo Leon

Figure 2.8 Tamaulipas

2.2.3 Features

The initial coordination meeting, held December 4 through 6, 1995, by La Empresa and Barton-Aschman representatives, identified the need for information regarding roadway features, or stretches of road making up the border network to be consistent, including the amount of detail required to address the study's goal: to provide policymakers with the information necessary to establish a continuing binational transportation planning and programming process.

Accordingly, the study team concluded that an excess of information regarding network features would be both of little significance and very hard to compile, since in many cases it is implied that the roadways maintain accepted features. For example, the maximum degree of curvature is determined by the posted speed. Therefore, information included in this report cannot be used for project design consisting of detailed infrastructure, widening or upgrading of cross-sections, as necessary. The inventory should reflect relevant aspects that offer a clear and sufficient image of geometric and operational features, as well as their jurisdiction for planning purposes.

Based on the aforementioned criteria, the following features are defined for the border roadway network.

<u>Features</u>	<u>Definition</u>
Jurisdiction	Federal, State, Other
Type	By Secretariat of Communication and Transport (SCT) classification; describes width of crown, maximum slope and curve according to terrain type: flat, hilly, or mountain, and traffic volumes they can carry. Classification types include A4, A2, B4, B2, C and D. (Ref.12, page 50).
No. of Lanes	By operational importance, according to capacity and service level.
Length	Considered for each subsegment into which the segment under consideration is divided in terms of changes in its geometric or operating features.
Project Speed (KM/HR)	This datum defines, more closely, features derived from the type of road, as well as operating conditions, and restrictions if any, for heavy vehicle traffic.
Rolling Surface	Considers those which are paved or covered; does not include trails or roads with dirt rolling surfaces.
Service Index	For purposes of this study we have simplified the SCT's road classification system for determining the physical condition of the federal road network, into "good," "fair," and "poor."
Average Daily Traffic per Year (TDPA, Spanish acronym)	From SCT data based on recorders at several points along the network that count the number of vehicles that pass the measuring site.
Capacity	From SCT data. Defined as the maximum number of vehicles that can pass a given point in the road in the course of one hour, under prevailing traffic and road conditions.
Service Level	From SCT data; defines the different operating conditions—from A, best, to F, congested—that a road or segment is subjected to, from the volume of traffic handled and the physical features of the road, under conditions established in the SCT's <i>Road Capacity Manual</i> , 1991 edition. (Ref. 13)

Tables 2.2 through 2.7 were compiled using information gathered from SCT sources that illustrate the features of border state roadways considered significant for binational transport, due to border port connectivity, emphasizing their greater importance within the national roadway network, and their access to the different origin or destination sites utilized by the country's freight traffic. (Data from 1995.)

**Table 2.2
Features of Baja California Highways**

Roadway Section Subsection	Jurisdiction			Type	# of lanes	Length/ km	Cum Length	Speed Limit km/hr	Rolling Surface	Service Index	Gauge		Capacity		Service Level	
	Fed	State	Oth								Site km	TDPA	Site km	vph*		
Tijuana - Ensenada	1															
Tijuana - Rosarito	x			B	4	26	26	60	PAV	FAIR	0.00					
											22.00	18,150				
											26.00	16,590	26.00	4,586		B
Rosarito - la Mision	x			D	2	39	65	40	PAV	FAIR	26.00	8,300				
											46.12	3,470	46.12	988		D
											57.00	2,762				
													65.00	988		C
La Mision - Ent. San Miguel	x			D	2	27	92	40	PAV	FAIR	91.47	2,880	91.47	1,158		C
Ent. San Miguel - Ensenada	x			A	4	15	107	80	PAV	FAIR	106.50	7,120				
Tijuana - Tecate	2															
Tijuana - P. Abelardo L. Rodriguez	x			C	2	17	17	50	PAV	FAIR	17.00	5,414	17.00	1,942		C
Presa A. L. Rodriguez - R. Sn. Jose	x			C	2	13	30	50	PAV	FAIR	17.00	4,870	30.00	1,305		D
P. San Jose - Tecate	x			C	2	20	50	50	PAV	FAIR	50.00	6,540	50.00	696		E
Tecate - El Sauzal	3															
Tecate - El Testerazo	x			D	2	49	49	25	PAV	FAIR	0.00	4,030				
											27.80	3,185	27.60	467		E
													48.80	467		E
El Testerazo - El Sauzal	x			D	2	55.6	105	25	PAV	FAIR	63.50	2,020				
											74.80	2,195				
											93.90	3,750	93.90	1,194		C
											104.50	3,780	104.50	1,452		C
Tecate - Mexicali	2															
Tecate - Agua Hechicera	x			C	2	44	44		PAV	FAIR	0.00	6,550	0.00	1,112		E
											20.00	6,490				
													30.00	696		E
													39.00	1,305		D
Agua Hechicera - La Rumorosa	x			C	2	22	66		PAV	FAIR	45.00	6,110				
											62.40	5,936				
											64.40	5,471	64.40	1,757		B
La Rumorosa - Mexicali	x			Cz	2	74	140		PAV	FAIR			80.00	3,582		B
											124.20	6,300				
											130.20	8,890				
Mexicali - San Luis Rio Colorado	2															
Mexicali - Entr. Algodones	x			A	4	47	47	80	PAV	FAIR	8.65	11,551				
													22.55	7,333		A
													36.49	10,963		
Entr. Algodones - S. L. R. Colorado	x			A	4	30	77	80	PAV	FAIR	50.32	9,552	40.12	7,220		A
											58.34	9,401				
											58.34	10,601				
													61.43	7,011		A
											64.78	3,023	65.00	6,785		A
Mexicali - San Felipe	5															
Mexicali - Libr. Mexicali	x			B	4	5	5	60	PAV	FAIR	0.00	18,774				
											5.00	12,978				
Libr. Mexicali - La Puerta	x			B	4	32	37	60	PAV	FAIR			37.30	2,221		B
La Puerta - El Faro	x			C	2	7	44	60	PAV	FAIR	39.00	2,268				
El Faro - San Felipe	x			C	2	152	196	60	PAV	FAIR	105.10	1,095				
											141.00	1,105	141.00	1,841		B
											141.00	1,347				
											189.60	1,563	189.00	1,809		B
Ensenada - El Chinero	3															
Ensenada - Entr. Ojos Negros	x			C	2	38	38	50	PAV	FAIR	0.00	1,720				
													27.80	1,472		B
											38.50	605	38.50	2,247		A
Entr. Ojos Negros - El Chinero	x			C	2	158	196	50	PAV	FAIR	60.50	484				

Table 2.2
Features of Baja California Highways

Roadway Section Subsection	Jurisdiction			Type	# of lanes	Length/ km	Cum Length	Speed Limit km/hr	Rolling Surface	Service Index	Gauge		Capacity		Service Level
	Fed	State	Oth								Site km	TDPA	Site km	vph*	
Tijuana - San Miguel (toll)	10										93.00	502			
Tijuana - San Miguel (toll)	x			A	4	96	96	80	PAV		196.00	647	196.00	5,065	A
Tijuana - Tecate (toll)	20										9.93	6,434			
Tijuana - Tecate (toll)			x	A	4	35	35	110	PAV		35.42	7,248			
Tecate - Mexicali (toll)	20										96.00	7,120			
La Rumorosa - Entr. El Centinela			x	A	4	46	46	80	PAV				2,830	6600	A
Ensenada - San Quintin	1														A
Ensenada - Entr. La Bufadora	x			B	4	21	21	60	PAV	POOR	0.00	15,130			
											14,710	13.50	4,706		B
												20.20	4,800		B
Entr. La Bufadora - Punta Colonet	x			B	2	107	128	60	PAV	POOR	11,215				
											21.16	6,280			
											52.00	3,520	51.20	1,562	C
											90.00	2,800			
Punta Colonet - San Quintin	x			B	2	65	193	60	PAV	POOR	128.00	2,860	128.00	1,562	C
											159.00	3,125	159.00	1,399	C
											172.40	2,975	172.14	2,175	B
											193.00	3,550	193.00	2,175	B
Mexicali - Algodones		2													
Mexicali - Ejido Puebla		x		C	2	12	12		PAV		12.00	5880.00			
Ejido Puebla - Entr. (Mexicali-Est. Coah)		x		C	2	26	38		PAV		37.70	3120.00			
Entr. (Mexicali-Est. Coah) - Entr. Ej. Mty.			X	C	2	12	50		PAV		37.70	1873.00			
											49.65	1720.00			
Entr. Ej. Mty. - Entr. (Sonoita-Mexicali)			x	C	2	22	72		PAV		49.65	1615.00			
											72.00	1425.00			
Entr. (Sonoita-Mexicali) - Algodones			x	C	2	29	101		PAV		72.00	1950.00			
											101.30	975.00			

*Vehicles per hour corresponding to capacity.

Table 2.3
Features of Sonora Highways

Roadway Section Subsection	Jurisdiction			Type	# of lanes	Length/ km	Cum Length	Speed Limit km/hr	Rolling Surface	Service Index	Gauge		Capacity		Service Level
	Fed	State	Oth								Site km	TDPA	Site km	vph*	
San Luis Rio Colorado - Sonoyta	2			B	2	200	200	60	PAV	FAIR	0.00	3,055			
San Luis Rio Colorado - Sonoyta	x												127.32	2,387	D
											200.00	3,242	200.00	2,470	D
S. L. R. Colorado - Golfo Sta. Clara		40		C	2	114	114		PAV		0.00	3,153			
S. L. R. Colorado - Golfo Sta. Clara		x									25.50	2,430			
Sonoyta - P. Peñasco	8			B	2	100	100	60	PAV	GOOD	0.00	1,556		2,404	B
Sonoyta - P. Peñasco	x														
Sonoyta - Sta. Ana	2			A	2	149	149	80	PAV	FAIR	0.00	6,730			
Sonoyta - Caborca	x			A	4	28	177	80	PAV	GOOD	157.00	4,485	155.80	1,901	D
Caborca - Altar	x										178.00	4,378			
											251.00	4,290			
Altar - Santa Ana	x														
Sasabe - Saric		-		D	2	70	70		REV						
Sasabe - Saric		x													
Saric - Altar		64		C	2	70	70		PAV		0.00	661			
Saric - Altar		x													
Nogales - Santa Ana	15			A	4	91	91	80	PAV	GOOD	0.00	20,617			
Nogales - Magdalena	x										7.00	7,072			

Table 2.3
Features of Sonora Highways

Roadway Section Subsection	Jurisdiction			Type	# of lanes	Length/ km	Cum Length	Speed Limit km/hr	Rolling Surface	Service Index	Gauge		Capacity		Service Level
	Fed	State	Oth								Site km	TDPA	Site km	vph*	
											16.00	6,980	16.00	4,865	B
											64.00	5,725	64.00	4,865	B
											87.00	7,060	87.00	4,865	B
Magdalena - Santa Ana	x			A	4	17	108	80	PAV	GOOD	104.00	7,145	104.00	7,188	A
Imuris - Agua Prieta	2			B	2	84	84	60	PAV	FAIR	0.00	2,695			
Imuris - Cananea	x			B	2	84	168	60	PAV	FAIR	81.00	2,950	82.00	613	D
Cananea - Agua Prieta	x												122.00	2,099	B
													160.00	613	C
											165.00	2,196			
Agua Prieta - Janos	2			B	2	74	74	60	PAV	GOOD	0.00	1,865			
Agua Prieta - (Lim. Son/Chih.)	x														
Hermosillo - Santa Ana	15			A	4	9	9	100	PAV	GOOD	0.00	20,290			
Hermosillo - Entr. Ures		x		A	4	59	68	100	PAV	GOOD	8.90	15,340	8.90	6,797	A
Entr. Ures - Entr. Carbo			x								8.90	9,405			
											67.85	6,955	67.85	4,417	B
											123.30	7,670	123.30	4,045	B
Entr. Carbo - Benjamin Hill			x	A	4	56	124	100	PAV	GOOD	123.30	8,366			
													144.10	4,045	B
													168.00	6,457	A
Benjamin Hill - Santa Ana			x	A	4	44	168	100	PAV	GOOD	168.00	8,776	168.00		
Hermosillo - Agua Prieta				C	2	158	158	50	PAV	FAIR	0.00	4,265			
T. Hermosillo - Moctezuma	14										74.50	1,055			
											97.50	500			
											166.00	470			
Moctezuma - Agua Prieta	17			C	2	204	362	50	PAV	FAIR	166.00	665			
											247.00	655			
											364.00	1,670			
Hermosillo - Guaymas	15														
Hermosillo - Guaymas	x			A	4	138	138	80	PAV	FAIR	0.00	9,760			
											81.00	6,497			
											120.00	6,730			
													126.90	4,114	B
													131.00	3,978	B
											137.00	7,680			
Ramal a Naco	-														
Ramal a Naco	x			C	2	15			PAV	GOOD					
Magdalena - Tubutama			-												
Magdalena - Tubutama			x	D	2	65			REV						

*Vehicles per hour corresponding to capacity.

Table 2.4
Features of Chihuahua Highways

Roadway Section Subsection	Jurisdiction			Type	# of lanes	Length/ km	Cum Length	Speed Limit km/hr	Rolling Surface	Service Index	Gauge		Capacity		Service Level
	Fed	State	Oth								Site km	TDPA	Site km	vph*	
Ramal a Palomas	-														
Ramal a Palomas	x			C	2	35			PAV	FAIR		370*			
Cd. Juarez - Janos	2														
Entr. (El Sueco - Cd. Juarez) - Garita	x			B	2	16	16	60	PAV	FAIR	0.00	2,650			
													16.00	1,189	C
Garita - Janos	x			B	2	189	205	60	PAV	FAIR	112.00	1,360	112.00	2,003	B
											170.95	1,722	170.95	2,009	B
											190.60	1,720			
											205.00	1,720	205.00	2,009	B

Table 2.4
Features of Chihuahua Highways

Roadway Section Subsection	Jurisdiction			Type	# of lanes	Length/ km	Cum Length	Speed Limit km/hr	Rolling Surface	Service Index	Gauge		Capacity		Service Level
	Fed	State	Oth								Site km	TDPA	Site km	vph*	
El Sueco - Cd. Juarez	45														
El Sueco - V. Ahumada	x			A	4	84	84	80	PAV	GOOD	0.00	3,891			
V. Ahumada - Entr. Janos	x			A	4	114	198	80	PAV	GOOD	83.63	4,539	83.63	2,068	B
Entr. Janos - Cd. Juarez	x			A	4	21	219	80	PAV	GOOD	197.92	8,240	167.65	2,024	C
											201.35	10,230	197.92	2,049	D
													219.00	2,046	A
El Sueco - Janos	10														
El Sueco - San Buenaventura	x			B	2	114	114	60	PAV	FAIR	0.00	1,155			
											59.00	1,330	59.00	1,217	B
											114.00	1,557	114.00	1,508	B
San Buenaventura - Nvo. Casas Grandes	x			B	2	81	195	60	PAV	FAIR	114.00	2,655			
													147.00	576	D
											195.00	2,685	195.00	1,971	B
Nvo. Casas Grandes - Janos	x			B	2	62	257	60	PAV	FAIR	257.00	2,385	257.00	1,154	C
Cd. Juarez - El Porvenir	2														
Cd. Juarez - El Porvenir	x			C	2	87			PAV	GOOD	0.00	1,825			
											30.54	3,190			
											70.82	7,620			
Chihuahua - Ojinaga	16														
Chihuahua - Entr. Aeropuerto	x										0.00	11,748			
				B	4	6.5	6.5	60	PAV	FAIR	6.50	5,778	6.50	2,218	C
Entr. Aeropuerto - Aldama	x										6.50	4,415			
				B	4	22	28.5	60	PAV	FAIR	26.80	4,340	26.80	2,417	B
Aldama - Ojinaga	x										26.80	984			
				C	2	197	226	50	PAV	FAIR			80.60	1,406	B
													89.90	1,852	A
											141.00	480	141.00	1,852	A
											224.00	755	224.00	1,852	A
Chihuahua - El Sueco	45														
Chihuahua - Entr. Aeropuerto	x										7.20	7,870			
Entr. Aeropuerto - Sacramento			x	A	4	7	7	80	PAV	GOOD			31.09	1,948	D
Sacramento - Entr. El Sauz	x			A	4	24	31	80	PAV	GOOD	55.38	6,104	55.38	1,979	C
Entr. El Sauz - El Sueco	x			A	4	24	55	80	PAV	GOOD	60.48	5,799			
				A	4	99	154	80	PAV	GOOD	155.27	6,210	155.87	2,068	C
Ojinaga - Cd. Camargo			-												
Ojinaga - Cd. Camargo			x								0.00	690			
				C	2	246	246		PAV		97.00	555			
											97.00	507			
											174.20	477			
											218.00	315			
Janos - Agua Prieta	2														
Janos - Agua Prieta (Lim. Chih/Son.)	x									FAIR	0.00	1,629			
											156.40	1,865			
Chihuahua - Cuahutemoc	16														
Chihuahua - Nvo. Palomas	x			B	4	38	38	60	PAV	GOOD	10.50	8,932			
											10.50	8,086			
													27.50	4,235	B
											36.20	7,847			
Nvo. Palomas - Cuahutemoc	x			B	4	66	104	60	PAV	GOOD	36.20	6,030			
											50.00	6,105	50.00	3,731	B
													61.10	3,934	B
													87.20	3,850	B
													90.45	3,731	B
											103.50	5,600	103.50	3,731	B

Table 2.4
Features of Chihuahua Highways

Roadway Section Subsection	Jurisdiction			Type	# of lanes	Length/ km	Cum Length	Speed Limit km/hr	Rolling Surface	Service Index	Gauge		Capacity		Service Level
	Fed	State	Oth								Site km	TDPA	Site km	vph*	
Cuahutemoc - Buenaventura			28												
Entr. (Chih.-Madera) - A. ObFairon			x								0.00	5,313			
A. ObFairon - Gomez Farias				B	4	42	42		PAV		42.00	2,362	42.00	1,942	C
											77.50	2,351			
			x	D	2	123	165		PAV		77.50	1,570	77.50	1,942	B
													114.40	609	C
													146.00	560	C
											165.00	2,030	165.00	1,942	B
Gomez Farias - Buenaventura											253.30	725	253.00	1,898	A
Cuahutemoc - Yepachic	16			D	2	88	253		PAV						
Cuahutemoc - La Junta			x								0.00	5,247	0.00	3,731	B
				C	2	47	47	50	PAV	GOOD	3.60	3,778			
													25.60	1,112	C
											47.30	2,690	47.20	1,942	B
La Junta - Tomochic			x								47.30	1,080			
				C	2	70	117	50	PAV	FAIR	63.30	1,000	63.20	651	B
											117.00	257	117.00	659	B
Tomochic - Yepachic			x										181.00	668	B
Hidalgo del Parral - Nvo. Palomas	24			C	2	50	167	50	PAV	FAIR					
Parral - Valle Zaragoza			x								0.00	1,600			
				C	2	72	72	50	PAV	FAIR	66.00	1,300			
Valle Zaragoza - Satevo			x								126.00	1,325			
Satevo - Entr. (Chih. - Madera)			x	C	2	81	153	50	PAV	FAIR	182.40	1,935			
Hidalgo del Parral - Jimenez	45														
Parral - Entr. Valle de Allende			x	B	2	29	29	60	PAV	FAIR	0.00	2,460			
													15.00	1,586	C
											26.23	1,795	26.00	1,586	C
Entr. Valle de Allende - Jimenez			x	B	2	53	82	60	PAV	FAIR			34.44	2,270	B
													62.00	2,270	B
											76.63	3,010	76.50	2,027	B
Jimenez - Camargo															
Jimenez - Camargo				C	2	80	80		PAV		0.00	3,010			
											65.80	2,430			
											65.80	2,540			
											78.20	2,646			
Cd. Camargo - Saucillo	49														
Cd. Camargo - Saucillo			x	C	2	42	42		PAV	FAIR	0.00	2,274			
											20.92	2,162			
Jimenez - Chihuahua (toll)	45														
Jimenez - Camargo			x	A	4	69	69	80	PAV	GOOD	0.00	3,734			
											66.28	2,082			
Camargo - Saucillo			x	A	4	42	111	80	PAV	GOOD	111.50	3,187			
Saucillo - Delicias			x	A	4	27	138	80	PAV	GOOD	138.00	9,548			
Delicias - Entr. L. Cárdenas			x	A	4	28	166	80	PAV	GOOD	166.87	7,581			
Entr. L. Cárdenas -Chihuahua			x	A	4	56	222	80	PAV	GOOD	166.87	7,080			
											210.00	9,400			

*Vehicles per hour corresponding to capacity.

Table 2.5
Features of Coahuila Highways

Roadway Section Subsection	Jurisdiction			Type	# of lanes	Length/ km	Cum Length	Speed Limit km/hr	Rolling Surface	Service Index	Gauge		Capacity		Service Level
	Fed	State	Oth								Site km	TDPA	Site km	vph*	
El Sauz - Boquillas del Carmen		-													
El Sauz - Palan		x		C	2	42	42		PAV		31.00	1,852			
Palan - La Cuesta		x		C	2	170	212		PAV		42.50	2,150			
La Cuesta - Boquillas del Carmen		x		C	2	75	287		PAV			2,060			
Cd. Acuña - Presa La Amistad	2														
Cd. Acuña - Presa La Amistad	x			C	2	23	23		PAV	GOOD	0.00	528			
											0.00	534			
											10.60	935			
											23.00	808			
Entr. Morelos - Cd. Acuña	29														
Entr. Morelos - Zaragoza	x			B	2	9	9	60	PAV	GOOD	0.00	2,904			
											9.00	1,690	9.00	2,214	B
Zaragoza - Cd. Acuña	x			B	2	95	104	60	PAV	GOOD	69.00	1,670			
											87.00	1,570	87.00	1,546	C
											87.00	3,714			
											104.00	3,720	104.00	1,546	C
Piedras Negras - Entr. Cd. Acuña	2														
Piedras Negras - Entr. Cd. Acuña	x			B	2	87	87	60	PAV	GOOD	46.00	2,080			
											83.00	2,060	83.00	2,247	B
Monclova - Piedras Negras	57														
Monclova - La Estancia	x			A	2	6	6	80	PAV	GOOD	0.00	8,486			
											5.86	8,054	5.86	2,294	C
La Estancia - Entr. El Sauz	x			A	2	82	88	80	PAV	GOOD	88.50	2,568	88.40	2,294	B
Entr. El Sauz - Entr. Der. Sabinas	x			A	2	27	115	80	PAV	GOOD	88.50	2,970			
													111.50	2,294	C
													112.50	7,293	A
Entr. Der. Sabinas - Entr. Izq. Nva. Rosita	x			A	4	13	128	60	PAV	GOOD	115.00	5,812			
											118.85	5,653		7,293	A
											118.85	5,685			
											126.30	5,537			
Entr. Izq. Nva. Rosita - Allende	x			A	2	64	192	80	PAV	GOOD	182.00	5,194			
											187.20	4,860	188.00	2,229	C
Allende - Nava	x			A	2	12	204	80	PAV	GOOD	206.85	5,135			
Nava - Piedras Negras	x			B	4	41	245	60	PAV	GOOD	206.85	5,040	206.85	1,508	C
											240.28	5,037	240.28	2,233	C
											248.00	9,572	248.00	7,181	A
Entr. (Monclova-P. Negras) - N. Laredo	2														
Entr. (Monclova-P. Negras)-Lim. Coah/NL	x			B	2	123	123	60	PAV	GOOD	0.00	1,630			
											16.90	519	16.90	1,089	A
											42.00	757	42.00	1,089	B
											113.00	630	113.00	1,089	B
Lim. Coah/NL - Nuevo Laredo	x			B	2	56	179	60	PAV	FAIR	175.00	3,277	175.00	1,438	C
Entr. (Moncl.-P. N.) - S. Buenaventura			-												
Entr. (Moncl.-P. N.) - S. Buenaventura		x		C	2	45	45		PAV	FAIR	0.00	827			
											45.00	475			
Monclova - Sn. Pedro Colonias	30														
Monclova - Sn. Buenaventura	x			B	4	22	22	60	PAV	FAIR	2.00	8,250			
											11.00	7,413			
											21.60	6,050			
Sn. Buenaventura - Cuatrociénegas	x			B	2	58	80	60	PAV	FAIR	21.60	4,360			
											27.00	3,798			
											27.00	2,070	27.00	1,654	B
											45.27	1,970			
											80.15	1,505	80.15	1,654	B

**Table 2.5
Features of Coahuila Highways**

Roadway Section Subsection	Jurisdiction			Type	# of lanes	Length/ km	Cum Length	Speed Limit km/hr	Rolling Surface	Service Index	Gauge		Capacity		Service Level
	Fed	State	Oth								Site km	TDPA	Site km	vph*	
Cuatrociénegas - Sn. Pedro Colonias	x			B	2	187	267	60	PAV	GOOD	80.15	870			
											134.70	505			
											201.50	495			
											267.00	971	267.00	1,937	A
Sn. Pedro Colonias - Torreon	30														
Sn. Pedro Colonias - Torreon	x			A	4	65	65		PAV	GOOD	18.70	2,970			
											33.00	3,090			
											41.10	3,202	22.00	2,080	C
											41.10	4,585			
											62.40	4,575			
											62.40	4,495			
													65.00	2,161	C
Saltillo - Monclova	57														
Saltillo - Entr. Ramos Arizpe	x			A	2	13	13	80	PAV	GOOD	0.00	5,510			
											13.00	3,243	13.00	1,217	C
Entr. Ramos Arizpe - Entr. Monterrey	x			A	2	152	165	80	PAV	GOOD	164.79	1,910			
Entr. Monterrey - Entr. Castaños	x			A	2	10	175	80	PAV	GOOD	164.79	4,112	164.79	631	D
											175.20	3,330	175.20	2,189	B
Entr. Castaños - Monclova	x			B	4	17	192	60	PAV	GOOD	192.00	8,246	192.00	7,092	A
Saltillo - Torreon (toll)			40D												
Saltillo - La Noria			x	A	4	31	31	100	PAV	GOOD					A
La Noria - Viñedos Alamos			x	A	2	75	106	80	PAV	GOOD					
Viñedos Alamos - San Rafael			x	A	4	42	148	100	PAV	GOOD					
San Rafael - Entr. La Cuchilla			x	A	2	48	196	80	PAV	GOOD					
Entr. La Cuchilla - Torreon			x	A	4	49	245	100	PAV	GOOD					
Saltillo - Torreon	40														
Saltillo - Entr. Gral. Cepeda	x			B	2	44	44	60	PAV	GOOD	44	5,190	44	1,247	C
Entr. Gral. Cepeda - Entr. Est. Marte	x			B	2	47	91	60	PAV	GOOD	91	4,075			
Entr. Est. Marte - Entr. Paila	x			B	2	37	128	60	PAV	GOOD	128	3,780			
Entr. Paila - El Mimbres	x			B	2	21	149	60	PAV	GOOD	149	3,580			
El Mimbres - Entr. La Cuchilla	x			B	2	55	204	60	PAV	GOOD	204	3,570	204	2,107	B
Entr. La Cuchilla - Emiliano Zapata	x			C	2	17	221	50	PAV	GOOD	221	3,770	221	2,107	B
E. Zapata - Libr. Matamoros (Acc.1)	x			A	4	29	250	80	PAV	GOOD	250	8,692			
Libr. Mat.. (Acc.1) - Libr. Mat.. (Acc.2)	x			A	4	5	255	80	PAV	GOOD	255	10,299			
Libr. Mat.. (Acc.2) - Libr. Torreon	x			A	4	10	265	80	PAV	GOOD	265	12,151			
Libr. Torreon - Torreon	x			A	4	26	291	80	PAV	GOOD	291				

*Vehicles per hour corresponding to capacity.

Table 2.6
Features of Nuevo Leon Highways

Roadway Section Subsection	Jurisdiction			Type	# of lanes	Length/ km	Cum Length	Speed Limit km/hr	Rolling Surface	Service Index	Gauge		Capacity		Service Level
	Fed	State	Oth								Site km	TDPA	Site km	vph*	
Colombia - El Huisachito		-													
Colombia - El Huisachito		x		C	2	52	52		PAV		0.00	420			
											2.40	640			
											50.30	520			
Monterrey - Castaños	53														
Entr. (Mty - N. Laredo) - Libr. NE Mty.	x			C	2	4	4	60	PAV	FAIR	3.00	8,710			
											3.46	7,540	3.46	1,826	D
Libr. NE Mty. - Entr. Izq. Hidalgo	x			C	2	23	27	60	PAV	FAIR	13.80	7,190			
											13.80	7,180	13.80	1,811	D
											24.78	7,380			
Entr. Izq. Hidalgo - Entr. Izq. Espinazo	x			C	2	67	94	80	PAV	FAIR	24.78	5,715	24.78	1,768	D
											34.75	5,075			
											34.75	5,060	34.75	1,703	C
											91.90	3,240	91.90	1,703	C
Entr. Izq. Espinazo - Entr. (Saltillo-Moncl.)	x			C	2	80	174	80	PAV	FAIR	91.90	2,660			
													124.00	1,743	B
													172.00	1,809	B
Monterrey - Cd. Mier	54														
Monterrey - Apodaca	x			B	4	19	19	60	PAV	GOOD	0.00	53,040			
											19.12	23,100	19.12	7,098	A
Apodaca - Cerralvo	x			C	2	77	96	50	PAV	GOOD	19.12	19,430			
											28.15	4,690	28.15	2,009	C
											28.15	4,620			
											38.00	4,330	38.00	2,221	C
											95.95	2,890	95.95	2,171	C
Cerralvo - Cd. Mier	x			C	2	60	156	50	PAV	GOOD	95.95	2,575			
											115.80	2,311	115.80	2,080	B
													132.80	2,043	B
											156.21	2,331	156.21	2,225	B
Montemorelos - China	35														
Montemorelos - Entr. Der. La Joya	x			D	2	23	23	40	PAV	FAIR	0.00	3,670			
													17.60	1,180	C
											23.00	2,500	22.90	1,412	C
Entr. Der. La Joya - China	x			D	2	70	93	40	PAV	FAIR	68.23	1,810	68.23	1,412	B
											93.00	1,540	93.00	1,412	B
Cadereyta - Allende	-														
Cadereyta - Allende	x			D	2	34		40	PAV			5,320*		1,200	C
Monterrey - Reynosa	40														
Lib. Monterrey - Lomas de Pilares	x			C	2	26	26	50	PAV	FAIR	0.00	42,911			
											19.10	19,208	19.10	1,942	E
													25.70	1,985	E
Lomas de Pilares - Entr. Der. Tepehuaje	x			C	2	26	52	50	PAV	FAIR	33.00	9,654	33.00	1,985	D
Entr. Der. Tepehuaje - Gral. Bravo	x			C	2	73	125	50	PAV	FAIR	68.78	5,735	68.78	2,161	C
											86.40	5,720	86.40	2,161	C
											113.00	5,912	113.00	2,123	C
											125.00	5,998	125.00	2,071	C
Gral. Bravo - Reynosa	x			C	2	100	225	80	PAV	FAIR			186.40	1,283	D
											192.55	6,304			
											225.00	7,616	225.00	2,071	D
Monterrey - Nuevo Laredo	85														
Monterrey - Entr. Gral. Zuazua	x			A	4	28	28	80	PAV	FAIR	0.00	18,891			
											12.10	13,500			

Table 2.6
Features of Nuevo Leon Highways

Roadway Section Subsection	Jurisdiction			Type	# of lanes	Length/ km	Cum Length	Speed Limit km/hr	Rolling Surface	Service Index	Gauge		Capacity		Service Level
	Fed	State	Oth								Site km	TDPA	Site km	vph*	
											16.00	12,040	16.00	6,525	A
Entr. Gral. Zuazua - Cienega de Flores	x			A	4	5	33				16.00	10,920			
*Dato de 1990. * Vehiculos por Hora.											20.19	10,412			
Cienega de Flores - Entr. Anahuac	x			C	2	123	156	50	PAV	FAIR			28.16	6,525	A
													41.60	1,247	E
											78.23	5,038	78.23	1,472	C
													98.90	1,473	C
Entr. Anahuac - Entr. Cd. Mier	x			A	4	49	205	80	PAV	FAIR	124.00	4,073			
													184.50	2,207	C
Entr. Cd. Mier - Nuevo Laredo	x			A	4	22	227	80	PAV	FAIR	205.90	9,317	205.90	2,207	D
Monterrey - Anahuac - Nvo. Laredo		-									205.90	10,990	205.90	2,207	D
Monterrey - Anahuac - Nvo. Laredo		x		D	2	263			PAV		228.00	12,720	228.00	1,706	E
											0.00	420			
											2.40	640			
											50.30	520			
											68.00	1,820			
											99.00	1,925			
											139.00	2,025			
											170.75	2,030			
											176.50	2,070			
											176.50	2,130			
												227.90	2,150		
												242.50	2,150		
												255.70	3,530		
Monterrey - Reynosa(toll)	40D														
Monterrey - Cadereyta	x			A	4	33	33	110	PAV	GOOD					A
Cadereyta - Gral. Bravo			x	A	4	84	117	110	PAV	GOOD				6,700	A
Gral. Bravo - Entr. Reynosa			x	A	4	45	162	110	PAV	GOOD				6,700	A
Entr. Reynosa - Reynosa	x			A	4	46	208	110	PAV	GOOD					A
Monterrey - Linares															
Monterrey - El Cercado	x			B	4	38	38	60	PAV	GOOD	0.00	24,587			
											38.00	18,200			
El Cercado - Allende	x			B	4	22	60	60	PAV	GOOD	59.55	9,620			
Allende - Montemorelos	x			B	4	22	82	60	PAV	GOOD	59.55	9,687			
											82.00	9,525	82.00	5,070	B
Montemorelos - Linares	x			B	4	51	133	60	PAV	GOOD	82.00	6,283			
													116.00	1,305	D
													121.00	1,466	C
											133.00	6,780			
											133.00	3,930	133.00	1,466	C
Monterrey - Nuevo Laredo (toll)	85D														
Monterrey - Dist. Cienega de Flores	x			A	4	31	31	110	PAV		56.00	3,410		7,000	A
Dist. Cienega de F. - Dist. Agua Leguas			x	A	4	45	76	110	PAV		80.70	2,894		7,000	A
											100.00	2,413			
Dist. Agua Leguas - San Carlos			x	A	4	39	115	110	PAV		116.00	2,447		7,000	A
San Carlos - Entr. La Gloria			x	A	4	30	145	110	PAV		154.00	3,332		7,000	A
Entr. La Gloria - Entr. (Mty - Nvo. Laredo)			x	A	4	51	196	110	PAV		197.00	3,826		7,000	A
Entr. (Mty - Nvo. Laredo) - Nuevo Laredo	x					22	218	110	PAV						A
Monterrey - Saltillo	40														
Monterrey - Entr. Lib. Monterrey	x			A	4	29	29	80	PAV		14.20	15,696			
											16.74	16,291			
											25.20	17,820			
Entr. Lib. Monterrey - Ramos Arizpe	x			A	4	43	72	80	PAV		52.90	13,968			

Table 2.6
Features of Nuevo Leon Highways

Roadway Section Subsection	Jurisdiction			Type	# of lanes	Length/ km	Cum Length	Speed Limit km/hr	Rolling Surface	Service Index	Gauge		Capacity		Service Level	
	Fed	State	Oth								Site km	TDPA	Site km	vph*		
Ramos Arizpe - Saltillo Linares - Entr. San Roberto Linares - Entr. San Roberto	x			A	4	11	83	80	PAV		63.20	19,120				
											66.20	19,874				
											67.90	19,920				
											74.95	26,855				
	x			D	2	98			40	PAV		0.00	2,167			
												44.00	1,230			
												44.00	1,240			
												66.00	1,470			
												66.00	1,435			
												98.00	820			

*Vehicles per hour corresponding to capacity.

Table 2.7
Features of Tamaulipas Highways

Roadway Section Subsection	Jurisdiction			Type	# of lanes	Length/ km	Cum Length	Speed Limit km/hr	Rolling Surface	Service Index	Gauge		Capacity		Service Level					
	Fed	State	Oth								Site km	TDPA	Site km	vph*						
Ent. Las Urracas - Entr. (Mat.- Reynosa) Ent. Las Urracas - Entr. (Mat.- Reynosa)	97																			
	x			C	2	113	113	80	PAV	GOOD	41.00	2,050	44.80	2,052	B					
											84.80	2,381				84.80	2,052	B		
											91.50	2,420				113.25	2,725	113.25	2,137	B
González - Cd. Mante González - Cd. Mante	80																			
	x			C	2	59	59	50	PAV		0.00	2,700								
											26.50	2,103				59.00	2,787			
Estacion Manuel - La Coma Estacion Manuel - Aldama	180																			
	x			C	2	36	36	60	PAV	FAIR	0.00	2,797								
											36.00	2,112				69.00	1,820			
Aldama - Soto la Marina	x			C	2	112	148	60	PAV	FAIR	69.00	1,820								
Soto la Marina - La Coma	x			C	2	86	234	60	PAV	FAIR	145.00	1,870								
											145.00	2,083				231.00	1,640			
Cd. Victoria - Soto la Marina Cd. Victoria - Aeropuerto	70																			
	x			D	2	19	19	40	PAV	GOOD	0.00	1,590	18.50	2,203	B					
41.30											820	41.30				2,137	A			
Aeropuerto - Entr. Sotola Marina	x			D	2	98	117	40	PAV	GOOD	117.00	545	117.00	2,435	A					
Cd. Victoria - Matamoros Cd. Victoria - Santander de Jimenez	101																			
	x			A	2	97	97	80	PAV	GOOD	5.00	4,433								
											24.20	2,030				46.50	3,625	46.50	2,030	B
											64.00	2,030				80.05	4,249	97.00	3,424	97.00
Santander de Jimenez - La Coma	101			A	2	32	129	80	PAV	GOOD	129.00	4,324	129.00	2,074	C					
La Coma - San Fernando	180			A	2	46	175	80	PAV	GOOD	175.00	4,973	175.00	2,074	B					
San Fernando - Francisco Villa	180			A	2	20	195	80	PAV	GOOD	202.00	5,625	195.00	2,074	C					

Table 2.7
Features of Tamaulipas Highways

Roadway Section Subsection	Jurisdiction			Type	# of lanes	Length/ km	Cum Length	Speed Limit km/hr	Rolling Surface	Service Index	Gauge		Capacity		Service Level
	Fed	State	Oth								Site km	TDPA	Site km	vph*	
Francisco Villa - Entr. La Jarita	180			A	2	93	288	80	PAV	GOOD	233.00	2,937	233.00	2,127	B
													245.00	2,127	B
											254.50	3,446			
											254.50	3,821			
Entr. La Jarita - Matamoros	180			A	4	26	314	80	PAV	GOOD	312.00	6,865	300.00	2,127	B
Lauro del Villar - Reynosa	2												312.00	6,963	A
Lauro del Villar - Matamoros	x			C	2	38	38	60	PAV	GOOD	0.00	1,522			
											37.00	7,112	37.00	2,366	D
Matamoros - Empalme	x			A	2	38	76	80	PAV	GOOD	37.00	8,730			
													58.60	7,036	A
											75.00	4,905	75.00	7,080	A
Empalme - Rio Bravo	x			A	2	35	111				75.00	4,780			
											94.00	6,315			
											104.00	9,440			
Rio Bravo - Reynosa	x			A	4	25	136	80	PAV	GOOD	104.00	13,241	104.00	7,018	A
											122.65	24,305			
											135.00	36,854	135.00	7,156	B
Tampico - Llera de Canales	180														
Tampico - Altamira	x			A	4	24	24	80	PAV		24.00	14,787	24.00	1,185	E
Altamira - González	x			A	2	78	102	80	PAV		78.12	4,626	78.12	1,185	D
González - Llera de Canales	x			C	2	89	191	60	PAV	GOOD	96.00	2,700			
											96.00	2,630			
													154.00	1,804	B
											185.00	2,591	185.00	2,077	B
Cd. Mante - Cd. Victoria	85														
Cd. Mante - Entr. Gomez Farias	x			C	2	35	35	50	PAV		0.00	4,487	0.00	2,168	B
											12.00	3,510	12.00	2,168	B
											12.00	3,550			
													27.00	2,247	B
											35.00	1,935	34.84	2,065	B
Entr. Gomez Farias - Llera de Canales	x			C	2	42	77	50	PAV		35.00	1,950			
											72.00	3,508	72.00	629	E
Llera de Canales - Cd. Victoria	x			B	2	58	135	55	PAV		74.50	4,314	74.50	2,027	B
											134.00	4,385	134.00	629	E
Entr. Tula - Cd. Victoria	101														
Entr. Tula - Tula	x			A	2	180	180	80	PAV		0.00	1,080			
													5.00	904	C
											38.00	1,700	38.00	904	C
											41.95	1,516	41.95	904	B
											85.95	1,360	85.95	904	C
											112.68	1,417	112.68	1,141	B
											135.00	1,850	135.00	1,141	C
Cd. Victoria - Linares	85														
Cd. Victoria - El Barretal	x			B	2	38	38		PAV		0.00	5,910			
													9.85	2,133	C
											19.60	5,250	19.60	2,133	C
											27.35	4,823	27.35	2,006	C
											39.00	4,100	39.00	2,033	C
													48.40	2,033	C
											77.50	3,400	77.50	1,232	C
El Barretal - Villagrán	x			B	2	68	106		PAV		106.00	3,502	106.00	1,466	C
											118.00	2,850	118.00	1,466	C
													126.00	1,466	B
Villagrán - Linares	x			B	2	49	155		PAV		154.00	3,930	154.00	1,819	D
Reynosa - Entr. (Mty. - Nuevo Laredo)	2														

Table 2.7
Features of Tamaulipas Highways

Roadway Section Subsection	Jurisdiction			Type	# of lanes	Length/ km	Cum Length	Speed Limit km/hr	Rolling Surface	Service Index	Gauge		Capacity		Service Level
	Fed	State	Oth								Site km	TDPA	Site km	vph*	
Reynosa - Cd. Camargo	x			B	2	65	65	60	PAV		0.00	5,731			
											35.68	3,515	35.68	2,290	C
											63.40	3,752	61.48	2,274	B
Cd. Camargo - Cd. Miguel Aleman	x			B	2	24	89	60	PAV		88.77	5,152	87.77	1,586	D
Cd. Miguel Aleman - Cd. Mier	x			B	2	15	104	60	PAV		102.35	1,915	102.35	1,628	B
Cd. Mier - Entr. (Mty. - Nuevo Laredo)	x			B	2	123	227	60	PAV		122.67	2,299	122.67	1,628	B
											205.50	790			
											205.50	910			
											221.08	2,876			
											180.00	5,041	227.00	1,344	C
		180.00	1,141	B											

*Vehicles per hour corresponding to capacity.

2.2.4 Domestic Road Freight Fleet

National Freight Truck Fleet

Currently, the total length of the roadway infrastructure consists of 303,261 kilometers, including 94,527 kilometers of paved rolling surface roads. Domestic freight fleet vehicles primarily use the paved surface roads. In 1994, the freight truck fleet consisted of 292,100 units, including 198,273 motor units (tractors) and 93,827 trailer units. This fleet transported 356.5 million tons of merchandise, averaging transport distances of 444 kilometers. The freight moved by the truck fleet, trailers, and semitrailers yielded an annual average of 1,798 tons per vehicle. (Ref. 6)

Border States Freight Truck Fleet

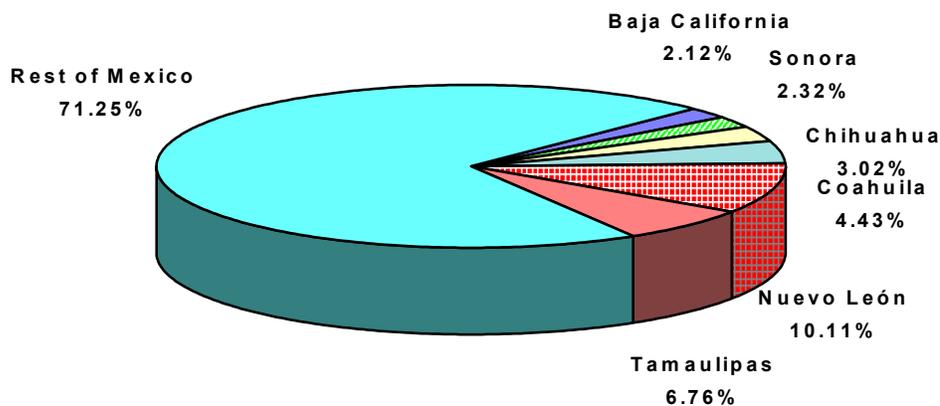
The freight truck fleet in the border states of Baja California, Sonora, Chihuahua, Coahuila, Nuevo Leon, and Tamaulipas in 1994 consisted of 83,977 units, including 76,634 units utilized for general freight and 7,343 utilized for specialized freight. These numbers include both motor and trailer units. (Ref. 6)

Table 2.8 shows the border states vehicle fleet, which collectively represents 28.75 percent of the national freight vehicles in federal public service (see Figure 2.9)

Table 2.8
Freight Truck Fleet in the Border States

State	General Freight Units (Total)	Specialized Freight Units(Total)	Vehicle Fleet Units (Total)
Baja California N.	5,867	315	6,182
Sonora	6,330	433	6,763
Chihuahua	8,543	282	8,825
Coahuila	11,446	1,487	12,933
Nuevo Leon	25,754	3,780	29,534
Tamaulipas	18,694	1,046	19,740
Total Border	76,634	7,343	83,977
Rest of Country	188,049	20,074	208,123
National Total	264,683	27,417	292,100

Figure 2.9 Freight Vehicle Percentage by Border State



SOURCE : SCT/DGTT

Passenger and Tourist Vehicle Fleet

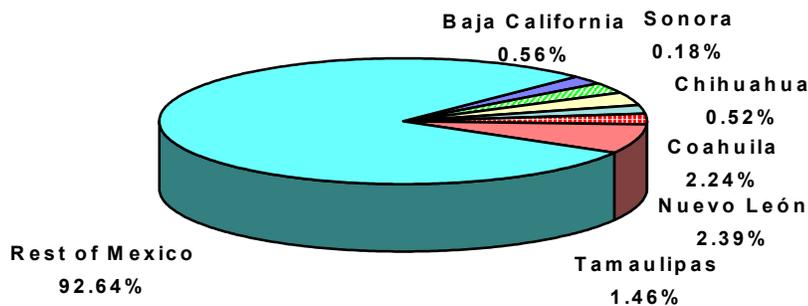
According to the sources consulted (Ref. 6), the 1994 vehicle fleet for interurban and tourist transport included 49,485 buses, of which, 44,109 were for passengers and 5,476 were for tourism. This fleet transported 2.636 billion passengers of which 210 million were passengers in specially registered tourist charter buses. Thus, the bus vehicle fleet produced 376,948 passenger-kilometers, with an average trip length of 143 kilometers. (Ref. 5, page 123 adjusted by La Empresa)

Table 2.9 lists the 1994 national passenger and tourism fleet total of 49,585 units, the six border states of northern Mexico total of 7.4 percent consisting of 3,650 units, and the remaining 92.6 percent, or 45,935 units, distributed in the country. (Fig. 2.10, Ref. 6)

Table 2.9
Passenger and Tourism Fleet in the Border States

State	Passenger Units	Tourism Units	Vehicle Fleet Units
Baja California N.	255	25	280
Sonora	86	4	90
Chihuahua	243	17	260
Coahuila	1,038	75	1,113
Nuevo Leon	1,016	168	1,184
Tamaulipas	723	0	723
Total Border	3,361	289	3,650
Rest of Country	40,748	5,187	45,935
National Total	44,109	5,476	49,585

Figure 2.10 Passenger and Tourism Vehicle Percentage by Border State



SOURCE : SCT/DGTT

Age of Vehicle Fleet for Binational Freight Transport

NAFTA implies the need for Mexico to have a competitive transport system, primarily supported by an efficient vehicle fleet comprising recent vehicle models.

In order to ascertain the age of the vehicle fleet engaged in binational transport, La Empresa analyzed the data bases of 19 origin-and-destination studies performed by the Secretariat for Communication and Transport in 1994 and 1995 on roads in northern Mexico that are important at the national and regional levels for international freight movement on the northern border. (Table 2.10).

Table 2.10
Origin-and-Destination Studies Analyzed

Date	Station	Road	Km
October 1994	Realito	Matamoros-Reynosa	17+500
October 1994	Samalayuca	El Sueco-Cd. Juarez	327+300
October 1994	Corona	Cd. Victoria Monterrey	23+800
October 1994	Rebeil	Hermosillo-Santa Ana	159+300
October 1994	Termoelectrica	Monclova-Piedras Negras	215+100
September 1994	La Joya	Cd. Victoria-Matamoros	180+000
October 1994	Rosarito	Tijuana-Ensenada (Cuota) (C)	35+000
October 1994	Puerto Nuevo	Tijuana-Ensenada (Libre) (L)	44+000
September 1994	Caserta	Monterrey-Nuevo Laredo (C)	100+000
September 1994	Palomas	Monterrey-Nuevo Laredo (L)	86+000
July 1995	Los Ramones	Monterrey-Reynosa (L)	88+000
July 1995	Los Herrera	Monterrey-Reynosa (C)	98+500
July 1995	Alto Del Mulato	Saltillo-Torreon	13+100
August 1995	Cd. Acuna	Morelos-Cd. Acuna	100+700
January 1994	Espuelas	Mazatlan-Culiacan	6+900
July 1995	Ventura	San Luis Potosi-Matehuala	33+400
June 1995	El Florido	Tecate-Tijuana (L)	155+300
July 1995	El 147	Tecate-Tijuana (C)	147+500
July 1995	Magdalena	Santa Ana-Nogales	178+000

Procedure

The tables presented here were designed on the following basis:

1. Data base record totals only reflect vehicles considered non-empty freight.
2. For each road, border towns were identified that were possible origins or destinations of trips, the towns being mandatory stops for the import or export of goods.
3. Differentiating the field relative to the classifications "Internal Market," "Not Declared," "Import," and "Export;" excluding all trips that were either of the first two options, then classifying the "Import" and "Export" complements in groups, based on information by vehicle type and model (year).

Table 2.11 illustrates the breakdown of the vehicle fleet engaged in roadway binational trade based on vehicle age, as follows: 41.75 percent of the vehicle fleet engaged in binational trade is less than five years old; 21 percent of the vehicles are between five and 10 years old, and 37.24 percent of the vehicles are over 10 years old.

Table 2.11
Age of the Vehicle Fleet Engaged in International Trade

Year	Vehicle Type *																		Total	%	% Cum.	% > Age
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18				
95	23	13			3			172	32	7	2		7						259	1.91%	1.91%	98.09%
94	191	59	3		7	5		824	115	2	5	10	19					1,243	9.15%	11.06%	88.94%	
93	188	76	4	1	6	7		945	128	1	1	4	37					1,401	10.32%	21.38%	78.62%	
92	178	84	7	3	6	4	1	1,143	205	2	3	2	20	2			2	1,662	12.24%	33.62%	66.38%	
91	118	57	2	1		5		750	139	2	1	6	21			1		1,104	8.13%	41.75%	58.25%	
90	84	47	2	2	3	4		416	89	2	4	1	8	1				663	4.88%	46.63%	53.37%	
89	65	22	2		1	1		487	70	1	5	1	5					665	4.90%	51.53%	48.47%	
88	41	7	1		1	3		439	51	1	2	1	11					559	4.12%	55.65%	44.35%	
87	26	9	2	1	1	2	1	379	59		1	2	11					494	3.64%	59.29%	40.71%	
86	39	12	1		3	3		364	41	1	1	1	5					471	3.47%	62.76%	37.24%	
85	42	17	1	1	5	9		581	44	1	1	3	6					711	5.24%	67.99%	32.01%	
84	35	19	1		1	4		389	38				7					494	3.64%	71.63%	28.37%	
83	19	15		2		5		138	7			1	2					189	1.39%	73.02%	26.98%	
82	26	29		1		1	1	366	59	1	1	2	5			1		493	3.63%	76.65%	23.35%	
81	32	35	4	1	2	3		445	90			1	2					616	4.54%	81.19%	18.81%	
80	35	31	3		1	1		382	51	2		2	4					512	3.77%	84.96%	15.04%	
79	29	18	3	1	1	3	1	292	39			1	3					392	2.89%	87.85%	12.15%	
78	30	21	1	1	1	1		225	38			1	1					319	2.35%	90.20%	9.80%	
77	15	12		1	1	3		115	22		3		1					173	1.27%	91.47%	8.53%	
76	12	21		1	2			181	43	2			4				1	267	1.97%	93.44%	6.56%	
75	22	21				6	1	152	26		2		4					234	1.72%	95.16%	4.84%	
74	7	14		1	2			107	16				1					149	1.10%	96.26%	3.74%	
73	5	11			1			38	9									64	0.47%	96.73%	3.27%	
72	6	9						62	11									88	0.65%	97.38%	2.62%	
71	4	8	1				1	48	6									68	0.50%	97.88%	2.12%	
70	4	13				1		39	11									69	0.51%	98.39%	1.61%	
69	3	6	1		1			21	1				1					34	0.25%	98.64%	1.36%	
68	6	6		1				9	3									25	0.18%	98.82%	1.18%	
67	3	6			2			19	6				1					37	0.27%	99.09%	0.91%	
66	1	2						8	2		1							14	0.10%	99.20%	0.80%	
65	1	4				1		13	2				1					22	0.16%	99.36%	0.64%	
64	1	7		1				13	1									23	0.17%	99.53%	0.47%	
63		1						8	3									12	0.09%	99.62%	0.38%	
62		1						10	1									12	0.09%	99.71%	0.29%	
61								7	1									8	0.06%	99.76%	0.24%	
60				1				2	2									5	0.04%	99.80%	0.20%	
59	1	2						2										5	0.04%	99.84%	0.16%	
58	1							3										4	0.03%	99.87%	0.13%	
57								3										3	0.02%	99.89%	0.11%	
56								1										1	0.01%	99.90%	0.10%	
55								5										5	0.04%	99.93%	0.07%	
54								1										1	0.01%	99.94%	0.06%	
53	1							1										2	0.01%	99.96%	0.04%	
52		1						4										5	0.04%	99.99%	0.01%	
51								1										1	0.01%	100.00%	0.00%	
50																		0	0.00%	100.00%	0.00%	
Totals	1,294	716	39	21	50	72	6	9,610	1,461	28	33	36	187	3	3	3	2	14	13,578			
%	9.53	5.27	0.29	0.15	0.37	0.53	0.04	70.78	10.76	0.21	0.24	0.27	1.38	0.02	0.02	0.02	0.01	0.10				

Vehicles up to 5 yrs old **41.75%**
 Vehicles 5 to 10 yrs **21.00%**
 Vehicles older than 10 yrs **37.24%**

1	C2	5	T2-S2	9	T3-S3	13	T3-S2-R4	17	T3-S2-R3
2	C3	6	T2-S3	10	T3-S1-R2	14	C3-R2	18	Others
3	C4	7	T2-S1-R2	11	T3-S2-R2	15	C3-R3		
4	T2-S1	8	T3-S2	12	T3-S2-R3	16	T3-S1-R3		

*C2 = 2 axle-single unit truck
 C3 = 3 axle-single unit truck
 C4 = 4 axle single unit truck
 T2 = 2 axle tractor
 T3 = 3 axle tractor
 S1 = 1 axle semi trailer
 S2 = 2 axle semi trailer
 S3 = 3 axle semi trailer
 R2 = 2 axle trailer
 R3 = 3 axle trailer
 R4 = 4 axle trailer

2.2.5 Short-and Medium-Term Program

The federal government, through the Secretariat for Communication and Transport, is directing a comprehensive modernization effort emphasizing the transport sector, utilizing the aid of private-sector participation.

The upgrading of the roadway transport infrastructure began between 1989 and 1994 with the National Superhighway Concession Program.

This modernizing process is to be continued from 1996 through 2000, focusing on three aspects:

- Increasing the network's capacity,
- Eliminating bottlenecks, and
- Improving user safety.

Implementing this modernization process will require establishing the proper designation of the primary users of each stretch of road, e.g. tourism commercial, mining, etc. and redefining the basic federal network, as well as expanding the high-specification superhighway network.

To coordinate the strategy for widening the network, 10 main trunk corridors for road transport have been defined, linking the country's largest production and consumption centers. See Figure 2.11.

The highest-priority segments of this network will soon be completed, thus improving the continuity of the existing network. The remainder of the network will be subject to routine programming of improvements or preventive maintenance.

Accordingly, the following projects of interest to binational trade in the border states currently underway include:

Baja California

Construction of the 60-kilometer Tecate-La Rumorosa facility necessary to complete the Tijuana-Mexicali four-lane highway. The 19-kilometer El Centinela-Mexicali project has been completed.

The four-lane 41-kilometer Mexicali link is under construction; however, work has been temporarily suspended.

Chihuahua

There are plans to demolish the existing Cordoba international bridge and replace it with a widened four-lane facility. Completion of this work is estimated to take two years.

Coahuila

The Monclova-Allende, a four-lane facility 180 kilometers in length, is under construction. It is part of the Mexico-Queretaro-San Luis Potosi-Salttillo-Piedras Negras main trunk corridor.

Tamaulipas

The Rio Bravo-Curva de Texas project, 55 kilometers in length consisting of four lanes, is under construction. It is part of the Mazatlan-Torreón-Salttillo-Monterrey-Reynosa main trunk corridor. The four-lane Curva de Texas-to-Matamoros project is complete.

In the medium term, in addition to maintenance activities, a priority will be to improve 300 kilometers of roadway segments within the 10 truck corridors currently awaiting modernization due to current service conditions and growing use.

In the long term, the missing facility links will be built, as necessary, to completely integrate the 10 trunk corridors mentioned in Section 2.2.1 to appropriate specifications.

Main Trunk Corridors

The 10 main trunk corridors are listed below and depicted on Figure 2.11.

1. Mexico-Guadalajara-Tepic-Mazatlan-Guaymas-Hermosillo-Nogales, with branches to Lazaro Cardenas and Tijuana.
2. Mexico-Queretaro-San Luis Potosi-Salttillo-Monterrey-Nuevo Laredo, with branches to Reynosa and Piedras Negras.
3. Queretaro-Irapuato-Leon-Lagos de Moreno-Aguascalientes-Zacatecas-Torreon Chihuahua-Ciudad Juarez.
4. Acapulco-Cuernavaca-Mexico-Pachuca-Tuxpan-Tampico-Matamoros.
5. Mexico-Puebla-Coatzacoalcos-Campeche-Merida-Cancun-Chetumal, with branches to Oaxaca and Chiapas.
6. Mazatlan-Durango-Torreon-Salttillo-Monterrey-Reynosa-Matamoros.
7. Manzanillo-Guadalajara-Lagos de Moreno-San Luis Potosi-Tampico.
8. Acapulco-Cuernavaca-Puebla-Veracruz.
9. Veracruz-Tampico-Monterrey.
10. Tijuana-Santa Rosalia-La Paz-Cabo San Lucas (transpeninsular).

Figure 2.11 Main Trunk Corridors

2.3 Railroads

2.3.1 General Facts¹

Mexico's rail system covers most of the country's territory with a radial structure of which the main trunk lines link the center of the country with the main ports and northern border cities.

The rail network belongs entirely to Ferrocarriles Nacionales de Mexico (Mexico National Railroads, or FNM, Spanish acronym) and is 26,477 kilometers long, of which 20,477 are main track, 4,460 kilometers are secondary track and 1,540 are private [sic]. It is made up entirely of wide (gauge) track with a 1.435-meter template. The national rail network is described in the Geographic Information System (GIS). Information from this system is shown on Figure 2.12.

The main lines are made up of 8,232 kilometers of modern track appropriate for carrying heavy traffic, with high-caliber rails with continuous welds and supported by concrete ties; 7,830 kilometers of classic track, with screwed-down rails, with 100 pounds per yard or more, fastened to wood ties by nails; and 4,435 kilometers of old track with low-caliber rails.

Three train control systems are used: The standard Train Order (OT) system that requires delivery of written orders to each train's crew, sent by the train dispatcher to the route stations by radio, selective telephone or telegraph. The Direct Traffic Control (CDT) system, based on direct radio communication between dispatcher and engineer, to protect stretches of track for movement of trains and other rail vehicles on a main track; and the Centralized Traffic Control system (CTC) that allows control of vehicle movement through signal lights and track switches by remote control from a central control center, with very smooth and safe train operation.

Currently, 13,487 kilometers of track operate with the OT system, 5,045 kilometers under the CDT train dispatch system, and only 1,945 kilometers of important, high-density-traffic lines are operating under the CTC system.

The most significant concerns facing the Mexican railroad system stem from the existing deficiencies in preventive maintenance of the rail lines; slow advances in reconstruction and modernization of infrastructure, acquisition of equipment and communication systems; decrease in fleet size and lack of sufficient equipment in order to move new freight. These deficiencies have influenced a limited coordination with other modes of transportation and the development of limited multimodal infrastructure.

In order to address these concerns, the railroad began a restructuring process in 1995. The process developed three regional railroads as trunk lines, a railroad that operates the Terminal Valle of Mexico and short railroads, of which the Chihuahua-Pacific has already been defined.

The infrastructure has been assigned as follows: 8,904 kilometers to the Ferrocarril Pacifico-Norte (FPN); 4,371 kilometers to the Ferrocarril del Noreste (FNE), 3,905 kilometers to the Ferrocarril del Sureste (FSE), 784 kilometers to the Ferrocarril Terminal Valle de Mexico (TVM) and the remaining 1,215 kilometers to various short-line railroads.

A significant action in the structural change contemplates the modifications to the Laws and Regulations that establish the legal framework for the segmentation of the railroad system into regional companies and existing or new short lines, as indicated in the previous paragraph.

¹Current situation and perspectives to the year 2000, Mexico National Railways, December 1994.

It is important to note that this structural change anticipates the participation of private investment through the bid concession process to the private sector invested to provide public railroad transportation services.

Recently, the concession of the Northeast Railroad was awarded, jointly, to the Maritime Mexican Transportation and the Kansas City Southern Railway companies. Currently, the bid of the Northern Pacific railroad and the Chihuahua-Pacific is in process.

The structural change has the objective of creating a safe, efficient, and competitive railroad system that, by means of the adoption and application of new technology, helps satisfy the needs of the economy and establish more close links with international markets.

With NAFTA, foreign trade has had a major upturn, reflected in growth of import-export traffic, which over the last few years has shown a annual mean growth of nine percent while domestic traffic has been stable.

Tables 2.12 through 2.16 identify specific railroad characteristics.

Figure 2.12 National Railroad Network

Table 2.12
Imports Number of Cars

Place	1990	1991	1992	1993	1994
Northern Border	120,130	128,809	156,191	158,853	160,971
Mexicali	1,337	1,328	199	66	1,510
Nogales	5,648	7,608	9,016	8,090	5,516
Cd. Juarez	9,896	11,549	16,913	19,975	18,898
Ojinaga	535	235	404	269	470
Piedras Negras	18,108	15,959	16,832	18,168	19,144
Nuevo Laredo	75,290	83,399	100,586	100,007	98,530
Matamoros	9,316	8,731	11,241	12,278	16,903

Source: E-6 1990-1994 FNM Information

Table 2.13
Imports Tons

Place	1990	1991	1992	1993	1994
Northern Border	7,429,185	7,888,699	9,899,523	10,419,323	11,078,164
Mexicali	71,129	68,006	10,637	3,593	77,592
Nogales	355,424	473,455	598,629	604,972	408,016
Cd. Juarez	620,775	721,478	1,143,531	1,438,625	1,500,240
Ojinaga	35,134	18,543	26,622	20,611	40,461
Piedras Negras	1,066,356	808,174	909,676	883,353	1,012,359
Nuevo Laredo	4,675,320	5,205,593	6,411,092	6,609,643	6,716,762
Matamoros	605,047	593,450	799,336	858,526	1,322,734

Source: E-6 1990-1994 FNM Information

Table 2.14
Exports Number of Cars

Place	1990	1991	1992	1993	1994
Northern Border	45,894	49,375	49,769	72,774	66,203
Mexicali	3,061	0	950	792	504
Nogales	12,180	14,304	16,870	17,302	18,455
Cd. Juarez	8,202	4,678	3,670	4,739	417
Ojinaga	4	0	0	0	0
Piedras Negras	1,390	10,395	8,969	14,055	13,476
Nuevo Laredo	18,988	18,643	17,340	33,261	26,891
Matamoros	2,069	1,355	1,970	2,625	2,460

Source: E-6 1990-1994 FNM Information

Table 2.15
ExportsTons

Place	1990	1991	1992	1993	1994
Northern Border	2,373,831	1,914,082	1,884,514	2,686,903	2,428,423
Mexicali	136,090	0	38,057	30,433	24,831
Nogales	479,212	485,628	574,007	612,689	548,745
Cd. Juarez	521,406	279,849	198,974	286,464	256,203
Ojinaga	309	0	0	0	0
Piedras Negras	378,555	394,985	342,508	547,394	537,626
Nuevo Laredo	716,694	667,400	603,091	1,082,879	891,151
Matamoros	141,565	86,220	127,877	127,044	169,867

Source: E-6 1990-1994 FNM Information

Table 2.16
Rail Border Crossings

Countries		
Mexico	USA	Border Crossing
Tamaulipas	Texas	Matamoros-Brownsville Nuevo Laredo-Laredo
Coahuila	Texas	Piedras Negras-Eagle Pass
Chihuahua	Texas	Ojinaga-Presidio Cd. Juarez-El Paso
Sonora	Arizona	Nogales-Nogales
Baja California	California	Mexicali-Calexico Tijuana-San Ysidro

Source: E-6 1990-1994 FNM Information

2.3.2 Border Network

The railroads providing access to the U.S. include the Ferrocarril Pacifico-Norte (FPN), the Ferrocarril Noreste (FNE), and the Ferrocarril Chihuahua-Pacifico (CHP).

In addition, the special case of the Tijuana-Tecate railway should be noted; it is ceded in concession to an American company, San Diego Imperial Valley and crosses U.S. territory from Tijuana to San Ysidro.

Ferrocarril Noreste

The Ferrocarril Noreste (FNE), illustrated on Figure 2.13, operates the line linking Monterrey and the center of the country to the border ports of Nuevo Laredo and Matamoros. The Monterrey-Nuevo Laredo line maintains significant traffic, which has led to its receiving special attention, keeping the line in excellent condition. It requires no added ballast, besides being a modern track with welded rail on concrete ties.

The FNE connects Nuevo Laredo to the Tex-Mex and Union Pacific railroads and Matamoros to the Union Pacific and Southern Pacific, capturing approximately 65 percent of cross-border traffic, operating 186 locomotives of the 373 total utilized to operate the network. Table 2.17 lists the locomotives assigned to the border region (FNE).

Table 2.17
Locomotives Assigned to Border Region (FNE)

Division/Train	Number of Locomotives
Major-itinerary passenger trains	7
Major-itinerary freight trains	105
Monterrey	74
Subtotal	186
Remainder	187
Total	373

The unit trains for foreign trade observed during the first quarter of 1996 are shown in Table 2.18.

Table 2.18
Train Units Driven Across the Border (January through March 1996)

Border	Type of Train	# of Trains	Product	Tons/Train	Cars/Train
Nuevo Laredo	Unit	3/day	Automotive	3,300	47
	Unit	2/wk	Intermode	2,470	47
	Express	2/day	Various	3,450	80

Figure 2.13 Mexican Railroad System

Ferrocarril Pacifico-Norte

The Ferrocarril Pacifico-Norte (FPN) connects with Southern Pacific Railways in Mexicali, Nogales, Cd. Juarez and Piedras Negras and with the Burlington-Santa Fe and Union Pacific in Cd. Juarez, thus capturing the remainder of international traffic. (Figure 2.14)

Table 2.19 illustrates the assignment of locomotives to border train service:

**Table 2.19
Locomotives Assigned to Border Region (FPN)**

Division/Train	Number of Locomotives
Major-itinerary passenger trains	20
Major-itinerary freight trains	95
Sonora	64
Monclova	49
Baja California	17
Chihuahua	18
Torreon	17
Subtotal	280
Others	217
Total	497

FPN has assigned 280 locomotives out of a total of 497 it has for its entire operation. Unit trains crossing the border during the first quarter of 1996 are shown in Table 2.20.

**Table 2.20
Train Units Driven Across the Border (January through March 1996)**

Border	Type of Train	# of Trains	Product	Tons/Train	Cars/Train
Nogales	Unit	4/wk	Automotive	2,000	30
	Unit	2/wk	Cement	4,217	39
	Unit	2/wk	Vegetables	1,417	46
Piedras Negras	Unit	2/wk	Automotive	2,870	51
	Unit	2/wk	Intermodal	2,938	62

Figure 2.14 Mexican Railroad System

Ferrocarril Chihuahua-Pacífico

The Ferrocarril Chihuahua-Pacífico connects at Ojinaga with the South Orient. (Figure 2.15)

Because of light demand, only four locomotives are assigned to the Chihuahua-Ojinaga link. It should be noted that the Nuevo Casas Grandes-to-Cd.Juarez link is currently out of operation because it was not cost effective.

This railroad was utilized to carry products toward the Port of Topolobampo. In addition, it provided tourist service to the Barranca del Cobre area which is famous for its natural beauty.

Figure 2.15 Mexican Railroad System

2.3.3 Features

The Secretariat of Communication and Transportation's Geographic Information System (GIS) has data detailing several rail links comprising the national railroad network.

Table 2.21 illustrates the rail link features accessing border ports and those that connect with the U.S. rail network. The features describe the links that have been upgraded/updated to 1994.

Based on data obtained from Ferrocarriles de Mexico, the following features were captured in the GIS for the border rail network links.

Length	Information provided for each 200-km-deep strip of territory adjacent to the border area.
Autonomous Railroad	Designation given to the railroads that were created as a result of FNM's administrative and operational restructuring.
Line	Letter that indicates the line to which the stretch belongs.
Control	Type of traffic control for crossing operation. CDT = direct traffic control OT = train orders
Slope	Maximum slope climbing northward or southward; in percentages.
Maximum Curve	Degree of curve; in metric system
Tonnage Allowed	Gross weight of four-axle cars allowed on the stretch.
Physical State	The FNM classification system has been simplified to "good", "fair", "poor".
Top Speed	As projected, according to the degree of curve in kilometers per hour.
Number of Trains	Number of trains observed, in both directions.
Potential Capacity	Number of trains-per-day that can circulate in both directions considering maximum transit time between passing tracks as factored by an efficiency coefficient.

**Table 2.21
Stretches of Rail That Feed Border Ports**

Segment Subsegment	Length Km.	Autonomous Railroad	Line	Control	Slope %		Maximum Curve	Allowed Tons	Physical State	Top Speed km/hr	Number of Trains	Potential Capacity
					North	South						
Monterrey-Nvo. Laredo	266.2	FNE	B	CDT	1.5	1.0	5.0	127	Good	48.8	25	33
Monterrey-Reynosa	243.4	FNE	F	CDT	0.7	0.7	2.0	120	Average	77.1	11	32
Reynosa-Matamoros	86.4	FNE	F	CDT	0.8	1.0	1.3	120	Average	94.6	10	30
Chihuahua-Ojinaga	267.5	CHP	Q	OT	1.6	1.6	4.0	110	Bad	54.6	5	30
Nogales-Hermosillo												
Nogales-Benjamin Hill	144.9	FPN	T	OT	2.0	2.0	6.7	110	Good	42.2	6	26
Benjamin Hill-Hermosillo	126.1	FPN	T	OT	0.8	0.4	2.6	110	Good	67.4	7	26
Mexicali-Puerto Peñasco	239.0	FPN	U	OT	1.3	1.3	4.0	110	Average	54.6	4	32
Chihuahua-Cd. Juarez	359.1	FPN	A	CDT	0.7	0.7	4.0	120	Good	54.6	4	36
Barroterán-Piedras Negras												
Barroterán-Sabinas	26.5	FPN	R	OT	0.9	1.0	3.0	120	Average	63	8.0	22
Sabinas-Allende	64.9	FPN	R	OT	1.0	1.0	5.0	120	Average	48.8	12.0	22
Allende-Piedras Negras	51.7	FPN	R	OT	0.0	1.0	4.0	120	Average	54.6	12.0	22
Tecate-Tijuana	58.9	*	UB	OT	0.0	1.4	8.6	80	Average	37.3		14

*Concession to San Diego-Imperial Valley [RR], a U.S. company.

2.3.4 Installations Near Border Crossings

Besides their function as route terminals, the terminal yards at the northern border are used to exchange hauling units with U.S. and Canadian railroads. Table 2.22 details the features of the terminals.

Table 2.22
Features of the Terminals

Terminal Yard	Autonomous Railroad	Physical		Operative		
		Length Track/Km	Capacity Cars (22 meters)	Trains/day	Classified Lots	Capacity Cars/Day
Matamoros	Noreste	6.45	267	6	13	481
Nuevo Laredo	Noreste	21.97	698	19	12	907
Piedras Negras	Pacifico Norte	14.92	465	8	9	814
Ojinaga	Chihuahua-Pacifico	13.00	336	3	5	588
Cd. Juarez	Pacifico-Norte	15.77	586	4	10	1,026
Nogales	Pacifico-Norte	22.10	909	6	6	1,591
Mexicali	Pacifico-Norte	21.92	872	4	3	1,526

The FNE's yards at Nuevo Laredo and Matamoros cannot handle the large volume of traffic that moves through the northern border (65% of the borderwide volume through these ports). The problems brought about by the lack of physical and operating capability cause serious problems with the grain trains handled there.

2.3.5 Transfer Terminals

New worldwide transport technologies, based on containers and piggy-back (trailers on flatcars) have stimulated the development of infrastructure with appropriate equipment to efficiently handle changes in transport mode for (intermodal) door-to-door delivery. Table 2.23 lists the transfer terminals.

Table 2.23
Transfer Terminals

Location	Investment	Owner
Grain Terminals		
La Laguna Torreon, Coahuila	Private	Ferropuerto Laguna, S.A.
Morales, Nuevo Leon	State	Boruconsa
Matamoros, Tamaulipas	Private	Korrel, S.A.
Multimodal Terminals		
Monterrey, Nuevo Leon	State and Private	Ferrocarriles Nacionales de Mexico
Ramos Arizpe, Coahuila	Private	General Motors
Automotive Terminals		
Hermosillo, sonora	Private	Ford
Ramos Arizpe, Coahuila	Private	General Motors
La Encantada, Coahuila	Private	Chrysler

2.3.6 Short- and Medium-Term Programs

Investment programs for freight rail transport include the following:

Signals Program 1995-2000

- Install the CDT direct control system on the Piedras Negras-Ramos Arizpe link
- Install CTC centralized traffic control system on the Monterrey-Nuevo Laredo link

Rehabilitation With New Rail, 1995-2000

- Mocho-Cd. Juarez
Altavista-Matamoros

Bridge Reinforcement Program, 1995-2000

- Reinforcement of 360 bridges along the Sufragio-Nogales link

Program for Multimodal Terminals Financed and Operated by Private Parties, 1995-2000

- Construction of interior multimodal terminals in Hermosillo, Sonora, and Chihuahua, Chihuahua.
- Expansion of the Monterrey, Nuevo Leon, terminal
- Construction of automotive terminals at Chihuahua, Chihuahua, and Apodaca, Nuevo Leon.
- Construction of grain terminals at Chihuahua, Chihuahua, Monterrey, and Rio Bravo, Tamaulipas.

2.4 Seaports

2.4.1 General Facts

The Mexican port system consists of 76 seaports and nine river ports including 31 that sustain domestic or international trade and serve the country's main centers of production and consumption. The remainder are fishing or tourist ports. Figure 2.16 (page 66) illustrates the 24 primary seaports in Mexico.

The commercial ports contain 76.4 kilometers of docks, 2.3 million square meters of yard storage space, 341,000 square meters of warehouses, and 7.5 million square meters of government areas. (Ref. 14)

2.4.2 Statistical Data

Evolution of Foreign Trade in Non-Petroleum Products by Transport Mode

The Instituto Mexicano del Transporte (IMT) has analyzed the participation of each transport mode in the distribution of the international flow of non-petroleum products. Table 2.24 reflects the 1992 transport mode percentage base on Mexico's historical trade flow. Of Mexico's 63 million tons of 1992 foreign trade transported, 54.5 percent was by sea, 27.2 percent was by road, and 18.3 percent was by rail. Air freight was insignificant. (Ref. 5)

Table 2.24
Historical Trade Flow by Mode of Transportation

Mode(1)	Imports					Exports					Total				
	1988	1989	1990	1991	1992	1988	1989	1990	1991	1992	1988	1989	1990	1991	1992
Road	6,410	6,290	7,992	8,694	13,118	6,262	7,231	4,438	7,157	4,095	12,672	13,521	12,430	15,851	17,213
Percent of Total (2)	29.5%	25.1%	26.8%	29.8%	35.1%	23.5%	27.4%	17.4%	26.3%	15.8%	26.2%	26.3%	22.5%	28.1%	27.2%
Rail	5,594	6,850	7,180	7,787	9,704	1,905	2,062	2,447	1,944	1,917	7,499	8,912	9,627	9,731	11,621
Percent of Total (3)	25.7%	27.4%	24.1%	26.7%	26.0%	7.2%	7.8%	9.6%	7.1%	7.4%	15.5%	17.3%	17.4%	17.2%	18.3%
Sea	9,751	11,902	14,645	12,706	14,567	18,474	17,134	18,653	18,156	19,944	28,225	29,036	33,298	30,862	34,511
Percent of Total (4)	44.8%	47.5%	49.1%	43.5%	39.0%	69.3%	64.8%	73.0%	66.6%	76.8%	58.3%	56.4%	60.2%	54.7%	54.5%
Air(5)	n.s.														
Total (6)(7)	21,755	25,042	29,817	29,187	37,389	26,641	26,427	25,538	27,257	25,956	48,396	51,469	55,355	56,444	63,345
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Notes:

- Neither petroleum nor its derivatives are included in any of the modes.
- Road transport data are from IMT estimates. Calculated by subtracting the amounts moved by rail and sea from the total amount of traded goods.
- Rail data refers only to freight movement across land borders. They come from official records in the E-6 Import-Export Customs report, ed. 1989, 1990, 1991 and 1992 by Ferrocarriles Nacionales de Mexico.
- The data for shipping are from official records obtained from the publication *Movimiento de Carga y Buques (Cargo and Ship Movement)*, ed. 1989, 1990, 1991, 1992 by the General Directorate of Ports and Merchant Marine (Direccion General de Puertos y Marina Mercante, SCT).
- Tonnage shipped by air is considered insignificant.
- The data for total weight of products imported and exported was estimated from statistical reports in the *BANCOMEXT'S* magazine, Comercio Exterior. The estimate includes the weight of merchandise reported by the source in tons plus the weight of products reported in heterogeneous measurement units.
- Does not agree with previous IMT editions, due to corrections in calculation.

Sources: Ferrocarriles Nacionales de Mexico
 Direccion General de Puertos y Marina Mercante, SCT
 Comercio Exterior (Foreign Trade) magazine, June 1990, May 1992, April 1993
 Banco Nacional de Comercio Exterior (National Bank for Foreign Trade) SNC.

Evolution of Mexico's Foreign Trade Shipping by Continent

Table 2.24 lists the traditional dominance of shipping in the transport of non-petroleum products in foreign trade. Shipping accounted for 39 percent of imports and 77 percent of exports of the tonnage moved for each of these flows in 1992. Including tonnage for petroleum and derivatives, which total 84.5 million tons, merchandise shipped by sea was almost 119 million tons, 21.5 million tons of which were for imports and 97.5 million tons for exports.

Table 2.25 illustrates the evolution of Mexico's seaborne foreign trade, by continent. Note that 1992 continued the pattern of foreign trade in which most of the flow is with other countries on the American continent: these exports and imports represent 69 percent of the 119 million tons—including petroleum and its derivatives—moved by sea. (Ref. 5)

Table 2.25
Evolution of Mexico's Foreign Trade Shipping, by Continent (in thousands of tons)

Country	Imports							Exports							Total							MAGR 80-92
	1980 (2)	1986 (2)	1988 (2)	1989	1990 (3)	1991	1992	1980	1986 (2)	1988 (2)	1989	1990 (3)	1991	1992	1980 (2)	1986 (2)	1988 (2)	1989	1990 (3)	1991	1992	
America	9,163 73.2%	7,075 73.6%	10,982 79.1%	13,933 80.3%	12,741 72.9%	14,391 75.5%	16,790 78.0%	37,422 71.2%	61,841 71.6%	56,054 60.3%	55,334 63.6%	55,961 63.1%	57,783 61.2%	65,294 67.0%	46,585 71.6%	68,916 71.8%	67,036 62.7%	69,266 66.4%	68,701 64.7%	72,174 63.6%	82,084 69.0%	4.8%
Europe	1,613 12.9%	1,030 10.7%	951 6.8%	1,361 7.8%	1,886 10.8%	2,217 11.6%	2,362 11.0%	7,373 14.0%	11,375 13.2%	19,444 20.9%	16,260 18.7%	18,087 20.4%	21,075 22.3%	19,460 20.0%	8,986 13.8%	12,405 12.9%	20,395 19.1%	17,621 16.9%	19,973 18.8%	23,292 20.5%	21,822 18.3%	7.7%
Asia	731 5.8%	334 3.5%	526 3.8%	668 3.8%	1,099 6.3%	1,054 5.5%	1,286 6.0%	7,714 14.7%	12,956 15.0%	16,561 17.8%	14,897 17.1%	14,273 16.1%	15,323 16.2%	12,632 13.0%	8,445 13.0%	13,290 13.9%	17,087 16.0%	15,564 14.9%	15,372 14.5%	16,377 14.4%	13,918 11.7%	4.3%
Africa	899 7.2%	834 8.7%	1,209 8.7%	1,168 6.7%	1,413 8.1%	1,191 6.2%	846 3.9%	20 0.038%	153 0.2%	928 1.0%	405 0.5%	203 0.2%	183 0.2%	50 0.1%	919 1.4%	987 1.0%	2,137 2.0%	1,573 1.5%	1,617 1.5%	1,374 1.2%	896 0.8%	-0.2%
Australia	115 0.9%	343 3.6%	217 1.6%	230 1.3%	333 1.9%	216 1.1%	236 1.1%	6 0.011%	13 0.015%	30 0.032%	106 0.1%	190 0.2%	76 0.1%	28 0.0%	121 0.2%	356 0.4%	247 0.2%	336 0.3%	523 0.5%	292 0.3%	264 0.2%	6.7%
Total	12,521 100%	9,616 100%	13,885 100%	17,359 100%	17,472 100%	19,069 100%	21,520 100%	52,535 100%	86,338 100%	93,017 100%	87,001 100%	88,714 100%	94,440 100%	97,464 100%	65,056 100%	95,954 100%	106,902 100%	104,360 100%	106,186 100%	113,509 100%	118,984 100%	5.2%

Notes

1. Includes petroleum and derivatives
2. Does not agree with previous IMT manuals owing to corrections by the source.
3. Imports amounted to 17.5 million tons and exports to 88.7 million tons, a total of 106.2 million tons. Does not agree with Tables 16 and 17 in which the total is 107.9 million tons, as the origin or destination of the cargo difference is unknown.

MAGR = Mean Annual Growth Rate, Spanish acronym

Source: Direccion General de Puertos y Marina Mercante, SCT
 Direccion General Marina Mercante, SCT.

Main Countries of Origin and Destination of Mexico's Seaborne Foreign Trade

Table 2.26 illustrates the pattern of Mexico's seaborne foreign trade with the countries that constitute the primary source and destination of products (including petroleum and derivatives). (Ref.5)

Note that in 1992, the U.S. remained Mexico's main trade partner, exchanging 10.6 million tons, 49.5 percent of our imports, and 54.7 million tons of export, the equivalent of 56.1 percent, by sea.

Table 2.26 also details trade between countries: the U.S. exported five tons for each ton imported, Japan received one ton for every eighteen exported, and Spain imported one ton for every 34 exported. On a global average, for each ton entering Mexico by sea, five go out. If petroleum and its derivatives are excluded, the proportion tends to balance, given the fact that for each ton imported, 1.4 tons are exported. (Ref. 5)

Though the above numbers show a trade balance favorable to Mexico in terms of tons shipped by sea, it should be kept in mind that the trade balance in monetary terms was unfavorable to Mexico by more than \$13 billion in 1993 considering all transport modes, including petroleum, its derivatives, and maquiladoras. This is due to the difference in economic density (value by weight) between products imported and exported. (Ref. 5)

Table 2.26
Main Countries of Origin and Destination of Mexico's Foreign Trade by Sea (1) (in thousands of tons)

Country	Imports										Country	Exports									
	1988(2)		1989		1990		1991		1992			1988(2)		1989		1990		1991		1992	
	Ton	%	Ton	%	Ton	%	Ton	%	Ton	%		Ton	%	Ton	%	Ton	%	Ton	%	Ton	%
1. United States	7,904	56.9%	10,661	61.4%	9,571	50.3%	10,335	54.2%	10,646	49.5%	1. United States	49,864	53.6%	49,716	57.1%	49,699	55.9%	51,527	54.6%	54,720	56.1%
2. Canada	1,022	7.4%	527	3.0%	374	2.0%	687	3.6%	1,640	7.6%	2. Spain	10,801	11.6%	10,195	11.7%	11,307	12.7%	13,649	14.5%	12,911	13.2%
3. Peru	n.d.		n.d.		n.d.		n.d.		1,230	5.7%	3. Japan	13,268	14.3%	12,163	14.0%	10,669	12.0%	11,520	12.2%	9,146	9.4%
4. Brazil	424	3.1%	801	4.6%	596	3.1%	686	3.6%	782	3.6%	4. Canada	981	1.1%	1,317	1.5%	1,051	1.2%	1,190	1.3%	1,952	2.0%
5. Morocco	1,167	8.4%	1,009	5.8%	936	4.9%	720	3.8%	698	3.2%	5. Brazil	n.d.		n.d.		n.d.		n.d.		1,816	1.9%
6. Germany	293	2.1%	458	2.6%	404	2.1%	576	3.0%	651	3.0%	6. France	4,551	4.9%	2,650	3.0%	2,983	3.4%	2,670	2.8%	1,632	1.7%
7. Venezuela	n.s.		n.s.		527	2.8%	413	2.2%	498	2.3%	7 Israel	2,038	2.2%	1,755	2.0%	1,502	1.7%	1,522	1.6%	1,495	1.5%
8. Japan	271	1.9%	275	1.6%	327	1.7%	426	2.2%	486	2.3%	8. Portugal	695	0.7%	534	0.6%	539	0.6%	921	1.0%	1,321	1.4%
9. Argentina	255	1.8%	316	1.8%	604	3.2%	710	3.7%	443	2.1%	9. Cuba	n.d.		n.d.		n.d.		n.d.		1,272	1.3%
10. Spain	n.s.		n.s.		249	1.3%	254	1.3%	377	1.8%	10. Dominican Republic	841	0.9%	758	0.9%	770	0.9%	1,051	1.1%	1,158	1.2%
11. Belgium	185	1.3%	233	1.3%	332	1.7%	314	1.6%	364	1.7%	11. Holland	397	0.4%	1,313	1.5%	1,936	2.2%	703	0.7%	877	0.9%
12. Poland	n.s.		n.s.		251	1.3%	350	1.8%	185	0.9%	12. Jamaica	503	0.5%	388	0.4%	597	0.7%	516	0.5%	858	0.9%
13. Australia	178	1.3%	177	1.0%	259	1.4%	327	1.7%	182	0.8%	13. Belgium	1,464	1.6%	309	0.4%	502	0.6%	1,272	1.3%	822	0.8%
14. Chile	n.s.		n.s.		343	1.8%	145	0.8%	181	0.8%	14. South Korea	n.s.		n.s.		729	0.8%	686	0.7%	747	0.8%
Total Main Countries	11,697	84.0%	14,457	83.0%	14,774	78.0%	15,942	84.0%	18,363	85.0%		85,402	92.0%	81,099	93.2%	82,284	92.6%	87,226	92.4%	90,727	93.1%
Other Countries(2)	2,188	15.8%	2,902	16.7%	4,245	22.3%	3,127	16.4%	3,157	14.7%		7,615	8.2%	5,902	6.8%	6,613	7.4%	7,214	7.6%	6,737	6.9%
Total	13,885	100%	17,359	100%	19,019	100%	19,069	100%	21,520	100%		93,017	100%	87,001	100%	88,897	100%	94,440	100%	97,464	100%

Notes:

- includes petroleum and derivatives
- Does not agree with previous editions of the IMT manual due to corrections by source.

n.s = not significant

n.d.= not available

Source: Direccion General de Puertos y Marina Mercante, SCT
 Direccion General Marina Mercante, SCT

Evolution of Main Products Imported and Exported by Sea

Table 2.27 catalogs the most significant products imported and exported by sea during the period 1988 through 1992. (Ref. 5)

Imports for 1992 totaled 21.5 million tons. Petroleum and derivatives topped the list of the 20 most important products, accounting for 6.9 million tons, or 32.2 percent of imports. Bulk farm products totaled 25 percent, consisting primarily of sorghum, soy, wheat, corn, rape, and sunflower seed. General cargo accounted for only four percent of total tonnage imported by sea, primarily chemicals, scrap metal, vehicles and parts, sheet steel, wood, sugar, and steel bars. Bulk minerals totaled four percent of total imports, consisting primarily of phosphoric rock and ilmenite.

The 20 products considered primary export products totaled 97.5 million tons in 1992: petroleum and derivatives represented 79.9 percent; bulk minerals, such as salt, lime, gypsum, cement, urea, and zinc concentrates and copper, 14 percent; and general cargo, two percent of the total.

Table 2.27
Evolution of Main Products Imported and Exported by Sea (in thousands of tons)

Product	Imports								Product	Exports							
	1988		1990		1991		1992			1988		1990		1991		1992	
	Ton	%	Ton	%	Ton	%	Ton	%		Ton	%	Ton	%	Ton	%	Ton	%
1. Petroleum and Derivatives	4,061	29.2%	4,375	23.0%	6,217	32.6%	6,953	32.2%	1. Petroleum and Derivatives	74,543	80.1%	70,244	79.0%	76,305	80.8%	77,520	79.5%
2. Sorghum	263	1.9%	1,281	6.7%	1,576	8.3%	2,503	11.6%	2. Salt	5,508	5.9%	5,898	6.6%	5,129	5.4%	5,595	5.7%
3. Soy	361	2.6%	314	1.6%	454	2.4%	885	4.1%	3. Lime	n.s.		1,803	2.0%	2,504	2.7%	4,162	4.3%
4. Wheat	1,043	7.5%	325	1.7%	644	3.4%	884	4.1%	4. Gypsum	2,414	2.6%	2,609	2.9%	2,554	2.7%	2,524	2.6%
5. Phosph. Rock/Fertilizers	1,758	12.7%	1,968	10.3%	706	3.7%	662	3.1%	5. Liquid sulphur	1,058	1.1%	1,101	1.2%	1,246	1.3%	1,039	1.1%
6. Corn	1,926	13.9%	3,002	15.8%	1,256	6.6%	576	2.7%	6. Steel plate	n.s.		606	0.7%	509	0.5%	848	0.9%
7. Rapeseed	156	1.1%	232	1.2%	237	1.2%	301	1.4%	7. Cement	2,872	3.1%	1,502	1.7%	967	1.0%	837	0.9%
8. Sunflower seed	74	0.5%	127	0.7%	235	1.2%	199	0.9%	8. Urea	259	0.3%	466	0.5%	453	0.5%	495	0.5%
9. Chem. prods.	110	0.8%	127	0.7%	143	0.8%	198	0.9%	9. Sulphuric acid	n.s.		213	0.2%	214	0.2%	363	0.4%
10. Scrap metal	232	1.7%	203	1.1%	144	0.8%	185	0.9%	10. Zinc concentr.	132	0.1%	222	0.2%	238	0.3%	227	0.2%
11. Vehicles/parts	189	1.4%	128	0.7%	316	1.7%	150	0.7%	11. Dimethyl terephthalate	n.d.		189	0.2%	241	0.3%	201	0.2%
12. Sheet steel	n.s.		163	0.9%	185	1.0%	147	0.7%	12. Steel tubing	217	0.2%	249	0.3%	284	0.3%	157	0.2%
13. Sunflower oil	n.d.		n.d.		116	0.6%	140	0.7%	13. Ammonium phosphate	n.d.		396	0.4%	239	0.3%	134	0.1%
14. Ilmenite	92	0.7%	127	0.7%	151	0.8%	118	0.5%	14. Non-crystallizable honeys	278	0.3%	146	0.2%	219	0.2%	124	0.1%
15. Rapeseed oil	n.s.		104	0.5%	125	0.7%	92	0.4%	15. Fluorite	385	0.4%	260	0.3%	160	0.2%	123	0.1%
16. Wood	n.s.		41	0.2%	91	0.5%	91	0.4%	16. Terephthalic acid	111	0.1%	135	0.2%	124	0.1%	108	0.1%
17. Sugar	n.s.		1,308	6.9%	624	3.3%	56	0.3%	17. Copper concentr.	338	0.4%	107	0.1%	229	0.2%	15	0.0%
18. Steel bars	n.s.		n.s.		144	0.8%	51	0.2%	18. Beer	27	0.0%	44	0.0%	106	0.1%	12	0.0%
19. Alum. oxide	132	1.0%	132	0.7%	87	0.5%	2	0.0%	19. Sugar	189	0.2%	n.s.		223	0.2%	7	0.0%
20. Chemical ether	n.d.		n.d.		179	0.9%			20. Bulk sulphur	708	0.8%	226	0.3%	101	0.1%		
Total main products	10,397	74.9%	13,958	73.4%	13,630	71.5%	14,193	66.0%	Total Main Products	89,039	95.7%	86,414	97.2%	92,044	97.5%	94,491	96.9%
Other Products	3,488	25.1%	5,061	26.6%	5,438	28.5%	7,327	34.0%	Other Products	3,978	4.3%	2,483	2.8%	2,396	2.5%	2,973	3.1%
Total	13,885	100%	19,019	100%	19,069	100%	21,520	100%	Total	93,017	100%	88,897	100%	94,440	100%	97,464	100%

Notes:

1. Includes petroleum and derivatives

n.s. = not significant

n.d. = not available

Source: IMT projection based on data from Direccion General de Puertos y Marina Mercante, SCT.
 Direccion General Marina Mercante, SCT

Evolution of Containerization Regarding High-Seas General Cargo Movement

From its appearance in the 1950s, the container has had an important role in intermodal transport. The worldwide container boom generated handling technologies in intermodal terminals and the appearance of container-specialized terminals in seaports.

As a result of worldwide containerization, the need for handling container cargo was felt in Mexico, primarily for international shipping. In 1979, seven percent of general high-seas cargo was handled in containers. This growing tendency to use containers began in 1982, with 23 percent of international trade handled by container and a 42 percent increase by 1993, as shown in Table 2.28. (Ref.5)

Table 2.28
Evolution of Containerization Regarding High-Seas General Cargo Shipping
(in thousands of tons)

Type of cargo	1979	1982	1983	1984	1985(3)	1986	1987(3)	1988(3)	1989(3)	1990	1991	1992	1993	TCMA 79-93
Total General Deep-water cargo	3,741	3,816	3,451	3,760	3,481	3,601	4,194	4,700	5,443	7,271	7,148	8,208	8,547	6.1%
Total Container Cargo	266	891	851	910	1,025	1,153	1,534	1,958	2,272	2,855	2,981	3,241	3,606	20.5%
Percent of Total	7.1%	23.3%	24.7%	24.2%	29.4%	32.0%	36.6%	41.7%	41.7%	39.3%	41.7%	39.5%	42.2%	

Notes:

1. Includes perishables; does not include petroleum and derivatives nor bulk agricultural, nor minerals or fluids.
2. Includes loaded-container tare
3. Does not agree with previous IMT editions due to corrections by the source.

Source: Direccion General de Puertos y Marina Mercante, SCT.
 Direccion General Marina Mercante, SCT.
 Puertos Mexicanos, SCT

Evolution of Container Sea Cargo in Mexico

Container cargo movement through Mexican ports has grown steadily. In 1979, the ports handled a total of 27,095 containers compared to the 1993 total of 241,483 (83% loaded and 17% empty in 1993; 74% loaded and 26% empty in 1979).

The world tendency to use 40-foot (2 TEU) containers was reflected in Mexico starting in 1984. In 1984, of all containers moved, 25 percent were 40-footers and 75 percent were 20-footers (1 TEU). In 1993, 46 percent were 40-footers and 54 percent were 20-footers. (Ref. 5) Table 2.29 illustrates the evolution of container sea cargo in Mexico.

Mexico's position in handling container cargo, with 337,500 containers in 1992, is marginal: 15th among developing countries. Hong-Kong and Singapore are first, with over seven million TEUs per year. This group of developing countries handles somewhat more than a third of the world container cargo traffic. Industrialized countries handle much larger numbers. The U.S., for example, moved more than 15 million TEUs, and Japan about eight million TEUs per year.

Table 2.29
Evolution of Container Sea Cargo in Mexico(1)

	1979	1982	1983	1984	1985	1986	1987	1988	1989(2)	1990	1991	1992	1993	TCMA 79-93
Number of Containers														
Loaded Containers	20,022	52,576	42,505	52,686	61,627	67,448	90,967	116,492	132,189	158,421	176,614	186,808	200,551	17.9%
Percent of Total	73.9%	67.3%	65.1%	70.0%	74.3%	73.3%	76.1%	72.5%	79.4%	80.6%	81.6%	80.1%	83.0%	
Empty Containers	7,073	25,550	22,750	22,541	21,320	24,555	28,533	44,241	34,309	38,114	39,922	46,362	40,932	13.4%
Percent of Total	26.1%	32.7%	34.9%	30.0%	25.7%	26.7%	23.9%	27.5%	20.6%	19.4%	18.4%	19.9%	17.0%	
Total Number of Containers	27,095	78,126	65,255	75,227	82,947	92,003	119,500	160,733	166,498	196,535	216,536	233,170	241,483	16.9%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Number of TEUs														
20-Foot Containers	n.d.	51,821	40,715	56,382	56,649	63,463	76,556	104,424	120,255	119,921	133,946	128,762	130,015	8.7%
Percent of Total		66.3%	62.4%	74.9%	68.3%	69.0%	64.1%	65.0%	61.7%	61.0%	61.9%	55.2%	53.8%	
40-Foot Containers	n.d.	26,305	24,540	18,845	26,298	28,540	42,944	56,309	74,556	76,614	82,590	104,408	111,468	14%
Percent of Total		33.7%	37.6%	25.1%	31.7%	31.0%	35.9%	35.0%	38.3%	39.0%	38.1%	44.8%	46.2%	
Total TEUs	27,861	104,431	89,795	94,072	109,245	120,543	162,444	217,042	269,367	273,149	299,126	337,578	352,951	11.7%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	

Notes:

- Does not include containers handled within port areas in in-port stowage maneuvers nor raising or lowering to correct ship stowage plan. For the period 1979-1986, in-transit containers are not included; however, tare of loaded containers is included. For 1986 does not include in-transit containers nor tare of loaded containers.
- Does not agree with previous IMT editions due to corrections by the source.

Source: Direccion General de Puertos y Marina Mercante, SCT.
Direccion General Marina Mercante, SCT.
Puertos Mexicanos, SCT

Evolution of Container Sea Cargo Imports and Exports in Mexico

Table 2.30 lists the behavior of import-export fluctuations in seaborne general deep-water cargo for the period 1979 through 1993. Import cargo dominated until 1985; during the subsequent four years, exports dominated; and in recent years, the fluctuation has alternated.

Fluctuations in seaborne container cargo reveal that import cargo dominated until 1983, export cargo from 1984 to 1988, and imports again dominate between 1989 and 1993. Analyzing the period 1979 to 1993 reveals a mean annual growth rate of 31.4 percent for exports and over 24.2 percent for imports during the same period.

The average growth rate for loaded containers between 1979 and 1993 showed a tendency to increase, with a 23 percent mean annual growth rate for all containers, noting an imbalance of 34,895 between import loaded containers (totaling 82,828) and export loaded containers (totaling 117,723) for 1993.

Table 2.30
Evolution of Container Sea Cargo Imports and Exports in Mexico

General Deep Water Cargo (1,000s of tons) (1)	1979	1982	1983	1984	1985(3)	1986	1987(3)	1988(3)	1989(3)	1990(3)	1991	1992	1993	TCMA 82-93
In Imports	2,320.7	2,584.4	1,916.2	2,106.7	2,042.0	1,570.3	1,301.0	1,784.3	2,675.0	4,048.1	3,543.4	4,424.9	n.d.	
Percent of Total	62.0%	67.7%	55.5%	56.0%	58.7%	43.6%	31.0%	38.0%	49.1%	55.7%	49.6%	53.9%		
In Exports	1,420.7	1,231.2	1,534.7	1,653.3	1,439.0	2,031.0	2,893.0	2,915.4	2,768.2	3,222.7	3,604.2	3,782.6	n.d.	
Percent of Total	38.0%	32.3%	44.5%	44.0%	41.3%	56.4%	69.0%	62.0%	50.9%	44.3%	50.4%	46.1%		
Total Container Cargo	3,741.4	3,815.6	3,450.9	3,760.0	3,481.0	3,601.3	4,194.0	4,699.7	5,443.2	7,270.8	7,147.6	8,207.5	8,547.0	7.8%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Container Cargo (1,000s of tons) (2)	1979	1982	1983	1984	1985(3)	1986	1987(3)	1988(3)	1989(3)	1990(3)	1991	1992	1993	TCMA 79-93
In Imports	189.4	495.7	490.8	382.0	486.6	443.4	554.2	819.5	1,196.8	1,496.1	1,544.3	1,862.8	2,052.6	24.2%
Percent of Total	71.1%	55.6%	57.7%	42.0%	47.5%	38.5%	36.1%	41.8%	54.6%	54.6%	51.8%	57.5%	56.9%	
In Exports	77.0	395.2	360.1	528.4	538.3	709.3	979.5	1,138.7	996.3	1,242.0	1,436.6	1,378.1	1,552.9	31.4%
Percent of Total	28.9%	44.4%	42.3%	58.0%	52.5%	61.5%	63.9%	58.2%	45.4%	45.4%	48.2%	42.5%	43.1%	
Total Container Cargo	266.4	890.9	850.9	910.4	1,024.9	1,152.7	1,533.7	1,958.2	2,193.1	2,738.1	2,980.9	3,240.9	3,605.5	26.7%
	100%	100%	100%	100%	100%	100%	100%	100%	100%(4)	100%(4)	100%	100%	100%	
Number of Loaded Containers	1979	1982	1983	1984	1985(3)	1986	1987(3)	1988(3)	1989(3)	1990(3)	1991	1992	1993	TCMA 79-93
In Imports	14,053	29,549	21,729	23,675	32,282	30,432	39,389	54,890	78,013	93,743	101,983	113,663	117,723	21.3%
Percent of Total	70.2%	56.2%	51.1%	44.9%	52.4%	45.1%	43.3%	47.1%	59.0%	59.2%	57.7%	60.8%	58.7%	
In Exports	5,969	23,027	20,776	29,011	29,345	37,016	51,578	61,602	54,176	64,678	74,631	73,145	82,828	27.0%
Percent of Total	29.8%	43.8%	48.9%	55.1%	47.6%	54.9%	56.7%	52.9%	41.0%	40.8%	42.3%	39.2%	41.3%	
Total Loaded Containers	20,022	52,576	42,505	52,686	61,627	67,448	90,967	116,492	132,189	158,421	176,614	186,808	200,551	23.3%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	

Notes:

1. Includes perishables.
2. Includes tare of loaded containers.
3. Does not agree with previous IMT editions due to corrections by the source.
4. Does not agree with data from Tables 18 and 21, due to inconsistencies in the information.

Source: Direccion General de Puertos y Marina Mercante, SCT.
Direccion General Marina Mercante, SCT.

Evolution of Containerized Seaborne Cargo by Coast and Port

The six Gulf of Mexico ports listed in Table 2.31 contain the most significant movement of containerized seaborne cargo. In 1993, the ports moved more than 2.5 million tons, equivalent to 70 percent of the national total of shipments in this mode, compared to the seven Pacific ports, which handled 967,000 tons, or 27 percent of the national total.

The port of Veracruz moved the largest volume of containerized cargo: more than 1.6 million tons in 1993, totalling 46 percent of the cargo handled in containers on both coasts. Altamira and Tampico, combined, handled 23 percent of the total cargo, while, on the Pacific, the ports of Lazaro Cardenas, Manzanillo, Salina Cruz and Ensenada handled 929,000 tons, or 26 percent of total cargo.

Note that the ports of Veracruz and Altamira on the Gulf and Lazaro Cardenas and Manzanillo on the Pacific, which have terminals specialized for handling containers, handled a combined 82 percent of total cargo.

The decrease in container cargo at the port of Tuxpan reflects the government takeover of the Port of Veracruz begun on June 1, 1991, and the resulting improvement of services at the Veracruz port to become better equipped to handle containers, thus capturing the type of cargo previously utilizing Tuxpan.

After 1969, the decrease in containerized cargo at the port of Guaymas is attributed to the decline in sales of the Mazda-Ford vehicles produced at the Hermosillo, Sonora, plant and the company's decision to route Japanese parts through Ensenada, which reflects the transfer of that container cargo started in 1990.

Table 2.31
Evolution of Seaborne Containerized Cargo by Coast and Port (in thousands of tons)

	1979	1982	1984	1985	1986	1987	1988	1989(4)	1990(4)	1991(4)	1992	1993	TCMA 79-93
Gulf Ports													
1. Veracruz	126.2 47.4%	384.2 43.1%	268.3 29.5%	340.2 33.2%	315.3 27.4%	405.7 26.5%	576.0 29.4%	641.4 29.2%	862.1 31.5%	1,069.4 35.9%	1,376.0 42.5%	1,651.1 45.8%	20.2%
2. Altamira	-	-	-	-	56.4 4.9%	64.7 4.2%	179.2 9.1%	320.8 14.6%	388.4 14.2%	363.8 12.2%	552.8 17.1%	629.4 17.5%	-
3. Tampico	18.3 6.9%	76.5 8.6%	224.0 24.6%	243.3 23.7%	220.3 19.1%	297.1 19.4%	266.3 13.6%	197.0 9.0%	288.2 10.5%	264.9 8.9%	308.8 9.5%	189.8 5.3%	18.2%
4. Progreso	-	-	-	-	-	-	2.8 0.1%	6.3 0.3%	9.1 0.3%	16.1 0.5%	33.4 1.0%	54.1 1.5%	-
5. Tuxpan	105.2 39.5%	325.2 36.5%	156.5 17.2%	188.1 18.4%	206.4 17.9%	219.6 14.3%	227.2 11.6%	334.5 15.3%	417.2 15.2%	331.3 11.1%	168.8 5.2%	18.1 0.5%	- 11.8%
6. Coatzacoalcos (1)	-	7.1 0.8%	33.4 3.7%	24.1 2.4%	10.3 0.9%	1.1 0.1%	59.9 3.1%	36.0 1.6%	8.3 0.3%	5.8 0.2%	-	-	-
Gulf Subtotals	249.7	793	682.2	795.7	808.7	988.2	1,311.3	1,536.0	1,973.3	2,051.3	2,439.8	2,542.5	18.0%
Percent of Total	93.7%	89.0%	74.9%	77.6%	69.0%	52.7%	67.0%	70.0%	72.1%	68.8%	75.3%	70.5%	
Pacific Ports													
1. Lázaro Cárdenas	-	8.1 0.9%	41.1 4.5%	67.1 6.5%	61.1 5.3%	88.5 5.8%	154.4 7.9%	200.4 9.1%	198.3 7.2%	308.2 10.3%	322.9 10.0%	377.2 10.5%	-
2. Manzanillo	8.4 3.2%	14.3 1.6%	39.6 4.3%	40.9 4.0%	48.5 4.2%	69.0 4.5%	163.5 8.3%	179.0 8.2%	254.1 9.3%	278.0 9.3%	273.2 8.4%	276.1 7.7%	28.3%
3. Salina Cruz	-	66.1 7.4%	143.6 15.8%	114.3 11.2%	212.8 18.5%	299.8 19.5%	160.9 8.2%	171.6 7.8%	147.7 5.4%	172.0 5.8%	42.1 1.3%	199.9 5.5%	-
4. Ensenada	-	-	-	-	-	-	-	-	79.1 2.9%	105.1 3.5%	107.4 3.3%	75.6 2.1%	-
5. Mazatlán	4.1 1.5%	0.3 0.0%	2.0 0.2%	0.5 0.0%	7.7 0.7%	3.4 0.2%	21.4 1.1%	24.3 1.1%	39.7 1.4%	30.1 1.0%	18.4 0.6%	24.7 0.7%	13.7%
6. Acapulco	1.3 0.5%	1.1 0.1%	1.5 0.2%	6.0 0.6%	4.4 0.4%	5.3 0.3%	13.0 0.7%	28.2 1.3%	35.8 1.3%	27.0 0.9%	19.0 0.6%	13.4 0.4%	18.1%
7. Guaymas	2.6 1.0%	0.2 0.0%	-	-	9.2 0.8%	79.3 5.2%	133.7 6.8%	44.9 2.0%	-	0.8 0.0%	-	0.03 0.0%	-
Pacific Subtotals	16.4	90.1	227.8	228.8	343.7	545.3	646.8	648.4	754.7	921.3	783.0	966.9	33.8%
Percent of Total	6.2%	10.1%	25.0%	22.3%	29.8%	35.6%	33.0%	29.6%	27.6%	30.9%	24.2%	26.8%	
Other Ports													
	0.3	7.8	0.4	0.4	0.3	0.2	-	8.7	10.1	8.6	18.1	96.1	51.0%
Percent of Total	0.1%	0.9%	0.04%	0.04%	0.03%	0.01%	-	0.6%	0.4%	0.3%	0.6%	2.7%	
Total Containerized Cargo (2)	266.4	890.9	910.4	1,024.9	1,152.7	1,533.7	1,958.2	2,193.1	2,738.1	2,980.9	3,240.9	3,605.5	20.5%
Total in Ports with Specialized Terminals(3)	126.2	465.5	486.4	545.7	655.9	859.8	1,130.4	1,370.2	1,850.6	2,191.5	2,567.0	3,133.7	25.8%
Percent of Total	47.4%	52.3%	53.4%	53.2%	56.9%	56.1%	57.7%	62.5%	67.6%	73.5%	79.2%	86.9%	

Notes:

1. The container crane was transferred to Veracruz port in April, 1990.
2. Includes tare of loaded containers but not of containers in transit. Does not include containers handled within port facilities in port stowage maneuvers nor raising/lowering for correcting ship stowage plans.
3. The ports of Veracruz, Coatzacoalcos, Lazaro Cardenas, Salina Cruz and Altamira are included up to 1989. Starting with 1990, Manzanillo is included and Coatzacoalcos is dropped.
4. Does not agree with previous IMT editions due to corrections by the source.

Source: Direccion General de Puertos y Marina Mercante, SCT.
 Direccion General de Marina Mercante, SCT.
 Puertos Mexicanos, SCT

Evolution of Container Movement by Coast and by Port

Table 2.32, prepared by the Instituto Mexicano del Transporte for 1979 through 1993, shows the growth in the number of containers handled by the six Gulf and seven Pacific ports. In 1993, the six Gulf ports handled 140,000 containers and the seven Pacific ports approximately 58,000, combining to total 98.7 percent of all containers handled in the country's seaports. (Ref 5)

The Gulf port of Veracruz remains the most significant port, handling approximately 91,000 containers in 1993, capturing 45.3 percent of the total containers handled on both coasts. The ports of Altamira and Tampico handled 16.2 percent and 6 percent, respectively, of containers moved. Analyzing the mean annual growth rate (MAGR) for the ports of Altamira and Tuxpan revealed an MAGR for Altamira of 28.5 percent for the period 1986-93 and a decline of 26.3 percent in the MAGR at Tuxpan. The increase at Altamira first occurred in 1992 due to the start of three container cranes, resulting in the transfer of cargo from Tampico to Altamira. Tuxpan's MAGR decline reflected the transfer of cargo to Veracruz, which had also started to operate three container cranes in 1992.

Lazaro Cardenas serves as the main Pacific port, having handled 21,500 containers in 1993, approximately 10.7 percent of the total on both coasts. Manzanillo followed with 9.5 percent, and Salina Cruz placed third with 5.2 percent. The mean annual growth rate calculated by the number of containers handled on the Pacific for the period 1982 through 1993 was 22.6 percent. The relationship between the number of containers recorded in 1993 and those recorded in 1982 is nine, while for the Gulf the relationship over the same period was two [sic].

Table 2.32
Evolution of Container Movement by Coast and by Port (in number of containers)

	1979	1982	1985	1986	1987	1988	1989 (4)	1990	1991	1992	1993	TCMA 82-93
Gulf Ports												
1. Veracruz	12,987 47.9%	37,000 47.4%	24,927 30.1%	22,810 24.8%	28,553 23.9%	42,623 26.5%	40,160 24.1%	53,568 27.3%	66,532 30.7%	82,547 35.4%	90,922 45.3%	8.5%
2. Altamira	-	-	-	5,614 6.1%	4,738 4.0%	15,271 9.5%	20,192 12.1%	21,003 10.7%	20,934 9.7%	35,576 15.3%	32,446 16.2%	(5) 28.5%
3. Tampico	1,460 5.4%	11,107 14.2%	24,536 29.6%	21,039 22.9%	25,864 21.6%	20,543 12.8%	15,731 9.4%	21,445 10.9%	19,522 9.0%	21,939 9.4%	12,022 6.0%	0.7%
4. Progreso	-	-	-	-	-	391 0.2%	980 0.6%	1,204 0.6%	1,790 0.8%	3,644 1.6%	3,857 1.9%	-
5. Tuxpan	10,355 38.2%	22,534 28.8%	13,066 15.8%	14,183 15.4%	14,328 12.0%	16,013 10.0%	23,375 14.0%	29,962 15.2%	22,068 10.2%	10,611 4.6%	791 0.4%	-26.3%
6. Coatzacoalcos (1)	13 0.05%	952 1.2%	1,599 1.9%	715 0.8%	59 0.05%	4,143 2.6%	2,537 1.5%	375 0.2%	305 0.1%	-	-	-
Gulf Subtotals	24,815	71,593	64,128	64,361	73,542	98,984	102,975	127,557	131,121	154,317	140,038	6.3%
Percent of Total	91.6%	91.6%	77.3%	69.7%	53.9%	61.6%	61.8%	64.9%	60.6%	66.2%	69.8%	
Pacific Ports												
1. Lázaro Cárdenas	-	734 0.9%	5,907 7.1%	5,042 5.5%	7,147 6.0%	19,091 11.9%	22,734 13.7%	21,421 10.9%	27,576 12.7%	26,957 11.6%	21,478 10.7%	35.9%
2. Manzanillo	1,097 4.0%	1,405 1.8%	4,396 5.3%	5,561 6.0%	6,828 5.7%	15,903 9.9%	17,259 10.4%	21,488 10.9%	26,781 12.4%	28,147 12.1%	19,064 9.5%	26.8%
3. Salina Cruz	-	3,762 4.8%	7,869 9.5%	15,250 16.6%	23,938 20.0%	13,592 8.5%	11,849 7.1%	9,724 4.9%	13,299 6.1%	2,738 1.2%	10,483 5.2%	9.8%
4. Ensenada	-	-	-	-	-	-	-	5,796 2.9%	9,287 4.3%	13,719 5.9%	4,785 2.4%	-
5. Mazatlán	542 2.0%	32 0.04%	55 0.1%	457 0.5%	285 0.2%	1,563 1.0%	2,099 1.3%	3,843 2.0%	2,344 1.1%	902 0.4%	1,117 0.6%	38.1%
6. Acapulco	447 1.6%	185 0.2%	591 0.7%	434 0.5%	587 0.5%	1,488 0.9%	3,678 2.2%	5,111 2.6%	4,575 2.1%	3,594 1.5%	945 0.5%	16.0%
7. Guaymas	194 0.7%	14 0.02%	1 n.s.	898 1.0%	7,173 6.0%	10,112 6.3%	4,513 2.7%	-	4 n.s.	-	2 n.s.	-
Pacific Subtotals	2,280	6,132	18,819	27,642	45,958	61,749	62,152	67,383	83,866	76,057	57,874	22.6%
Percent of Total	8.4%	7.8%	22.7%	30.0%	38.5%	38.4%	37.3%	34.3%	38.7%	32.6%	28.9%	
Other Ports	-	401	-	-	-	-	1,371	1,595	1,549	2,796	2,639	18.7%
Percent of Total	-	0.5%	-	-	-	-	0.8%	0.8%	0.7%	1.2%	1.3%	
Total Containerized Carto(2)	27,095	78,126	82,947	92,003	119,500	160,733	166,498	196,535	216,536	233,170	200,551	8.9%
Total in Ports with Specialized Terminals (3)	13,000	42,448	40,302	49,431	64,435	94,720	97,472	127,204	155,122	175,965	174,393	13.7%
Percent of Total	48.0%	54.3%	48.6%	53.7%	53.9%	58.9%	58.5%	64.7%	71.6%	75.5%	87.0%	

Notes

- The container crane was transferred to Veracruz port in April, 1990.
- For 1979-1992 includes loaded containers and empty containers. For 1993, loaded containers only.
- The ports of Veracruz, Coatzacoalcos, Lazaro Cardenas, Salina Cruz and Altamira are included up to 1989. Starting with 1990, Manzanillo is included and Coatzacoalcos is dropped.
- Does not agree with previous IMT editions due to corrections by the source.
- MAGR for the period 1986-1993

n.s. = not significant

Source: Direccion General de Puertos y Marina Mercante, SCT.
 Direccion General Marina Mercante, SCT.
 Puertos Mexicanos, SCT

Evolution in Number of Passengers and Cruise Dockings at National Ports

Cruise passenger movement is concentrated in two ports on the Caribbean—Cozumel and Progreso—and seven Pacific ports: Ensenada, Puerto Vallarta, Cabo San Lucas, Mazatlan, Acapulco, Zihuatanejo and Manzanillo. In 1993, approximately 2,000 cruise ship arrivals containing more than 1.9 million passengers visited the nine ports, averaging 5.6 cruises per day, with average occupancy of 939 passengers per ship. (See Table 2.33.)

Cozumel attracted the most passengers on the Caribbean, averaging 39.5 percent with 630 dockings. Ensenada led the Pacific ports averaging 653 dockings and 18.7 percent of passengers.

Progreso and Manzanillo were the stragglers, each with a thousand passengers in four dockings for 1993.

Table 2.33
Evolution of Passenger Movement and Number of Cruise Arrivals at National Ports (in thousands of passengers)

Ports	1986		1987 (1)		1988 (1)		1989		1990		1991		1992		1993		TCMA 86-93	
	Arrivals	Passengers	Arrivals	Passengers														
Cozumel	420	329	412	378	394	398	496	470	418	430	424	492	485	610	630	764	6.0%	12.8%
	33.6%	30.4%	31.0%	36.7%	23.5%	34.1%	30.2%	37.3%	28.7%	34.4%	21.1%	30.0%	23.6%	31.8%	30.6%	39.5%		
Ensenada	106	77	245	88	363	138	419	165	321	172	675	374	601	382	653	362	29.7%	24.7%
	8.5%	7.1%	18.5%	8.6%	21.6%	11.8%	25.5%	13.1%	22.1%	13.7%	33.6%	22.8%	29.3%	19.9%	31.7%	18.7%		
Puerto Vallarta	180	163	175	129	212	166	198	176	181	178	221	201	263	269	197	213	1.3%	3.9%
	14.4%	15.1%	13.2%	12.5%	12.6%	14.3%	12.1%	14.0%	12.4%	14.3%	11.0%	12.3%	12.8%	14.0%	9.6%	11.0%		
Cabo San Lucas	173	162	170	143	302	154	189	161	200	164	235	198	284	261	231	224	4.2%	4.7%
	13.8%	15.0%	12.8%	13.8%	18.0%	13.2%	11.5%	12.8%	13.8%	13.2%	11.7%	12.0%	13.8%	13.6%	11.2%	11.6%		
Mazatlán	146	131	115	106	188	147	180	162	156	159	193	183	243	236	185	200	3.4%	6.3%
	11.7%	12.1%	8.7%	10.3%	11.2%	12.6%	11.0%	12.8%	10.7%	12.7%	9.6%	11.1%	11.8%	12.3%	9.0%	10.4%		
Acapulco	143	161	142	42	117	39	105	96	110	103	145	124	109	115	112	132	-3.4%	-2.8%
	11.4%	14.8%	10.7%	4.1%	7.0%	3.3%	6.4%	7.6%	7.6%	8.2%	7.2%	7.5%	5.3%	6.0%	5.4%	6.8%		
Zihuatanejo	74	56	54	142	75	118	49	30	57	40	77	55	58	43	42	37	-7.8%	-5.9%
	5.9%	5.2%	4.1%	13.8%	4.5%	10.2%	3.0%	2.4%	3.9%	3.2%	3.8%	3.3%	2.8%	2.3%	2.0%	1.9%		
Manzanillo	8	1	13	2	28	5	4	0	11	3	34	15	8	5	4	1	-9.4%	-0.5%
	0.6%	0.1%	1.0%	0.2%	1.7%	0.4%	0.2%	0.0%	0.8%	0.2%	1.7%	0.9%	0.4%	0.2%	0.2%	0.1%		
Progreso	n.e.	n.e.	2	1	1	0.3	4	1	-	-								
											0.1%	0.1%	0.05%	0.02%	0.2%	0.03%		
Total	1,251	1,082	1,327	1,031	1,680	1,167	1,641	1,261	1,454	1,248	2,006	1,642	2,052	1,920	2,058	1,934	7.3%	8.5%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%		

Notes:

1. Does not agree with previous IMT editions due to corrections by the source.

n.e. = this type of service did not exist

Source: Direccion General de Puertos y Marina Mercante, SCT.
Direccion General Marina Mercante, SCT.
Puertos Mexicanos, SCT

2.4.3 Selection of the Most Significant Seaports for Purposes of the Study

For Their Location in Border States

Due to their locations in border states, the following ports should be considered:

State	Port
Baja California	Ensenada
Sonora	Guaymas
Tamaulipas	Altamira Tampico

For Volume of Total Deep-Water Cargo Handled, in Tons

Based upon total volume of deep-water cargo handled, the most significant ports—those handling more than a million tons in 1992, excluding petroleum and its derivatives—were:

Port	Tons/Year (in thousands)
Tampico	3,042
Vera Cruz	4,799
Coatzacoalcos	1,810
Progreso	1,141
Guaymas	1,917
Manzanillo	2,183
Lazaro Cardenas	3,087

For Containerized Cargo

The mean annual growth rate (MAGR) of deep-water cargo movement was 6.1 percent for the period from 1979 to 1993. Meanwhile, the total containerized cargo for the same period reflects a 20.5 percent MAGR (Ref. 5). For this reason, ports considered to be significant are those having specialized container-handling facilities, as follows:

Gulf (1992 figures)

Veracruz: Handled 118,521 TEUs loaded with 1,376,015 tons.

Altamira: Handled 39,000 TEUs loaded with 552,800 tons. Note that containerized cargo handled by the port of Tampico is being transferred to Altamira, as the latter has appropriate facilities for handling containers.

Pacific (1992 figures)
 Manzanillo: Handled 24,761 TEUs loaded with 273,000 tons.
 Lazaro Cardenas: Handled 33,496 TEUs loaded with 323,000 tons.

For Cruise Passengers

In 1993 (Ref. 5) nine ports on both coasts received cruise ship port-of-call visits. In order of importance they are: Cozumel, Ensenada, Puerto Vallarta, Cabo San Lucas, Mazatlan, Acapulco, Zihuatanejo, Manzanillo, and Progreso, totaling 2,058 dockings and 1,934,000 passengers served.

Considered to be the most significant ports are Cozumel (averaging 630 dockings and 764,000 passengers, capturing 39.5 percent) and Ensenada (averaging 653 dockings and 362,000 passengers, totaling 18.7 percent). Combining these ports accounts for 58.2 percent of total passenger port visits. Table 2.34 lists the most significant ports for purposes of the binational study.

Summary

Table 2.34
Most Significant Ports for Purposes of the Binational Study

Port	Location in Border States	Cargo Volume (1,000s of tons)	Containerized Cargo (1,000s of tons)	Cruise Passenger (1,000s of tons)
Ensenada	Baja California	—	—	362
Guaymas	Sonora	1,917	—	—
Altamira	Tamaulipas	—	553	—
Tampico	Tamaulipas	3,042	—	—
Veracruz	—	4,799	1,376	—
Lazaro Cardenas	—	3,087	323	—
Manzanillo	—	2,183	273	—
Coatzacoalcos	—	1,810	—	—
Progreso	—	1,141	—	—
Cozumel	—	—	—	764

Selected Ports

Reviewing the aforementioned findings, the following ports are considered to be the most significant, based on: location in a border state, handling more than two million tons, and having specialized container-handling terminals:

On the Pacific

Ensenada
 Guaymas
 Manzanillo
 Lazaro Cardenas

On the Gulf

Altamira
 Tampico
 Vera Cruz

Figure 2.16 shows the most important ports on both coasts of Mexico, emphasizing the ports selected for the study.

Figure 2.16 Mexico's Principal Ports



2.4.4 Features of the Ports Selected

Table 2.35 lists the features that have been judged sufficient to provide a clear image of the ports selected.

The features are divided into three groups:

Sheltering Works

Refers to breakwaters, jettys, piers and shore protection, all designed to provide calm waters in the shipping lanes and in maneuvering, docking and getting underway; listed in linear meters.

Docking Works

Refers to the different types of dock that receive ships, dividing them by use, such as high-seas cargo, coastal, fishing, tourist, oil and derivatives, Navy, drydocks and shipbuilding, and others; listed in linear meters. Their jurisdiction is given as federal or private.

Storage Areas

Refers to yards, sheds, and warehouses, for cargo needing to be stored in the open, under a roof, or in closed areas; listed in square meters. Two area values are shown: total and useful. The latter, for yards, excludes unpaved areas and areas with rails or installations such as electricity substations, post/pole clusters, and light towers; for sheds and warehouses, the useful area is what remains after subtracting walkways and columns from the total area.

Table 2.35
Features of Ports Selected

Features	Ports													
	Ensenada		Guaymas		Manzanillo		Lázaro Cárdenas		Altamira		Tampico		Veracruz	
Shelter Works (linear meters)	5,065				1,850		6,841		2,573		2,970		6,674	
Breakwaters	1,640				700		970						3,851	
Jettys	0				500		0		2,168		2,758			
Piers	975				0		1,991		405		185		2,823	
Shore Protection	2,450				650		3,880							
Docking Works (linear meters)	Federal	Private	Federal	Private	Federal	Private	Federal	Private	Federal	Private	Federal	Private	Federal	Private
	2,146	1,144	3,064	1,754	4,391	211	2,913		750	287	4,406	4,779	6,787	236
High-Sea	370		929	36	2,111		2,484		750	287	1,786	343	2,466	
Coastal	394	7	193		216		150					785	548	
Fishing	411		501	1,033	655	20					65	712	51	122
Tourism	265	509	7	119	3	187						448	360	114
Petroleum			822		516		110				608		180	
Navy	196		121		876		49				103		916	
Repairs/Building	510	628	480	566							957	209	1,405	
Other			11		14	4	120				887	2,282	861	
Storage Areas (square meters)	Total	Useful	Total	Useful	Total	Useful	Total	Useful	Total	Úseful	Total	Useful	Total	Useful
	81,019	49,526	202,850	153,530	147,164	117,699	316,374	219,920	347,380	126,154	132,458	90,342	317,222	231,986
Yards	28,260	17,494	181,000	134,700	126,944	102,777	282,400	193,580	342,000	121,962	90,118	63,082	223,817	171,463
Sheds	30,789	21,552	8,614	7,950	455	364			900	708	5,372	3,840	8,164	
Warehouses	21,970	10,480	13,236	10,880	19,765	14,558	33,974	26,340	4,480	3,584	36,968	23,420	85,241	60,523

Source: Direccion General de Puertos, SCT. Data, Dec. 1995

2.4.5. General Information on Ports Selected

Pacific Coast

Ensenada

The port of Ensenada is located in the north of the border state of Baja California 111 km from Tijuana. It is connected to Tijuana by four-lane Mexican Federal Highway 1D (FH-001D), providing the port's main access. It contains no railroad link, therefore it serves as a commercial and tourist port. As a tourist port, it is the most significant on this coast, with 653 cruise dockings and 362,000 passengers in 1993.

The average depth in the access channels and general cargo berths is 10 meters and requires an average maintenance dredging of about 120,000 cubic meters per year.

In 1992 this port handled 199,000 tons of deep-water cargo, of which 135,000 tons were imports and 64,000 exports. The main imports included: assembly products (15%), electrolytic sheeting (14.5%) and automobile parts (12.3%). Main exports included: empty cargo containers (36.5%), cardboard (13.3%), and cotton (10%). The volume percentages are determined based on tons of total imports and exports, respectively, handled in the port.

Trade with the U.S. accounted for 13.34 percent of the total 199,000 tons of deep-water cargo handled at this port—6.1% of the imports and 28.5% of the total exports. (Ref.15)

Short-term investment programs are mainly related to maintenance activities. Constructing a firefighting system is identified as a medium-term project.

In the long term, based on the port's development plan, a terminal for containers and one for cruises will be built, in addition to several tourist nautical developments operated as concessions to private business.

Guaymas

Guaymas is the main port for the border state of Sonora. It is accessed by road from the north through Nogales and Hermosillo, and from the south through Sinaloa state, on four-lane FH-015, which has sufficient capacity. There is rail access to the port. This is a commercial port and has specialized terminals for handling grain, cement, fluids and petroleum.

The average depth of the access channel is 11.5 meters and at the loading docks depth is 11 meters. It requires annual maintenance dredging of an average 90,000 cubic meters.

In 1992 this port moved 2.23 million tons of deep-water cargo including petroleum and derivatives. Main import products included: fuel oil (30.9% of total imports), sorghum (21%), corn (14%), sunflower seed (11.3%), and soy (10.3%). The main exports included: cement (64.5% of total exports from this port) and sulphuric acid (30%). Note that 75% of deep-water cargo moving through this port was for trade with the US, including petroleum, that represented 15% of imports and showed no export movement. (Ref. 15)

Short-term investment programs are for normal maintenance activities including repairing road/street pavement.

Medium-term plans consider railroad repair and building a dock linking the docks on the east side with the ferry dock, and constructing a refrigerated warehouse. Dock rehabilitation will also be undertaken.

In the long term, plans are contemplated to finish rehabilitating the docks, a multiple-use dock in the west area and a container dock.

Manzanillo

This is a commercial access port in the state of Colima. It has specialized terminals for: containers, operating two cranes; and petroleum, cement, and fluid cargo. Access to the port is via two-lane FH-200, which is the Pacific Coast highway; with main access provided by the four-lane highway linking Manzanillo to Guadalajara. Rail access to the port is also available. Figure 2.17 illustrates the port's general layout.

Average depth of the access channel and berths is 14 meters and maintenance dredging of an average of 40,000 cubic meters per year is required.

The port moved 2.2 million tons of imports and exports, excluding petroleum. In 1992, the main import products, as a percentage of that tonnage, included: sorghum (27%), rapeseed (11%), animal feed (7%) and small percentages of sheet steel and sulphur. Main exports included: iron (4.2%), cement (2.6%), refined lead (1.3%), and others, with low percentages in relation to total movement. Note that the imports of petroleum and derivatives (primarily fuel oil) totaled 2.8 million tons moved.

Trade with the U.S. amounted to 43 percent of the total moved through this port, excluding petroleum and derivatives. If petroleum is included, the percentage is 52.

Short-term investment programs refer primarily to maintenance.

Medium-term programs consider repaving the A- and B-side yards; extending and widening storm drains, constructing the customs building, rehabilitating interior streets and other small projects to improve port operation.

Long-term plans contemplate dredging and filling Tapeixtles Lagoon, building Container Dock No. 2, and building new rail access to the port.

Lazaro Cardenas

The port of Lazaro Cardenas in the state of Michoacan is a commercial and industrial port with railroad and highway access. FH-200 travels along the Pacific Coast and northeast to Manzanillo; southwest it goes to Acapulco. Northward access is available via FH-037, which links the port to Uruapan. These are two-lane highways.

Average depth of the access channel and berths is 14 meters and requires maintenance dredging of some 35,000 cubic meters per year on average.

This port has a specialized terminal for container handling, with three cranes; it also has a specialized terminal for ore handling and another for grain.

Total import/export movement in 1992 totaled 3.1 million tons. The main import products included coal (39.8%), iron ore (18.6%), sulphur (5.5%), automobile parts (5.5%), scrap metal (5.2%), and agricultural bulk products (_%). The main export products included: steel plate (72.3%), corrugated rods (4.24%), and dimethylterephthalate (3.51%). Percentages refer to total exports. (Ref. 15)

Figure 2.17 Manzillo Port

Trade with the U.S. in 1992 placed third in imports, 14 percent of total imports. Exports from this port placed fourth, 11.7 percent of all exports.

Short-term investment programs are basically for maintenance and small works to improve electrical installations, changing a stretch of drinking water pipe, etc.

Medium-term plans consider definitive access to the port with a eight-kilometer stretch of highway four lanes wide, shore protection with works and piers, definitive highway access to the port [sic] and paving six hectares of yards.

In the long-term, constructing two berthing positions in the general cargo dock area and two ore terminals is planned. For this purpose, paving the yard areas and the necessary dredging are planned.

Gulf Coast

Altamira

This industrial and commercial port is in the south of Tamaulipas state, about 30 kilometers north of the port of Tampico. It has railroad access and the following highway access: FH-080, a two-lane facility to the north, connects to FH-180 to Matamoros; FH-081, also a two-lane facility, links this port and Ciudad Victoria; southern travel via four-lane FH-180 connects the port with Tampico, and continues to Veracruz as a two-lane highway; and FH-070, also a two-lane highway, travels toward the center of the country.

Average depth of the port access shipping channel is 12 meters at its current stage; berth depth is 12 meters. It requires dredging amounting to some 200,000 cubic meters a year.

This port has a specialized container-handling terminal with three dock cranes, and specialized terminals for handling petroleum and derivatives and other fluids.

Movement of foreign trade through this port in 1992 totaled 1.125 million tons. Imports accounted for 60.5 percent of that total and exports 39.5 percent. Main products imported were petroleum and derivatives with 60.4 percent of the total imported through the port, followed by general cargo with 37.6 percent of imports. The most significant export item was general cargo, accounting for 99.7 percent of total exports through the port. (Ref.15)

The U.S. in 1992 placed first in imports, totaling 50.7 percent; exports to the U.S. placed seventh, totaling 7.3 percent of the tonnage exported through the port.

Short-term investment programs are for facilities and equipment maintenance and minor infrastructure work.

In the medium-term, plans are to dredge the third berth of the container terminal, repair the breakwater and complete the yards and parking for trailers.

For the long-term, projects are considered based on fulfilling the ports growth objectives, including: dredging the south inner harbor; extending the breakwater; intermodal construction and equipment; railroad access, and modernizing a five-kilometer stretch of the port's access road.

Tampico

This commercial oil port is developed on the left bank of the Panuco River, which divides the state of Tamaulipas from Veracruz. The port has railroad access. FH-080 provides highway access to the north. This is a four-lane facility traveling to the town of Tres Marias through Altamira and continues as a two-lane facility to Estacion Manuel where it joins two-lane FH-180 north to Matamoros. It continues from Estacion Manuel with two lanes to Ciudad Victoria. The port of

Tampico is linked southward by FH-180 to Tuxpan. Westward travel via FH-070 links the port with the central part of the country.

The average depth of the river access channel is 11 meters and at the berths is 10 meters average. It requires maintenance dredging of some 800,000 cubic meters per year on average.

This port has an oil terminal that in 1992 moved 5.367 million tons. Deep-water cargo totaled 507,000 tons and coastal trade totaled 4.86 million tons.

Total foreign trade movement for that year includes petroleum and was 3.549 million tons, 55 percent of which was imports and 45 percent was exports. (Ref. 15)

The main imports included: sorghum (21.2% of total imports), corn (8.25%), ilmenite (6%), lead concentrate (4.5%), petroleum and derivatives (10.86%). General cargo [sic ?] was sheet steel (3.19%), and corrugated rods (2.5%). Main exports included: petroleum and derivatives (18.5%), zinc concentrate (14.2%), fluorite (7.6%), sodium sulfate (4.2%), vinyl chloride (6.3%), and dimethylterephthalate (5.1%). Percentages are in relation to total exports.

At this port in 1992, trade with the U.S. placed first in imports, totaling 51.7 percent, and exports to the U.S. placed third, totaling 11.4 percent.

Short-term investment programs are for conservation and maintenance of infrastructure and facilities as well as for maintenance dredging.

In the medium term, work under consideration includes continuing and completing work-in-progress, and starting other work that is justified by special features, such as: a linking dock for metal and ores; paving streets at the west access; releveling of yards (Stretch 9); acquisition and installation of two scales and two emergency electrical plants.

In the long-term, the ports of Tampico and Altamira are considered one port system and work is programmed based on the joint development plan.

Veracruz

This commercial port is the most significant on the Gulf because of its location in relation to major production and consumption centers in the central area of the country. It is located at the center of the Veracruz coast about 385 kilometers from Mexico City. It has rail access and the following highway access: four-lane toll FH-150D and two-lane FH-150 links the port to the cities of Cordoba, Orizaba, Puebla and Mexico City; southeast, the port is linked to Coatzacoalcos via four-lane toll FH-180D and two-lane FH-180; northward, by four-lane FH-180 to Cardel which continues, with two lanes, to Tuxpan. Figure 2.18 shows the general layout of the port.

The average depth of the access channel is 13.5 meters and of the high-cargo docks is 9.5 to 12 meters. It requires maintenance dredging of some 100,000 cubic meters a year.

This port has specialized terminals, as follows: for containers, with four cranes; for bulk grains; for ores; for fluids; for petroleum; it also takes ore barges and has shipyards.

Total deep-water cargo traffic through this port in 1992 was 4.944 million tons, including petroleum and derivatives, of which imports and exports were 144,667 tons. On the other hand, the coastal trade in petroleum and derivatives was 1.771 million tons. Imports through this port amounted to 85 percent of international traffic and exports were 15 percent.

Figure 2.18 Veracruz Port

The main imports included: industrial products (20.4%), construction materials (9.2%), assembly (9%), sorghum (14%), wheat (12.8%), soy (5.4%), iron ore (2.7%), petroleum and derivatives (3.3%), sunflower oil (3.1%), rapeseed oil (2.1%). Percentages were calculated regarding total imports through this port. (Ref. 15)

Main exports included: steel tubing (20.6%), chemicals (18.3%), beverages (11.7%), assorted merchandize (7.3%), coffee beans (4.6%), honey (4.4%), vehicles (3.7%), non-crystallizable honey (5.1%), chemicals [sic] (4.5%), and petroleum and derivatives (0.9%). All products are in relation to total exports through this port.

Imports from the U.S. through this port were 1.279 million tons, equivalent to 30.6 percent of total imports; and exports to the U.S. totaled 153,800 tons, or 20.2 percent.

Short-term investment programs consider, on the one hand, conservation and maintenance of existing infrastructure and, on the other, new infrastructure construction needed to solve operational and access problems. New construction projects may include: dock construction for a multiple-use terminal (TUM, Spanish acronym), extending yards, and complementary work on the container terminal, expropriation and purchase of land, and starting work on the road around the port.

Medium-term programs consider completing the expansion of the north breakwater; filling and leveling land; upgrading the multiple-use terminal yards (first phase); the access road, the port area boundary wall, and completing the road around the port.

Long-term plans are for the following: extending the aluminum dock for grain handling; expanding the container dock; Phase 2 of the multiple-use terminal dock; Phase 2 of the multiple-use terminal yard upgrade; rehabilitating railroad tracks, and building offices for customs and authorities.

2.5 Airports

2.5.1 General Facts

Mexico currently has 1,560 airports and airstrips registered with the Registro Aeronautico Mexicano² (Mexican Aeronautical Register), and which are inspected, regulated and checked by the Secretaria de Comunicaciones y Transportes (SCT) through the Direccion General de Aeronautica Civil (General Office of Civil Aviation [DGAC, Spanish acronym]). Therefore, Mexico has an extensive commercial airport network of 83 airports providing public service;³ of those, the Aeropuertos y Servicios Auxiliares (ASA) agency manages 58⁴ of the largest airports, which make up the country's federal network.

The incumbent authorities recognize the need to restructure air transport and in 1995 approved two new laws, one relative to civil aviation, the other specifically for airports. The new law for airports promotes diversification in airport ownership and management so as to encourage modernization, and improving operational efficiency through issuing concessions to private parties and government entities that prove they are capable of operating and managing the infrastructure.

According to studies,⁵ an estimated 23 airports (39% of the federal network) require upgrades to their terminal building. The analysis indicates that where runway systems are concerned, 21 percent (12 airports) are close to saturation. An estimated 20 airports require upgrades of aircraft aprons in order to increase capacity.

Companies operating within the network airports, by level, included: 62 international charter flight airlines; 26 domestic charter airlines; 41 for normal international flight airlines and 20 for domestic flight airlines.⁶ Of the total of international traffic during 1994, 86.5 percent of flights either originated, or were destined to U.S. cities.⁷

2.5.2 Statistical Data

The federal airport network managed by ASA in 1994 served a total 52.6 million passengers on 1.5 million flights. This value represented an annual increase increment compared to 1993 of 15 percent for passengers and 5 percent for flights. In 1995, and because of the country's economic crisis, traffic declined by some 15 percent for passengers and 10 percent for

²Initiative New Law of Airports/Presidency; E.P. Zedillo/Nov.15, 1995

³Ibid

⁴Airport Statistical System/Aeropuertos y Serv. Aux./1994

⁵Ibid.

⁶1994 Statistical report/DGAC

⁷Ibid.

Table 2.36
1993-95 Overall Passenger and Cargo Statistics

Year	National	International Charter	Tot Com "A"*	Regional	Total	Percent	Cargo (tons)
1993	31,507,247	13,742,478	45,249,725	479,063	45,728,788		293,724
1994	37,375,227	14,597,057	51,972,284	650,811	52,623,095	15.1%	
1995	29,862,594	14,247,051	44,109,645	459,216	44,568,861	-15.3%	

Source: 1993 and 1994, Subdireccion de Planeamiento y Finanzas/ASA

1995: ASA preliminary statistics

* Total commercial cargo carried by ASA

Table 2.37
1993-95 Overall Operations Statistics

Year	National	International Charter	Tot Com "A"*	Regional	Av. Gral.	Total	Percent
1993	669,434	192,248	861,682	174,033	391,772	1,427,487	
1994	716,070	205,755	921,825	222,016	355,823	1,499,664	5.1%
1995	676,492	193,074	869,566	191,594	284,262	1,345,422	-10.3%

Source: 1993 and 1994, Subdireccion de Planeamiento y Finanzas/ASA

1995: ASA preliminary statistics

* Total commercial cargo carried by ASA

operations, based on preliminary figures that indicate 44.6 million passengers and 1.3 million flights for that year,⁸ as shown in Tables 2.36 and 2.37.

Despite the 1995 drop in demand, current conditions, and the outlook for a sustained and gradual recovery of the country's economy, estimates that volume of air traffic will return to 1994 levels in a couple of years. Table 2.38 lists traffic volumes and air cargo, processed by terminal, for the country's 10 major airports.

Table 2.38
1994 Passenger and 1993 Cargo Statistics

Number	Acronym	National	International Charter	Total Com "A"*	Average Regional	Grand Total	Percent	1993 Cargo (Tons)	Percent
1	MEX	13,817,128	5,050,499	18,867,627	21,629	18,889,256	35.9%	147,229	50.1
2	GDL	4,037,308	1,207,434	5,244,742	38,728	5,283,470	10.0%	33,608	11.4
3	CUN	1,002,300	3,413,324	4,415,624	12,905	4,428,529	8.4%	5,588	1.9
4	TIJ	3,744,646	324,546	4,069,192	3,538	4,072,730	7.7%	6,561	2.2
5	MTY	2,047,044	662,938	2,709,982	33,858	2,743,840	5.2%	7,354	2.5
6	PVR	485,996	1,109,681	1,595,677	17,709	1,613,386	3.1%	2,797	1.0
7	ACA	1,135,956	405,633	1,541,589	13,942	1,555,531	3.0%	3,605	1.2
8	MID	784,618	107,266	891,884	13,374	905,258	1.7%	17,503	6.0
9	SJD	94,295	657,692	751,987	2,381	754,368	1.5%	3,533	1.2
10	BJX	569,628	146,807	716,435	6,196	722,631	1.4%	2,913	1.0
Subtotal		27,718,919	13,085,820	40,804,739	164,260	40,968,999	77.9%	230,691	78.5
Rest		9,656,308	1,511,237	11,167,545	486,551	11,654,096	22.1%	63,033	21.5
Total		37,375,227	14,597,057	51,972,284	650,811	52,623,095	100.0%	293,724	100.0
Network									

Source: Passengers: Statistical Report/Subdireccion de Planeamiento y Finanzas/ASA/May 1995

Cargo: SEA/94

* Total commercial cargo carried by ASA

⁸Subdirectorato de Planning and Finance/ASA/Executive Report/December 1995

2.5.3 Selecting the Most Significant Airports

The following are the criteria used in selecting the airports to be analyzed in the study:

For Location

In agreement with the study's general criterion, airports located within a 100 kilometer strip along the U.S. border have initially been analyzed.

The following 13 airports meet that criterion: Tijuana (TIJ), Ensenada (ENS) and Mexicali (MXL) in the state of Baja California; Puerto Penasco (PPE), Nogales (NOG), and Cananea (CNA) in Sonora; Ciudad Juarez (CJS) and Ojinaga (OJA) in Chihuahua; Ciudad Acuna (CAC) and Piedras Negras (PNG) in Coahuila; Nuevo Laredo (NLD), Reynosa (REX), and Matamoros (MAM) in Tamaulipas. Of these, Tijuana was chosen because of its importance in the network.

For Classification

The second set of criteria identified international airports. Airports included are those authorized and equipped to process and serve flights to, or from, other countries.

Of the 58 federal airports, 42 (or 72%) are international airports.⁹ The 10 most significant airports, based on total 1994 passenger volume, are: Mexico City (MEX), Guadalajara (GDL), Cancun (CUN), Tijuana (TIJ), Monterrey (MTY), Puerto Vallarta (PVR), Acapulco (ACA), Merida (MID), Los Cabos (SJD), and Del Bajío (BJX). In addition, the following six airports located on the U.S. border were analyzed: Mexicali, Ciudad Juarez, Nuevo Laredo, Nogales, Reynosa, and Matamoros.

Airports were analyzed based on the availability of equipment and facilities sufficient to guarantee the safety of air operations. This third criterion is based on the type and capabilities of rescue and firefighting equipment (CREI, Spanish acronym) that every airport possesses. This capability determines the type of aircraft that can be handled in the event of aircraft fires.

Ten airports that, while handling international traffic, fulfill the requirements to aid wide-cabin jet aircraft (DC-10 and B-747 or similar) were chosen in this manner. Those ten airports are: ACA, CUN, CZM (Cozumel), GDL, MEX, MTY, MZT, PVR, SJD and TIJ. The eight airports selected by the second criterion are: ACA, MTY, SJD, MEX, GDL, CUN, TIJ, and PVR.

For Traffic Volume

For this selection criterion, 1994 statistics were reviewed based on international passenger traffic for that year, as shown in Table 2.39.

⁹Sistema Estadístico Aeroportuario 1994/ASA

Table 2.39
1994 International Passengers

Number	Letters	International Total	Percent	Percent Accumulated
1	Mexico City (MEX)	5,050,499	34.6%	
2	Cancun (CUN)	3,413,324	23.4%	58.0%
3	Guadalajara (GDL)	1,207,434	8.3%	66.3%
4	Puerto Vallarta (PVR)	1,109,681	7.6%	73.9%
5	Monterrey (MTY)	662,938	4.5%	78.4%
6	Los Cabos (SJD)	657,692	4.5%	82.9%
7	Acapulco (ACA)	405,633	2.8%	85.7%
8	Tijuana (TIJ)	324,546	2.2%	87.9%
	Subtotal	12,831,747	87.9%	
	Remainder	1,765,310	12.1%	100.0%
	Total Network	14,597,057	100.0%	

As can be seen, those airports whose 1994 passenger traffic was more than 300,000 international passengers have been noted. They are: MEX, CUN, GDL, PVR, MTY, SJD, ACA and TIJ. Note that of this group of eight airports, four are in tourist centers (ACA, CUN, PVR and SJD); three in metropolitan centers (GDL, MEX, and MTY) and the remaining one (TIJ) is on the U.S. border. According to the criterion of selecting only those airports with passenger traffic of more than a million in 1994 for study, four were selected: MEX, CUN, GDL, and PVR.

For Cargo Volume

Air cargo movement on the network is generally light, despite a significant increment over recent years (MAGR of 8.6% from 1990 to 1993). This is due to the lack of a firm infrastructure to process it, since only in the airports at Mexico City and Merida, Yucatan, are there appropriate facilities. At other ASA-network airports, facilities are below par and old, or non-existent, and air cargo is used mainly to carry spare parts or mail.

A total 293,724 tons¹⁰ of air cargo were processed in 1993, of which 178,278 (60.7% of the total) was processed within the country and 115,451 tons (39.3%) came from or was sent abroad.

Table 2.40 shows the main air cargo volumes processed on the network in 1993.

Table 2.40
1993 Air Transport Cargo (in tons)

Number	Acronym	National	International	Total	Percent	Accumulated Percent
1	MEX	63,067	84,162	147,229	50.1%	
2	GDL	20,807	12,801	33,608	11.4%	61.5%
3	MID	10,139	7,364	17,503	6.0%	67.5%
	Subtotal	94,013	104,327	198,340	67.5%	
	Remainder	84,261	11,123	95,384	32.5%	100.0%
	Total Network	178,274	115,450	293,724	100.0%	

As can be seen, MEX, GDL and MID airports together processed almost 68 percent of all cargo in 1993. They have been selected for this study for that reason.

¹⁰SEA/94/ASA

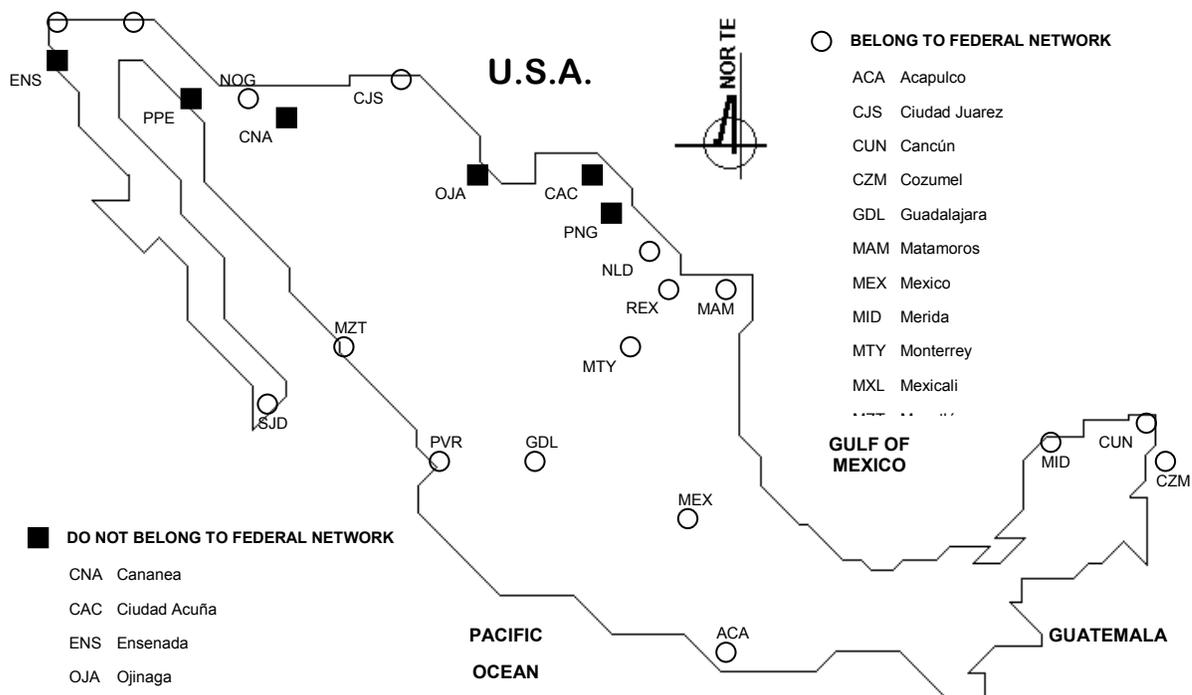
Summary of Selection Criteria

To sum up the selection criteria, six airports were chosen for the study: CUN, GDL, MEX, MID, PVR and TIJ, as shown in Table 2.41

Table 2.41
Summary of Selection Criteria

Criterion	Number of Airports	Acronym
Location	1	TIJ
International Classification	5	MEX,GDL,CUN,TIJ,PVR
International Passenger Traffic Volume	4	MEX,CUN,GDL , PVR
Cargo Processed	3	MEX, GDL, MID
Summary	6	CUN,GDL,MEX,MID,PVR, TIJ

Figure 2.19 Most Significant Airports



2.5.4 Inventory of Airports in the Study

Cancun International Airport, Quintana Roo

Cancun's international airport was built primarily to serve this tourist center, which has grown to become a major attraction for international and domestic visitors. The airport lies 16 kilometers from the city and has the most modern installations of the network, including a satellite building and a soon-to-be-opened terminal for serving charter flights only. These two projects have developed through co-investment agreements with private enterprise. (Figure 2.20)

General Facts

The air strip is designated 12-30 and is 3,500 meters long by 60 meters wide. There are two aircraft parking aprons: commercial, with 154,800 square meters (sq. meters) for 23 positions at a time; for general aviation, with 19,600 sq. meters for 33 small aircraft and one FBO to serve them. The terminal complex for passenger processing has an overall surface of 26,710 sq. meters, developed in four elements: a main building, 10,630 sq. meters; a satellite building, 13,900 sq. meters; a reception room, 850 sq. meters; and a connecting walkway, 1,090 sq. meters. The satellite building has nine connecting walkways. Parking for 290 vehicles belonging to passengers, visitors, and employees is provided and there is an area for 25 tourist buses. The fueling area can hold 5,700 cubic meters of turbozine and 20 cubic meters of aviation gasoline. (Figure 2.21)

Traffic Statistics and Forecasts

The average annual growth rate for 1993 through 95 was 6.1 percent for passengers and 1.6 percent in operations, due mainly to increases in international charter traffic at this terminal. (Table 2.43)

Despite the fact that during 1995 most network airports showed a decline in demand compared to 1994, at this terminal the reverse happened. Since 1995, preliminary numbers indicated a 9.4 percent growth in passengers and 10 percent growth in operations for the period.

This growth tendency projects six million passengers in 79,000 operations for the year 2000, and 15 million passengers on 171,000 flights for the year 2020. Average annual growth rates estimated for the 1995 through 2020 planning horizon are 4.7 percent for passengers and 3.9 percent for operations. (Table 2.42)

Shortcomings and Planned Improvements

At this time, work generated by private investors on the new charter flight terminal is about to be completed. The terminal contains aprons to accommodate a maximum of four aircraft, an access runway, and parking for cars and buses. Estimates indicate that the condition of the facilities, and the level of service offered, are good and, given the volume of current and projected demand, capacity exists to process it, at least in the short-term.

Access

Access to this terminal area consists of a four-lane highway in excellent condition that joins the Cancun-Puerto Morelos-Tulum highway.

Table 2.42
Cancun International Airport, Quintana Roo Existing and Projected Air Traffic

Year	Passengers					Operations					
	National	International	Charters	Regional	Total	National	International	Charters	Regional	Gen. Av.	Total
1993	1,108,699	1,567,168	1,622,787	7,011	4,305,665	23,951	17,792	15,025	2,504	4,351	63,623
1994	1,002,300	1,299,318	2,114,006	12,905	4,428,529	18,318	15,205	18,124	4,278	3,643	59,568
1995	974,740	1,601,282	2,257,992	13,083	4,847,097	18,880	18,174	19,107	3,934	5,519	65,614
2000	1,166,849	2,075,019	2,827,358	17,142	6,086,368	22,083	22,768	23,235	4,974	6,170	79,230
2005	1,396,820	2,688,910	3,540,293	22,461	7,648,485	25,828	28,522	28,256	6,289	6,898	95,793
2010	1,672,116	3,484,421	4,432,999	29,430	9,618,965	30,210	35,731	34,361	7,952	7,711	115,965
2015	2,001,669	4,515,281	5,550,807	38,561	12,106,317	35,334	44,763	41,785	10,054	8,621	140,557
2020	2,396,172	5,851,121	6,950,475	50,525	15,248,294	41,328	56,076	50,814	12,712	9,638	170,568
MAGR 1993-1995	-6.2%	1.1%	18.0%	36.6%	6.1%	-11.2%	1.1%	12.8%	25.3%	12.6%	1.6%
MAGR 1995-2010	3.7%	5.3%	4.6%	5.6%	4.7%	3.2%	4.6%	4.0%	4.8%	2.3%	3.9%

Source: 1993-94 Statistics, subdivision of planning and finance, ASA
1995 Preliminary Statistics, ASA
1996-2020: Forecasts, estimated by ICASA

Figure 2.20 Cancun International Airport, Quintana Roo - Site Location

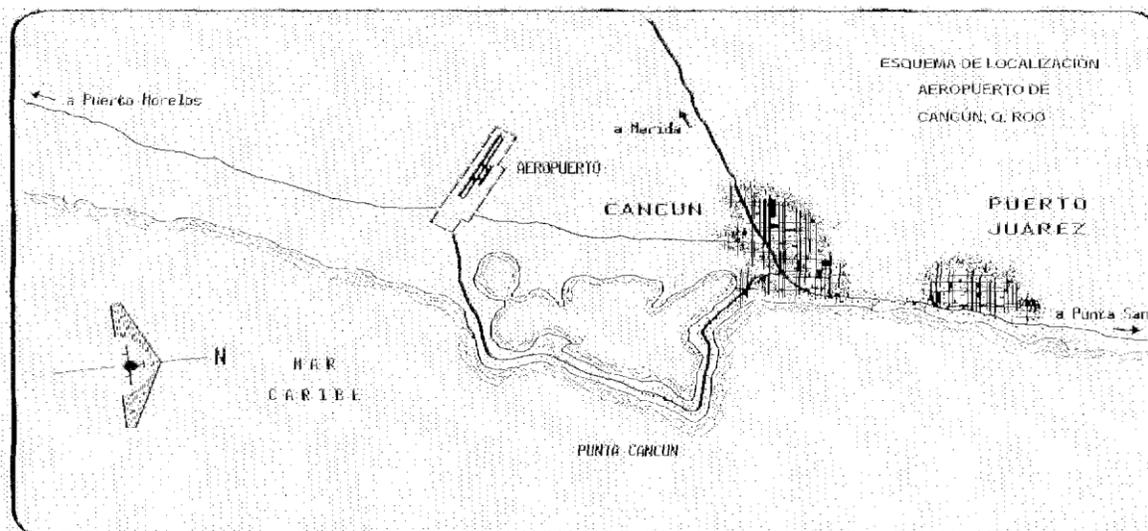
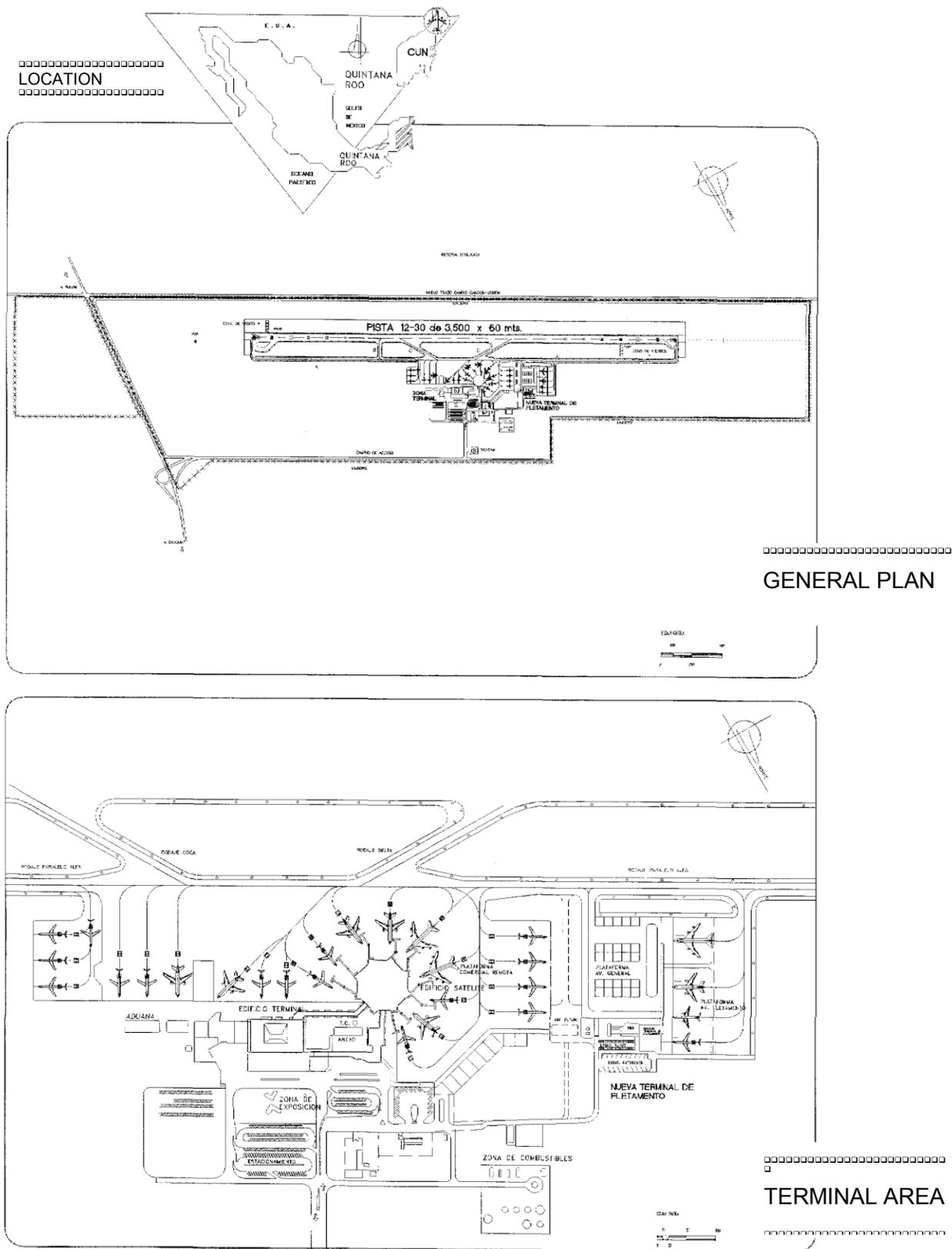


Figure 2.21 Cancun International Airport, Quintana Roo



Air-Cargo Handling

Despite the location providing a government area for legal processing of air cargo, volume is not sufficient to warrant a larger area. Primary traffic is generated, 100 percent, by tourist travel.

Guadalajara International Airport, Jalisco

The Guadalajara airport serves the city with the second largest population in the country. It lies 25 km. from the city and can accommodate wide-cabin, long-range aircraft. The terminal building was recently enlarged by enlisting the participation of private investors. (Figure 2.22)

General Facts

There are two runways: the main one, designated 10-28, is 4,000 meters long by 60 meters wide; the second is perpen

dicular to it, designated 02-20 and 1,770 meters long by 35 wide, for light aircraft. There are two aircraft parking aprons: commercial, with 89,600 sq. meters for 16 positions at a time, and for general aviation, 74,250 sq. meters for 122 light aircraft, and a wide area with 52 hangars. The terminal building has four connecting walkways for passenger traffic and has a 19,600 sq-meter surface on two levels. There is parking for 1,000 passenger, visitor and employee vehicles. The fueling area can hold 5,200 cubic meters of turbozine and 100 cubic meters of aviation gas. (Figure 2.23)

Traffic Statistics and Outlook

The average annual growth rate between 1993 and 1995 was negative for passengers and operations (-12.4%), primarily due to the 1995 drop in commercial traffic.

Despite the previous drop in demand, which is considered an event unlikely to happen again, future estimates are for traffic to increase to six million passengers, on 172,000 operations, by the year 2005. If the growth trend continues, estimates for the year 2020 have this terminal serving 11 million passengers, on 281,000 flights. Average annual growth rates for the 1995-2020 planning horizon are approximately four percent for passengers and three percent for operations. (Table 2.43)

Shortcomings and Programmed Improvements

The drop in demand postponed the need for a second, parallel runway. However, this must be built within a couple of years, given the flight volume estimated for this terminal. As noted above, work was recently done on the terminal building to reset and increase service capability by building boarding-waiting rooms with connecting passageways to aircraft.

The signal system for aircraft on the apron has also been redesigned, increasing the aviation area's capacity. In addition, a hotel, built next to the parking lots, is now operating. There are now two runways for take off and landing of vehicles

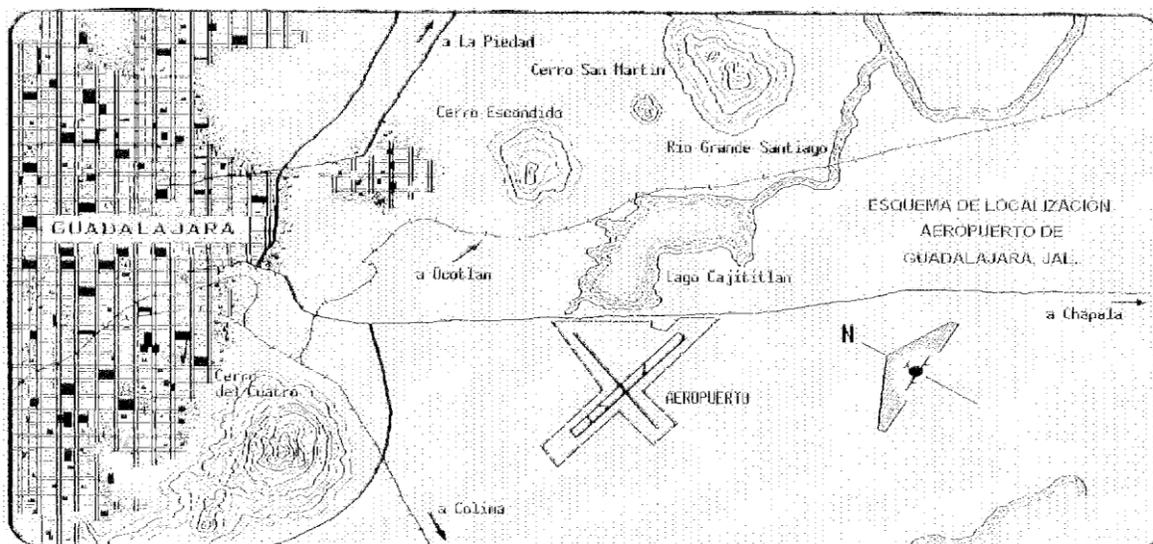
At this time, requirements are focussed on the need for even greater expansion of the apron and of the parking area for vehicles, which are currently at capacity. Also, preboarding waiting rooms for international passengers are required.

Table 2.43
Guadalajara International Airport, Jalisco Existing and Projected Air Traffic

Year	Passenger					Operations					
	National	International	Charter	Regional	Total	Nacional	International	Charter	Regional	Gen. Av.	Total
1993	3,720,947	1,492,252	20,937	36,398	5,270,534	102,167	23,532	3,955	15,250	19,316	164,220
1994	4,037,308	1,161,185	46,249	38,728	5,283,470	84,048	16,273	414	18,734	20,788	140,257
1995	2,821,285	1,145,035	42,409	38,597	4,047,326	80,611	14,041	1,689	14,880	14,663	125,884
2000	3,463,163	1,357,317	49,427	45,627	4,915,534	96,413	16,285	1,930	17,217	15,618	147,463
2005	4,251,077	1,608,954	57,606	53,939	5,971,574	115,313	18,888	2,206	19,920	16,635	172,962
2010	5,218,250	1,907,242	67,138	63,763	7,256,394	137,918	21,907	2,521	23,048	17,719	203,112
2015	6,405,468	2,260,832	78,248	75,378	8,819,926	164,953	25,409	2,880	26,667	18,873	238,783
2020	7,862,793	2,679,974	91,196	89,108	10,723,072	197,289	29,470	3,292	30,854	20,102	281,008
MAGR 1993-1995	-12.9%	-12.4%	42.3%	3.0%	-12.4%	-11.2%	-22.8%	-34.7%	-1.2%	-12.9%	-12.4%
MAGR 1995-2010	4.2%	3.5%	3.1%	3.4%	4.0%	3.6%	3.0%	2.7%	3.0%	1.3%	3.3%

Source: 1993-94 Statistics, subdivision of planning and finance, ASA
 1995 Preliminary Statistics, ASA
 1996-2020: Forecasts, estimated by ICASA

Figure 2.22 Guadalajara International Airport, Jalisco - Site Location



Access

This terminal area is accessed by an excellent four-lane highway that joins the Guadalajara-Chapala freeway.

Air-Cargo Handling

Based on 1993 records, this airport served the second largest volume of air cargo (33,600 tons). Despite this, there is no specialized terminal designated for handling cargo. Constructing a specialized terminal should not be postponed.

Mexico City International Airport

Mexico City airport serves the country and the world's largest population center. It processes almost 40 percent of the network's air traffic, and consequently there is constant upgrading, maintenance and expansion of its infrastructure. It is 30 minutes from downtown, completely surrounded by the city, which blocks its growth. It has facilities for long-range domestic and international aircraft. The new international terminal, financed by private investors, recently started operating. (Figure 2.24)

General Facts

There are two parallel runways: the first, designated 05I-23D, is 3,846 meters long by 46 meters wide; the second is 05D-23I, 3,900 meters long and 45 meters wide. The aprons, overall, can accommodate 66 aircraft at a time, 21 of which are in direct contact with the building. The terminal building's surface is 107,800 sq. meters, divided into national and international space. There is parking for some 4,700 passenger, visitor and employee vehicles. The fueling area can store 12,600 cubic meters of turbozine and 400 cubic meters of aviation gasoline. (Figure 2.25)

Traffic Statistics and Outlook

Average annual growth rates for the 1993 through 95 period were negative, both for passengers (-1%) and for operations (-10%) due to the severe drop in commercial traffic for 1995.

Despite the drop, traffic here is estimated to rise to 25.5 million passengers on 402,000 flights by 2005. Should the growth trend continue, construction of a new airport aside, estimates are for 52 million passengers on 873,000 operations by 2020.

Average annual growth rates for the 1995-2020 planning horizon are 5% for passengers and for operations. (Table 2.44)

Shortcomings and Programmed Improvements

The drop in demand postponed the need for a third, parallel, runway inside current boundaries. However, unless a new airport is constructed in the short term, not only must a third runway be built, but also a new passenger terminal (south or north option) and improvements to complement operations. If a new airport is built, demand would be shared between the two and would gradually decline at Mexico City International Airport. For this reason, it is estimated that the new airport, no matter where located, should have four or five runways.

Table 2.44
Mexico City International Airport Existing and Projected Air Traffic

Year	Passenger					Operations					
	Natonal	Internatonal	Charter	Regional	Total	Natonal	Internatonal	Charter	Regional	Gen.Av.	Total
1993	11,176,832	4,956,885	ND	26,064	16,159,781	155,114	60,346	ND	27,728	67,503	310,691
1994	13,817,128	5,023,156	27,343	21,629	18,889,256	195,856	68,646	432	24,289	58,103	347,326
1995	11,193,484	4,589,907	67,965	2,456	15,853,812	168,608	57,871	1,162	15,039	9,967	252,647
2000	14,286,037	5,708,920	88,204	2,824	20,085,985	223,515	70,004	1,450	17,210		312,179
2005	18,233,006	7,100,748	114,469	3,247	25,451,470	296,302	84,680	1,810	19,694		402,487
2010	23,270,449	8,831,901	148,557	3,733	32,254,640	392,793	102,433	2,260	22,537		520,022
2015	29,699,645	10,985,108	192,794	4,292	40,881,839	520,705	123,908	2,821	25,790		673,223
2020	37,905,110	13,663,263	250,205	4,934	51,823,512	690,271	149,885	3,521	29,512		873,190
MAGR 1993-1995	0.1%	-3.8%	ND	-69.3%	-1.0%	4.3%	-2.1%	ND	-26.4%	0.0%	-9.8%
MAGR 1995-2010	5.0%	4.5%	5.4%	2.8%	4.9%	5.8%	3.9%	4.5%	2.7%	0.0%	5.1%

Source: 1993-94 Statistics, subdivision of planning and finance, ASA
 1995 Preliminary Statistics, ASA
 1996-2020: Forecasts, estimated by ICASA

Figure 2.24 Mexico City International Airport - Site Location

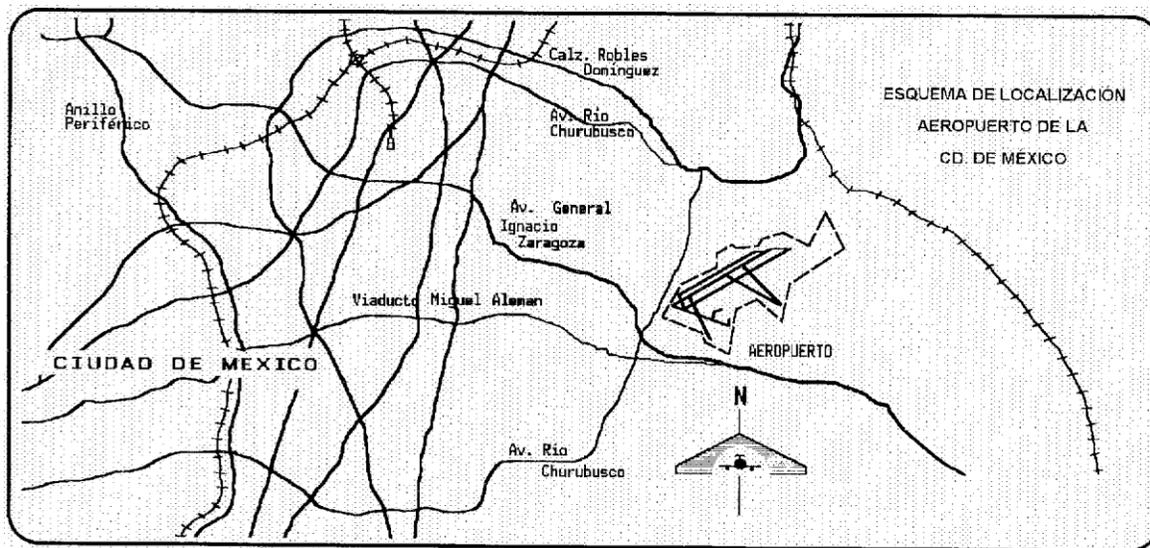
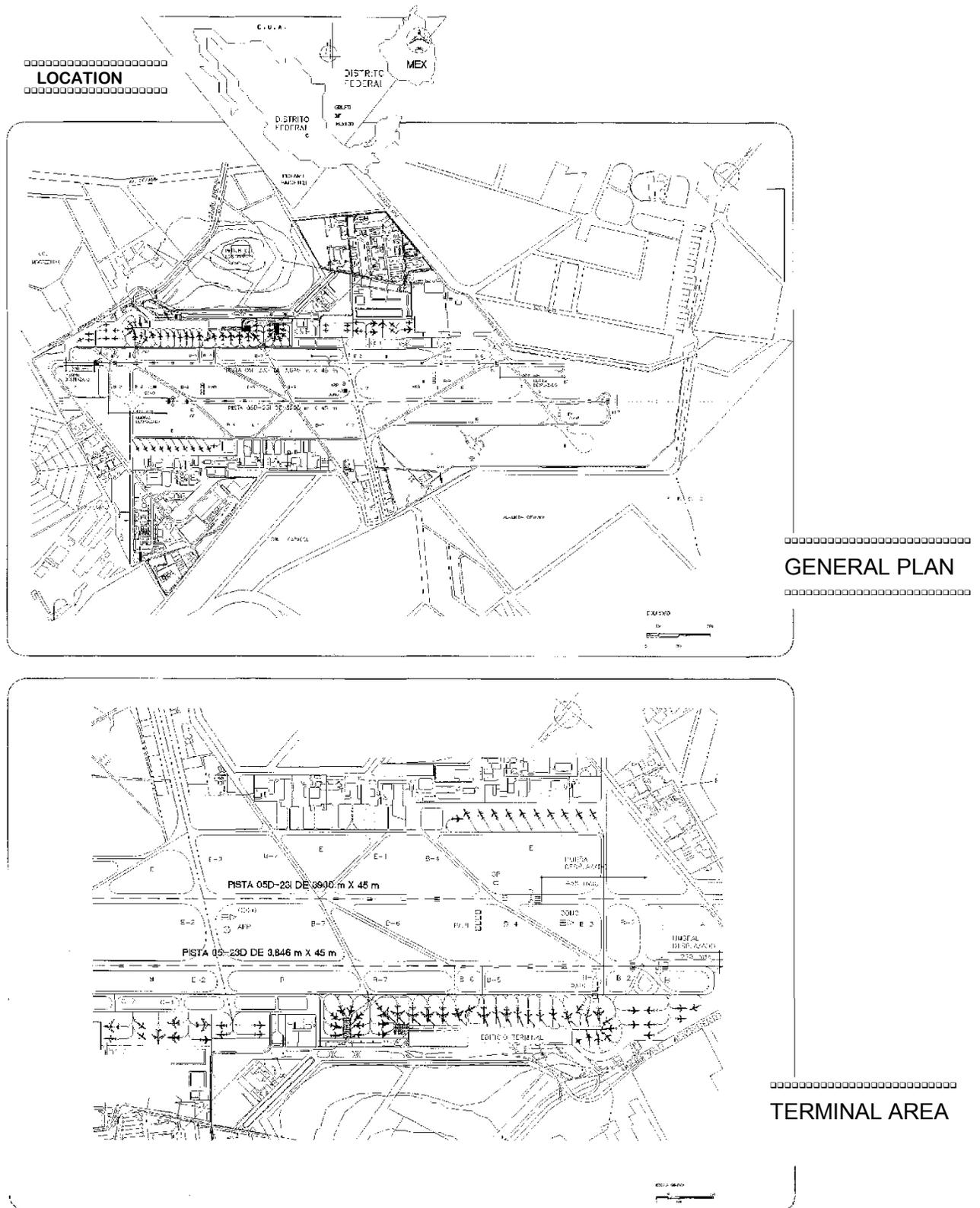


Figure 2.25 Mexico City International Airport



As noted above, the new international terminal, financed by private capital, recently came into operation, providing better service for international flights. Several projects are currently underway to reduce pressure on the existing aviation system.

Access

The surface system access to this air terminal links significant arteries within the city (Boulevard Aeropuerto, Avenida Hangares, Avenida Oceania, etc.), improved through the recent work to improve circulation, presenting excellent results. Subway train access is available.

Air Cargo Handling

Based on 1993 records, this airport processed the most air cargo, 147,229 tons (50% of the network that year). International cargo accounted for 57% of the total, or 84,000. Once its full cargo-handling capacity is reached, cargo can be diverted to other airports such as Puebla or Toluca.

Note: Toluca Airport, 50 kilometers from Mexico City, in the short term, will remain a general-aviation airport to relieve Mexico City airport of pressure from private aircraft. It is probable that in the medium term it will be upgraded for cargo service on a larger scale. In the long term, it could serve commercial aviation.

Merida International Airport, Yucatan

Merida's airport serves one of the most attractive colonial tourist centers in the country. It is 15 kilometers from town and can handle long-range aircraft. (Figure 2.26)

General Data

Of the two runways, the main one is designated 10-28 and is 2,700 meters long by 46 wide; the second, for light aircraft, is perpendicular to it, designated 17-35 and 2,300 meters long by 46 wide. Of the aircraft aprons, the commercial one is 54,200 sq. meters, for 10 positions at a time, four of them in direct contact with the building; and the general one, 37,200 sq. meters, is for 66 light planes. The terminal building has four connecting walkways, 11,900 sq. meters of surface on two levels, including the piers or "fingers". There is parking for 520 vehicles. The fueling area can hold 2,400 cubic meters of turbozine and 220 cubic meters of aviation gas. (Figure 2.27)

Traffic Statistics and Outlook

Average annual growth rates for 1993 through 95 were negative (-10% for passengers and -22% for operations) due to the 1995 drop in commercial traffic.

Despite the drop, traffic is estimated to rise and reach one million passengers on 29,000 flights by 2005. If the growth trend continues, estimates are for 1.9 million passengers on 76,000 flights by 2020. Average annual growth rates for the 1995 through 2020 planning horizon are 4.2 percent for passengers and 4.7 percent for operations. (Table 2.45)

Shortcomings and Programmed Improvements

Despite the 1995 decline, the volume processed through this terminal requires expanding the commercial apron and terminal building in the short term. The service currently provided by this terminal is considered among the best in the country.

Table 2.45

Merida International Airport, Yucatan Existing and Projected Air Traffic

Year	Passengers					Operations					
	National	International	Charter	Regional	Total	National	International	Charter	Regional	Gen. Av.	Total
1993	669,803	153,284	ND	9,203	832,290	25,891	4,315	124	2,980	6,940	40,250
1994	784,618	104,437	2,829	13,374	905,258	16,439	2,544	337	3,854	5,397	28,571
1995	599,491	52,492	3,295	10,677	665,955	13,993	1,231	989	3,047	5,077	24,337
2000	738,712	60,810	4,657	13,328	817,508	16,789	1,429	1,877	3,560	5,557	29,211
2005	910,266	70,447	6,582	16,637	1,003,931	20,143	1,659	3,561	4,159	6,083	35,604
2010	1,121,659	81,611	9,302	20,767	1,233,339	24,167	1,926	6,756	4,859	6,658	44,366
2015	1,382,145	94,544	13,147	25,923	1,515,759	28,995	2,236	12,819	5,677	7,288	57,015
2020	1,703,124	109,526	18,581	32,359	1,863,591	34,788	2,596	24,323	6,632	7,977	76,317
MAGR 1993-1995	-5.4%	-41.5%	ND	7.7%	-10.5%	-26.5%	ND	182.4%	1.1%	-14.5%	-22.2%
MAGR 1995-2010	4.3%	3.0%	7.2%	4.5%	4.2%	3.7%	3.0%	13.7%	3.2%	1.8%	4.7%

Source: 1993-94 Statistics, subdivision of planning and finance, ASA
1995 Preliminary Statistics, ASA
1996-2020: Forecasts, estimated by ICASA

Figure 2.26 Merida International Airport, Yucatan - Site Location

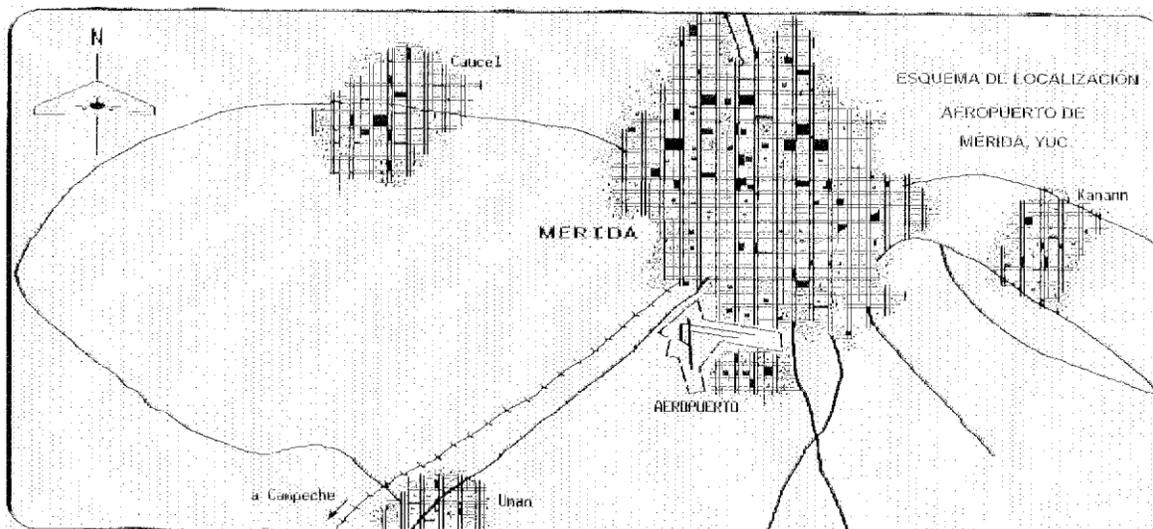
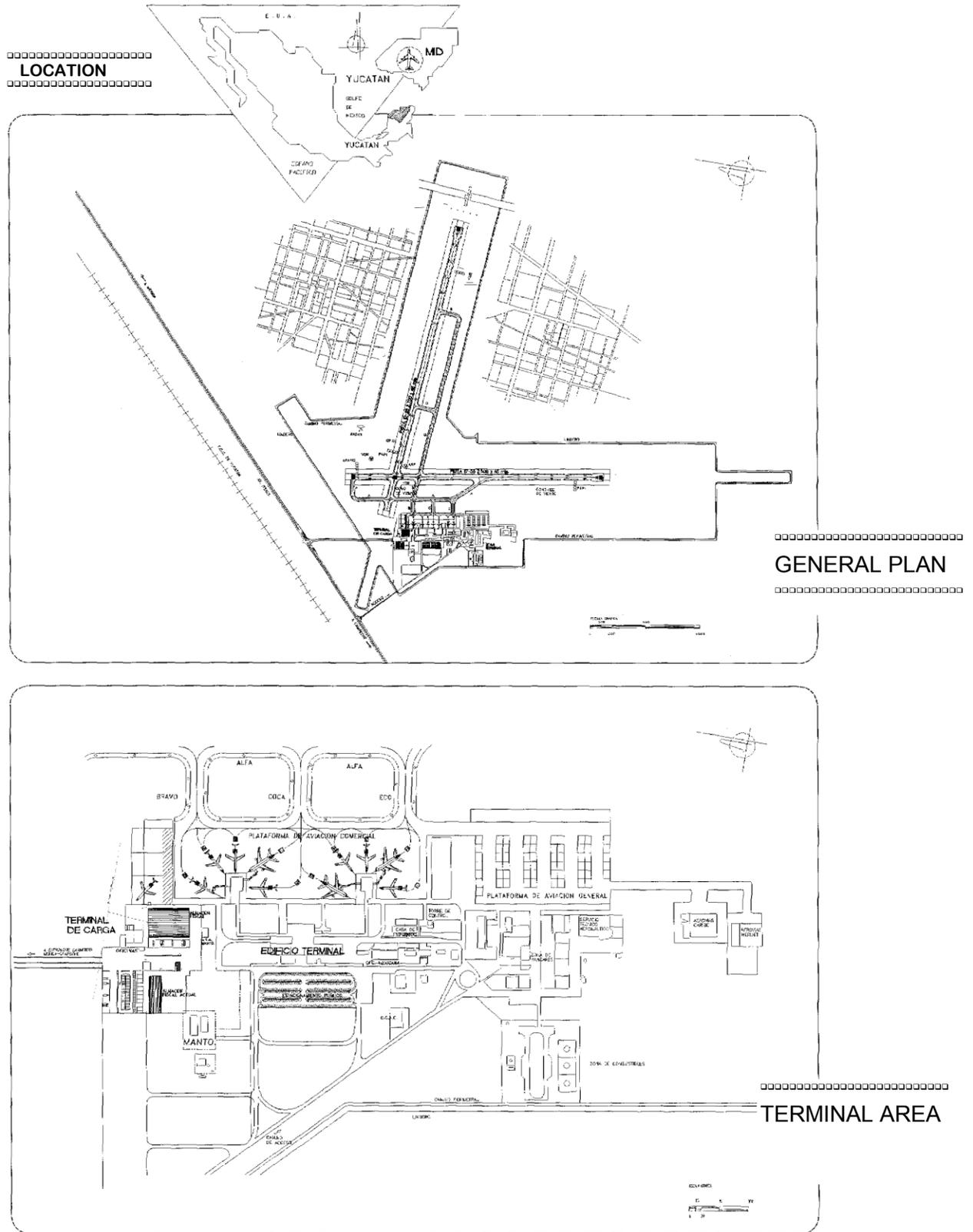


Figure 2.27 Merida International Airport, Yucatan



A new, modern facility financed by private enterprise is currently under construction. Considering the large volumes of cargo handled here, a major increase is expected for that activity.

Access

The surface system access to this air terminal is an excellent four-lane highway that joins the Merida-Campeche highway.

Air Cargo Handling

Based on 1993 records, this airport processed the third largest volume of air cargo: 17,500 tons (6% of the network for that year), therefore it is considered of major significance in the terminal's activity.

Puerto Vallarta International Airport, Jalisco

The Puerto Vallarta Airport serves this major tourist center, 15 minutes from the city and capable of handling aircraft including the Boeing 747. (Figure 2.28)

General Data

Its runway is designated 04-22 and is 3,100 meters long by 45 wide. The commercial apron is 102,900 sq. meters, for 11 positions at a time, three of them in direct contact with the building; the general apron, 37,600 sq. meters, is for 19 light planes. The terminal building has been remodeled to provide three connecting walkways; its surface is 15,350 sq. meters on two levels. There is parking for 260 vehicles. The fueling area can hold 3,000 cubic meters of turbozine and 290 cubic meters of aviation gas. (Figure 2.29)

Traffic Statistics and Outlook

Average annual growth rates for 1993 through 95 were 5.4 percent for passengers and 0.5 percent for operations, recognizing a slight increase in commercial traffic in 1994 and 1995, contrary to most of the network's airports. The trend indicates that demand may rise to 2.5 million passengers on 45,000 flights by 2005. If the trend continues, estimates are for 4.9 million passengers on 77,000 flights by 2020. Average annual growth rates for the 1995 through 2020 planning horizon are 4.5 percent for passengers and 3.6 percent for operations. (Table 2.46)

Shortcomings and Programmed Improvements

The volume processed through this terminal requires enlarging the commercial apron and terminal building in the short term. However, the service provided by this terminal is considered among the best in the country.

Access

The surface system of access to this air terminal is linked to the four-lane highway between Puerto Vallarta and Tepic.

Table 2.46
Puerto Vallarta International Airport, Jalisco Existing and Projected Air Traffic

Year	Passengers					Operations					
	National	International	Charter	Regional	Total	National	International	Charter	Regional	Gen. Av.	Total
1993	509,397	576,315	362,474	19,817	1,468,003	11,388	6,951	3,110	4,398	5,710	31,557
1994	485,996	564,378	545,303	17,709	1,613,386	11,189	6,593	6,268	4,734	6,111	34,895
1995	483,295	585,694	542,718	17,800	1,629,507	11,196	6,756	4,182	5,577	4,179	31,890
2000	628,808	723,270	650,203	20,323	2,022,605	14,083	8,121	4,897	6,259	4,390	37,750
2005	818,134	893,162	778,976	23,204	2,513,476	17,714	9,763	5,733	7,024	4,612	44,846
2010	1,064,463	1,102,960	933,252	26,493	3,127,169	22,282	11,736	6,713	7,882	4,844	53,457
2015	1,384,958	1,362,039	1,118,083	30,248	3,895,328	28,027	14,108	7,860	8,846	5,089	63,929
2020	1,801,950	1,681,975	1,339,519	34,536	4,857,979	35,254	16,959	9,202	9,927	5,346	76,689
MAGR 1993-1995	-2.6%	0.8%	22.4%	-5.2%	5.4%	-0.8%	-1.4%	16.0%	12.6%	-14.5%	0.5%
MAGR 1995-2010	5.4%	4.3%	3.7%	2.7%	4.5%	4.7%	3.8%	3.2%	2.3%	1.0%	3.6%

Source: 1993-94 Statistics, subdivision of planning and finance, ASA
 1995 Preliminary Statistics, ASA
 1996-2020: Forecasts, estimated by ICASA

Figure 2.28 Puerto Vallarta International Airport, Jalisco - Site Location

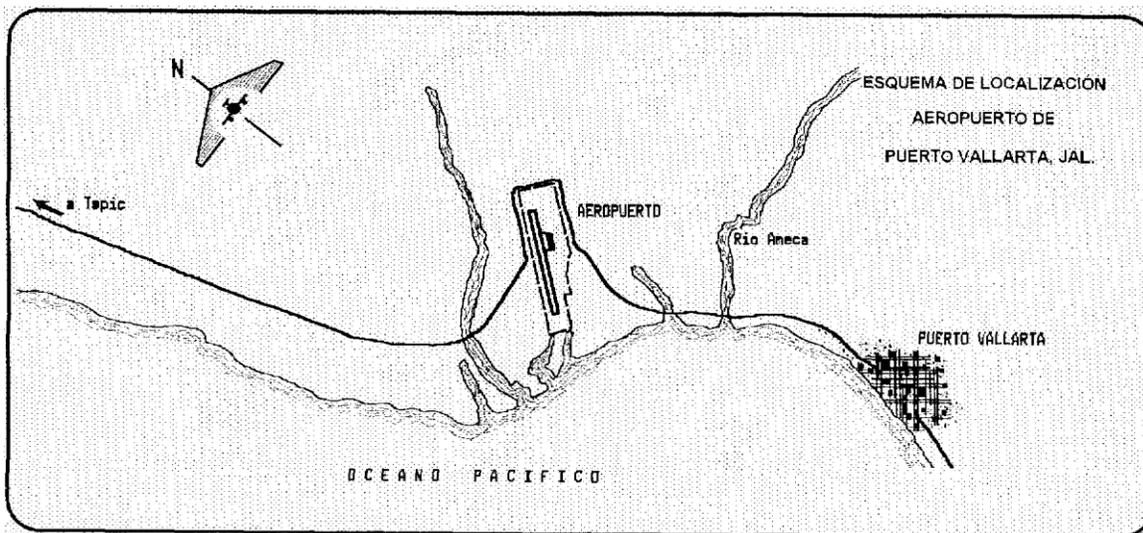
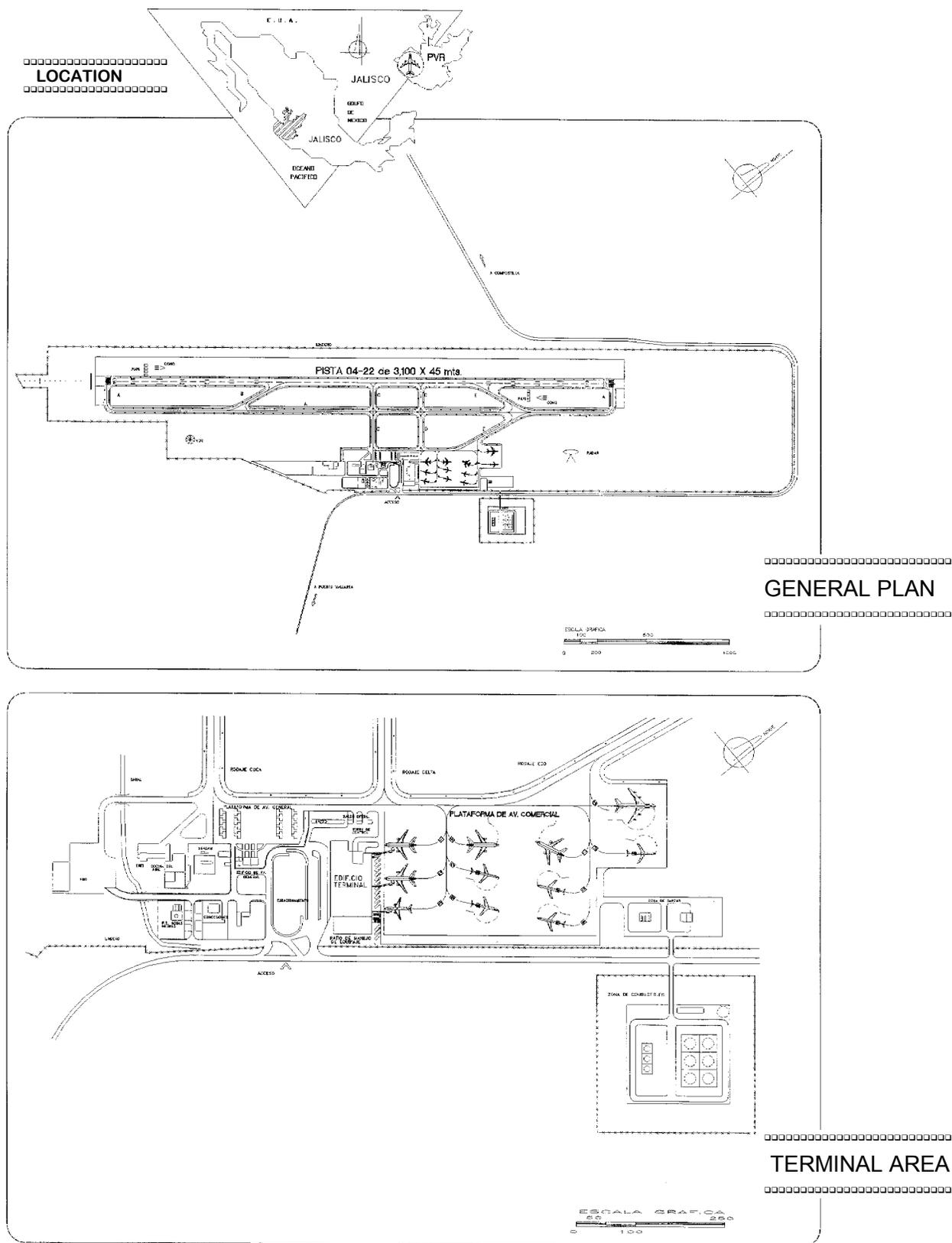


Figure 2.29 Puerto Vallarta International Airport, Jalisco



Air Cargo Handling

Based on 1993 records, this airport processed 2,797 tons (1% of the network for that year) of cargo, so it is considered of average significance for the terminal's activity.

Tijuana International Airport, Baja California

This airport serves the country's main U.S. border center, and provides major movement of people, goods, and services in both directions. In addition, it is strategically located to share in the future development offered by the Pacific Rim and the region of the Californias, and the possibility of sharing with San Diego Airport to serve area demand.

It lies 10 minutes from the city, on the Mexico-U.S. border and can accommodate aircraft flying abroad. (Figure 2.30)

General Data

Its runway is designated 09-27 and is 3,000 meters long by 44 meters wide. The commercial apron is 73,080 sq. meters for 10 positions at a time and the general apron is 18,135 sq. meters, for 39 light planes. The terminal building's surface is 16,220 sq. meters developed on two levels and with two docks or "fingers" to connect to the planes. There is parking for 450 vehicles. The fueling area can hold 3,000 cubic meters of turbozine and 150 cubic meters of aviation gas. (Figure 2.31)

Traffic Statistics and Outlook

Average annual growth rates for 1993 through 95 were 0.7 percent for passengers and 4.5 percent for operations. However, as with most of the network's airports, the 1995 crisis caused a severe drop in traffic at this terminal compared to 1994, as 1995 figures show a decline of 31 percent in passengers and 13 percent in operations for that year.

Despite this, and given the airport's potential, estimates are that by 2002 demand will return to 1994 levels (four million passengers) and that by 2020, 9.2 million passengers on 110,000 flights will be processed.

Average annual growth rates for the 1995 through 2020 planning horizon are five percent for passengers and four percent for operations. (Table 2.47)

Shortcomings and Programmed Improvements

As a result of an agreement between the Federal Government through ASA and a group of Hong Kong businessmen, a maintenance base for Boeing 747-type aircraft is being built which will provide world-class service. Construction of six airbridges and readjustment of aircraft on the apron achieved better use of the facility.

Access

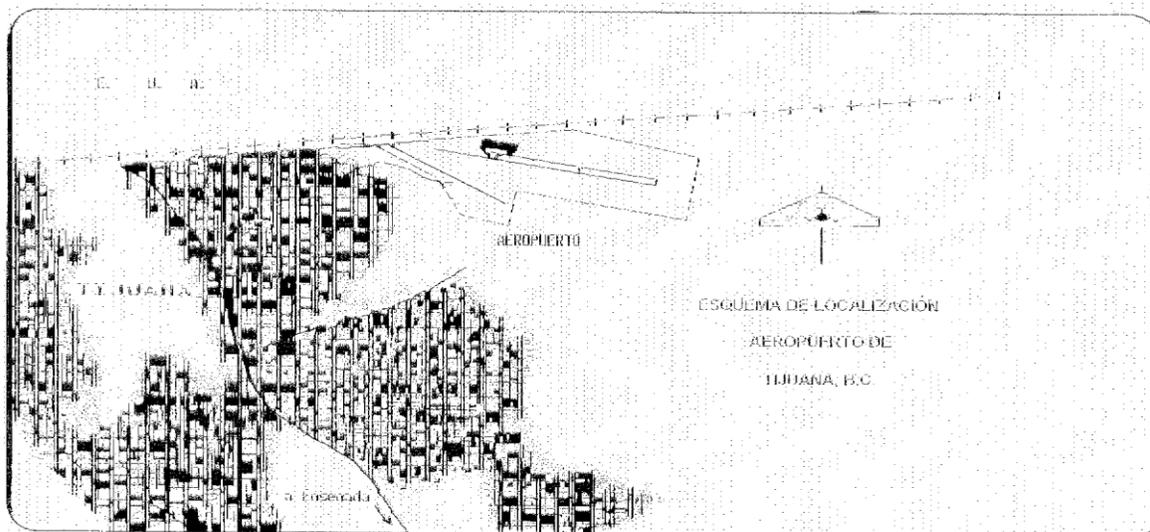
The surface system of access to this air terminal consists of a four-lane road in good condition that goes to Tijuana and Garita de Otay, the main border crossing for commercial vehicles.

Table 2.47
Tijuana International Airport, Baja California Existing and Projected Air Traffic

Year	Passengers					Operations					
	National	International	Charter	Regional	Total	National	International	Charter	Regional	Gen. Av.	Total
1993	2,744,015	15,080	8,939	1,406	2,769,440	28,063	2,059	76	1,618	5,925	37,741
1994	3,744,646	20,059	304,487	3,538	4,072,730	35,403	3,758	664	1,917	5,692	47,434
1995	2,799,072	4,719	1,804	2,889	2,808,484	33,520	714	536	1,835	4,627	41,232
2000	3,546,960	6,188	2,439	3,856	3,559,443	41,265	904	697	2,087	5,056	50,010
2005	4,494,676	8,114	3,297	5,147	4,511,234	50,799	1,145	906	2,374	5,525	60,750
2010	5,695,615	10,640	4,457	6,870	5,717,582	62,536	1,451	1,179	2,701	6,037	73,904
2015	7,217,433	13,953	6,025	9,170	7,246,581	76,985	1,838	1,533	3,072	6,597	90,025
2020	9,145,868	18,296	8,145	12,239	9,184,549	94,773	2,327	1,994	3,494	7,208	109,797
MAGR 1993-1995	1.0%	-44.1%	-55.1%	43.3%	0.7%	9.3%	-41.1	165.6%	6.5%	-11.6%	4.5%
MAGR 1995-2020	4.9%	5.6%	6.2%	5.9%	4.9%	4.2%	4.8	5.4%	2.6%	1.8%	4.0%

Source: 1993-94 Statistics, subdivision of planning and finance, ASA
 1995 Preliminary Statistics, ASA
 1996-2020: Forecasts, estimated by ICASA

Figure 2.30 Tijuana International Airport, Baja California - Site Location



Air Cargo Handling

Despite having a cargo-handling facility, volume is not very significant, so providing a larger service area is not required, at least for the short term.

2.6 Demographic and Socioeconomic Data of the Selected Border Cities

2.6.1 General Data on the Structure of the Northern Border

Mexico's northern border, defined as the area containing all the municipalities bordering the U.S., consists of 39 municipalities in six states: Baja California, Sonora, Chihuahua, Coahuila, Nuevo Leon and Tamaulipas.

Table 2.48 illustrates border towns by government entity listed in alphabetical order. (Ref. 16, page 1)

Table 2.48
List of Municipalities on the Northern Border

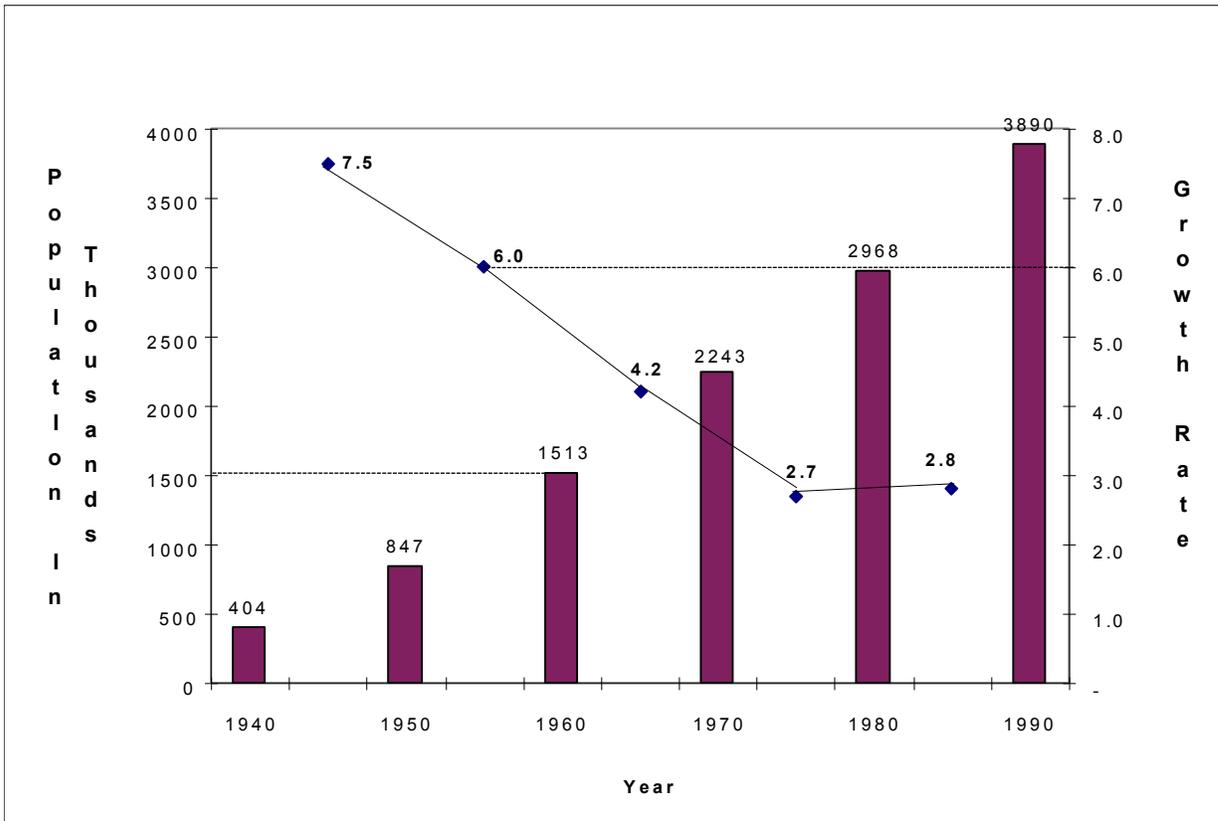
State	Border Municipality	State	Border Municipality
Baja California	Mexicali	Sonora	Agua Prieta
	Tecate		Altar
	Tijuana		Caborca
Chihuahua	Ascension		Cananea
	Guadalupe		Naco
	Janos		Nogales
	Juarez		Puerto Peñasco
	Manuel Benavides		San Luis Rio Colorado
	Ojinaga		Santa Cruz
	Praxedis G. Guerrero		Saric
Coahuila		Tamaulipas	Gral. Plutarco E. Calles
	Acuña		Camargo
	Guerrero		Guerrero
	Hidalgo		Gustavo Diaz Ordaz
	Jimenez		Matamoros
	Nava		Mier
	Ocampo		Miguel Aleman
	Piedras Negras		Nuevo Laredo
Nuevo Leon			Reynosa
	Anahuac		Rio Bravo
			Valle Hermoso

Demographic Growth

The 1990 census yielded almost 3.9 million people on the northern border, or 4.8 percent of the country's total population, totalling approximately 81.25 million inhabitants that year. (Ref. 16, page 2 and Ref. 17, page 8)

Compared to the previous census, it shows that population growth was stable after a steady decline for 1940-80 as can be observed from Figure 2.32. (Ref. 16, page 3)

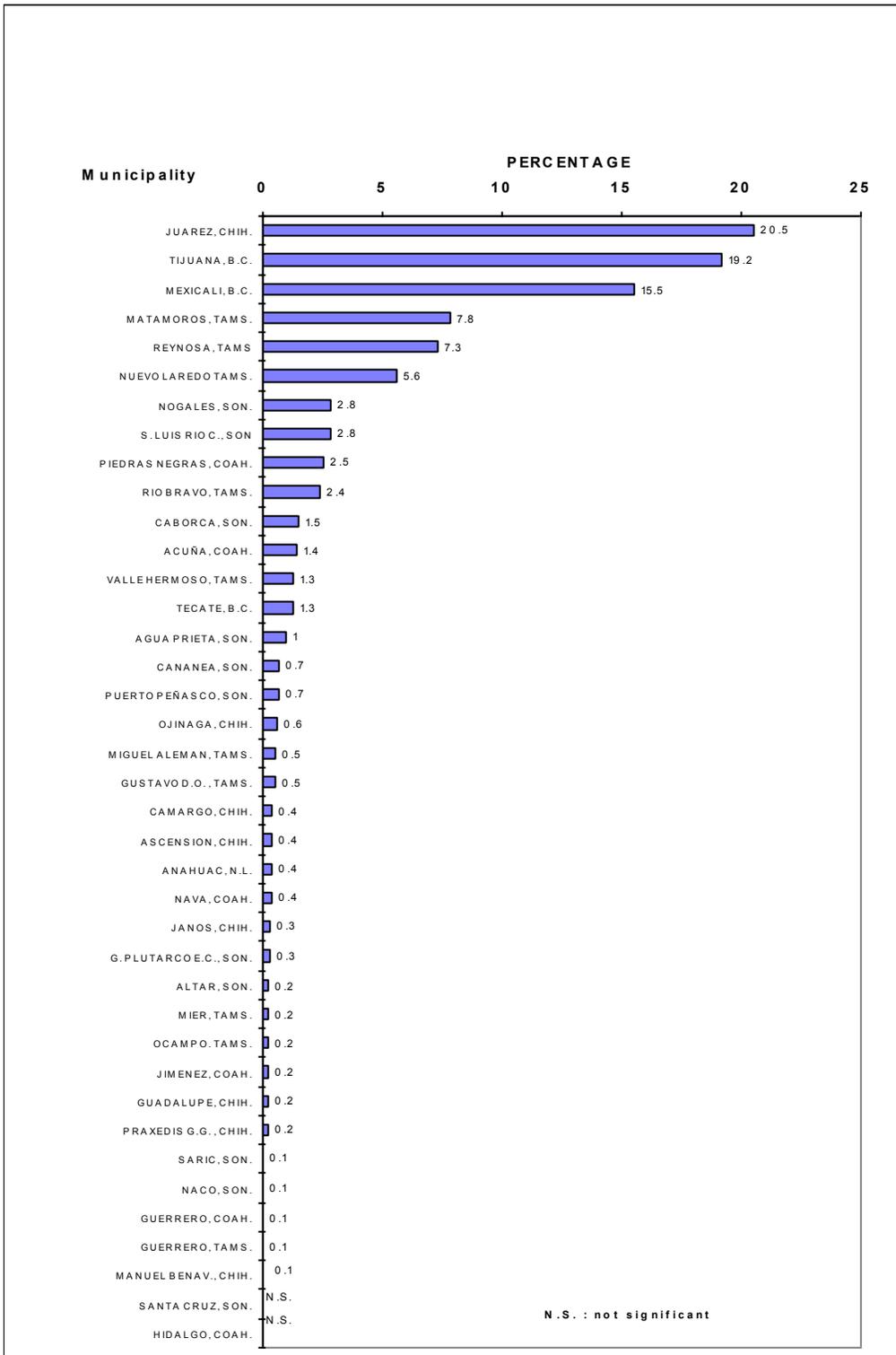
Figure 2.32 Population Growth on the Northern Border



Geographic Distribution

Figure 2.33 charts data based on the 1990 border municipalities. Ciudad Juarez has the largest population, 21 percent of all border residents, followed by Tijuana with 19 percent, Mexicali with 16 percent, Matamoros with 8 percent, and Reynosa with 7 percent, Nuevo Laredo with 6 percent. The smallest in terms of population are Hidalgo in Coahuila state and Santa Cruz in Sonora, each with less than two thousand inhabitants. (Ref. 16, page 6)

Figure 2.33 1990 Population Distribution Among the Municipalities along the Northern Border



Total population for Border Municipalities = 3.9 million

Migration

In 1990, there were 1.095 million residents of the border towns that were not natives to the states that make up the northern border; accounting for 28 percent of the total population of the area. More than half of that [sic] population lives in the border towns of Baja California. See Figure 2.34.

The main states from which non-natives of the border or border entities migrate include (in order of importance): Jalisco, Durango, Sinaloa, Guanajuato, and the Federal District (Mexico City), all contributing a combined 51.6 percent of the immigrants to the border area. Immigrants from other countries account for 7.5 percent, or approximately 82,000 residents recorded by the census. See Figure 2.35. (Ref. 16, page 11)

Figure 2.34 1990 Distribution of Non-Native Border Residents Among the Entities of the Northern Border

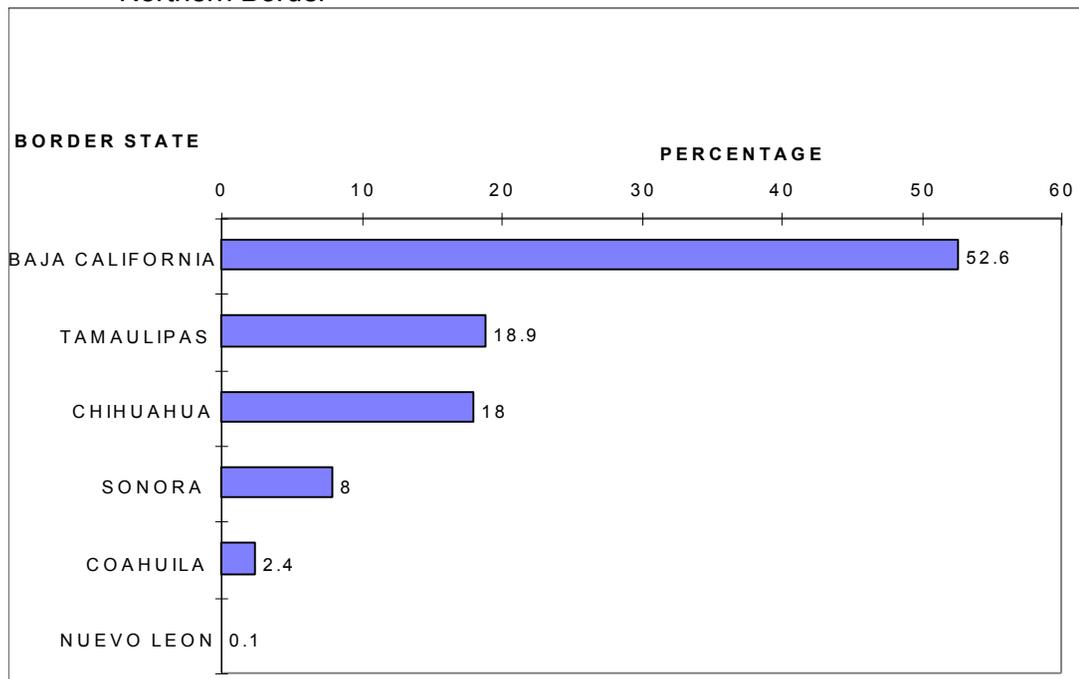
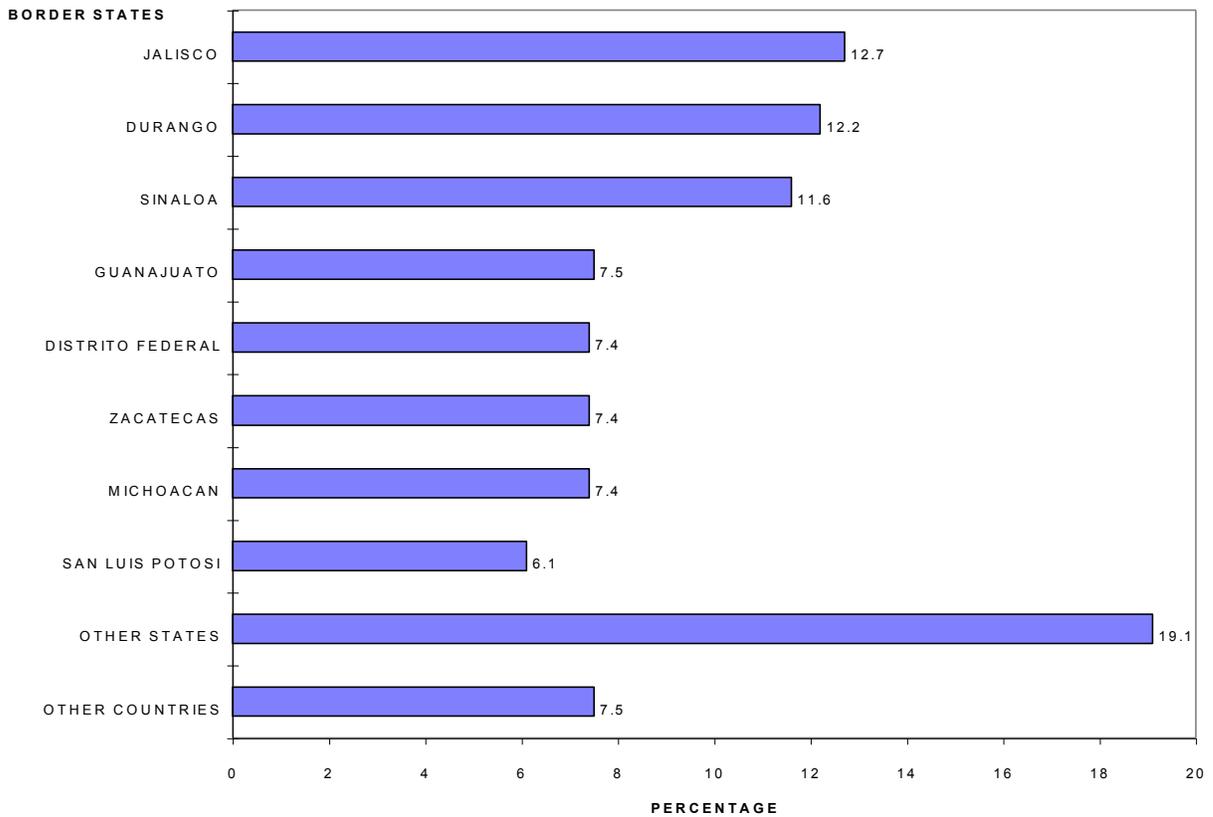


Figure 2.35 Sources of Migration to the Northern Border, 1990



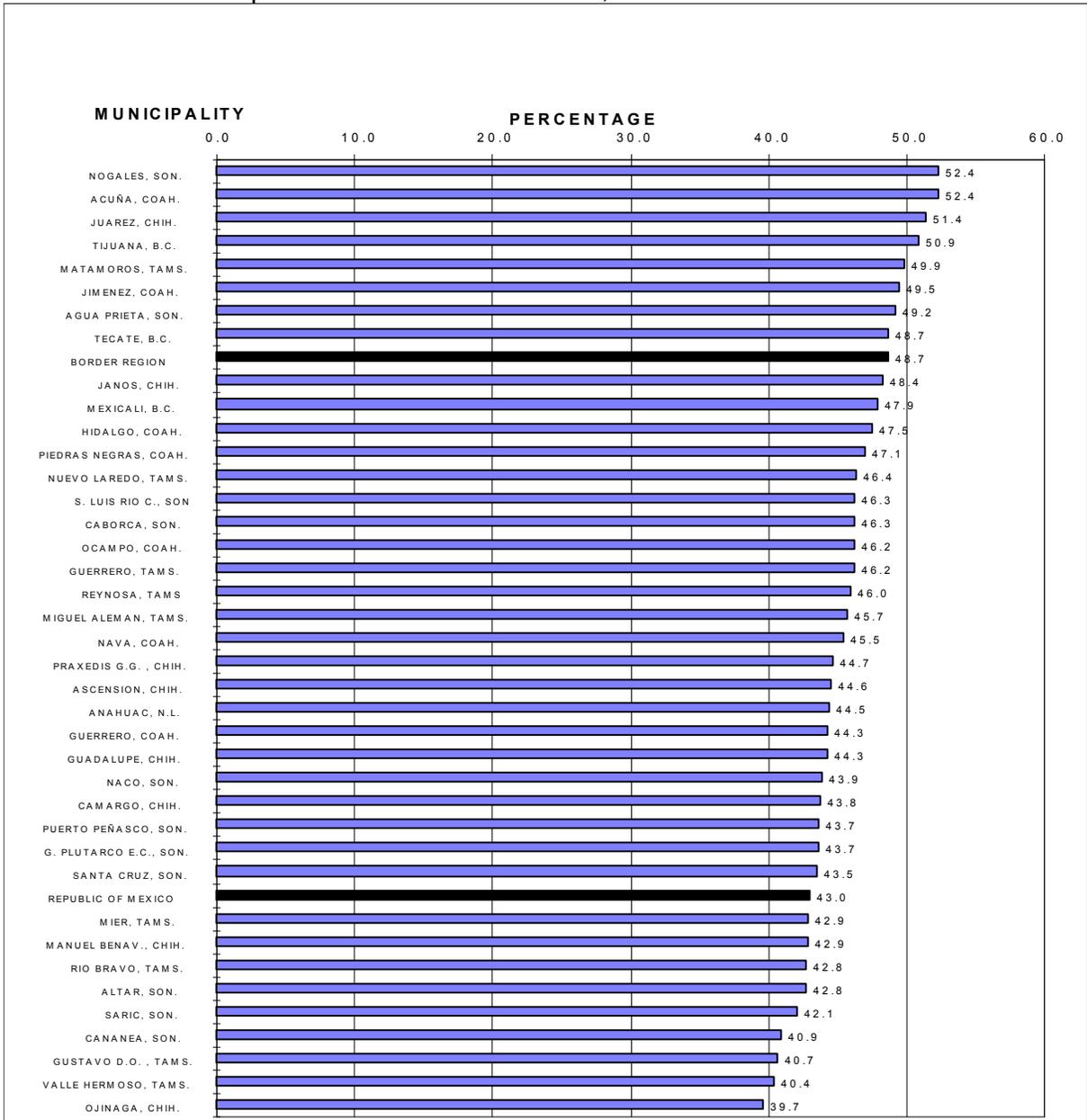
Economically Active Population

The census of 1990 on the northern border reported that 49 percent of the population 12 years old and over declared they were economically active, 7 percent more than the 42 percent that did so in 1970. Participation in economic activity at the national level was 43 percent.

The largest proportion of economically active population among the border towns in 1990 were in Nogales, Sonora; Acuna, Coahuila; Ciudad Juarez, Chihuahua; Tijuana, B.C.; and Matamoros, Tamaulipas.

Figure 2.36 illustrates percent of economic participation of the population, 12 years old and older, in the towns of the northern border compared to the border municipalities, as a block, and to Mexico. (Ref. 16, page 24)

Figure 2.36 Economic Participation of the Population 12 Years of Age and Older in the Municipalities of the Northern Border, 1990



Distribution by Sector

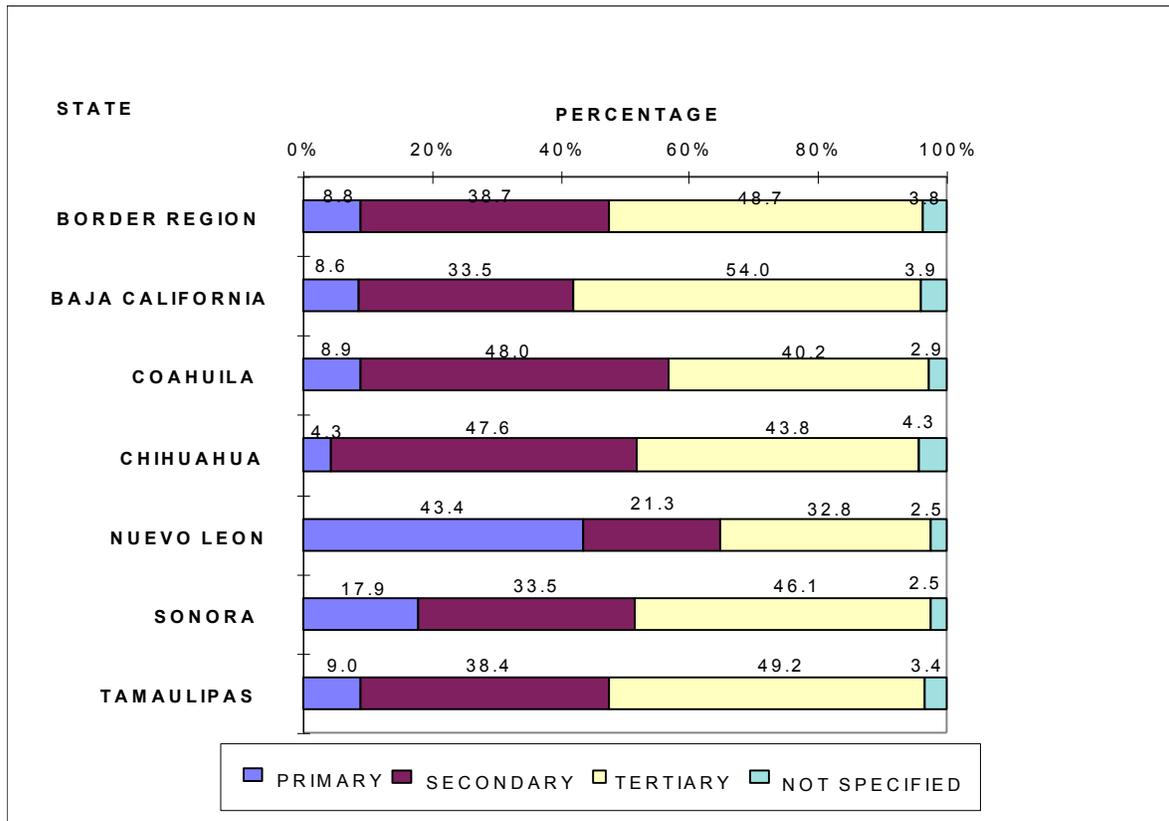
The employed population 12 years of age or older is distributed into three major economic sectors:

Primary: Agriculture, cattle ranching, forestry, hunting and fishing

Secondary: Mining, oil and gas, manufacturing, electricity generation and construction

Tertiary: Business and services

Figure 2.37 Sector Structure of the Northern Border's Employed Population, by State, 1990



The 1990 census indicates significant changes compared to the 1970 census, as the primary sector declined from 25 percent to 9 percent, the secondary sector increased its share from 25 percent to 39 percent and the tertiary sector also increased, from 43 percent to 49 percent for the same period.

Note that if the sector structure of the employed population at the national level is compared to that of the northern border, the latter has a level of industrialization 11 percentage points higher than the rest of the nation. Thus, the primary sector of the northern border has a level of employment 14 percent lower than the rest of the country, while the border's tertiary sector is higher by 3 percentage points than the country's.

The six border states show differences in the sector structure of people employed in the border towns, as shown in Figure 2.37. (Ref.16, page 26)

2.6.2 Demographic and Socioeconomic Data of the Selected Border Cities

The following six border port systems were selected as a result of analyses in Task 3 of the Binational Planning and Programming Study of Border Transportation: Tijuana, B.C.; Nogales, Sonora; Piedras Negras, Coahuila; Ciudad Juarez, Chihuahua; and Nuevo Laredo and Matamoros in Tamaulipas.

The following sections provide data for each of those cities, for the border municipality to which they belong and define areas as a reflection of population state and movement, education, and employment.

The charts and graphics that provide data for each of those cities are taken from the most recent publications by the source, the *Cuadernos Estadísticos Municipales* (Municipal Statistical Notebooks), published by the Instituto Nacional de Estadística, Geografía, e Informática (INEGI, or National Institute of Statistics, Geography, and Data Processing).

2.6.3 Tijuana, B.C.

Contents:

State/Condition and Movement of the Population

- Total population by sex according to the three main locations, 1970-1990.
- Mean annual growth rates between census of the main locations, 1970-1990 (in percent).
- Total population by sex according to five-year age group, 1980-1990.
- Total population by sex according to main locations to March 12, 1990.

Education

- Population 5 years of age and older by condition of school attendance and sex according to age to March 12, 1990.
- Male and female population 15 years of age and older, literate and illiterate, 1950-1990 (in percent).
- Registered pupils, teaching personnel and school at course end by educational level, 1993/94.

Employment

- Population at least 12 years of age by activity status according to sex, 1980-1990.
- Economically active population by sex according to five-year age group, 1980.
- Economically active population by sex according to five-year age group, 1990
- Male and female employed population by activity sector to March 12, 1990.
- Employed population by work situation, 1980-1990.
- Main employment indicators in urban Tijuana, 1994 (in percent).

State and Movement of the Population

**Table 2.49
Total Population by Sex According to the Three Main Locations, 1970-1990**

Location	Total	Men	Percent	Women	Percent
1970					
State	870,421	nd	nd	nd	nd
Municipality of Tijuana	340,583	nd	nd	Nd	nd
Tijuana	277,306	nd	nd	nd	nd
Rosarito	6,645	nd	nd	nd	nd
Joya, La	2,623	nd	nd	nd	nd
Rest of Locations	54,009	nd	nd	nd	nd
1980					
State	1,177,886	580,727	49.3	597,159	50.7
Municipality of Tijuana	461,257	224,861	48.7	236,396	51.3
Tijuana	429,500	208,886	48.6	220,614	51.4
Rosarito	5,954	2,970	49.9	2,984	50.1
Joya, La	3,575	1,755	49.1	1,820	50.9
Rest of Locations	22,228	11,250	50.6	10,978	49.4
1990					
State	1,660,855	832,090	50.1	828,765	49.9
Municipality of Tijuana	747,381	374,632	50.1	372,749	49.9
Tijuana	698,752	349,730	50.1	349,022	49.9
Rosarito	23,067	11,708	50.8	11,359	49.2
Joya, La	8,884	4,530	51.0	4,354	49.0
Rest of Locations	16,678	8,664	51.9	8,014	48.1

Source: "Baja California, definitive results. Data by location (Territorial Integration), IX, X, XI General Census of population and Housing, 1970, 1980, 1990". INEGI

**Table 2.50
Mean Annual Growth Rates Between Census of the Main Locations, 1970-1990
(in percent)**

Location	1970 - 1980 a/	1980 - 1990 a/
State	3.0	3.6
Municipality of Tijuana	3.0	5.1
Tijuana	4.3	5.1
Rosarito	-1.1	14.9
Joya, La	3.0	9.8

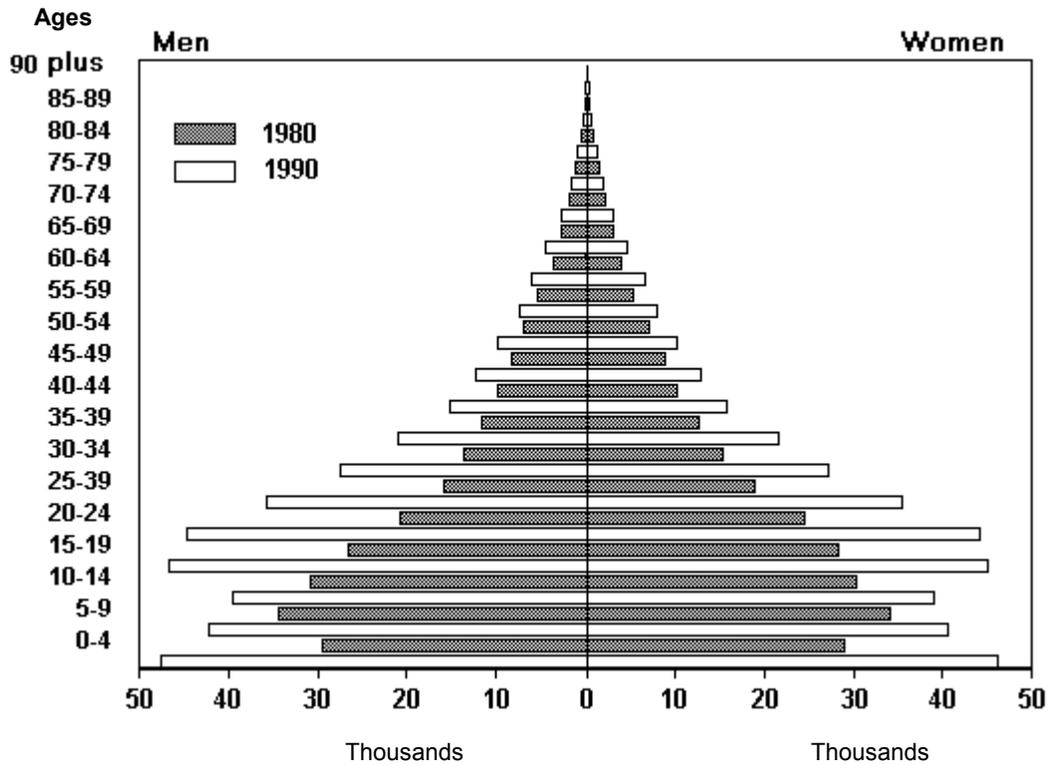
a/ expresses the annual growth rhythm of the population living in a defined geographic unit.

Rates were estimated as:

$$\text{Mean annual growth rate} = (\text{Population at the end of the period} / \text{Population at the beginning of the period})^{(1/\text{No. of years considered})} - 1 \times 100$$

Source: INEGI

Figure 2.38 Total Population by Sex According to Five-Year Age Group, 1980-1990.



Source: "Baja California, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

**Table 2.51
Total Population by Sex by Main Locations to March 12, 1990**

Location	Total	Men	Women
State	1,660,855	832,090	828,765
Municipality of Tijuana	747,381	374,632	372,749
Tijuana	698,752	349,730	349,022
Rosarito	23,067	11,708	11,359
Joya, La	8,884	4,530	4,354
San Luis	4,889	2,470	2,419
Matamoros	3,476	1,752	1,724
Prima Tapia	2,056	1,064	992
Ejido Tierra Y Libertad (Maclovio Rojas)	592	313	279
Pescador, El	499	271	228
Ejido Morelos	480	272	208
Encantada, La	465	246	219
Descanso, El	370	192	178
Rest of Locations	3,851	2,084	1,767

Source: "Baja California, definitive results. Data by location (Territorial Integration), XI General Census of Population and Housing, 1990." INEGI

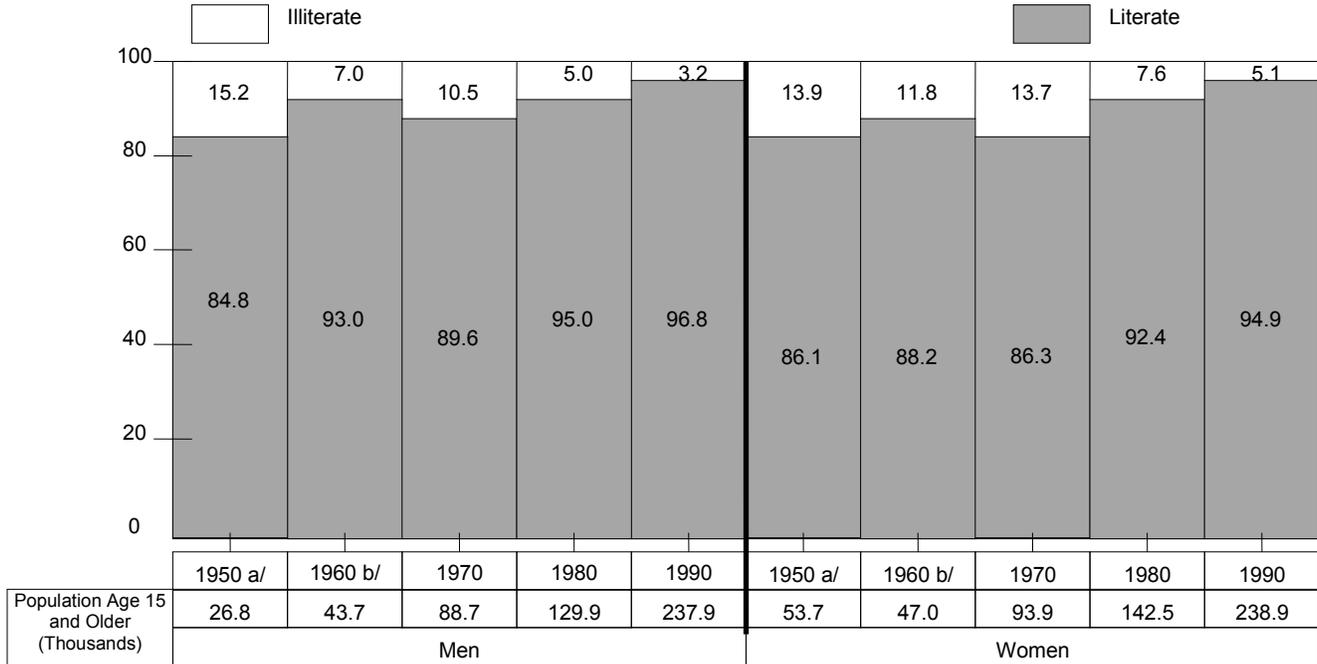
Education

Table 2.52
Population 5 Years of Age and Older by Condition of School Attendance and Sex by Age to March 12, 1990

Age	Total	Attend		Do not Attend		Not Specified	
		Men	Women	Men	Women	Men	Women
State							
Total	1,425,801	224,762	224,991	479,063	477,966	9,365	9,654
5 years	38,185	10,973	10,542	6,895	6,377	1,798	1,600
6 years	37,373	15,264	15,192	3,166	2,990	382	379
7 years	36,879	17,021	16,445	1,464	1,384	306	259
8 years	37,026	17,519	17,006	1,123	958	236	184
9 years	35,840	17,007	16,749	899	835	187	163
10 years	36,222	17,217	16,817	1,039	879	139	131
11 years	33,659	15,781	15,698	1,018	900	146	116
12 years	36,576	16,655	16,469	1,700	1,526	126	100
13 years	36,177	15,550	15,528	2,386	2,497	100	116
14 years	37,794	14,325	14,952	4,208	4,054	136	119
15 - 19 years	202,116	42,418	44,833	59,434	53,621	955	855
20 - 24 years	184,182	13,991	13,376	77,570	77,371	975	899
25 years and older	673,772	11,041	11,384	318,161	324,574	3,879	4,733
Municipality of Tijuana							
Total	639,451	97,572	96,626	218,856	218,825	3,658	3,914
5 years	17,336	4,496	4,340	3,661	3,378	730	731
6 years	16,929	6,587	6,569	1,777	1,655	160	181
7 years	16,396	7,404	7,161	799	781	130	121
8 years	16,403	7,720	7,412	593	518	85	75
9 years	15,876	7,489	7,349	469	420	73	76
10 years	15,822	7,535	7,220	510	454	52	51
11 years	14,810	6,923	6,906	474	405	52	50
12 years	15,931	7,171	7,167	790	700	51	52
13 years	15,732	6,786	6,639	1,029	1,207	31	40
14 years	16,394	6,098	6,323	1,895	1,963	67	48
15 - 19 years	91,815	18,217	18,662	28,238	25,991	375	332
20 - 24 years	89,060	6,159	5,881	38,372	37,880	397	371
25 years and older	296,947	4,987	4,997	140,249	143,473	1,455	1,786

Source: "Baja California, definitive results. XI General Census of Population and Housing, 1990". INEGI

Figure 2.39
Male and Female Population 15 Years of Age and Older, Literate and Illiterate, 1950-1990
(In Percent)



a/ Refers to population 6 yrs. and over.

b/ Does not include population of "not specified" age.

Source: "Baja California, definitive results. VII, VIII, IX, X, XI General Census of Population and Housing, 1950, 1960, 1970, 1980, 1990. INEGI

Table 2.53
Registered Pupils, Teaching Personnel, and Schools at Course End by Educational Level 1993/94

Level	State			Municipality		
	Registered Pupils	Teaching personnel a/	Schools b/	Registered Pupils	Teaching personnel a/	Schools b/
Total	525,527	22,402	2,535	228,283	8,416	953
Pre-School c/	62,169	2,387	755	23,856	867	281
Grade School d/	294,668	9,362	1,138	136,732	3,862	432
Work Training	19,638	668	141	7,016	253	57
High School e/	94,368	5,757	312	40,672	1,986	111
Middle Vocational	11,440	1,180	99	4,648	458	42
Baccalaureate f/	40,173	2,753	72	14,777	926	24
Teachers College g/	3,071	295	18	582	64	6

a/Includes executive with the/a group.

b/School quantification is offered by the shifts the facility offers and in terms of the physical plant.

c/Includes Indian, community courses and pre-school maintained by DIF.

d/Includes bilingual and bicultural and community courses run by CONAFE.

e/Includes general, for workers, and technical in three branches: industrial, farm, and fishing.

f/Includes two- and three year general, and technical in the branches of industrial and services, farm, and fishing.

g/Includes pre-school, primary, special education and physical education.

Source: Baja California Institute of Education and Teaching Services, Directorate of Education Planning; Statistics Dept.

Employment

**Table 2.54
Population at Least 12 Years of Age by Activity Status According to Sex, 1980-1990**

Sex	Total	Economically Active Population		Economically Inactive Population	Not Specified
		Employed	Unemployed a/		
1980					
State	791,768	400,837	2,442	388,489	-
Men	386,423	281,060	1,586	103,777	-
Women	405,345	119,777	856	284,712	-
Municipality of Tijuana					
Men	148,136	Nd	Nd	38,546	-
Women	160,585	Nd	Nd	108,111	-
1990					
State	1,170,617	565,471	12,924	558,838	33,384
Men	583,610	407,442	10,134	151,354	14,680
Women	587,007	158,029	2,790	407,484	18,704
Municipality of Tijuana					
Men	262,367	187,312	5,006	64,349	5,700
Women	263,512	74,214	1,346	181,224	6,728

a/ 80 Data includes the population at least 12 years of age who never worked and that during the week of March 5-11 sought but did not find work.

Source: "Baja California, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

**Table 2.55
Economically Active Population by Sex According to Five-Year Age Group, 1980**

Age Group	State			Municipality		
	Total	Men	Women	Total	Men	Womens
1980						
Total	403,279	282,646	120,633	162,064	109,590	52,474
12-14 years	8,367	6,037	2,330	3,330	2,360	970
15-19 years	56,544	36,042	20,502	24,263	14,189	10,074
20-24 years	74,116	46,443	27,673	29,855	17,843	12,012
25-29 years	58,615	39,648	18,967	23,102	15,258	7,844
30-34 years	46,693	33,293	13,400	18,971	13,298	5,673
35-39 years	39,113	28,413	10,700	15,883	11,365	4,518
40-44 years	31,787	23,717	8,070	12,892	9,500	3,392
45-49 years	26,516	20,280	6,236	10,552	7,856	2,696
50-54 years	21,641	16,840	4,801	8,418	6,464	1,954
55-59 years	16,669	13,403	3,266	6,279	4,903	1,376
60-64 years	10,252	8,265	1,987	3,847	3,006	841
65 years and older	12,966	10,265	2,701	4,672	3,548	1,124

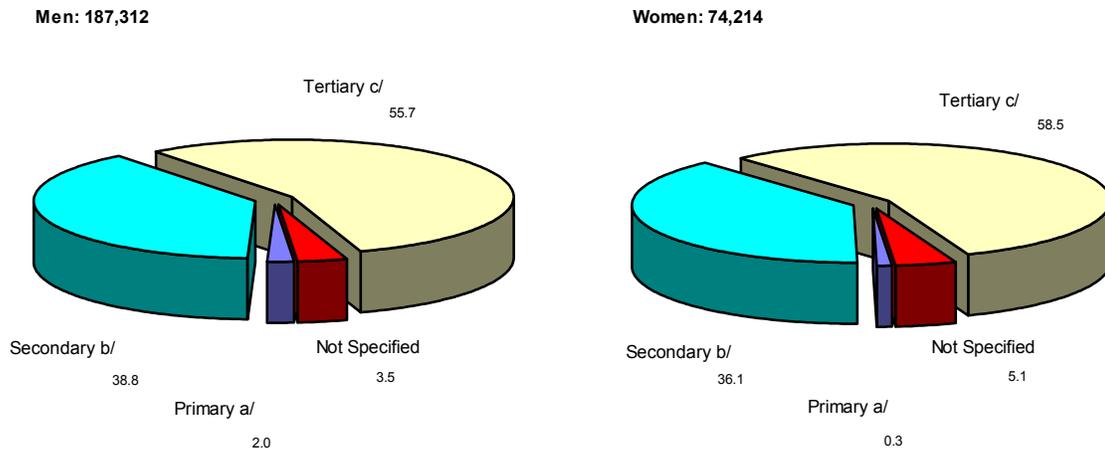
Source: "Baja California, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

**Table 2.56
Economically Active Population by Sex According to Five-Year Age Group, 1990**

Age Group	State			Municipality		
	Total	Men	Women	Total	Men	Women
1990 Total	578,395	417,576	160,819	267,878	192,318	75,560
12-14 years	6,619	4,414	2,205	2,441	1,680	761
15-19 years	80,252	52,917	27,335	39,413	25,298	14,115
20-24 years	112,599	76,152	36,447	56,212	37,917	18,295
25-29 years	96,188	68,684	27,504	45,733	33,010	12,723
30-34 years	77,969	56,289	21,680	35,262	25,815	9,447
35-39 years	61,325	44,818	16,507	26,958	19,759	7,199
40-44 years	43,911	32,770	11,141	19,285	14,460	4,825
45-49 years	33,843	26,276	7,567	14,848	11,479	3,369
50-54 years	24,636	20,112	4,524	10,661	8,578	2,083
55-59 years	17,231	14,539	2,692	7,332	6,116	1,216
60-64 years	11,566	9,932	1,634	4,801	4,038	763
65 years and older	12,256	10,673	1,583	4,932	4,168	764

Source: "Baja California, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

**Figure 2.40 Male and Female Employed Population by Activity Sector to March 1990
(In Percent)**



a/ Includes farming, cattle, forestry, and fishing.

b/ Includes mining, manufacturing, electric generation, and construction.

c/ Includes business and services.

Source: " Baja California, definitive results. XI General Census of Population and Housing, 1990". INEGI.

Table 2.57
Employed Population by Work Situation, 1980-1990

Work Situation	State	Municipality
1980 Total	400,837	161,087
Owner of Businessman	27,280	10,814
Employee, Worker, or Unskilled Labor	207,124	82,213
Independent Worker a/	46,161	17,990
Unpaid Worker	20,276	8,809
Not Specified	99,996	41,261
1990 Total	565,471	261,526
Owner of Businessman	22,480	10,266
Employee, Worker, or Unskilled Labor	439,303	202,622
Independent Worker a/	84,472	40,103
Unpaid Worker	3,004	1,284
Not Specified	16,212	7,251

a/includes workers who are members of a production co-op.

Source: "Baja California, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

Table 2.58
Main Employment Indicators in Urban Tijuana, 1994 (in percent)

Indicator	General Quarter				Tijuana Urban Area Quarter			
	I	II	III	IV	I	II	III	IV
Specific Rate of Participation								
Men	74.4	74.7	74.9	74.7	74.5	74.8	76.5	34.1
Women	36.4	36.2	36.7	36.6	32.8	33.3	36.3	28.0
Rate of Open Unemployment a\								
Men	3.7	3.7	3.6	3.4	1.0	1.7	0.9	1.1
Women	3.8	3.4	4.5	4.0	1.4	1.5	1.6	1.2
Reason for Leaving Job								
Fired/Laid Off	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Temporary Work Finished	26.7	28.5	29.0	28.3	26.8	35.2	30.6	27.7
Unsatisfied With Job	23.0	23.3	19.3	21.7	16.7	17.3	11.0	12.5
Other Reasons	27.6	27.5	42.5	40.8	29.7	23.8	36.6	44.4
Duration of Employment	22.7	20.7	9.2	9.2	26.8	23.7	21.8	15.4
1 to 4 Weeks	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
5 to 8 Weeks	44.2	39.4	55.2	49.4	62.3	65.2	63.8	47.8
9 or More Weeks	24.6	23.2	18.0	19.6	25.6	24.0	24.3	44.2
	31.2	37.4	26.8	31.0	12.1	10.8	11.9	8.0

a/refers to population at least 12 yrs of age and that in the week preceding the interview had no job and in the previous two months attempted in some way to find one.

Source: INEGI. General Directorate of Statistics, Directorate of Short-term Statistics.

2.6.4 Nogales, Sonora

Content

State/Condition and Movement of the Population

- Total population by sex, 1950-1990.
- Mean annual growth rates between census of the main locations, 1950-1990.
- Total population by sex by five-year age group, 1980-1990.
- Total population by sex according to main locations to March 12, 1990.

Education

- Population 5 years of age and older by condition of school attendance and sex by age, to March 12, 1990.
- Population 15 years of age and older, by literacy, 1950-1990 (in percent).
- Registered pupils, teaching personnel and schools at course beginning, by educational level and administrative upkeep/support 1993/94.

Employment

- Population at least 12 years of age by activity status by sex, 1980-1990.
- Economically active population, by sex, according to five-year age group, 1980.
- Economically active population, by sex, according to five-year age group, 1990.
- Specific participation rates to March 12, 1990.
- Employed population by work situation, 1980-1990.
- Employed population by main activity to March 12, 1990 (in percent).

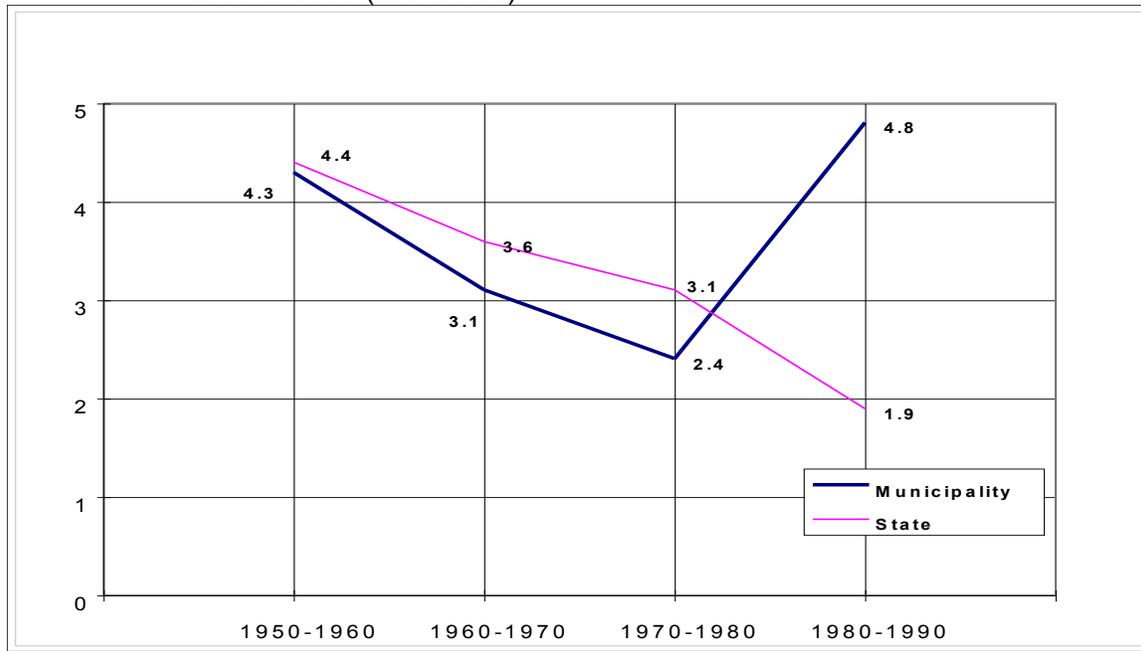
State and movement of the population

**Table 2.59
Total Population by Sex, 1950-1990**

Location	Total	Men	%	Percent	%
1950					
State	510,607	255,825	50.1	254,782	49.9
Municipality	26,016	12,172	46.8	13,844	53.2
1960					
State	783,378	395,965	50.5	387,413	49.5
Municipality	39,812	19,187	48.2	20,625	51.8
1970					
State	1,098,720	551,496	50.2	547,224	49.8
Municipality	53,494	26,570	49.7	26,924	50.3
1980					
State	1,513,731	761,047	50.3	752,684	49.7
Municipality	68,076	33,008	48.5	35,068	51.5
1990					
State	1,823,606	915,088	50.2	908,518	49.8
Municipality	107,936	54,410	50.4	53,526	49.6

Source: "Sonora, definitive results. VII, VIII, IX, X, XI General Census of Population and Housing, 1950, 1960, 1970, 1980 and 1990". INEGI

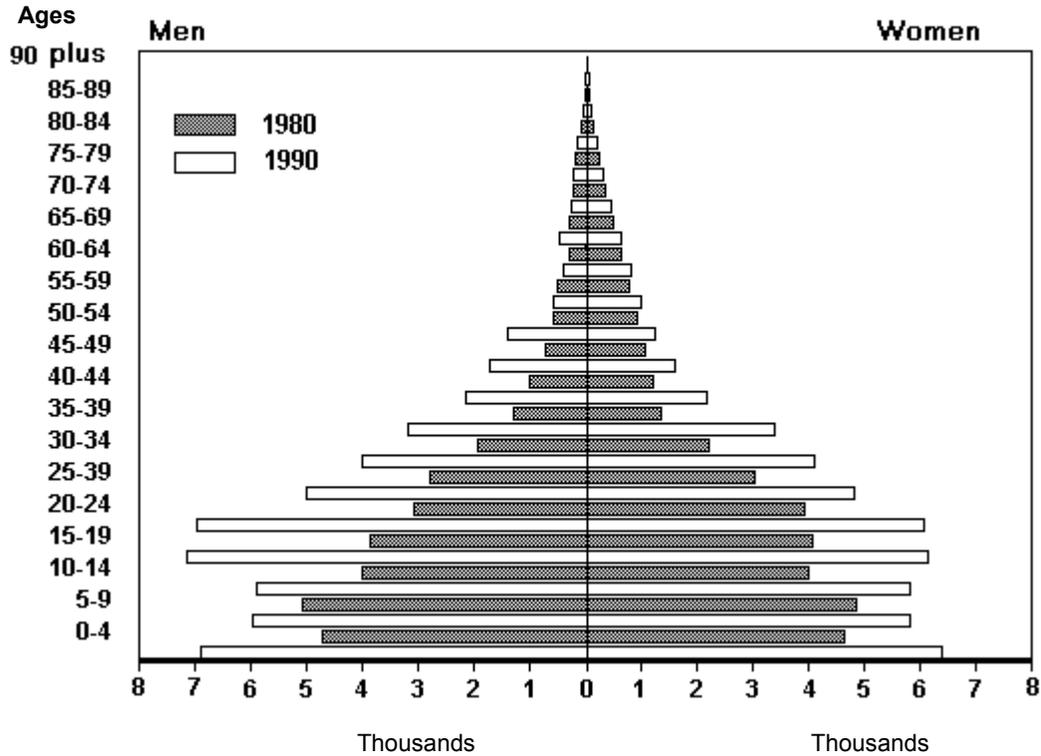
Figure 2.41 Mean Annual Growth Rates, Between Census, of the Main Locations, 1950 to 1990 (In Percent)



a/ Expresses the annual growth rhythm of the population living in a defined geographic unit during a certain period. It was estimated at: $\text{Mean annual growth rate} = \left(\frac{\text{Population at the end of the period}}{\text{Population at the beginning of the period}} \right)^{\frac{1}{\text{No. of years considered}-1}} \times 100$.

Source: INEGI.

Figure 2.42 Total Population by Sex by Five-Year Age Groups, 1980-1990



Source: "Sonora, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

**Table 2.60
Total Population by Sex According to Main Locations, to March 12, 1990**

Location	Total	Men	Women
State	1,823,606	915,088	908,518
Municipality	107,936	54,410	53,526
Heroica Nogales	105,873	53,312	52,561
Cibuta	627	299	328
Poblado	233	130	103
Licenciado Adolfo Lopez Mateos	115	59	56
Bellota, La	110	57	53
Picachos, Los (Cárdenas Valdez)	110	67	43
Ejido Cibuta	108	60	48
Cieneguita, La	81	46	35
Chimeneas, Las	53	28	25
Arizona, La	44	25	19
Doble R	42	22	20
Rest of Locations	540	305	235

Source: "Sonora, definitive results. Data by location (Territorial Integration), XI General Census of Population and Housing, 1990". INEGI

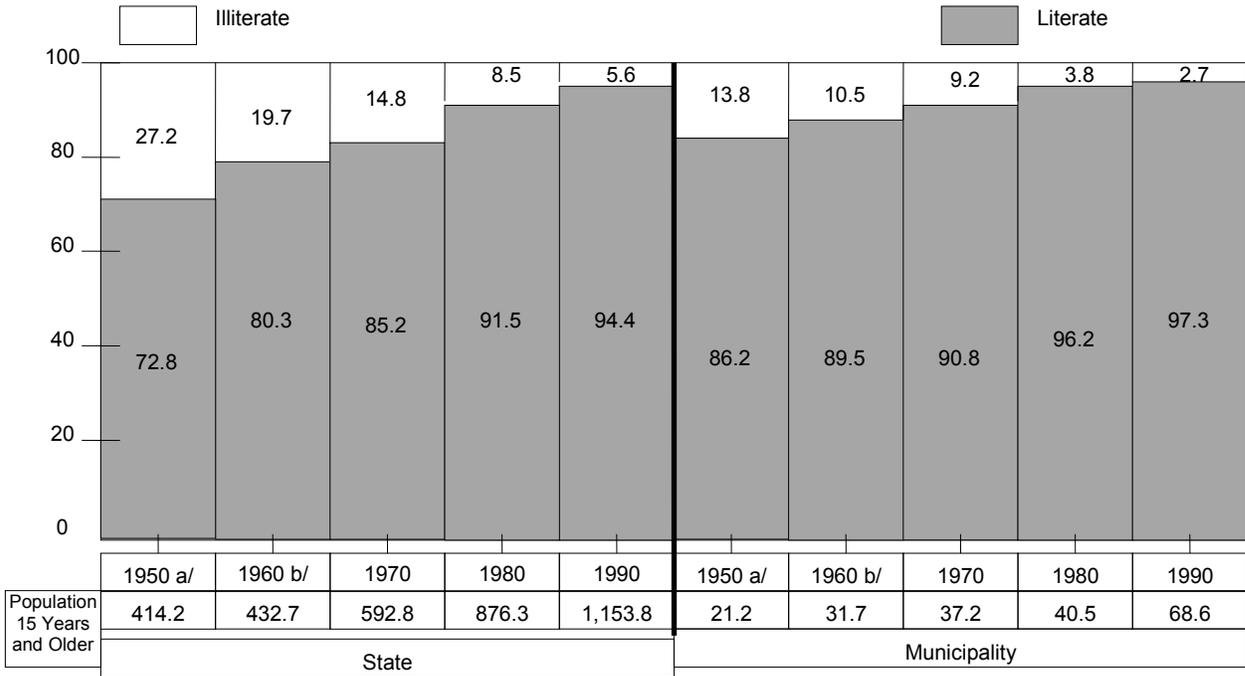
Education

**Table 2.61
Population Five Years of Age and Older by Condition of School Attendance and Sex by
Age to March 12, 1990**

Age	Total	Attend		Do Not Attend		Not Specified	
		Men	Women	Men	Women	Men	Women
State							
Total	1,596,063	270,622	266,958	518,985	520,116	10,040	9,342
5 years	43,044	13,186	13,489	6,975	6,344	1,583	1,467
6 years	42,585	18,453	18,372	2,819	2,363	292	286
7 years	43,090	20,395	20,202	1,137	894	241	221
8 years	44,728	21,375	21,187	824	663	160	159
9 years	43,321	21,042	20,739	695	568	140	137
10 years	44,883	21,667	21,490	825	676	123	102
11 years	41,453	19,803	19,793	921	720	109	107
12 years	45,692	21,488	20,828	1,707	1,458	116	95
13 years	43,933	19,397	19,155	2,679	2,496	101	105
14 years	46,384	17,938	18,657	4,939	4,603	128	119
15 - 19 years	217,889	49,377	51,842	59,791	55,200	928	751
20 - 24 years	181,031	15,670	12,769	73,232	77,308	1,195	857
25 years and older	758,030	10,471	8,435	362,441	366,823	4,924	4,936
Municipality							
Total	92,262	15,052	14,171	30,951	31,401	371	316
5 years	2,462	740	762	400	395	80	85
6 years	2,215	978	985	117	118	7	10
7 years	2,353	1,146	1,092	57	39	8	11
8 years	2,439	1,216	1,136	47	28	7	5
9 years	2,360	1,154	1,126	40	31	2	7
10 years	2,378	1,182	1,110	46	30	3	7
11 years	2,234	1,062	1,090	45	33	2	2
12 years	2,377	1,102	1,110	82	72	8	3
13 years	2,334	1,033	1,062	120	116	1	2
14 years	2,436	959	983	246	245	2	1
15 - 19 years	13,294	2,655	2,567	4,235	3,770	36	31
20 - 24 years	13,078	956	649	5,748	5,649	51	25
25 years and older	42,302	869	499	19,768	20,875	164	127

Source: "Sonora, definitive results. XI General Census of Population and Housing, 1990". INEGI

Figure 2.43 Population 15 Years of Age and Older by Literacy, 1950-1990 (In Percent)



a/ Refers to population 6 years and older.

b/ Does not include population of "not specified" age.

Source: "Sonora, definitive results. VII, VIII, IX, X, XI General Census of Population and Housing, 1950, 1960, 1970, 1980 and 1990". INEGI.

**Table 2.62
Registered Pupils, Teaching Personnel, and Schools at Course Beginning by Educational Level and Administrative Upkeep, 1993/94.**

Level and Upkeep	State			Municipality		
	Registered Pupils	Teaching Personnel a/	Schools	Registered Pupils	Teaching Personnel a/	Schools
Total	601,855	28,428	3,962	23,898	1,211	122
Pre-School Elementary	65,820	2,713	1,176	3,645	130	38
Federal b/	51,348	2,038	923	2,662	90	23
State c/	7,190	257	75	505	16	3
Private c/	5,394	332	114	185	12	4
Other d/	1,888	86	64	293	12	8
Elementary Primary	301,915	10,664	1,724	7,355	212	27
Federal e/	183,824	6,835	1,303	58	3	3
State	99,302	3,100	299	6,049	168	17
Private	18,789	729	122	1,248	41	7
Elementary Terminal Work Training	9,439	334	73	1,402	49	10
Federal	2,979	88	15	462	12	2
State	1,117	47	4	-	-	-
Private	2,586	159	53	940	37	8
Independent	2,757	40	1	-	-	-
Middle Cycle, Secondary Basic f/	110,720	5,830	539	5,720	325	20
Federal	69,660	3,357	148	4,490	221	9
State	33,306	1,505	298	635	33	4
Private	7,754	968	93	595	71	7
Middle Terminal Technical	17,184	1,681	173	1,325	124	12
Federal	7,270	687	26	669	57	3
Private	9,695	932	144	656	67	9
Independent	219	62	3	-	-	-
Upper Middle Cycle Baccalaureate g/	54,762	3,744	196	2,430	230	12
Federal	24,616	1,257	49	1,384	58	2
State	18,573	1,277	60	-	-	-
Private	11,475	1,201	86	1,046	172	10
Other	98	9	1	-	-	-
Upper h/	37,357	3,166	67	1,470	115	2
Licenciatura [College Equivalent]	36,250	3,104	56	1,429	115	1
Graduate Study	1,107	62	11	41	ND	1
Teacher's College i/	4,658	296	14	551	26	1
Licenciatura [College Equivalent]	4,641	296	13	551	26	1
Graduate Study	17	ND	1	-	-	-

a/Includes executive with the group[?].

b/Includes Indian education, community courses, Child Development Centers (CENDI), Migrant Children and Kindergarten

c/Includes kindergarten and Child Development Centers (CENDI)

d/Includes Municipal Child Development Centers of DIF, ISSSTE and MSS, UNISON and CIAD, A.C. and DIF Pre-school Assistance Centers. e/Includes Community courses and Migrant Children under CONAFE, Indian boarding school service and Ferrocarriles Nacionales de Mexico (Mexico National Railways).

f/Includes general and technical for workers, and "tele-high school".

g/Includes general, technical, art, technological, and teaching. and technical in the branches of industrial and services, farm, and fishing.

h/For the state, includes federal, state, independent, and private. For the municipality it refers to federal subsidy/upkeep.

i/For the state, includes federal and state. For the municipality it refers to federal subsidy/upkeep.

Source: Sonora State Government Secretariat of Education and Culture, Directorate of Education Planning; Statistics Dept.

Employment

**Table 2.63
Population at Least 12 Years of Age by Activity Status According to Sex, 1980-1990**

Sexo Sex	Total Total	Economically Active Population		Economically Inactive Population	Not Specified
		Employed	Unemployed		
1980					
State	996,841	480,692	3,585	512,564	-
Men	500,527	363,161	2,536	134,830	-
Women	496,314	117,531	1,049	377,734	-
Municipality	45,321	25,919	141	19,261	-
Men	21,562	Nd	Nd	5,014	-
Women	23,759	Nd	Nd	14,247	-
1990					
State	1,292,959	562,386	14,819	688,545	27,209
Men	646,522	427,354	11,789	194,405	12,974
Women	646,437	135,032	3,030	494,140	14,235
Municipality	75,821	38,936	807	35,104	974
Men	38,035	27,479	615	9,460	481
Women	37,786	11,457	192	25,644	493

a/ 1980 data includes the population at least 12 years of age who never worked. 1990 data includes the population at least 12 years of age that during the week of March 5-11 had no work, but actively sought it.

Source: "Sonora, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

**Table 2.64
Economically Active Population by Sex According to Five-Year Age Group, 1980.**

Age Group	State			Municipality		
	Total	Men	Women	Total	Men	Women
1980						
Total	484,277	365,697	118,580	26,060	16,548	9,512
12-14 years	9,567	6,625	2,942	385	206	179
15-19 years	66,755	44,464	22,291	4,694	2,442	2,252
20-24 years	86,983	59,237	27,746	5,252	2,942	2,310
25-29 years	68,296	50,902	17,394	4,323	2,731	1,592
30-34 years	54,333	42,399	11,934	3,007	2,065	942
35-39 years	47,223	37,371	9,852	2,280	1,529	751
40-44 years	39,911	32,170	7,741	1,611	1,150	461
45-49 years	31,901	26,136	5,765	1,306	955	351
50-54 years	25,824	21,472	4,352	1,050	803	247
55-59 years	19,970	16,967	3,003	877	722	155
60-64 years	13,904	11,615	2,289	552	433	119
65 years and older	19,610	16,339	3,271	723	570	153

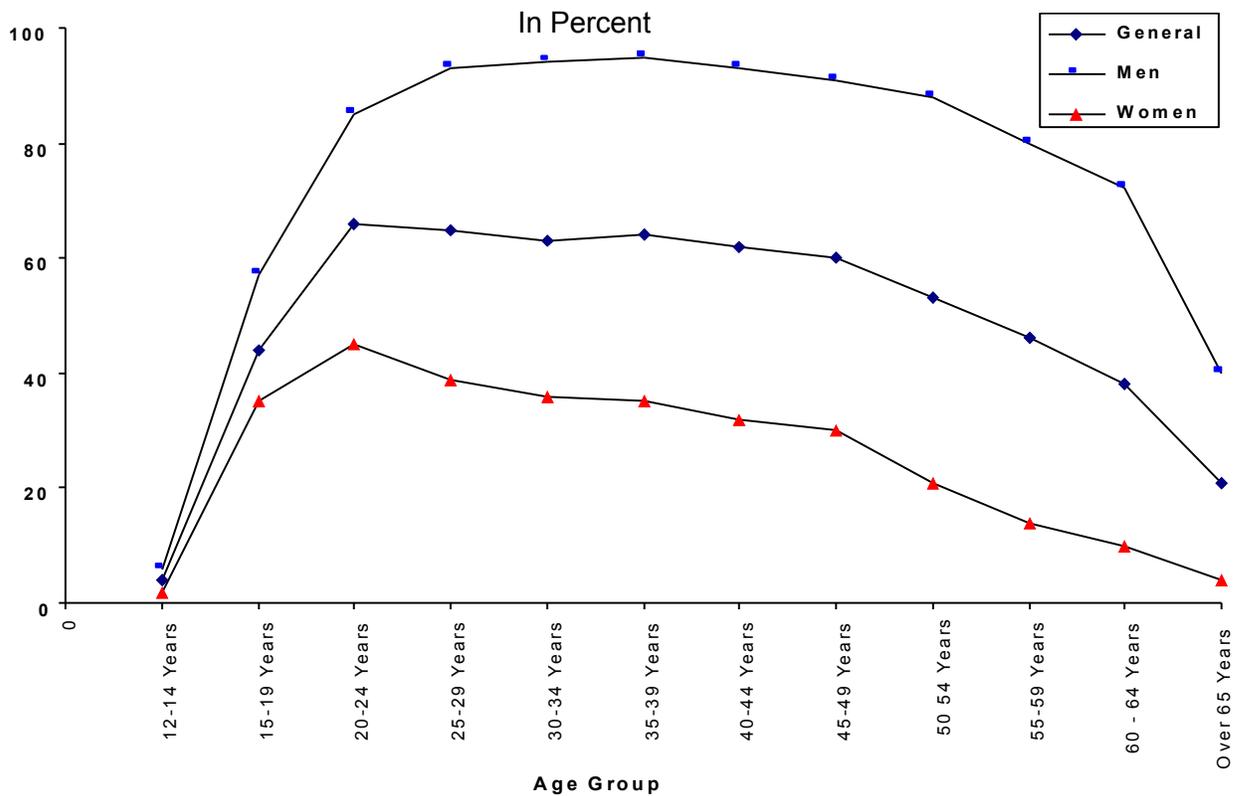
Source: "Sonora, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

**Table 2.65
Economically Active Population by Sex According to Five-year Age Group, 1990.**

Age Group	State			Municipality		
	Total	Men	Women	Total	Men	Women
1990						
Total	577,205	439,143	138,062	39,743	28,094	11,649
12-14 years	6,929	4,774	2,155	275	188	87
15-19 years	73,740	50,418	23,322	6,071	3,887	2,184
20-24 years	101,666	69,374	32,292	8,753	5,773	2,980
25-29 years	90,093	65,880	24,213	6,622	4,729	1,893
30-34 years	79,042	60,324	18,718	5,230	3,739	1,491
35-39 years	63,424	49,967	13,457	4,336	3,148	1,188
40-44 years	46,961	37,969	8,992	2,778	2,067	711
45-49 years	37,336	31,273	6,063	1,969	1,509	460
50-54 years	28,603	24,746	3,857	1,419	1,118	301
55-59 years	20,223	17,978	2,245	959	795	164
60-64 years	13,485	12,145	1,340	622	530	92
65 years and older	15,703	14,295	1,408	709	611	98

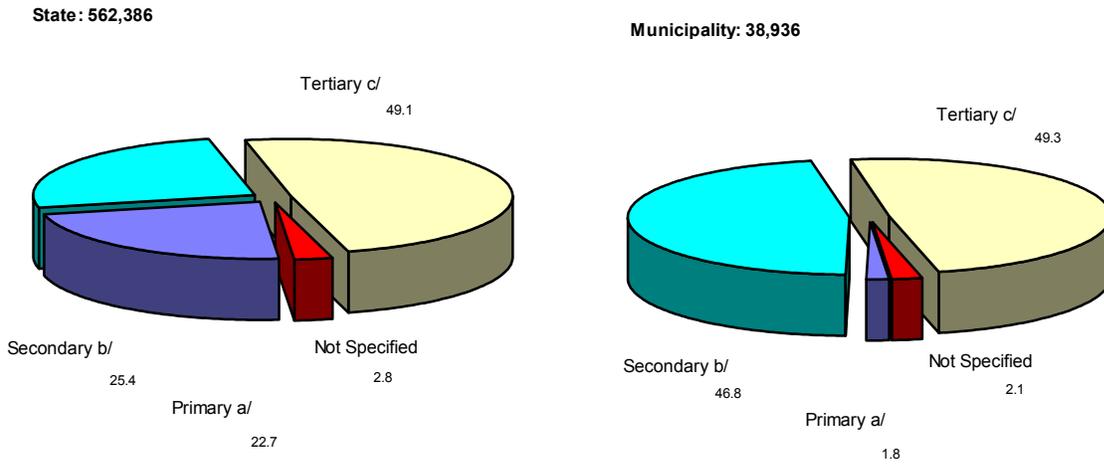
Source: "Sonora, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

Figure 2.44 Specific Participation Rates to March 1990



Source: " Sonora, definitive results. XI General Census of Population and Housing, 1990". INEGI.

Figure 2.45 Employed Population by Activity Sector to March 1990 (In Percent)



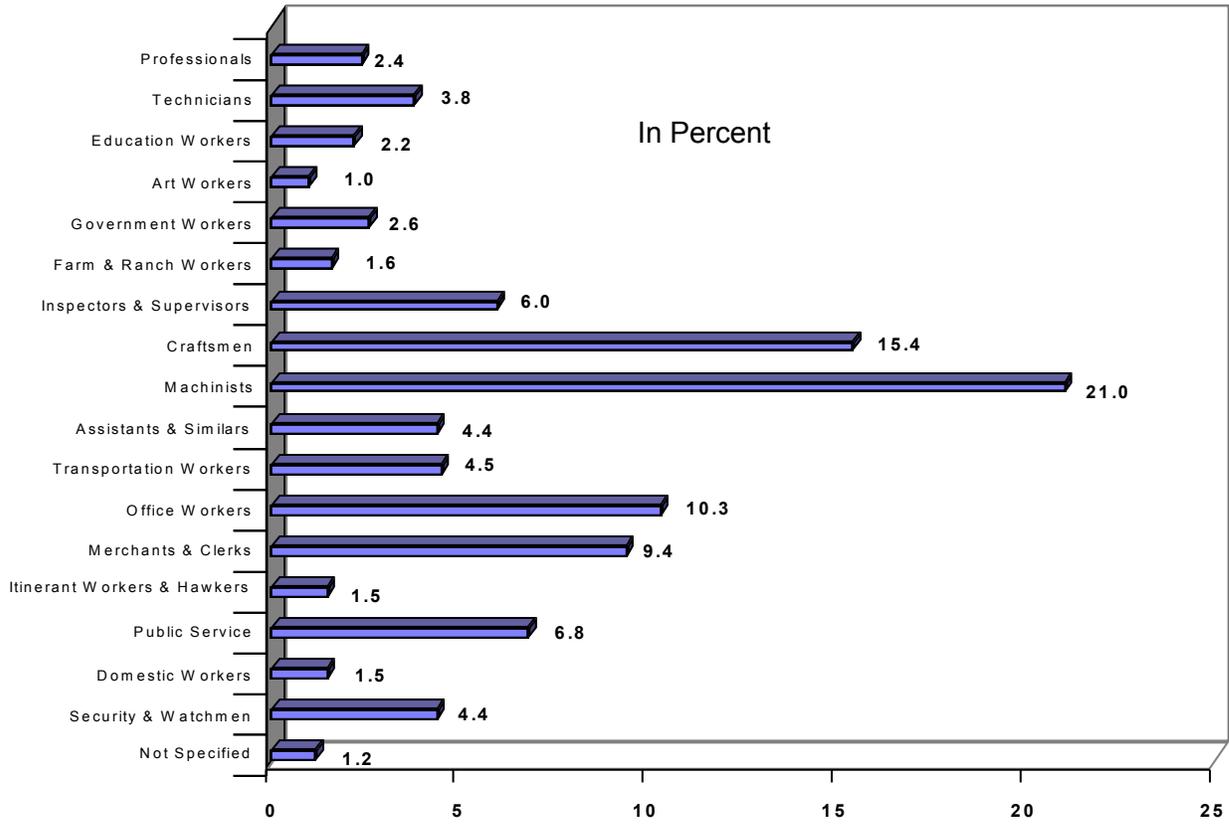
a/ Includes farming, cattle, forestry, and fishing.

b/ Includes mining, manufacturing, electric generation, and construction.

c/ Includes business and services.

Source: "Sonora, definitive results. XI General Census of Population and Housing, 1990". INEGI.

Figure 2.46 Employed Population by Main Occupation to March 12, 1990 (In Percent)



Source: "Sonora, definitive results. XI General Census of Population and Housing, 1990." IINEGI

2.6.5 Ciudad Juarez, Chihuahua

Content

State/Condition and Movement of the Population

- Total population by sex, 1950-1990.
- Mean annual growth rates between census, 1950-1990.
- Total population by sex by five-year age group, 1980-1990.
- Total population by sex according to main locations to March 12, 1990.

Education

- Population 5 years of age and older by condition of school attendance and sex according to age to March 12, 1990.
- Population 15 years of age and older by literacy, 1950-1990 (in percent).
- Registered pupils, teaching personnel and schools at course beginning by educational level and administrative upkeep/support 1992/93.

Employment

- Population at least 12 years of age by activity status according to sex, 1980-1990.
- Economically active population by sex according to five-year age group, 1980.
- Economically active population by sex according to five-year age group, 1990.
- Specific participation rates to March 12, 1990.
- Employed population by activity sector to March 12, 1990 (in percent).
- Employed population by main activity to March 12, 1990 (in percent).

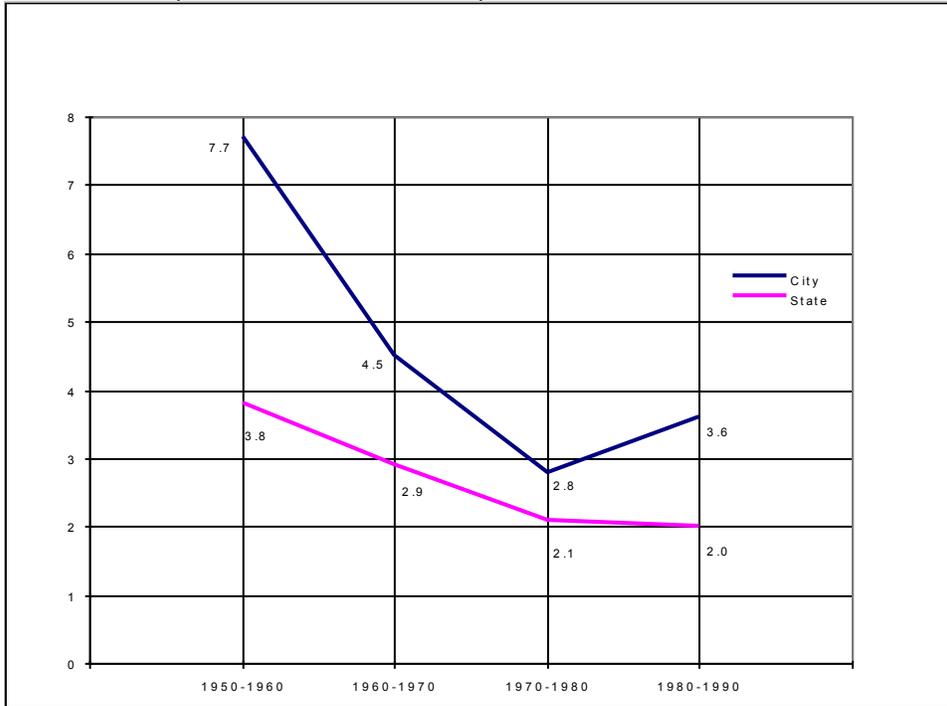
State and movement of the population

**Table 2.66
Total Population by Sex, 1950-1990**

Location	Total	Men	%	Women	%
1950					
State	846,414	423,538	50.0	422,876	50.0
Municipality	131,308	62,873	47.9	68,435	52.1
1960					
State	1,226,793	621,616	50.7	605,177	49.3
Municipality	276,995	134,480	48.5	142,515	51.5
1970					
State	1,612,525	812,649	50.4	799,876	49.6
Municipality	424,135	209,053	49.3	215,082	50.7
1980					
State	2,005,477	992,132	49.5	1,013,345	50.5
Municipality	567,365	273,187	48.2	294,178	51.8
1990					
State	2,441,873	1,213,302	49.7	1,228,571	50.3
Municipality	798,499	395,163	49.5	403,336	50.5

Source: "Chihuahua, definitive results. VII, VIII, IX, X, XI General Census of Population and Housing, 1950, 1960, 1970, 1980 and 1990". INEGI

**Figure 2.47 Mean Annual Growth Rate Percentages Between Census Counts
(Chihuahua, 1950-1990)**

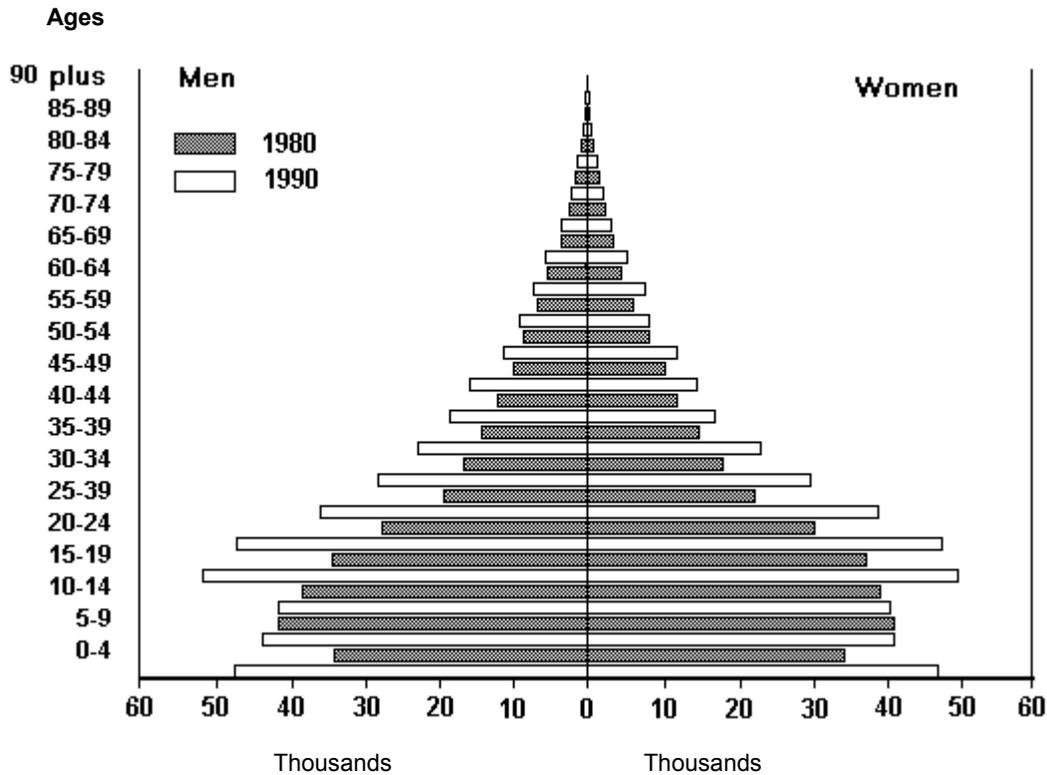


a/ Expresses the annual growth rate of the population living in a defined geographic unit during a certain period. It is derived as follows:

$$\text{Mean annual growth rate} = \left(\frac{\text{Population at the end of a period}}{\text{Population at the beginning of a period}} \right)^{\frac{1}{\text{Number of years considered} - 1}} \times 100$$

Source: INEGI.

Figure 2.48
Total Population by Sex by Five-Year Age Groups (Chihuahua, 1980-1990)



Source: "Chihuahua, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

Table 2.67
Total Population by Sex According to Main Locations to March 12, 1990

Location	Total	Men	Women
State	2,441,873	1,213,302	1,228,571
Municipality	798,499	395,163	403,336
Juarez	789,522	390,588	398,934
Puerto de Anapra	2,976	1,556	1,420
San Isidro (Rio Grande)	2,115	1,051	1,064
San Agustin	899	456	443
Samalayuca	804	390	414
Tres Jacales (El Millon)	542	271	271
Lomas Blancas (Loma Blanca)	503	247	256
Jesús Carranza (La Colorada)	498	251	247
Tres Jacales (San Francisco)	250	122	128
Alfredo B. Bonfil (Lomas del Poleo)	123	65	58
Plazuela de Acuña (El Vergel)	100	64	36
Rest of Locations	167	102	65

Source: Chihuahua, definitive results. Data by location (Territorial Integration), XI General Census of Population and Housing, 1990". INEGI

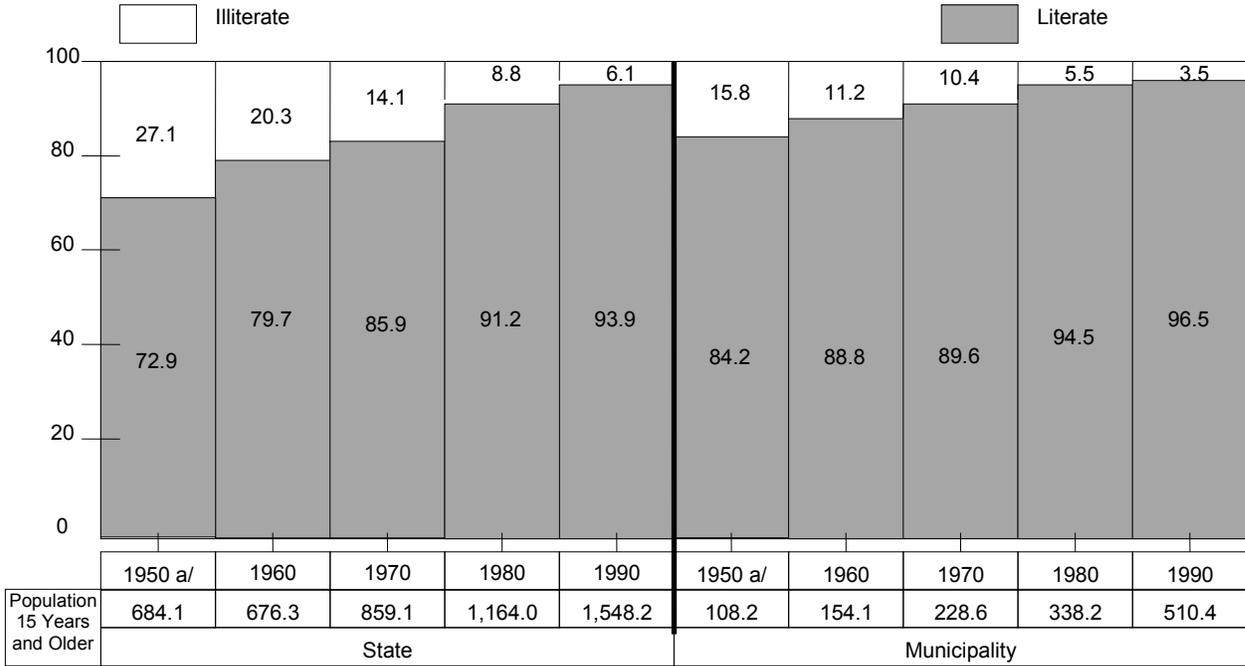
Education

**Table 2.68
Population Five Years of Age and Older by Condition of School Attendance and Sex
According to Age to March 12, 1990**

Age	Total	Attend		Do Not Attend		Not Specified	
		Men	Women	Men	Women	Men	Women
State							
Total	2,118,557	323,662	319,815	714,629	737,028	11,364	12,059
5 years	58,445	16,937	17,165	10,519	9,680	2,144	2,000
6 years	57,331	23,906	23,797	4,651	4,140	418	419
7 years	56,853	26,362	25,639	2,236	1,939	363	314
8 years	58,020	27,478	26,758	1,758	1,577	237	212
9 years	54,839	26,207	25,743	1,338	1,176	196	179
10 years	56,063	26,912	25,783	1,668	1,425	155	120
11 years	52,603	25,115	24,330	1,511	1,357	161	129
12 years	57,439	25,906	25,044	3,028	3,207	122	132
13 years	56,238	22,780	22,306	5,344	5,520	142	146
14 years	59,772	19,816	20,384	9,867	9,366	185	154
15 - 19 years	299,267	51,188	54,394	98,151	93,204	1,219	1,111
20 - 24 years	254,240	17,723	15,585	106,453	112,097	1,162	1,220
25 years and older	997,447	13,332	12,887	468,105	492,340	4,860	5,923
Municipality							
Total	680,028	105,418	101,625	225,177	238,018	4,719	5,071
5 years	18,555	5,514	5,349	3,220	2,954	795	723
6 years	17,229	7,354	7,187	1,218	1,137	175	158
7 years	16,623	7,802	7,552	546	469	136	118
8 years	16,930	8,125	7,949	373	304	96	83
9 years	15,873	7,701	7,405	331	289	86	61
10 years	16,248	7,907	7,580	364	297	57	43
11 years	15,450	7,474	7,187	366	311	67	45
12 years	16,624	7,585	7,489	733	717	42	58
13 years	16,707	7,059	6,776	1,290	1,464	53	65
14 years	18,120	6,312	6,401	2,540	2,725	79	63
15 - 19 years	100,893	18,405	18,469	32,239	30,733	535	512
20 - 24 years	93,084	7,643	6,287	38,457	39,549	567	581
25 years and older	317,692	6,537	5,994	143,500	157,069	2,031	2,561

Source: "Chihuahua, definitive results. XI General Census of Population and Housing, 1990". INEGI

Figure 2.49
Population 15 years of Age and Older by Literacy (Chihuahua, 1950-1990)
(In Percent)



Note: Does not include population of "not specified" age.

a/ Refers to population 6 years and older.

Source: "Chihuahua, definitive results. VII, VIII, IX, X, XI General Census of Population and Housing, 1950, 1960, 1970, 1980 and 1990". INEGI.

**Table 2.69
Registered Pupils, Teaching Personnel, and Schools at Course Beginning by Educational Level and Administrative Upkeep, 1992/93**

Level and Upkeep	State			Municipality		
	Registered Pupils	Teaching Personnel/a	Schools	Registered Pupils	Teaching Personnel	Schools
Total	708,065	33,015	5,047	221,334	8,688	708
Pre-School Elementary	77,791	3,280	1,338	21,795	804	197
Federal b/	49,836	2,010	974	14,457	479	107
State c/	22,794	975	263	5,547	212	50
Private c/	5,161	295	101	1,791	113	40
Elementary Primary	410,756	14,812	2,877	127,658	3,691	346
Federal e/	270,718	9,618	2,125	88,150	2,470	222
State	118,259	4,422	636	31,383	963	89
Private	21,779	772	116	8,125	258	35
Elementary Terminal Work Training	12,380	744	99	5,353	240	33
Federal	3,376	104	10	1,945	51	3
State	80	2	1	-	-	-
Private	8,924	638	88	3,408	189	30
Middle Cycle, Secondary Basic f/	111,203	6,434	454	32,740	1,659	80
Federal	69,655	3,662	171	23,014	1,062	39
State	35,608	2,163	233	7,808	399	22
Private	5,940	609	50	1,918	198	19
Middle Terminal Technical	9,185	1,081	88	2,018	229	14
Federal	4,814	451	21	1,461	118	4
Private	4,261	572	66	557	111	10
Independent	110	58	1	-	-	-
Normal b/	5,925	327	12	276	24	1
Federal	2,876	154	7	276	24	1
State	772	67	2	-	-	-
Private	2,277	106	3	-	-	-
Upper Middle Cycle Baccalaureate g/	46,153	2,644	124	15,482	698	31
Federal	23,549	1,264	47	6,502	284	10
State	15,605	722	28	5,089	209	7
Private	6,999	658	49	3,891	205	14
Upper h/	34,672	3,693	55	16,012	1,343	6
Federal						
Licenciatura [College Equivalent]	13,711	796	8	Nd	Nd	Nd
Graduate Study	279	13	3	Nd	Nd	Nd
Particular						
Licenciatura	2,707	413	11	Nd	Nd	Nd
Graduate Study	22	-	1	Nd	Nd	Nd
Independent						
Licenciatura [College Equivalent]	16,939	2,168	17	Nd	Nd	Nd
Graduate Study	1,014	303	15	Nd	Nd	Nd

a/Includes general and technical for workers, and "tele-high school".

b/Includes pre-school, primary, special education, physical education and upper teacher's college.

c/Includes two-year general, industrial and for services and farm/ranching.

Source: State Educational Services. Directorate of Education Planning; Statistics Dept.

Employment

**Table 2.70
Population at Least 12 Years of Age by Activity Status According to Sex, 1980-1990**

Sex	Total	Economically Active Population		Economically Inactive	Not Specified
		Employed	Unemployed a/		
1980					
State	1,332,389	659,056	5,651	667,682	-
Men	653,241	479,974	4,138	169,129	-
Women	679,148	179,082	1,513	498,553	-
Municipality	384,015	204,536	2,332	177,147	-
Men	181,116	Nd	Nd	48,864	-
Women	202,899	Nd	Nd	128,283	-
1990					
State	1,724,403	773,100	23,951	888,701	38,651
Men	849,383	571,793	19,706	239,687	18,197
Women	875,020	201,307	4,245	649,014	20,454
Municipality	563,120	283,182	6,372	255,543	18,023
Men	275,607	196,491	4,900	66,144	8,072
Women	287,513	86,691	1,472	189,399	9,951

a/ 1980 data includes the population at least 12 years of age who have never worked. 1990 data includes the population at least 12 years of age that during the week of March 5-11 had no work, but actively sought it.

Source: "Chihuahua, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

**Table 2.71
Economically Active Population by Sex According to Five-Year Age Group, 1980**

Age Group	State			Municipality		
	Total	Men	Women	Total	Men	Women
Total	664,707	484,112	180,595	206,868	132,252	74,616
12-14 years	18,544	13,742	4,802	4,088	2,783	1,305
15-19 years	106,540	69,695	36,845	34,677	18,430	16,247
20-24 years	115,673	75,659	40,014	40,793	23,033	17,760
25-29 years	85,954	61,123	24,831	29,314	18,300	11,014
30-34 years	70,092	52,201	17,891	22,275	14,794	7,481
35-39 years	62,965	47,963	15,002	18,635	12,771	5,864
40-44 years	53,573	41,679	11,894	15,552	11,142	4,410
45-49 years	43,169	34,233	8,936	12,388	9,008	3,380
50-54 years	34,711	27,771	6,940	9,945	7,317	2,628
55-59 years	26,149	21,264	4,885	7,518	5,718	1,800
60-64 years	17,710	14,436	3,274	4,648	3,542	1,106
65 years and older	29,627	24,346	5,281	7,035	5,414	1,621

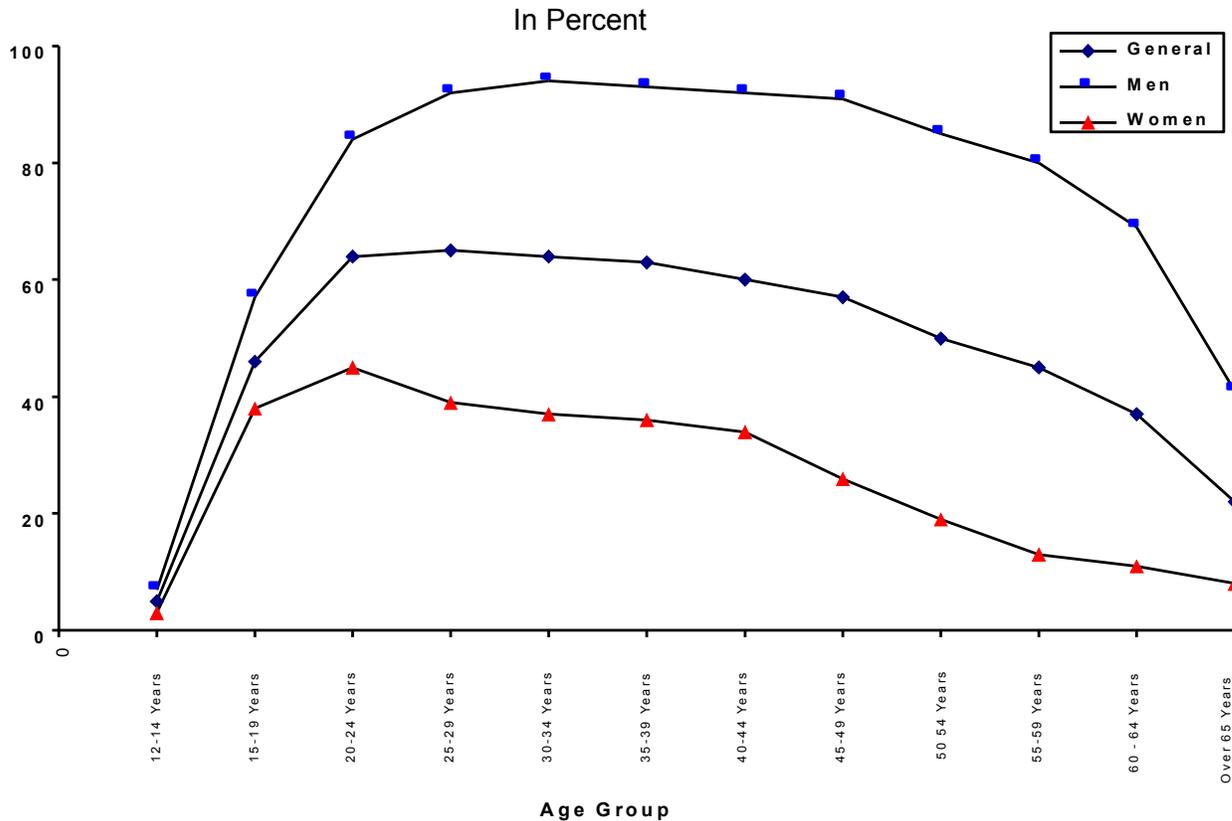
Source: "Chihuahua, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

**Table 2.72
Economically Active Population by Sex According to Five-Year Age Group, 1990**

Age Group	State			Municipality		
	Total	Men	Women	Total	Men	Women
Total	797,051	591,499	205,552	289,554	201,391	88,163
12-14 years	11,628	8,743	2,885	2,871	1,868	1,003
15-19 years	123,384	80,926	42,458	47,316	29,016	18,300
20-24 years	147,545	100,133	47,412	59,667	39,116	20,551
25-29 years	123,289	88,957	34,332	47,569	33,073	14,496
30-34 years	99,458	73,691	25,767	37,317	26,261	11,056
35-39 years	78,276	59,432	18,844	28,132	19,984	8,148
40-44 years	59,135	46,599	12,536	19,949	14,466	5,483
45-49 years	49,138	40,507	8,631	15,739	11,996	3,743
50-54 years	38,066	32,595	5,471	11,899	9,544	2,355
55-59 years	26,283	23,192	3,091	7,843	6,536	1,307
60-64 years	18,805	16,759	2,046	5,367	4,496	871
65 years and older	22,044	19,965	2,079	5,885	5,035	850

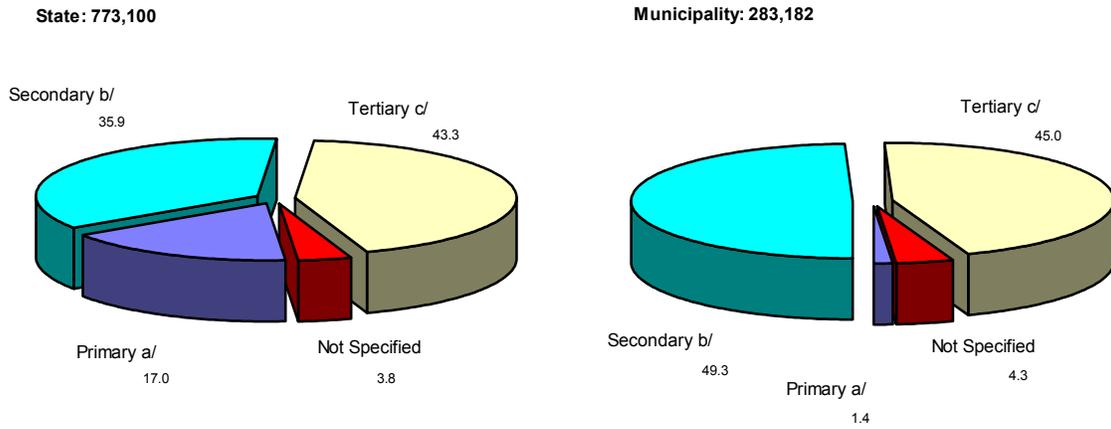
Source: "Chihuahua, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

**Figure 2.50
Specific Participation Rates to March 1990 (Chihuahua)**



Source: "Chihuahua, definitive results. XI General Census of Population and Housing, 1990". INEGI.

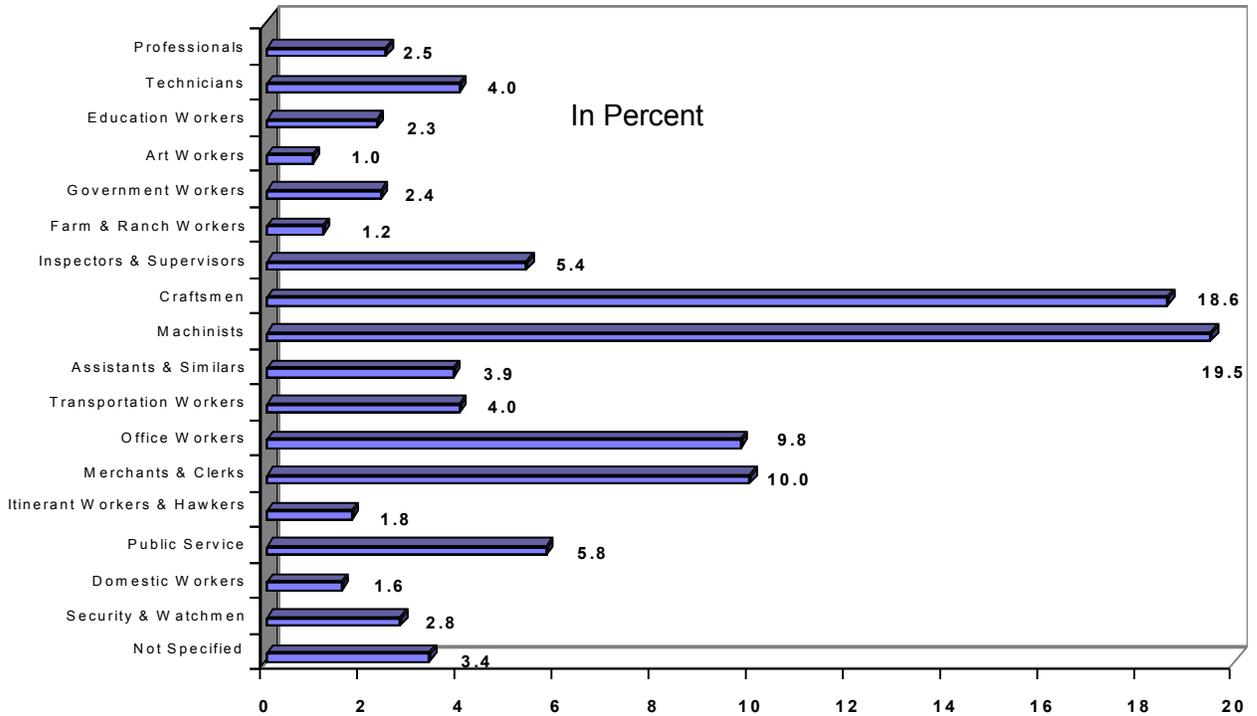
Figure 2.51 Employed Population by Activity Sector to March 1990 (Chihuahua)
(In Percent)



a/Includes farming, cattle, forestry, hunting and fishing.
b/Includes mining, oil and gas extraction, manufacturing, electricity generation and construction.
c/Includes business and services.

Source: "Chihuahua, definitive results. XI General Census of Population and Housing, 1990". INEGI

Figure 2.52 Employed Population by Main Occupation to March 1990 (Chihuahua)



Source: "Chihuahua, definitive results. XI General Census of Population and Housing, 1990". INEGI.

2.6.6 Piedras Negras, Coahuila

Content

State/Condition and Movement of the Population

- Total population by sex, 1950-1990.
- Mean annual growth rates between census, 1950-1990.
- Total population by sex according to five-year age group, 1980-1990.
- Total population by sex according to main locations to March 12, 1990.

Education

- Population 5 years of age and older by condition of school attendance and sex according to age, to March 12, 1990.
- Population 15 years of age and older by literacy, 1950-1990 (in percent).
- Registered pupils, teaching personnel and schools at course beginning by educational level and administrative upkeep/support 1993/94.

Employment

- Population at least 12 years of age by activity status according to sex, 1980-1990.
- Economically active population by sex according to five-year age group, 1980.
- Economically active population by sex according to five-year age group, 1990.
- Specific participation rates to March 12, 1990.
- Employed population by activity sector to March 12, 1990 (in percent).
- Employed population by main activity to March 12, 1990 (in percent).

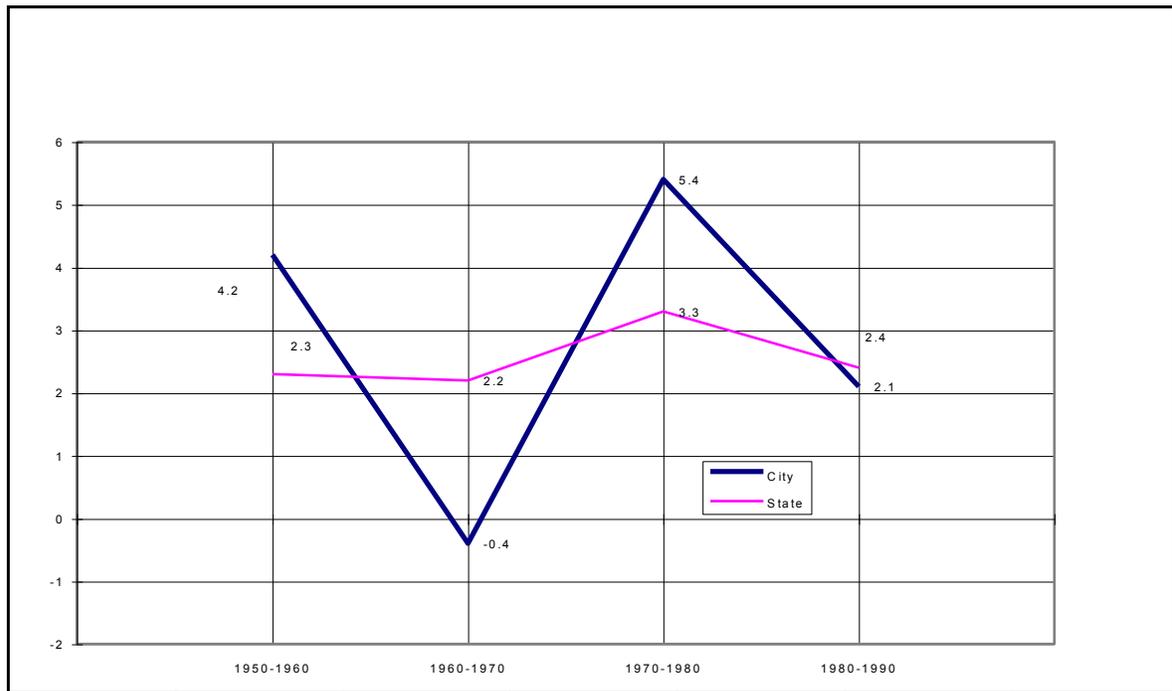
State and Movement of the Population

**Table 2.73
Total Population by Sex, 1950-1990**

Location	Total	Men	%	Women	%
1950					
State	720,619	358,731	49.8	361,888	50.2
Municipality	31,665	15,170	47.9	16,495	52.1
1960					
State	907,734	458,937	50.6	448,797	49.4
Municipality	48,408	24,231	50.1	24,177	49.9
1970					
State	1,114,956	563,545	50.5	551,411	49.5
Municipality	46,698	22,792	48.8	23,906	51.2
1980					
State	1,557,265	774,010	49.7	783,255	50.3
Municipality	80,290	38,997	48.6	41,293	51.4
1990					
State	1,972,340	979,097	49.6	993,243	50.4
Municipality	98,185	48,346	49.2	49,839	50.8

Source: Coahuila, definitive results. VII, VIII, IX, X, XI General Census of Population and Housing, 1950, 1960, 1970, 1980 and 1990". INEGI

Figure 2.53 Mean Annual Growth Rates, Between Census, a/1950-1990 (In Percent)



^a / Expresses the annual growth rate of the population living in a defined geographic unit during a certain period. It is derived as follows: Mean annual growth rate = (Population at the end of a period/Population at the beginning of a period)^{1/Number of years considered-1}*100

Source: INEGI.

Figure 2.54 Total Population by Sex by Five-Year Age Groups (Coahuila, 1980-1990)

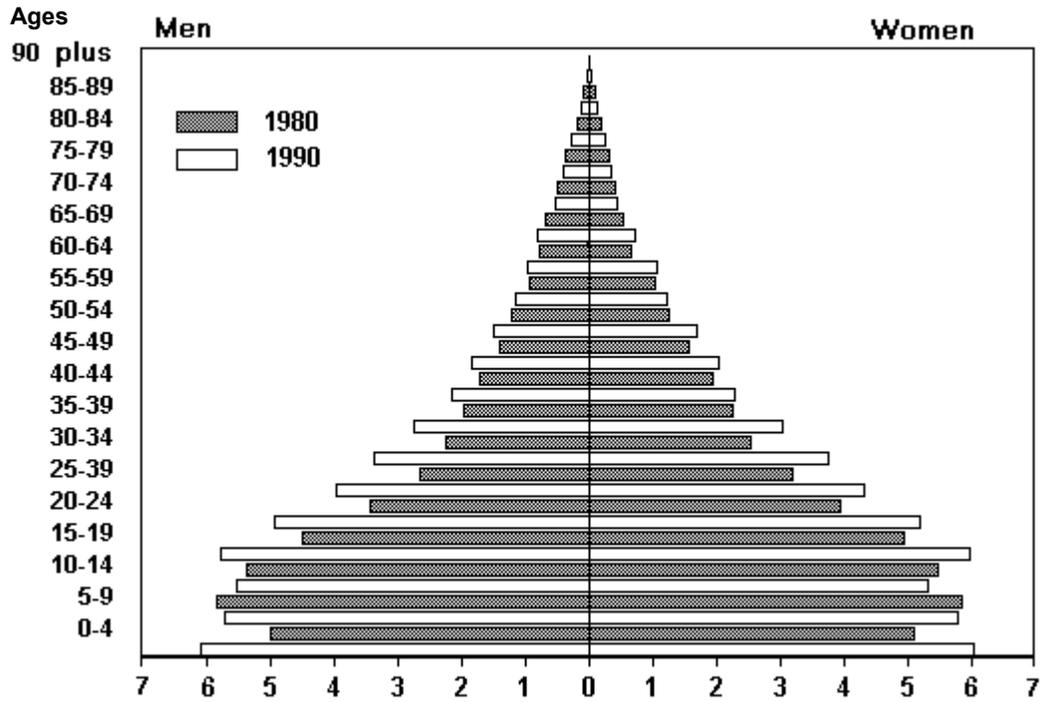


Table 2.74
Total Population by Sex According to Main Locations to March 12, 1990

Location	Total	Men	Women
State	1,972,340	979,097	993,243
Municipality	98,195	48,346	49,839
Piedras Negras	96,178	47,099	49,079
Moral, El	535	271	264
San Isidro	178	90	88
Centinela, El	137	77	60
Ampliacion Ejido, Piedras Negras	121	70	51
Moral, El	112	63	49
Navaja, La	107	58	49
San Ramon	45	26	19
Las Vegas del Centinela	45	25	20
Navaja, La	31	20	11
Gavilán, El	19	12	7
Rest of Locations	677	535	142

Source: "Coahuila, definitive results. Data by location (Territorial Integration), XI General Census of Population and Housing, 1990". INEGI

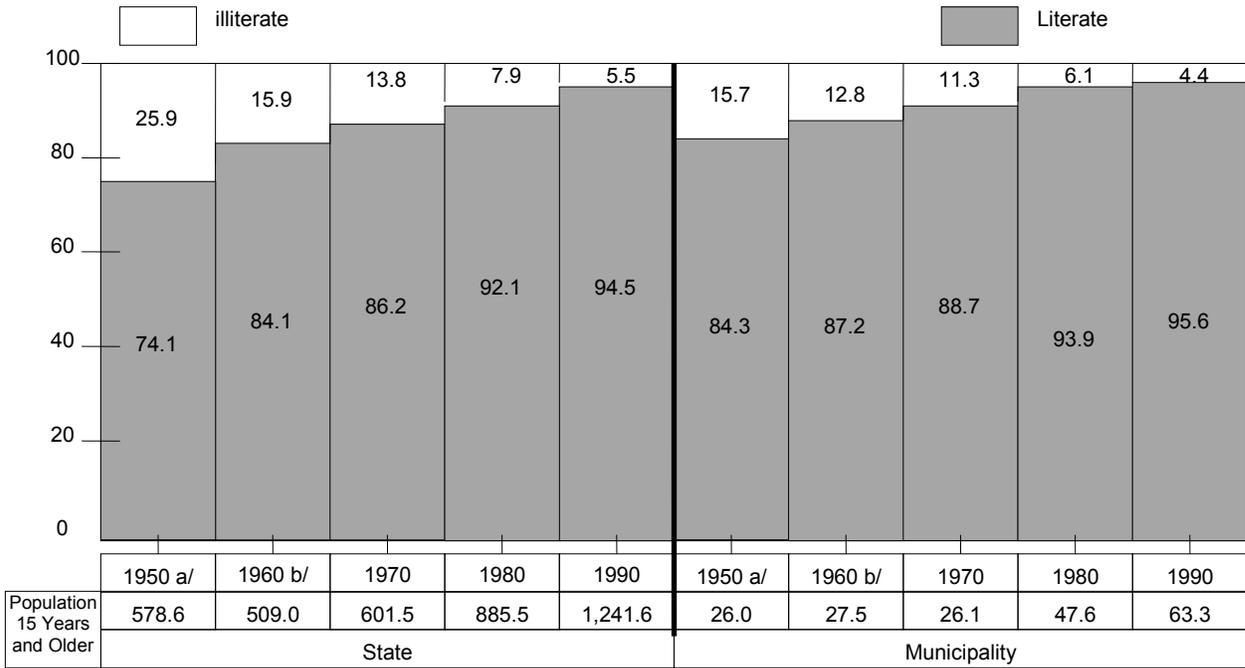
Education

**Table 2.75
Population Five Years of Age and Older by Condition of School Attendance and Sex
According to Age to March 12, 1990**

Age	Total	Attend		Do Not Attend		Not Specified	
		Men	Women	Men	Women	Men	Women
State							
Total	1,730,829	294,207	282,719	554,085	582,324	8,515	8,979
5 years	47,432	13,028	13,109	8,592	8,060	2,390	2,253
6 years	46,270	19,564	19,609	3,305	3,017	412	363
7 years	46,525	22,192	21,597	1,193	952	283	308
8 years	48,288	23,477	22,827	881	777	171	155
9 years	47,410	23,181	22,434	838	654	170	133
10 years	50,275	24,525	23,605	1,070	847	135	93
11 years	47,276	22,566	22,411	1,119	945	115	120
12 years	52,050	24,143	23,053	2,242	2,400	117	95
13 years	50,585	21,407	20,724	3,747	4,490	99	118
14 years	51,697	19,219	19,011	6,205	7,009	128	125
15-19 years	243,023	53,135	51,496	67,494	69,581	680	637
20-24 years	198,192	16,749	12,778	79,812	87,412	692	749
25 years and older	801,806	11,021	10,065	377,587	396,180	3,123	3,830
Municipality							
Total	85,726	13,090	12,963	28,566	30,295	391	421
5 years	2,379	628	684	438	419	96	114
6 years	2,298	946	1,025	146	152	13	16
7 years	2,261	1,062	1,060	56	50	19	14
8 years	2,376	1,154	1,124	31	51	11	5
9 years	2,246	1,128	1,009	40	46	14	9
10 years	2,170	1,052	1,034	43	29	6	6
11 years	2,136	1,071	974	45	39	3	4
12 years	2,137	985	973	86	83	3	7
13 years	2,144	904	882	172	178	3	5
14 years	2,237	861	838	262	266	4	6
15-19 years	11,799	2,246	2,282	3,567	3,648	33	23
20-24 years	10,106	545	541	4,359	4,593	31	37
25 years and older	41,437	508	537	19,321	20,741	155	175

Source: "Coahuila, definitive results. XI General Census of Population and Housing, 1990". INEGI

Figure 2.55 Population 15 Years of Age and Older by Literacy (Coahuila, 1950-1990)
(In Percent)



a/ Refers to population 6 years and under

b/ Does not include population of "not specified" age.

Source: "Coahuila, definitive results. VII, VIII, IX, X, XI General Census of Population and Housing, 1950, 1960, 1970, 1980 and 1990". INEGI.

Table 2.76
Registered Pupils, Teaching Personnel, and Schools at Course Beginning, by
Educational Level and Administrative Upkeep, 1993/94

Level and Upkeep	State			Municipality		
	Registered Pupils	Teaching Personnel a/	Schools	Registered Pupils	Teaching Personnel a/	Schools
Total	615,262	32,125	3,679	30,774	1,471	154
Pre-School Elementary	73,994	2,658	1,119	3,956	136	47
Federal b/	1,613	183	183	7	1	1
State c/	62,726	2,040	798	3,369	115	38
Private d/	9,655	435	138	580	20	8
Elementary Primary	309,608	11,359	1,759	15,931	524	64
Federal e/	859	100	100	-	-	-
State	285,067	10,487	1,560	14,768	487	59
Private	23,862	772	99	1,163	37	5
Elementary Terminal Work Training	17,276	1,096	156	773	40	5
Federal	5,177	89	6	562	12	1
State	216	14	7	-	-	-
Private	11,853	980	142	211	28	4
Independent	30	13	1	-	-	-
Middle Cycle, Secondary Basic f/	111,532	7,337	337	5,627	282	16
State	99,717	6,177	248	4,883	221	11
Private	11,815	1,160	89	744	61	5
Middle Terminal Technical	11,531	1,217	85	875	100	10
Federal	6,402	652	22	506	49	2
Private	5,034	537	61	369	51	8
Independent	95	28	2	-	-	-
Teacher College g/	3,533	438	11	-	-	-
State	3,533	438	11	-	-	-
Upper middle cycle Baccalaureate h/	43,277	3,394	175	1,681	174	9
Federal	20,524	1,187	32	1,378	61	1
State	904	196	5	-	-	-
Private	13,958	1,543	125	180	93	6
Independent	7,891	468	13	123	20	2
Upper	44,511	4,626	37	1,931	215	3
Federal	8,525	702	9	996	57	1
Licenciatura [College Equivalent]	8,295	622	5	996	57	1
Graduate Study	230	80	4	-	-	-
State	4,072	118	3	374	26	- i/
Licenciatura [College Equivalent]	3,296	106	1	374	26	-
Graduate Study	776	12	2	-	-	-
Private	8,795	1,413	21	244	99	2
Licenciatura [College Equivalent]	8,441	1,352	17	230	87	2
Graduate Study	354	61	4	14	12	- i/
Independent	23,119	2,393	4	317	33	- i/
Licenciatura [College Equivalent]	22,225	2,260	2	317	33	-
Graduate Study	894	133	2	-	-	-

a/Includes directors with group [sic].

b/Includes community courses run by CONAFE.

c/Includes CENDI and pre-schools maintained by DIF.

d/Includes CENDI

e/Includes community courses run by CONAFE

f/Includes general and technical for workers.

g/Includes pre-school, primary, special education, physical education and upper teacher's college.

h/Includes two-year general, industrial and for services and farm/ranching.

i/Refers to units of the UA de C and UPN, which provide educational services at that level in the municipality.

Source: State of Coahuila Educational System Basic Statistics; Beginning of Courses, 1993-1994. SEPC Institute of Educational Services of Coahuila State. Directorate General of Education Planning.

Employment

**Table 2.77
Population at Least 12 Years of Age by Activity Status According to Sex, 1980-1990**

Sex	Total	Economically Active Population		Economically Inactive	Not Specified
		Employed	Unemployed a/		
1980					
State	1,012,033	480,161	3,737	528,135	-
Men	500,071	365,487	2,687	131,897	-
Women	511,962	114,674	1,050	396,238	-
Municipality	53,872	26,119	226	27,527	-
Men	25,810	Nd	Nd	6,750	-
Women	28,062	Nd	Nd	20,777	-
1990					
State	1,397,353	586,165	19,086	765,658	26,444
Men	687,600	444,742	15,341	215,147	12,370
Women	709,753	141,423	3,745	550,511	14,074
Municipality	69,860	32,095	811	35,414	1,540
Men	34,045	23,125	662	9,565	693
Women	35,815	8,970	149	25,849	847

a/ 1980 data includes the population at least 12 years of age who have never worked. 1990 data includes the population at least 12 years of age that during the week of March 5-11 had no work but actively sought it.

Source: "Coahuila, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

**Table 2.78
Economically Active Population by Sex According to Five-Year Age Group, 1980**

Age Group	State			Municipality		
	Total	Men	Women	Total	Men	Women
1980 Total	483,898	368,174	115,724	26,345	19,060	7,285
12-14 years	12,484	8,940	3,544	462	328	134
15-19 years	71,527	48,293	23,234	4,137	2,572	1,565
20-24 years	83,959	58,165	25,794	4,831	3,065	1,766
25-29 years	67,047	50,757	16,290	3,685	2,624	1,061
30-34 years	55,030	43,266	11,764	2,946	2,228	718
35-39 years	46,914	37,421	9,493	2,504	1,903	601
40-44 years	38,443	31,190	7,253	2,063	1,641	422
45-49 years	30,702	25,155	5,547	1,696	1,391	305
50-54 years	24,641	20,361	4,280	1,363	1,132	231
55-59 years	18,915	15,852	3,063	1,026	817	209
60-64 years	12,407	10,410	1,997	646	545	101
65 years and older	21,829	18,364	3,465	986	814	172

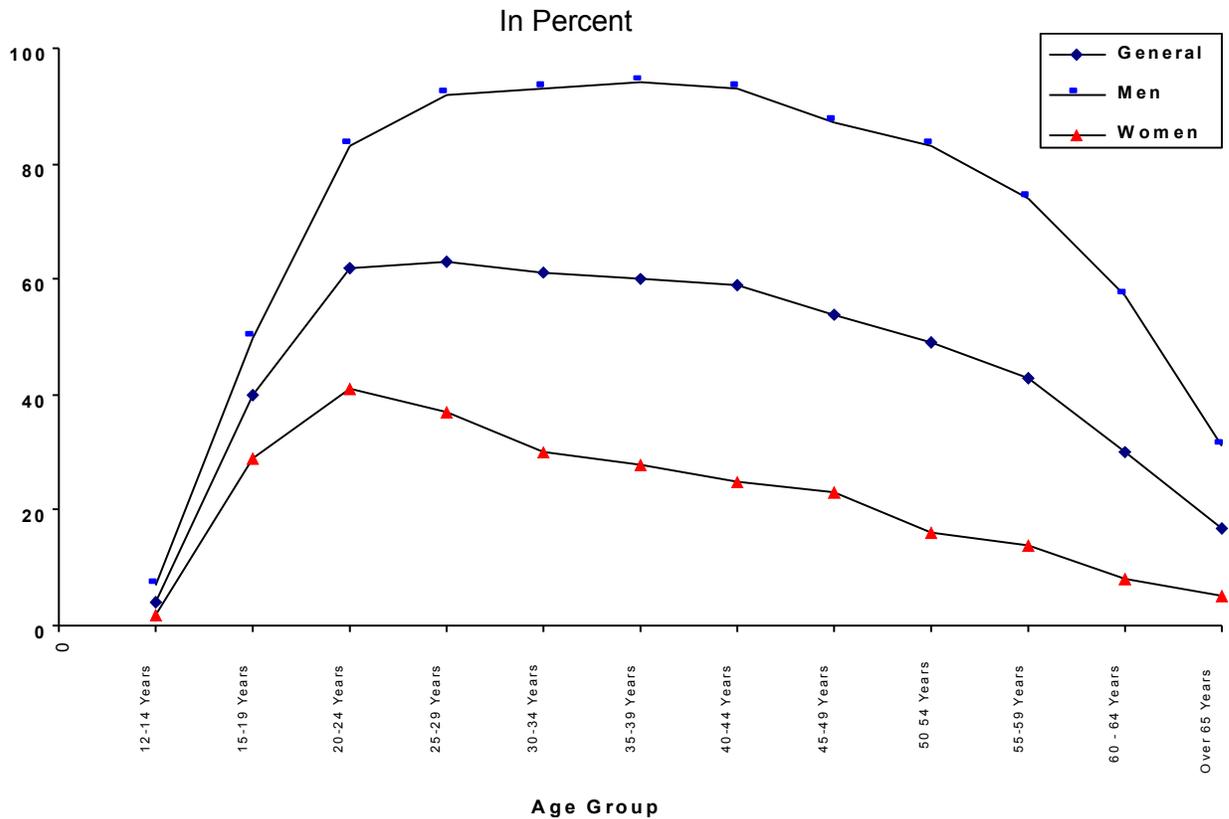
Source: "Coahuila, definitive results. X and XI General Census of Population and Housing, 1980 and 1990." INEGI

**Table 2.79
Economically Active Population by Sex According to Five-Year Age Group, 1990**

Age Group	State			Municipality		
	Total	Men	Women	Total	Men	Women
1990 Total	605,251	460,083	145,168	32,906	23,787	9,119
12-14 years	7,402	5,469	1,933	266	204	62
15-19 years	81,080	53,867	27,213	4,673	2,878	1,795
20-24 years	109,807	75,779	34,028	6,291	4,143	2,148
25-29 years	95,157	70,942	24,215	5,259	3,746	1,513
30-34 years	80,133	61,613	18,520	4,365	3,244	1,121
35-39 years	64,990	51,324	13,666	3,474	2,643	831
40-44 years	49,125	39,592	9,533	2,572	1,983	589
45-49 years	39,009	32,591	6,418	2,075	1,626	449
50-54 years	28,768	24,728	4,040	1,550	1,274	276
55-59 years	19,656	17,351	2,305	1,053	894	159
60-64 years	13,560	11,999	1,561	625	546	79
65 years and older	16,564	14,828	1,736	703	606	97

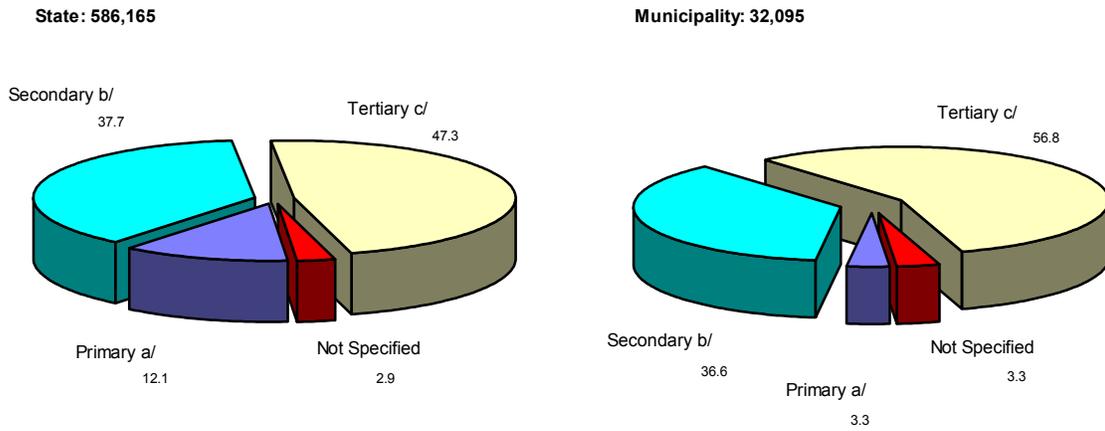
Source: "Coahuila, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

Figure 2.56 Specific Participation Rates to March 12, 1990 (Coahuila)



Source: "Coahuila, definitive results. XI General Census of Population and Housing, 1990". INEGI.

Figure 2.57 Employed Population by Activity Sector to March 12, 1990 (Coahuila)
(In Percent)



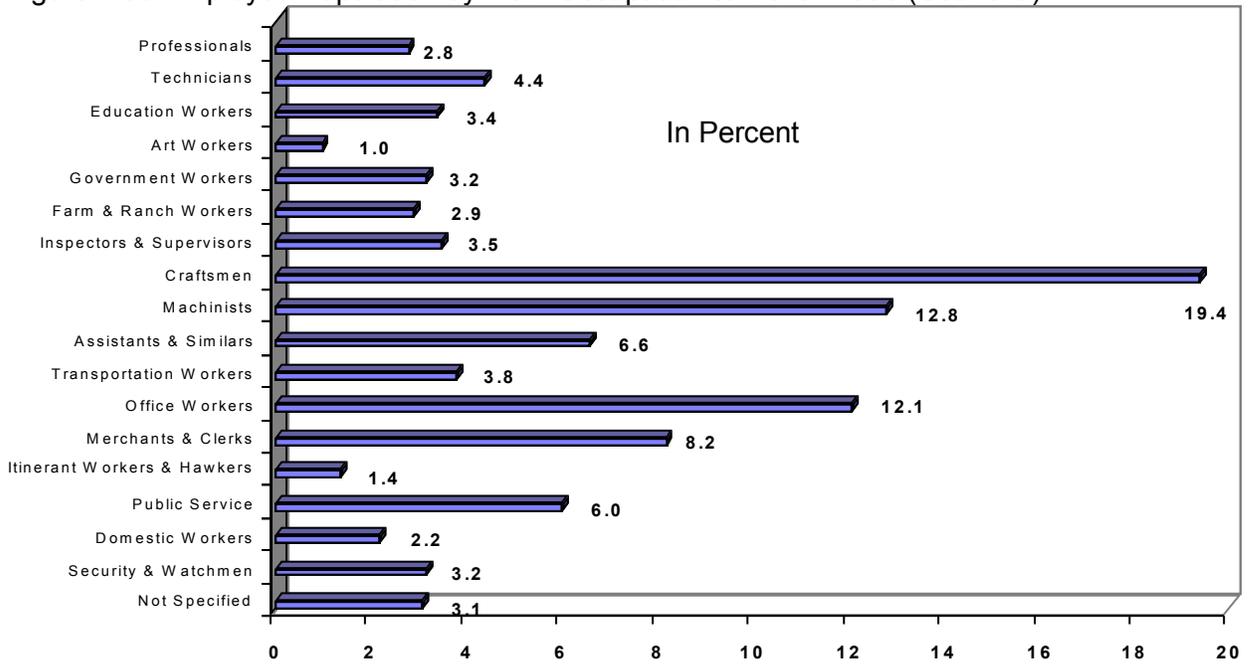
a/Includes farming, cattle, forestry, hunting and fishing.

b/Includes mining, oil and gas extraction, manufacturing, electricity generation and construction.

c/Includes business and services.

Source: "Coahuila, definitive results. XI General Census of Population and Housing, 1990". INEGI

Figure 2.58 Employed Population by Main Occupation to March 1990 (Coahuila)



Source: "Coahuila, definitive results. XI General Census of Population and Housing, 1990". INEGI.

2.6.7 Nuevo Laredo, Tamaulipas

Content

State/Condition and Movement of the Population

- Total population by sex, 1950-1990.
- Mean annual growth rates between census, 1950-1990.
- Total population by sex according to five-year age group, 1980-1990.
- Total population by sex according to main locations to March 12, 1990.

Education

- Population 5 years of age and older by condition of school attendance and sex according to age, to March 12, 1990.
- Population 15 years of age and older by literacy, 1950-1990 (in percent).
- Registered pupils, teaching personnel and schools at course beginning by educational level and administrative upkeep/support 1994/95.

Employment

- Population at least 12 years of age by activity status according to sex, 1980-1990.
- Economically active population by sex according to five-year age group, 1980.
- Economically active population by sex according to five-year age group, 1990.
- Specific participation rates to March 12, 1990.
- Employed population by activity sector to March 12, 1990 (in percent).
- Employed population by main activity. To March 12, 1990 (in percent).

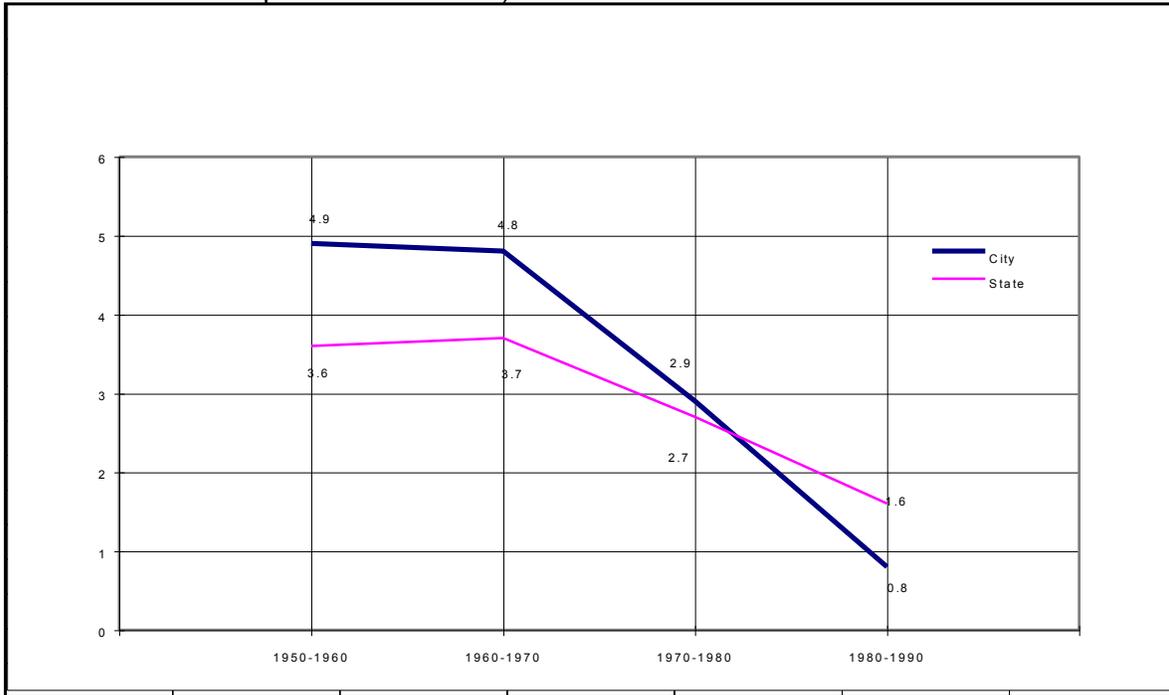
State and Movement of the Population

**Table 2.80
Total Population by Sex, 1950-1990**

Location	Total	Men	%	Women	%
1950					
State	718,167	360,278	50.2	357,889	49.8
Municipality	59,496	28,582	48.0	30,914	52.0
1960					
State	1,024,182	513,915	50.2	510,267	49.8
Municipality	96,043	46,527	48.4	49,516	51.6
1970					
State	1,456,858	725,463	49.8	731,395	50.2
Municipality	151,253	72,637	48.0	78,616	52.0
1980					
State	1,924,484	949,996	49.4	974,488	50.6
Municipality	203,286	98,080	48.2	105,206	51.8
1990					
State	2,249,581	1,111,698	49.4	1,137,883	50.6
Municipality	219,468	107,218	48.9	112,250	51.1

Source: "Tamaulipas, definitive results. VII, VIII, IX, X, XI General Census of Population and Housing, 1950, 1960, 1970, 1980 and 1990". INEGI

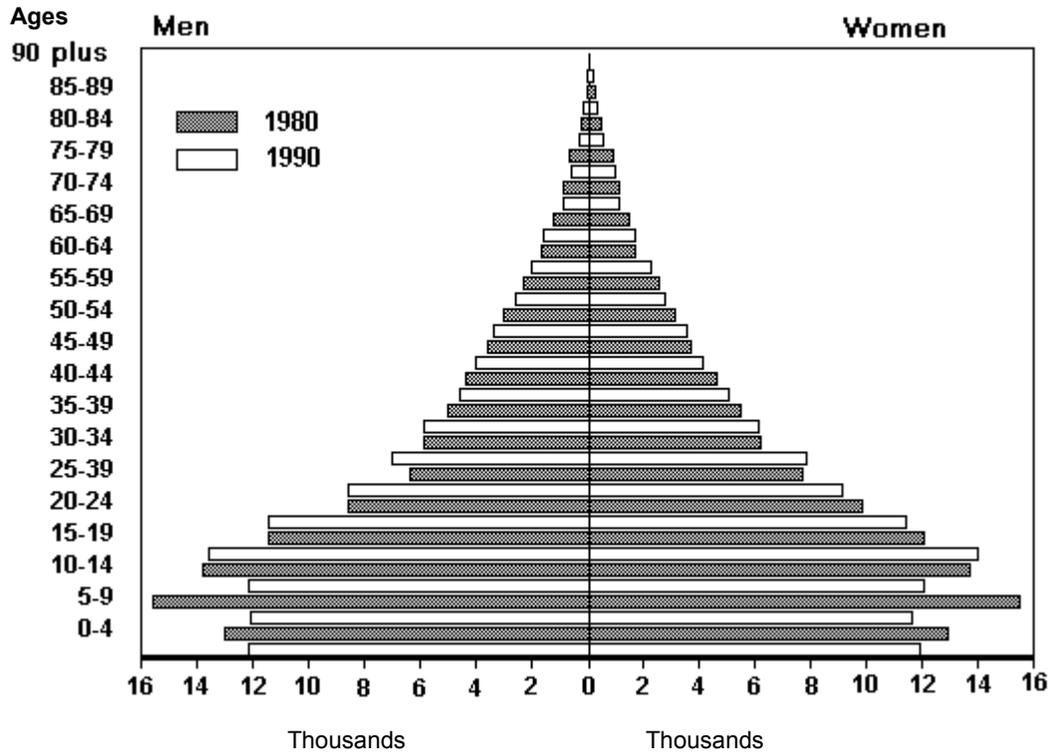
Figure 2.59 Mean Annual Growth Percentages Between Census Counts (1950-1990, Tamaulipas/Nuevo Laredo)



^a / Expresses the annual growth rate of the population living in a defined geographic unit during a certain period. It is derived as follows: Mean annual growth rate = (Population at the end of a period/Population at the beginning of a period)^{1/Number of years considered-1}*100

Source: INEGI.

Figure 2.60 Total Population by Sex by Five-Year Age Groups (Tamaulipas/Neuvo Laredo, 1980-1990)



Source: "Tamaulipas, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

**Table 2.81
Total Population by Sex According to Main Locations to March 12, 1990**

Location	Total	Men	Women
State	2,249,581	1,111,698	1,137,883
Municipality	219,468	107,218	112,250
Nuevo Laredo	218,413	106,595	111,818
Miguel Aleman	186	115	71
America	167	94	73
La Cruz	91	46	45
Morelos	85	46	39
San Francisco	78	44	34
Nuevo Progreso	63	40	23
Fraccionamiento America	40	23	17
Rest of Locations	345	215	130

Source: "Tamaulipas, definitive results. Data by location (Territorial Integration), XI General Census of Population and Housing, 1990". INEGI

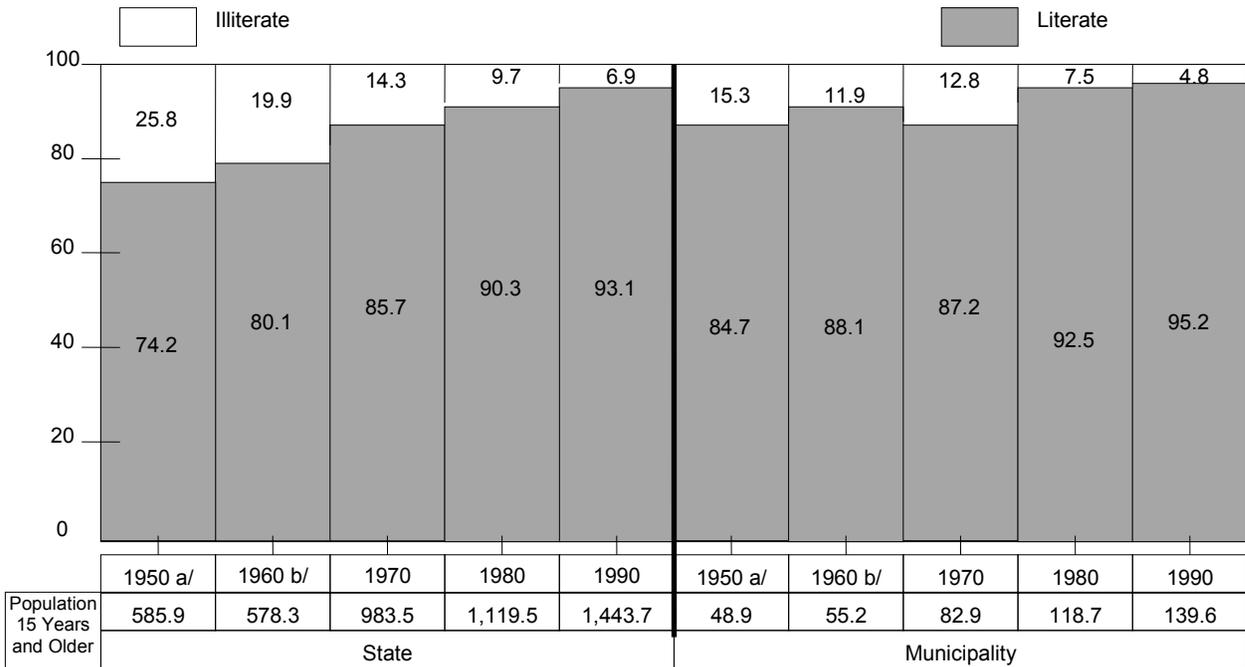
Education

**Table 2.82
Population Five Years of Age and Older by Condition of School Attendance and Sex
According to Age to March 12, 1990**

Age	Total	Attend		Do Not Attend		Not Specified	
		Men	Women	Men	Women	Men	Women
State							
Total	1,974,755	319,810	308,868	640,929	682,537	11,426	11,185
5 years	52,359	15,396	15,072	8,831	8,255	2,536	2,269
6 years	51,685	22,169	22,019	3,495	3,206	405	391
7 years	51,143	24,056	23,587	1,530	1,354	306	310
8 years	53,602	25,643	25,090	1,316	1,111	242	200
9 years	51,495	24,977	24,128	1,095	955	179	161
10 years	53,721	25,834	25,046	1,342	1,202	141	156
11 years	50,504	23,841	23,532	1,448	1,375	168	140
12 years	54,896	25,082	23,663	2,813	3,049	142	147
13 years	54,230	22,646	21,634	4,310	5,352	160	128
14 years	55,464	20,444	19,815	6,909	7,978	170	148
15-19 years	273,793	59,772	58,560	75,241	78,333	1,009	878
20-24 years	231,171	18,407	15,270	92,587	102,770	1,138	999
25 years and older	940,692	11,543	11,452	440,012	467,597	4,830	5,258
Municipality							
Total	187,737	29,621	28,904	60,471	66,255	1,198	1,288
5 years	4,835	1,445	1,409	695	669	329	288
6 years	4,660	2,041	2,000	254	284	46	35
7 years	4,590	2,210	2,075	135	97	31	42
8 years	4,792	2,350	2,202	99	92	22	27
9 years	4,713	2,261	2,238	87	86	16	25
10 years	4,842	2,366	2,262	100	86	12	16
11 years	4,598	2,125	2,224	98	119	19	13
12 years	4,900	2,254	2,214	205	199	10	18
13 years	4,937	2,158	2,059	327	373	11	9
14 years	5,139	1,945	1,994	530	637	15	18
15-19 years	27,621	5,657	5,720	7,739	8,307	107	91
20-24 years	22,848	1,654	1,387	9,569	9,984	119	135
25 years and older	89,262	1,155	1,120	40,633	45,322	461	571

Source: "Tamaulipas, definitive results. XI General Census of Population and Housing, 1990". INEGI

Figure 2.61 Population 15 Years of Age and Older by Literacy (Tamaulipas/Nuevo Laredo, 1950-1990) (In Percent)



a/ Refers to population 6 years and older.

b/ Does not include population of "not specified" age.

Source: "Tamaulipas, definitive results. VII, VIII, IX, X, XI General Census of Population and Housing, 1950, 1960, 1970, 1980 and 1990". INEGI.

Table 2.83
Registered Pupils, Teaching Personnel, and Schools at Course Beginning by Educational Level and Administrative Upkeep, 1994/95

Level and Upkeep	State			Municipality		
	Registered Pupils	Teaching Personnel a/	Schools	Registered Pupils	Teaching Personnel a/	Schools
Total	637,248	29,153	4,397	61,427	2,836	263
Pre-School Elementary	73,689	2,630	1,255	7,574	280	61
Federal b/	3,208	299	286	-	-	-
State c/	63,695	2,054	851	7,156	263	55
Private d/	6,723	275	117	418	17	6
Independent	63	2	1	-	-	-
Elementary Primary	346,236	12,999	2,342	35,511	1,349	132
Federal/e	3,670	373	373	-	-	-
State	326,151	12,038	1,878	34,068	1,295	124
Private	16,415	588	91	1,443	54	8
Elementary Terminal Work Training	17,501	863	144	1,283	102	18
Federal	9,066	248	29	290	14	3
State	2,924	125	19	169	9	1
Private	5,511	490	96	824	79	14
Middle Cycle, Secondary Basic f/	119,427	6,568	437	11,499	671	30
Federal	329	14	2	78	1	1
State	111,871	5,867	377	9,858	550	20
Private	7,227	687	58	1,563	120	9
Middle Terminal Technical	12,923	1,787	46	844	130	6
Federal	8,344	847	18	444	55	2
State	1,916	107	4	-	-	-
Private	1,752	138	18	297	15	3
Independent	911	695	6	103	60	1
Teacher College g/	14,608	736	20	115	55	3
Federal	-	-	-	-	-	-
State	1,158	304	9	57	44	2
Private	13,450	432	11	58	11	1
Upper Middle Cycle Baccalaureate h/	52,864	3,570	153	4,601	249	13
Federal	37,423	2,186	66	3,152	128	5
State	3,787	247	19	559	27	1
Private	10,212	996	66	890	94	7
Independent	1,442	141	2	-	-	-
Upper	Nd	Nd	Nd	Nd	Nd	Nd

a/Includes directors with group [sic].

b/Includes community courses, child development centers (CENDI).

c/Includes CENDI and pre-schools maintained by DIF.

d/Includes CENDI

e/Includes community courses run by CONAFE

f/Includes general, and technical for workers, tele-high school and technical, by branch: industrial, farm/ranch, fishing and forestry.

g/Includes pre-school, primary, special education, physical education and upper teacher's college.

h/Includes two-year or three-year general, and technological by branch: industrial, for services, farm/ranching, fishing and forestry and teaching.

Source: State of Tamaulipas Secretariat for Education, Culture and Sports. Directorate of Education Planning Statistics Dept.

Employment

**Table 2.84
Population at Least 12 Years of Age by Activity Status According to Sex, 1980-1990**

Sex	Total	Economically Active Population		Economically Inactive	Not Specified
		Employed	Unemployed a/		
1980					
State	1,273,958	620,305	4,192	649,461	-
Men	622,044	454,034	3,061	164,949	-
Women	651,914	166,271	1,131	484,512	-
Municipality	134,806	64,281	611	69,914	-
Men	63,711	Nd	Nd	17,522	-
Women	71,095	Nd	Nd	52,392	-
1990					
State	1,610,246	684,550	25,497	869,637	30,562
Men	787,215	506,003	20,759	245,144	15,309
Women	823,031	178,547	4,738	624,493	15,253
Municipality	154,707	69,803	1,935	78,930	4,039
Men	74,549	49,702	1,516	21,405	1,926
Women	80,158	20,101	419	57,525	2,113

a/ 1980 data includes the population at least 12 years of age who have never worked. 1990 data includes the population at least 12 years of age that during the week of March 5-11 had no work but actively sought it.

Source: Tamaulipas, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

**Table 2.85
Economically Active Population by Sex According to Five-Year Age Group, 1980**

Age Group	State			Municipality		
	Total	Men	Women	Total	Men	Women
1980						
Total	624,497	457,095	167,402	64,892	46,189	18,703
12-14 years	16,386	11,166	5,220	1,400	1,003	397
15-19 years	90,150	58,160	31,990	9,365	5,873	3,492
20-24 years	105,535	70,242	35,293	11,700	7,449	4,251
25-29 years	83,563	60,063	23,500	8,694	6,089	2,605
30-34 years	68,874	51,090	17,184	7,513	5,594	1,919
35-39 years	60,611	46,410	14,201	6,366	4,708	1,658
40-44 years	51,797	40,284	11,513	5,399	4,126	1,273
45-49 years	42,821	33,722	9,099	4,343	3,305	1,038
50-54 years	33,848	27,239	6,609	3,428	2,676	752
55-59 years	25,601	20,925	4,676	2,619	2,041	578
60-64 years	15,521	12,682	2,839	1,641	1,332	309
65 years and older	29,790	24,512	5,278	2,424	1,993	431

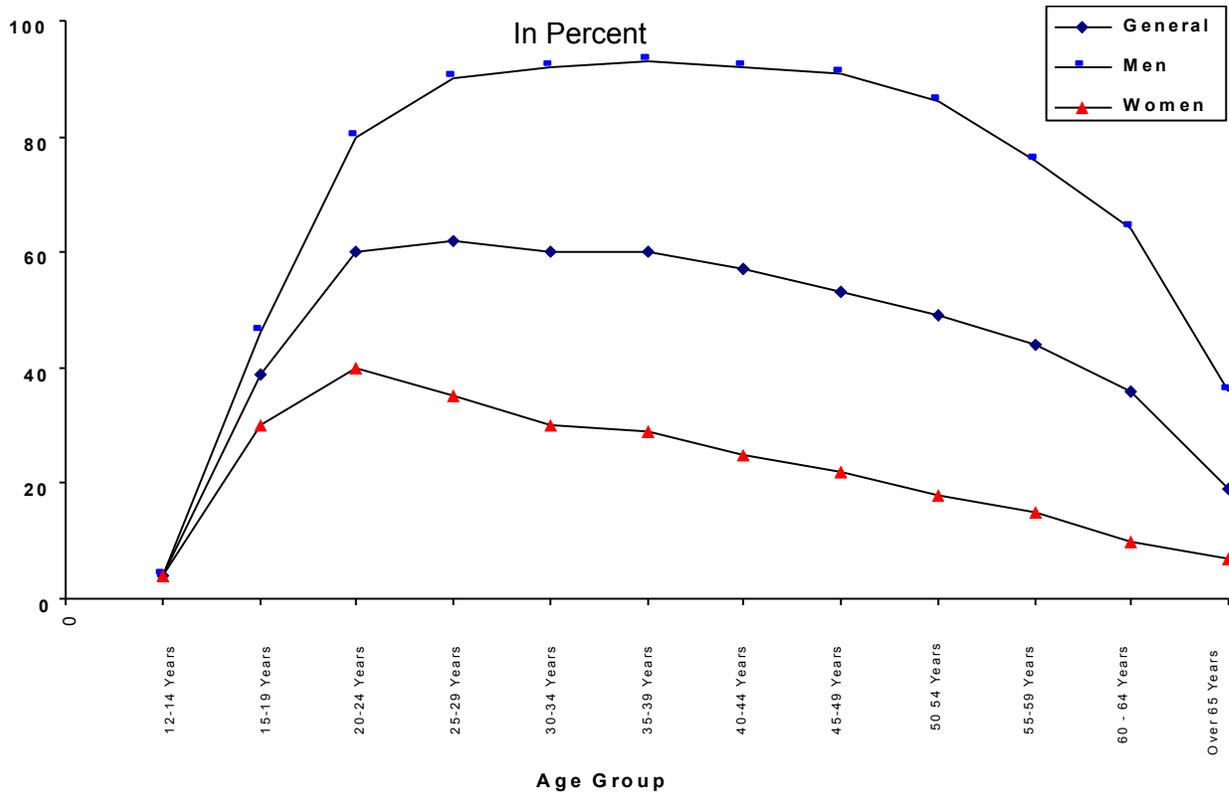
Source: "Tamaulipas, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

**Table 2.86
Economically Active Population by Sex According to Five-Year Age Group, 1990**

Age Group	State			Municipality		
	Total	Men	Women	Total	Men	Women
1990						
Total	710,047	526,762	183,285	71,738	51,218	20,520
12-14 years	9,288	6,622	2,666	687	424	263
15-19 years	90,982	59,374	31,608	10,705	6,373	4,332
20-24 years	127,579	85,773	41,806	13,611	9,038	4,573
25-29 years	111,944	80,798	31,146	11,198	8,014	3,184
30-34 years	93,530	69,348	24,182	9,040	6,641	2,399
35-39 years	74,231	56,321	17,910	7,279	5,409	1,870
40-44 years	56,140	43,966	12,174	5,645	4,340	1,305
45-49 years	46,143	37,797	8,346	4,442	3,506	936
50-54 years	35,648	29,969	5,679	3,458	2,755	703
55-59 years	25,251	21,898	3,353	2,360	1,935	425
60-64 years	17,435	15,329	2,106	1,571	1,312	259
65 years and older	21,876	19,567	2,309	1,742	1,471	271

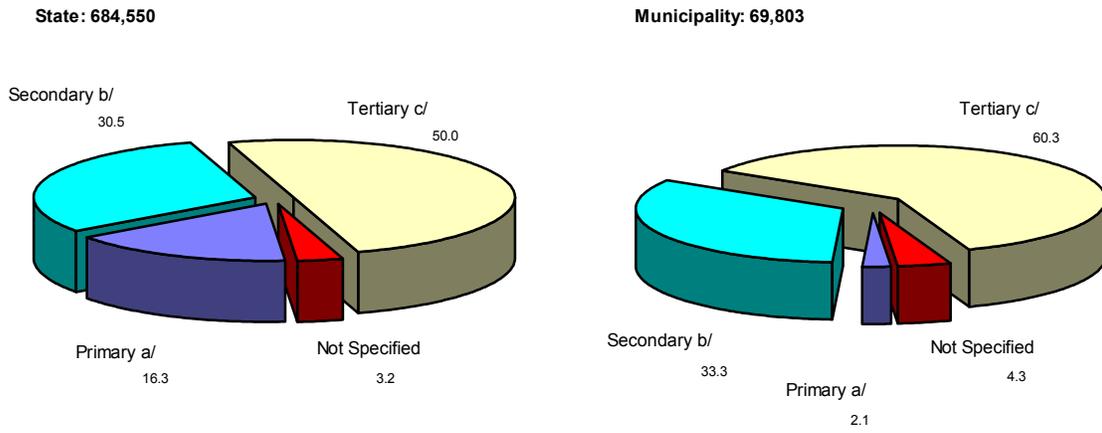
Source: "Tamaulipas, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

Figure 2.62 Specific Participation Rates to March 1990 (Tamaulipas/Nuevo Laredo)



Source: "Tamaulipas, definitive results. XI General Census of Population and Housing, 1990". INEGI.

Figure 2.63 Employed Population by Activity Sector to March 1990
(Tamaulipas/Nuevo Laredo) (In Percent)



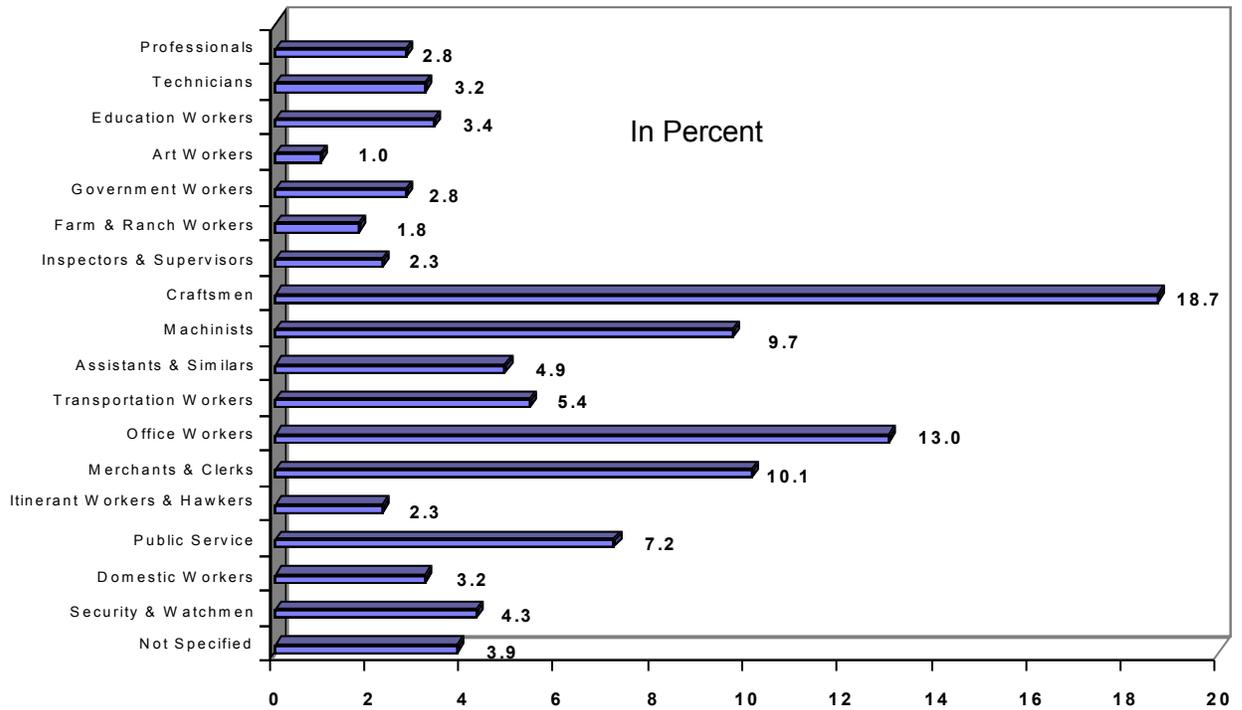
a/Includes farming, cattle, forestry, hunting and fishing.

b/Includes mining, oil and gas extraction, manufacturing, electricity generation and construction.

c/Includes business and services.

Source: "Tamaulipas, definitive results. XI General Census of Population and Housing, 1990". INEGI

Figure 2.64 Employed Population by Main Occupation to March 12, 1990
(Tamaulipas/Nuevo Laredo)



Source: "Tamaulipas, definitive results. XI General Census of Population and Housing, 1990". INEGI.

2.6.8 Matamoros, Tamaulipas

Content

State/Condition and Movement of the Population

- Total population by sex, 1950-1990.
- Mean annual growth rates between census, 1950-1990.
- Total population by sex according to five-year age group, 1980-1990.
- Total population by sex according to main locations to March 12, 1990.

Education

- Population 5 years of age and older by condition of school attendance and sex according to age, to March 12, 1990.
- Population 15 years of age and older by literacy, 1950-1990 (in percent).
- Registered pupils, teaching personnel, and schools at course beginning by educational level and administrative upkeep/support 1992/93.

Employment

- Population at least 12 years of age by activity status according to sex, 1980-1990.
- Economically active population by sex according to five-year age group, 1980.
- Economically active population by sex according to five-year age group, 1990.
- Specific participation rates to March 12, 1990.
- Employed population by activity sector to March 12, 1990 (in percent).

Employed population by main activity to March 12, 1990 (in percent).

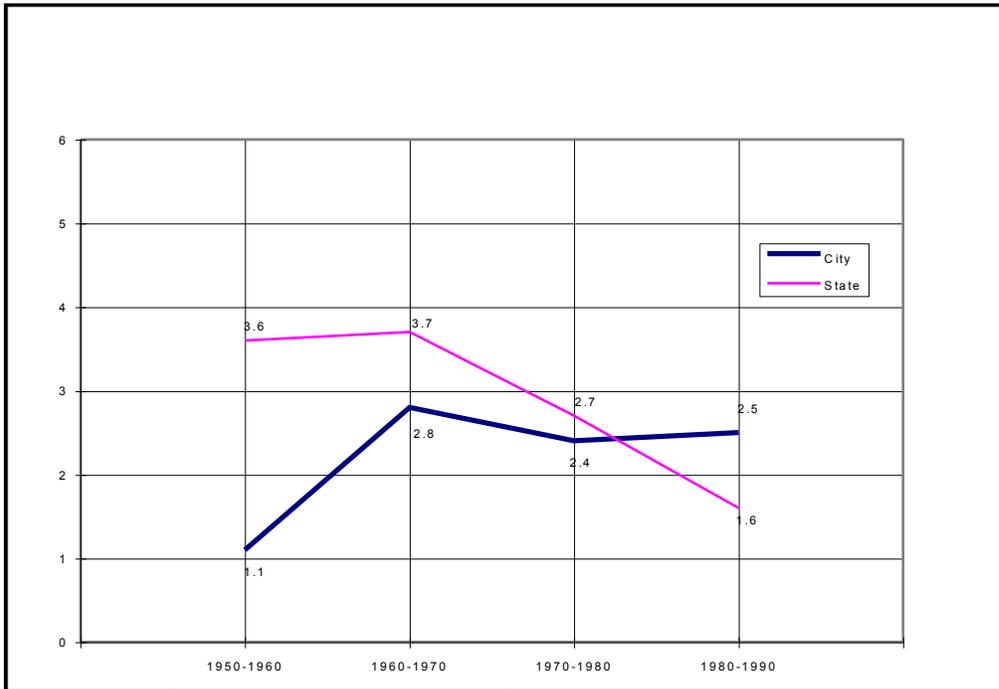
State and Movement of the Population

**Table 2.87
Total Population by Sex, 1950-1990**

Location	Total	Men	%	Women	%
1950					
State	718,167	360,278	50.2	357,889	49.8
Municipality	128,347	65,944	51.4	62,403	48.6
1960					
State	1,024,182	513,915	50.2	510,267	49.8
Municipality	143,043	71,746	50.2	71,297	49.8
1970					
State	1,456,858	725,463	49.8	731,395	50.2
Municipality	186,146	94,998	51.0	91,148	49.0
1980					
State	1,924,484	949,996	49.4	974,488	50.6
Municipality	238,840	116,234	48.7	122,606	51.3
1990					
State	2,249,581	1,111,698	49.4	1,137,883	50.6
Municipality	303,293	148,249	48.9	155,044	51.1

Source: "Tamaulipas, definitive results. VII, VIII, IX, X, XI General Census of Population and Housing, 1950, 1960, 1970, 1980 and 1990". INEGI

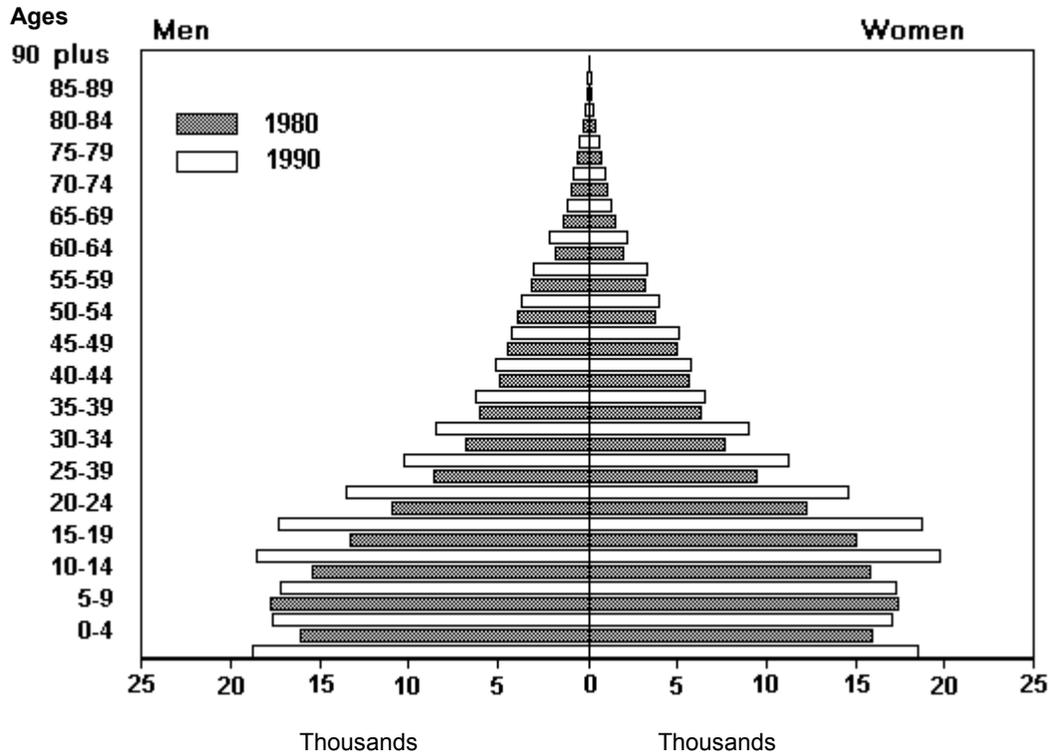
Figure 2.65 Mean Annual Growth Rates Between Census a/, 1950-1990 (In Percent)



^{a/} Expresses the annual growth rate of the population living in a defined geographic unit during a certain period. It is derived as follows: Mean annual growth rate = (Population at the end of a period/Population at the beginning of a period)^{1/Number of years considered-1}*100

Source: INEGI.

Figure 2.66 Total Population by Sex by Five-Year Age Groups (Tamaulipas/Matamoros, 1980-1990)



Source: "Tamaulipas, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

Education

**Table 2.88
Total Population by Sex According to Main Locations to March 12, 1990**

Location	Total	Men	Women
State	2,249,581	1,111,698	1,137,883
Municipality	303,293	148,249	155,044
Heroica Matamoros	266,055	129,129	136,926
Control, El	3,739	1,858	1,881
Ramirez	3,488	1,769	1,719
Santa Adelaida	1,601	794	807
Sandoval	1,216	617	599
Refugio, El	832	420	412
Sierrita, La	804	409	395
Galaneño, EL	781	385	396
Gloria, La	742	362	380
Higuerillas	706	375	331
Guadalupe	691	359	332
Rest of Locations	22,638	11,772	10,866

Source: "Tamaulipas, definitive results. Data by location (Territorial Integration), XI General Census of Population and Housing, 1990". INEGI

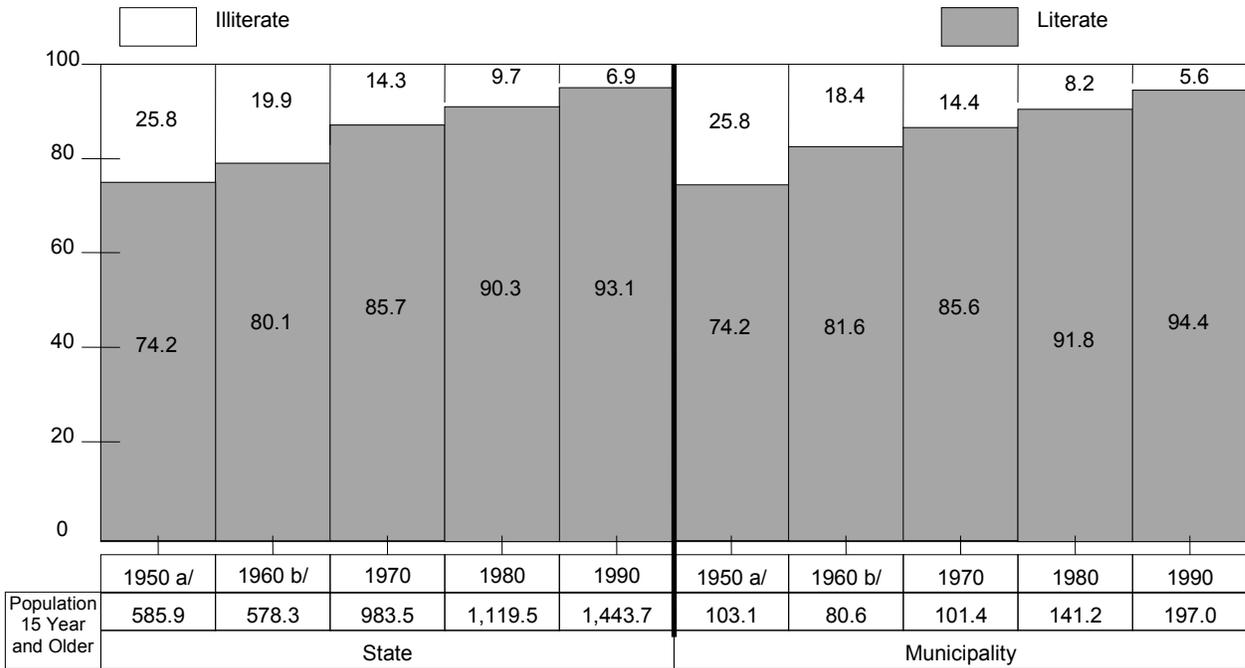
Education

**Table 2.89
Population Five Years of Age and Older by Condition of School Attendance and Sex
According to Age to March 12, 1990**

Age	Total	Attend		Do Not Attend		Not Specified	
		Men	Women	Men	Women	Men	Women
State	1,974,755	319,810	308,688	640,929	682,537	11,426	11,185
5 years	52,359	15,396	15,072	8,831	8,255	2,536	2,269
6 years	51,685	22,169	22,019	3,495	3,206	405	391
7 years	51,143	24,056	23,587	1,530	1,354	306	310
8 years	53,602	25,643	25,090	1,316	1,111	242	200
9 years	51,495	24,977	24,128	1,095	955	179	161
10 years	53,721	25,834	25,046	1,342	1,202	141	156
11 years	50,504	23,841	23,532	1,448	1,375	168	140
12 years	54,896	25,082	23,663	2,813	3,049	142	147
13 years	54,230	22,646	21,634	4,310	5,352	160	128
14 years	55,464	20,444	19,815	6,909	7,978	170	148
15-19 years	273,793	59,772	58,560	75,241	78,333	1,009	878
20-24 years	231,171	18,407	15,270	92,587	102,770	1,138	999
25 years and older	940,692	11,543	11,452	440,012	467,597	4,830	5,258
Municipality	264,711	40,346	39,314	86,868	94,823	1,605	1,755
5 years	7,138	2,083	2,105	1,165	1,074	375	336
6 years	6,653	2,894	2,868	434	345	52	60
7 years	6,387	2,966	2,966	201	158	46	50
8 years	6,864	3,287	3,160	186	163	37	31
9 years	6,666	3,204	3,136	153	113	31	29
10 years	6,790	3,257	3,135	181	160	25	32
11 years	6,249	2,922	2,926	189	163	32	17
12 years	6,822	3,102	2,950	308	424	20	18
13 years	6,752	2,735	2,824	508	640	22	23
14 years	7,108	2,574	2,579	905	999	24	27
15-19 years	37,913	7,338	6,956	10,912	12,453	118	136
20-24 years	35,824	2,289	1,980	14,766	16,477	141	171
25 years and older	123,545	1,695	1,729	56,960	61,654	682	825

Source: "Tamaulipas, definitive results. XI General Census of Population and Housing, 1990". INEGI

Figure 2.67 Population 15 Years of Age and Older by Literacy (Tamaulipas/Matamoros, 1950-1990) (In Percent)



a/ Refers to population 6 years and older.

b/ Does not include population of "not specified" age.

Source: "Tamaulipas, definitive results. VII, VIII, IX, X, XI General Census of Population and Housing, 1950, 1960, 1970, 1980 and 1990". INEGI.

Table 2.90
Registered Pupils, Teaching Personnel, and Schools at Course Beginning by Educational Level and Administrative Upkeep, 1992/93

Level and Upkeep	State			Municipality		
	Registered Pupils	Teaching Personnel	Schools	Registered Pupils	Teaching Personnel	Schools
Total	656,166	30,501	4,341	83,878	4,043	403
Pre-school Elementary	67,873	2,964	1,263	9,962	356	120
Federal	60,565	2,596	1,101	9,310	330	112
State	1,372	79	70	-	-	-
Private	5,857	286	91	652	26	8
Independent	79	3	1	-	-	-
Elementary Primary	338,865	12,457	2,265	44,046	1,481	198
Federal	322,835	11,930	2,187	42,468	1,436	193
State	111	4	1	111	4	1
Private	15,919	523	77	1,467	41	4
Elementary Terminal Work Training	16,327	844	148	2,422	99	13
Federal	6,668	240	32	1,622	29	4
State	2,027	99	14	430	21	4
Private	7,600	498	101	370	49	5
Independent	32	7	1	-	-	-
Middle Cycle, Secondary Basic a/	117,527	6,472	375	14,387	768	41
Federal	110,237	5,826	310	13,202	675	35
State	322	20	11	-	-	-
Private	6,968	626	54	1,635	93	6
Middle Terminal Technical	10,989	1,266	49	1,106	140	3
Federal	6,988	637	19	946	71	1
State	1,361	104	3	-	-	-
Private	1,553	107	21	40	5	1
Independent	1,087	418	6	120	64	1
Teacher College b/	12,483	664	20	131	76	2
Federal	1,128	298	9	131	76	2
Private	11,355	366	11	-	-	-
Upper Middle Cycle Baccalaureate c/	51,577	3,243	153	6,050	374	16
Federal	36,878	1,834	68	4,701	260	10
State	2,798	245	13	301	26	1
Private	8,422	879	63	1,048	88	5
Independent	3,475	285	9	-	-	-
Upper	40,525	2,591	68	5,324	749	10
Federal	10,776	71	11	3,348	166	2
Licenciatura [College Equivalent]	10,680	71	8	Nd	Nd	Nd
Graduate Study	96	-	3	Nd	Nd	Nd
State	132	45	1	-	-	-
Licenciatura [College Equivalent]	132	45	1	-	-	-
Private	9,867	1,258	25	1,495	286	4
Licenciatura [College Equivalent]	9,837	1,258	23	1,495	286	4
Graduate Study	30	1	2	-	-	-
Independent	19,750	1217	31	481	297	4
Licenciatura [College Equivalent]	19,154	1,217	20	427	Nd	2
Graduate Study	596	-	11	54	Nd	2

a/Includes general, and technical for workers and tele-high school.

b/Includes pre-school, primary, special education, physical education and upper teacher's college.

c/Includes two-year or three-year general; industrial, for services, farm/ranching.

d/Included at the college degree level.

Source: State Government. Secretariat for Education, Culture and Sports. Subsecretariat of Education Planning and Development. Directorate of Education Planning; Statistics Dept.

Employment

**Table 2.91
Population at Least 12 Years of Age by Activity Status According to Sex, 1980-1990**

Sex	Total	Economically Active Population		Economically Inactive Population	Not Specified
		Employed	Unemployed a/		
1980					
State	1,273,958	620,305	4,192	649,461	-
Men	622,044	454,034	3,061	164,949	-
Women	651,914	166,271	1,131	484,512	-
Municipality	159,793	85,833	637	73,323	-
Men	76,399	Nd	Nd	18,406	-
Women	83,394	Nd	Nd	54,917	-
1990					
State	1,610,246	684,550	25,497	869,637	30,562
Men	787,215	506,003	20,759	245,144	15,309
Women	823,031	178,547	4,738	624,493	15,253
Municipality	217,964	105,127	3,570	105,929	3,338
Men	105,099	70,661	2,806	30,009	1,623
Women	112,865	34,466	764	75,920	1,715

a/1980 data includes the population at least 12 years of age who have never worked. 1990 data includes the population at least 12 years of age that during the week of March 5-11 had no work but actively sought it.

Source: "Tamaulipas, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

**Table 2.92
Economically Active Population by Sex According to Five-Year Age Group, 1980**

Age Group	State			Municipality		
	Total	Men	Women	Total	Men	Women
1980						
Total	624,497	457,095	167,402	86,470	57,993	28,477
12-14 years	16,386	11,166	5,220	2,026	1,231	795
15-19 years	90,150	58,160	31,990	14,546	8,124	6,422
20-24 years	105,535	70,242	35,293	16,329	9,663	6,666
25-29 years	83,563	60,063	23,500	11,967	7,758	4,209
30-34 years	68,874	51,690	17,184	9,162	6,336	2,826
35-39 years	60,611	46,410	14,201	7,627	5,497	2,130
40-44 years	51,797	40,284	11,513	6,307	4,701	1,606
45-49 years	42,821	33,722	9,099	5,346	4,069	1,277
50-54 years	33,848	27,239	6,609	4,198	3,286	912
55-59 years	25,601	20,925	4,676	3,323	2,712	611
60-64 years	15,521	12,682	2,839	1,951	1,599	352
65 years and older	29,790	24,512	5,278	3,688	3,017	671

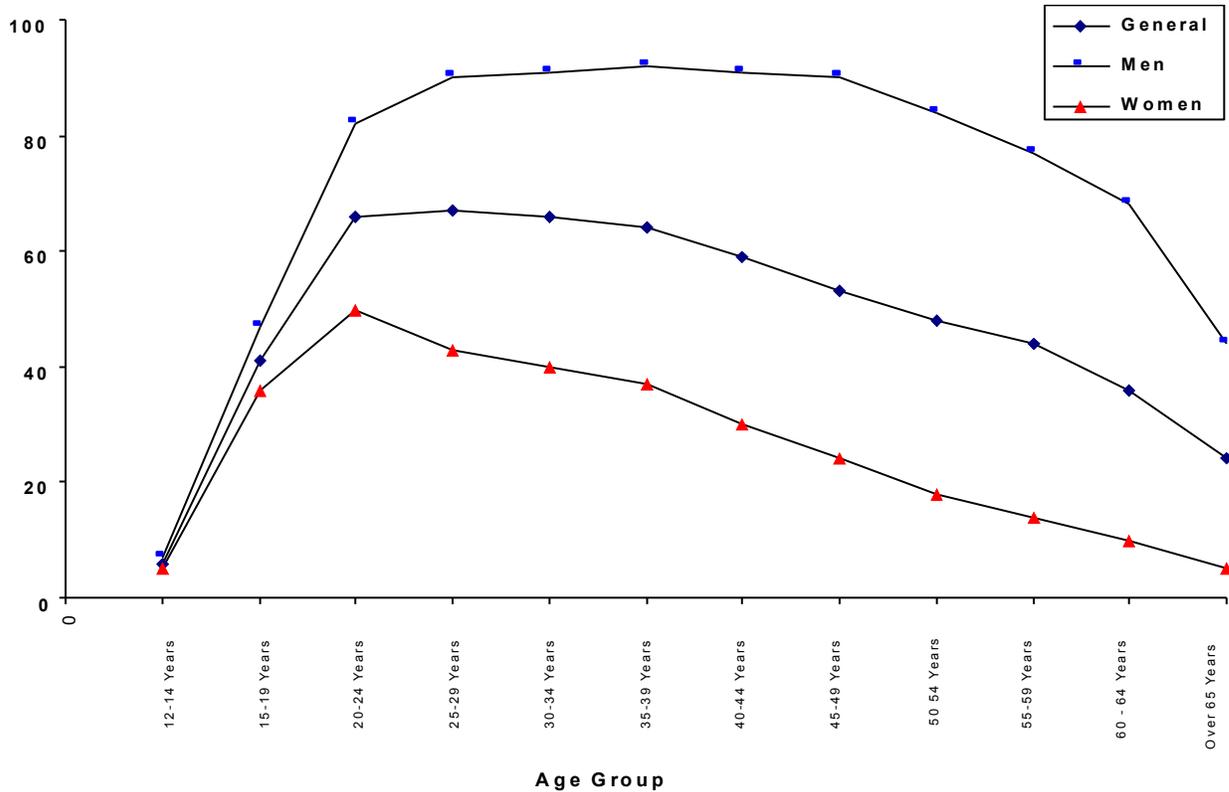
Source: "Tamaulipas, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

**Table 2.93
Economically Active Population by Sex According to Five-Year Age Group, 1990**

Age Group	State			Municipality		
	Total	Men	Women	Total	Men	Women
1990						
Total	710,047	526,762	183,285	108,697	73,467	35,230
12-14 years	9,288	6,622	2,666	1,043	673	370
15-19 years	90,982	59,374	31,608	15,621	8,719	6,902
20-24 years	127,579	85,773	41,806	23,256	14,127	9,129
25-29 years	111,944	80,798	31,146	18,294	12,223	6,071
30-34 years	93,530	69,348	24,182	14,433	9,859	4,574
35-39 years	74,231	56,321	17,910	10,557	7,473	3,084
40-44 years	56,140	43,966	12,174	7,294	5,401	1,893
45-49 years	46,143	37,797	8,346	5,910	4,620	1,290
50-54 years	35,648	29,969	5,679	4,300	3,500	800
55-59 years	25,251	21,898	3,353	3,076	2,580	496
60-64 years	17,435	15,329	2,106	2,139	1,860	279
65 years and older	21,876	19,567	2,309	2,774	2,432	342

Source: Tamaulipas, definitive results. X and XI General Census of Population and Housing, 1980 and 1990". INEGI

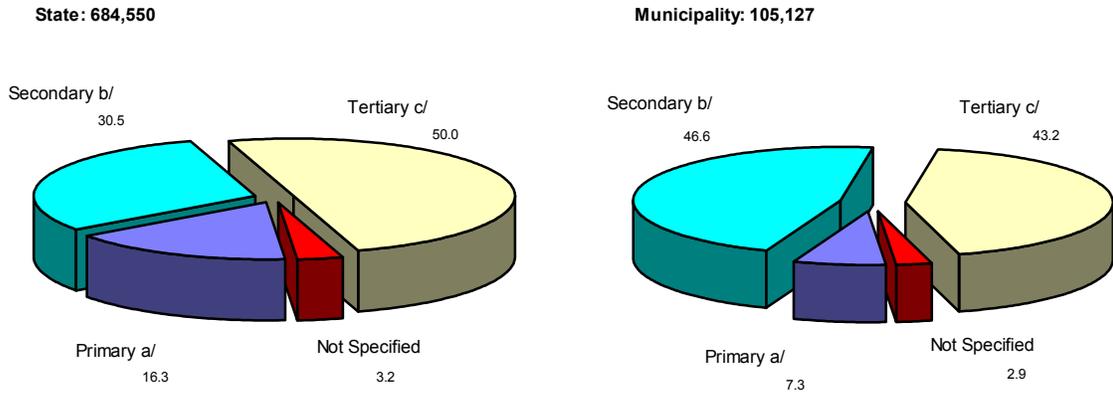
Figure 2.68 Specific Participation Rates to March 1990 (Tamaulipas/Matamoros)



Source: "Tamaulipas, definitive results. XI General Census of Population and Housing, 1990". INEGI.

Employment

Figure 2.69 Employed Population by Activity Sector to March 1990 (Tamaulipas/Matamoros)
(In Percent)



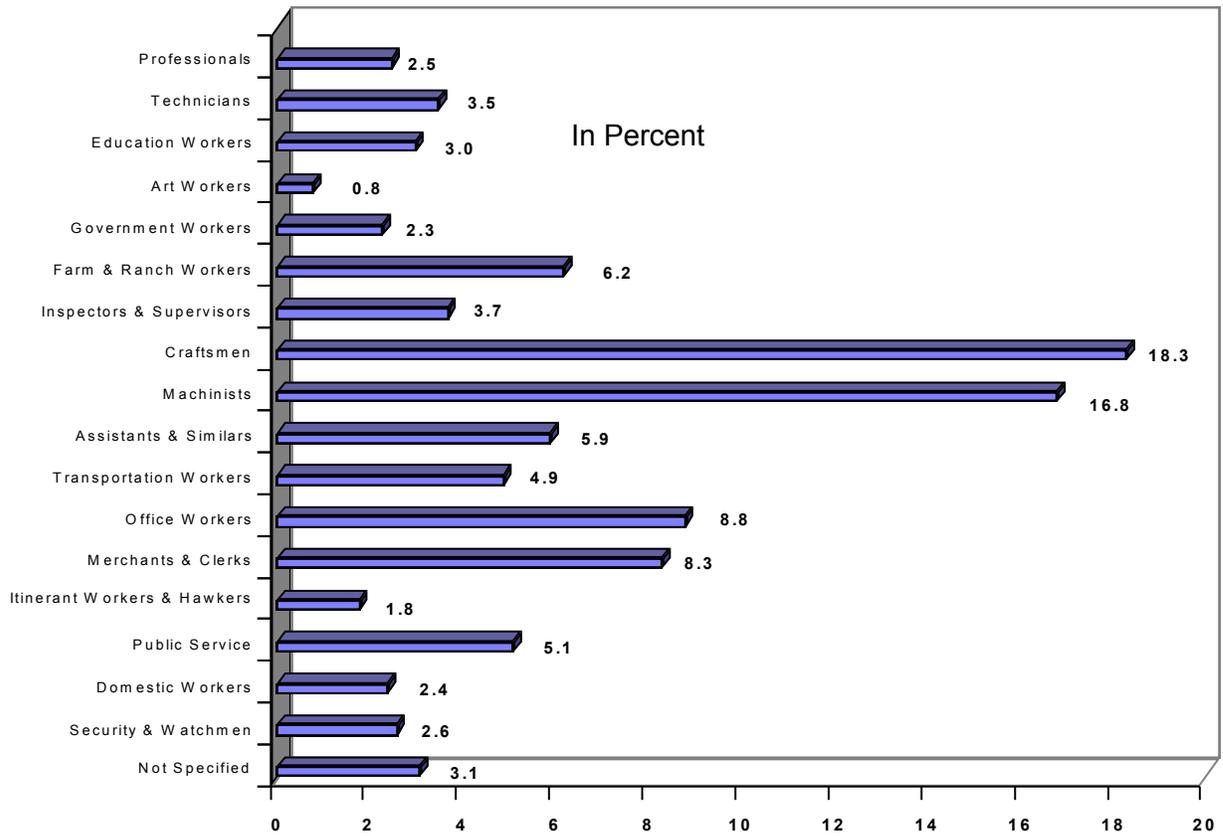
a/Includes farming, cattle, forestry, hunting and fishing.

b/Includes mining, oil and gas extraction, manufacturing, electricity generation and construction.

c/Includes business and services.

Source: "Tamaulipas, definitive results. XI General Census of Population and Housing, 1990". INEGI

Figure 2.70 Employed Population by Main Occupation to March 1990
(Tamaulipas/Matamoros)



Source: "Tamaulipas, definitive results. XI General Census of Population and Housing, 1990". INEGI.

2.7 Gas Pipelines

Petroleos Mexicanos operates a 13,485 kilometer nationwide network of gas pipelines, of which 11,440 kilometers carry natural gas and 2,045 kilometers carry liquid propane.

Northern Mexico has 4,250 kilometers of natural gas pipelines.

The network crosses the U.S. border at four points: Reynosa-Hidalgo, Ciudad Juarez-El Paso, Naco-Naco, and Piedras Negras-Eagle Pass.

2.7.1 North-South Flow

Table 2.94 lists the volumes and value of natural gas imports, southward, for 1992 through 1995. Volumes are expressed in millions of cubic feet per day and the value in US \$ millions.

Table 2.94
Pipeline Flow of Natural Gas South From the Binational Border (1992-1995)

Crossing	1992		1993		1994		1995	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Reynosa-Hidalgo	—	—	66.49	52.16	85.71	53.94	122.95	71.05
Cd. Juarez-El Paso	—	—	22.92	18.18	33.78	23.20	39.13	22.11
Naco-Naco	—	—	5.23	4.59	3.95	3.40	8.72	4.39
P. Negras-Eagle Pass	—	—	1.98	1.89	2.07	1.61	2.13	1.59
Total	250.31	179.46	96.61	77.53	125.07	82.19	172.92	99.13

Source: Basic Gas and Petrochemicals, PEMEX

Seasonal distribution of volumes and value of southward flow appear in Tables 2.95 through 2.98.

Table 2.95
Monthly Amounts of Natural Gas Flow Through Pipeline Southward From the International Border-1992

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
(MMPCD)	316.69	197.03	212.01	235.93	224.97	233.07	195.08	274.87	262.26	322.30	263.39	262.53	Average 250.31
(MMUSD)	18.33	7.17	9.33	11.14	12.15	12.96	10.51	17.24	16.25	27.49	18.21	18.68	Total 179.46

Source: Basic Gas and Petrochemicals, PEMEX

(MMPCD) millions of cubic feet per day

(MMUSD) US\$ millions

Table 2.96
Monthly Amounts of Natural Gas Flow Through Pipeline Southward From the International Border-1993

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
(MMPCD)	185.13	96.76	114.92	89.43	106.16	130.92	119.25	97.71	72.10	54.54	55.25	35.94	Average 96.61
Reynosa, Tamps.	193.38	77.29	90.86	63.50	66.39	86.40	79.86	63.29	47.17	47.62	36.07	0	66.49
Cd. Juarez, Chih.	36.15	9.46	16.56	19.05	33.25	38.32	33.74	29.20	19.13	0	11.29	27.46	22.92
Naco, Son.	6.73	7.59	5.42	5.27	4.77	4.53	4.11	3.76	4.33	5.01	5.34	6.05	5.23
P. Negras, Coah.	2.86	2.42	2.10	1.62	1.74	1.67	1.54	1.46	1.47	1.90	2.55	2.44	1.98
(MMUSD)	12.34	4.90	7.51	6.45	8.66	7.82	7.59	6.76	5.24	3.86	3.58	2.83	Total 77.53
Reynosa, Tamps.	8.85	3.79	5.87	4.60	5.52	5.15	4.92	4.34	3.44	3.38	2.30	0	52.16
Cd. Juarez, Chih.	2.72	0.51	1.11	1.29	2.55	2.24	2.23	2	1.36		0.74	2.13	18.88
Naco, Son.	0.53	0.44	0.35	0.42	0.42	0.30	0.31	0.30	0.32	0.35	0.36	0.49	4.59
P. Negras, Coah.	0.24	0.16	0.17	0.14	0.17	0.13	0.13	0.11	0.12	0.13	0.18	0.21	1.89

Source: Basic Gas and Petrochemicals, PEMEX

(MMPCD) millions of cubic feet per day

(MMUSD) US\$ millions

Table 2.97
Monthly Amounts of Natural Gas Flow Through Pipeline Southward From the International Border-1994

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
(MMPCD)	48.02	51.59	42.26	46.10	78.96	32.80	71.37	218.10	235.10	170.53	306.88	196.06	125.07
Reynosa, Tamps.		26.75	16.97	14.65	44.73	14.36	52.57	159.63	181.70	126.79	254.12	134.52	85.71
Cd. Juarez, Chih.	40.79	17.69	19.18	25.66	29.28	13.82	14.93	53.23	48.90	37.56	44.79	51.99	33.28
Naco, Son.	4.41	3.61	3.92	3.80	2.99	2.83	2.31	3.50	2.79	4.42	5.71	7.08	3.95
P. Negras, Coah.	2.83	2.67	2.20	1.89	1.96	1.80	1.57	1.74	1.71	1.76	2.26	2.47	2.07
(MMUSD)	3.49	3.19	2.98	2.86	4.99	1.82	4.37	12.31	11.78	8.03	15.50	10.87	82.19
Reynosa, Tamps.		1.63	1.06	0.85	2.81	0.76	3.18	8.85	9.01	5.99	12.64	7.15	53.94
Cd. Juarez, Chih.	2.92	1.09	1.38	1.58	1.85	0.74	0.89	3.12	2.48	1.69	2.39	3.08	23.20
Naco, Son.	0.37	0.27	0.36	0.30	0.19	0.21	0.18	0.23	0.19	0.26	0.34	0.49	3.40
P. Negras, Coah.	0.21	0.17	0.18	0.13	0.14	0.11	0.11	0.11	0.09	0.09	0.13	0.15	0.61

Source: Basic Gas and Petrochemicals, PEMEX

(MMPCD) millions of cubic feet per day

(MMUSD) US\$ millions

Table 2.98
Monthly Amounts of Natural Gas Flow Through Pipeline Southward From the International Border-1995

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Total (MMPCD)	191.00	197.90	225.72	227.54	231.00	271.35	206.75	107.44	74.76	181.33	117.85	44.80	172.92
Reynosa, Tamps.	131.34	151.2	175.41	175.27	191.84	199.90	138.14	63.39	37.09	139.79	4.65		122.95
Cd. Juarez, Chih.	49.63	36.34	40.36	44.12	30.21	61.85	57.05	35.27	27.27	29.53	30.45	27.11	39.13
Naco, Son.	7.43	7.66	7.61	6.62	7.50	8.26	8.95	7.39	8.92	10.24	9.22	14.66	8.72
P. Negras, Coah.	2.68	2.41	2.34	1.53	1.45	1.33	2.61	1.40	1.48	1.77	3.54	3.02	2.13
Total (MMUSD)	9.60	7.82	10.08	10.81	11.80	13.52	9.53	4.41	3.50	9.44	6.08	.54	99.13
Reynosa, Tamps.	6.44	5.96	7.87	8.47	9.94	10.13	6.60	2.57	1.72	7.45	3.89		71.05
Cd. Juarez, Chih.	2.59	1.42	1.72	1.97	1.40	2.92	2.47	1.51	1.34	1.48	1.61	1.68	22.11
Naco, Son.	0.41	0.32	0.36	0.28	0.38	0.38	0.30	0.24	0.34	0.40	0.35	0.63	4.39
P. Negras, Coah.	0.16	0.12	0.13	0.09	0.09	0.09	0.16	0.08	0.09	0.11	0.23	0.24	1.59

Source: Basic Gas and Petrochemicals, PEMEX

(MMPCD) millions of cubic feet per day

(MMUSD) US\$ millions

2.7.2 South-North Flow

For natural gas flow north from the border, we only have total volumes and values for 1994 and 1995 are available. These are: 19.21 and 21.47 millions of cubic feet per day, on average and US \$14.81 million and US \$12.37 million, respectively. Seasonal distribution of volumes and values of those flows are shown in Table 2.99.

Table 2.99
Natural Gas Flow by Pipeline Northward From the Binational Border (1994-1995)

	1994		1995	
	MMPCD	MMUSD	MMPCD	MMUSD
Jan.	56.80	3.57	0	0
Feb.	17.99	1.22	1.99	0.08
Mar.	67.13	4.72	4.65	0.22
Apr.	0	0	1.28	0.06
May	51.90	3.35	0	0
Jun.	35.24	1.94	0	0
Jul.	0	0	0	0
Aug.	0	0	26.24	1.27
Sept.	0	0	160.65	7.50
Oct.	0	0	58.17	2.92
Nov.	0	0	5.42	0.32
Dec.	0	0	0	0
Total	19.21	14.81	21.47	12.37

Source: Basic Gas and Petrochemicals, PEMEX

Figure 2.71 illustrates the gas pipeline network of northern Mexico, including pipe diameters.

Figure 2.71 Natural Gas Pipelines of Northern Mexico

2.7.3 Short- and Medium-Term Program

In the short and medium term, interconnections between the 24" and the 36" pipeline originating at Reynosa will be built at Kilometers 20 and 78+450, in order to reduce the drop in pressure toward Reynosa, in order to export gas from the interior of the country.

A compressor station will be built at Kilometer 19, originating in Reynosa, with the installation of two turbocompressors of 4,700 horse-power each, in order to expand export capacity to 500 million cubic feet per day.

A 24", 2.1-km pipeline will be built at Reynosa between the petrochemical complex and the import station.

A compressor station is to be built at Los Ramones, with the installation of three turbocompressors of 4,700 h.p. each, as necessary, to increase the carrying capacity in northern Mexico.

Currently, several proposals exist by American companies to construct and operate an interconnection head between southern Texas and the northern part of Mexico in the Reynosa area.

2.8 Bibliography

1. Secretaria de Comunicaciones y Transportes (SCT); *Communications and Transport Atlas*, Mexico, D.F. 1995
2. Coordinacion General de Planeacion, SCT; *Tourist Map of each State of Mexico*, Mexico, 1994.
3. Rand McNally & Co.; *Roadway Atlas*, 1979 Edition.
4. Subsecretaria de Infraestructura, SCT; *National Superhighway Program 1989-1994; Goals and Achievements*, Mexico City, July 1994.
5. Instituto Mexicano del Transporte, SCT; *Statistical Manual of the Transport Sector, 1993*, San Fandila, Queretaro, 1995.
6. Direccion General de Autotransporte Federal, SCT; *1994 Basic Federal Automobile Transport Statistics*, Mexico, D.F. 1995.
7. Secretaria de Comunicaciones y Transportes; *Road Data, 1989 to 1995*.
8. Direccion General de Proyectos, Servicios Tecnicos y Concesiones, SCT; *Origin and Destination Studies, 1993 to 1994*.
9. Puertos Mexicanos, SCT; *Port Assessment Survey 1990 and 1991*.
10. Aeropuertos y Servicios Auxiliares, SCT; *Airport Statistical System, 1993*.
11. Secretaria de Comunicaciones y Transportes; *National Highway Program 1995-2000*. Mexico D.F., August 21, 1995.
12. Diario Oficial de la Federacion [official federal government newspaper], Jan. 26, 1994. *Rules on weight, size and capacity of transport vehicles using roads and bridges in federal jurisdiction*, SCT.
13. Direccion General de Proyectos, Servicios Tecnicos y Concesiones, SCT; *Road Capacity Manual*, SCT, Mexico DF, 1991.
14. Secretaria de Comunicaciones y Transportes; *Communications and Transport Development Program, 1995-2000*.
15. Direccion General de Marina Mercante, SCT; *Cargo and Ship Movement, 1992*.
16. Instituto Nacional de Estadistica, Geografia e Informatica (INEGI); *The Northern Border: A view of population and housing*. Definitive Results. XI General Census of Population and Housing, 1990.
17. Grupo Financiero Bancomer. *Indicators and Forecasts 1995-1996*.
18. Instituto Nacional de Estadistica, Geografia e Informatica (INEGI); *Municipal Statistical Notebook (For each municipality: Tijuana, 1995; Nogales, 1994; Juarez, 1993; Piedras Negras, 1994; Nuevo Laredo, 1995; Matamoros, 1993)*.
19. PEMEX. *Gas y petroquimica basica: Information provided on the gas transport pipeline on the northern border. 1996*.