



México

RENEWABLE ENERGIES

PRO MÉXICO is the Mexican Government institution that promotes the **export of Mexican products** and services, the **internationalization of national companies**, and the **attraction of foreign investment**. ProMéxico drives Mexico's active participation in the international economic arena. Through a network of **48 offices** in **31 countries** and **29 offices in the country** it offers a wide range of specialized services and support.

WHEREVER *you* ARE, it's HIGHLY PROBABLE *that* SOMETHING AROUND *you has* BEEN MADE in **MEXICO.**

THE INDUSTRY IN MEXICO

POTENTIAL OF POWER GENERATION

According to the **National Inventory of Renewable Energies** (Inventario Nacional de Energías Renovables, INER), Mexico has **plenty of natural resources** for **power generation** from **renewable sources**.

The country has a proven potential to **generate up to 13,167 GWh/year** of **electricity**. However, these estimates are increased if we consider the possible and probable reserves.

Table 1. Potential for electricity generation from renewable energies (GWh /year)

Resources	Geothermal	Mini hydro	Wind	Solar	Biomass
Possible	16,165	-	87,600	6,500,000	16,165
Probable	95,596	1,805	9,597	-	95,596
Proven	892	1,365	9,789	542	892

Source: Renewable Energy Prospects 2014-2028, Ministry of Energy.

The GOAL of the FEDERAL GOVERNMENT
is to achieve the share of 35% of CLEAN
TECHNOLOGIES in total
POWER GENERATION by 2024.

THE INDUSTRY IN MEXICO

INSTALLED CAPACITY

In late **2014**, **Mexico** had **16,070 MW** of **renewable energy** installed capacity, including major **hydroelectric plants**.

Table 2. Renewable power in Mexico 2014

Energy	Installed Capacity (MW)	Generation GWh/year
Hydro	12,474	38,821
Wind	2,037	6,086
Geothermal	847	6,104
Biomass	646	1,399
Solar	66	84
Total	16,070	52,494

Source: National Inventory of Renewable Energy, Ministry of Energy.

THE INDUSTRY IN MEXICO

Table 3. Installed Capacity under Construction or About to Start Operations MW

States	Hydro	Biomass	Geothermal	Solar	Wind	Total
Oaxaca	47	0	-	-	1,292	1,339
Coahuila	-	5	-	333	501	838
Sonora	37	0	-	755	27	818
Tamaulipas	-	0	-	90	603	693
Chihuahua	10	1	-	676	-	687
Baja California	28	0	-	45	559	632
Veracruz	534	0	-	1	40	575
Puebla	135	0	-	30	366	531
Durango	30	0	-	292	121	443
Zacatecas	-	0	-	240	180	420
Nuevo León	-	3	-	-	302	305
San Luis Potosí	-	1	-	90	200	291
Others	304	78	65	1,281	220	-
Total	1,125	88	65	3,833	4,410	9,520

Source: Energy Regulatory Commission.

Many transnational renewable energy equipment suppliers and project developers consider Mexico an appealing investment destination. Furthermore, Mexican companies have diversified their businesses towards this sector through participations in small scale projects for renewable energy equipment manufacturing and sales.

THE INDUSTRY IN MEXICO

Table 4. Foreign Direct Investment 2010-2015, Millions of US dollars

Countries	Wind	Solar	Biomass	Marine	Total
Spain	3,831	1,710	15	-	5,556
USA	3,240	435	-	-	3,675
Germany	995	500	-	-	1,495
Portugal	280	280	-	-	560
UK	-	500	10	-	510
Bermuda	-	500	-	-	500
Italy	326	-	-	-	326
Israel	-	280	-	280	280
Taiwan	-	190	-	-	280
France	-	-	-	-	190
Total	8,672	4,395	25	280	13,372

Source: FDI Markets, Financial Times, March 2015.

** Data estimated based on investment announcements.

Between **2010** and **March 2015**, **Mexico's renewable energy industry** received 44 FDI projects that added up to **US\$13.4 billion**.

The main investor countries were **Spain**, the **United States** and **Germany**.



SOME RENEWABLE ENERGY

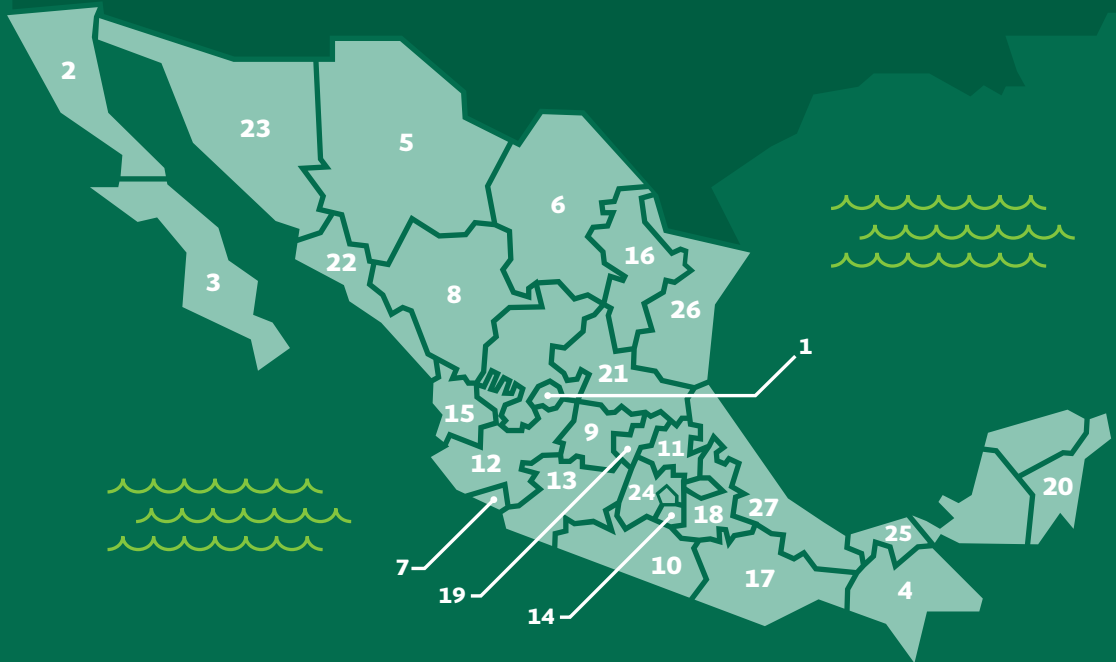
COMPANIES *in* MEXICO








Sources: BNEF, AMDEE, ANES, Company websites.

RENEWABLE ENERGY FACILITIES *in OPERATION* by STATE, 2015

INSTALLED CAPACITY OF RENEWABLE ENERGY FACILITIES BY STATE (MW)



INSTALLED CAPACITY of RENEWABLE ENERGY FACILITIES by STATE

#	States	MW				
						
1	Aguascalientes	-	-	1	-	3
2	Baja California	11	-	6	570	-
3	Baja California Sur	-	-	40	10	-
4	Chiapas	29	4,828	-	-	25
5	Chihuahua	-	28	-	-	6
6	Coahuila	-	66	-	-	-
7	Colima	-	-	-	-	6
8	Durango	-	20	-	-	2
9	Guanajuato	-	2	2	-	2
10	Guerrero	-	1,828	-	-	-
11	Hidalgo	-	292	-	-	-
12	Jalisco	50	410	-	-	88
13	Michoacán	-	582	-	192	15
14	Morelos	-	-	-	-	12
15	Nayarit	-	2,462	-	-	10
16	Nuevo León	22	-	-	-	28
17	Oaxaca	1,870	356	-	-	21
18	Puebla	-	450	-	52	16
19	Querétaro	-	-	-	-	2
20	Quintana Roo	2	-	-	-	9
21	San Luis Potosí	-	20	-	-	41
22	Sinaloa	-	777	-	-	24
23	Sonora	-	164	1	-	-
24	State of Mexico	-	7	-	-	2
25	Tabasco	-	-	-	-	42
26	Tamaulipas	54	32	-	-	13
27	Veracruz	-	149	-	-	282



Wind



Hydro



Po Solar



Geothermal



Bioenergy

THE INDUSTRY IN MEXICO

FORECAST TO 2028

It is estimated that by **2028 the installed capacity of renewable energy power will increase to 19,761 MW**, these will be led by wind and hydropower sources, with a **59%** and **21%** share, respectively.

Table 5. Forecast of additional renewable power capacity 2014–2028 (MW)

Energy	2018	2024	2028	% Share
Wind	7,608	10,260	11,585	59%
Geothermal	178	258	338	2%
Bioenergy	92	494	671	3%
PV Solar	543	1,941	3,121	16%
Hydro < 30 MW	110	352	502	3%
Hydro > 30 MW	1,230	3,017	3,544	18%
Total	9,761	16,322	19,761	

Source: Renewable Energy Prospects 2014–2028, Ministry of Energy.

SOLAR POTENTIAL

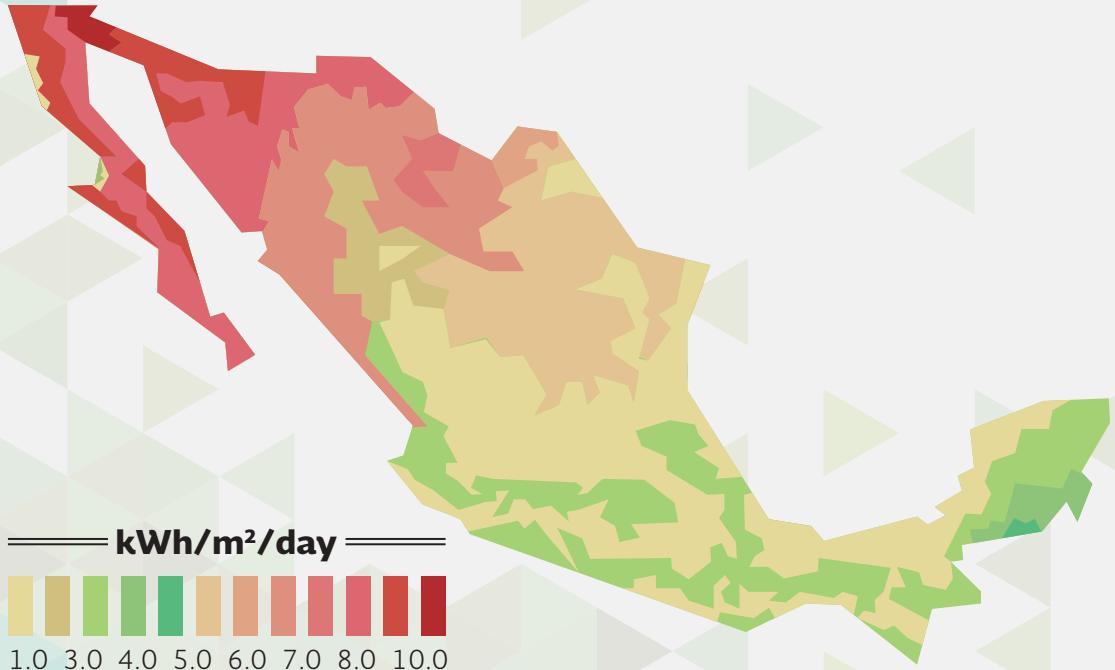
The **geographic location of Mexico** positions it as the **third most attractive country** in the world for **investing in solar photovoltaic energy projects**, behind only China and Singapore.

If the **high levels of solar radiation in Mexico** are **leveraged, solar energy** could be one of the country's primary sources. The **north** and **northwestern regions** have the **highest average sunshine** in the country.

According to the **INER, solar energy** has a generation potential of **6,500,000 GWh**.

SOLAR RADIATION IN MEXICO

The **AVERAGE** *daily* **SOLAR RADIATION**
during the year is **5.5 KWH/M²,**
and can reach values in
EXCESS OF 8.5 KWH/M².



Source: Renewable Energy Prospects 2014-2028, Ministry of Energy.

SOLAR INDUSTRY

SOLAR PROJECTS

In **2014**, installed capacity of **solar photovoltaic energy** in operation reached **66 MW**, however, as of **January 2015** the **Energy Regulatory Commission** had registered **3,833 MW** in projects that are either under construction or about to start operations.

Table 6. Solar power authorized projects

States	Amount of projects	Under construction	About to start operations	Total	% Share
		MW			
Sonora	25	237	518	755	19%
Chihuahua	20	181	495	676	17%
Coahuila	12	184	149	333	9%
Durango	14	156	136	292	8%
Baja California Sur	10	117	97	214	6%
Zacatecas	8	60	180	240	6%
Jalisco	11	149	70	219	6%
Guanajuato	9	64	149	214	6%
Sinaloa	6	150	30	180	5%
Aguascalientes	6	60	120	180	5%
Tamaulipas	3	90	-	90	2%
San Luis Potosí	3	30	60	90	2%
Others	17	271	80	351	9%
Total	144	1,749	2,084	3,833	

Source: Energy Regulatory Commission.

SOLAR INDUSTRY

SOLAR EQUIPMENT MANUFACTURING COMPANIES

Mexico has the **largest manufacturing base** of **photovoltaic modules** in **Latin America**, with an **annual production capacity** of **over 1,217 MW**.

Among the leading developers of **PV solar projects** include: **Gauss Energía, Grupo Dragón, Sonora Energy Group, Enercity Alfa**, and **Eosol Energy**.

Table 7. Solar equipment manufacturing companies in Mexico, 2015

Company	Country	Production	Location
Baja Sun Energy S.R.L. de C.V.	Mexico	100	Baja California
ERDM Solar S.A. de C.V.	Mexico	60	Veracruz
IUSASOL S.A. de C.V.	Mexico	125	State of Mexico
Jabil Circuit Inc.	U.S.	45	Chihuahua
Kyocera Corp.	Japan	150	Baja California
Sanyo	Japan	65	Nuevo León
Solartec S.A. de C.V.	Mexico	172.5	Guanajuato
SunPower Corp.	U.S.	500	Baja California
Total		1,217.50	

Source: Bloomberg New Energy Finance, June 2015.

SOLAR INDUSTRY

PV MARKET ATTRACTIVENESS RANKING

PV projects currently under construction in **Mexico** reached a value of **1,700 MW**, this fact placed the country in **third place for attractiveness** to **investors, developers** and **manufacturers** of the industry.

Table 8. IHS PV Market Attractiveness Ranking: Top 5 Markets

Rank	Country	Macro-economic	Market Size	Project Profitability	Development Environment Maturity	Total Score
1	South Africa	56	64	62	75	67
2	Turkey	55	49	53	20	45
3	Mexico	59	35	34	60	43
4	Israel	62	14	58	35	42
5	Switzerland	80	13	32	60	40

Source: IHS Technology Marzo 2014.

SUPPLY CHAIN

Table 9. Thin Film PV Solar supply chain in Mexico (# of companies)

CEM	1
Raw materials (e.g. silane, glass)	-
Cells, monolithic integration and modules	8
Balance of plant	8
Project Development	32
Installation	21

Source: Bloomberg New Energy Finance, June 2015.

SOLAR INDUSTRY

SUPPLY CHAIN

Table 10. Crystalline PV Solar supply chain in Mexico (# of Companies)

Raw feedstock (solar grade silicon)	-
Ingots	-
Wafers	-
Cells	2
Modules	3
Balance of plant	1
Project Development	31
Installation	20

Source: Bloomberg New Energy Finance, June 2015.

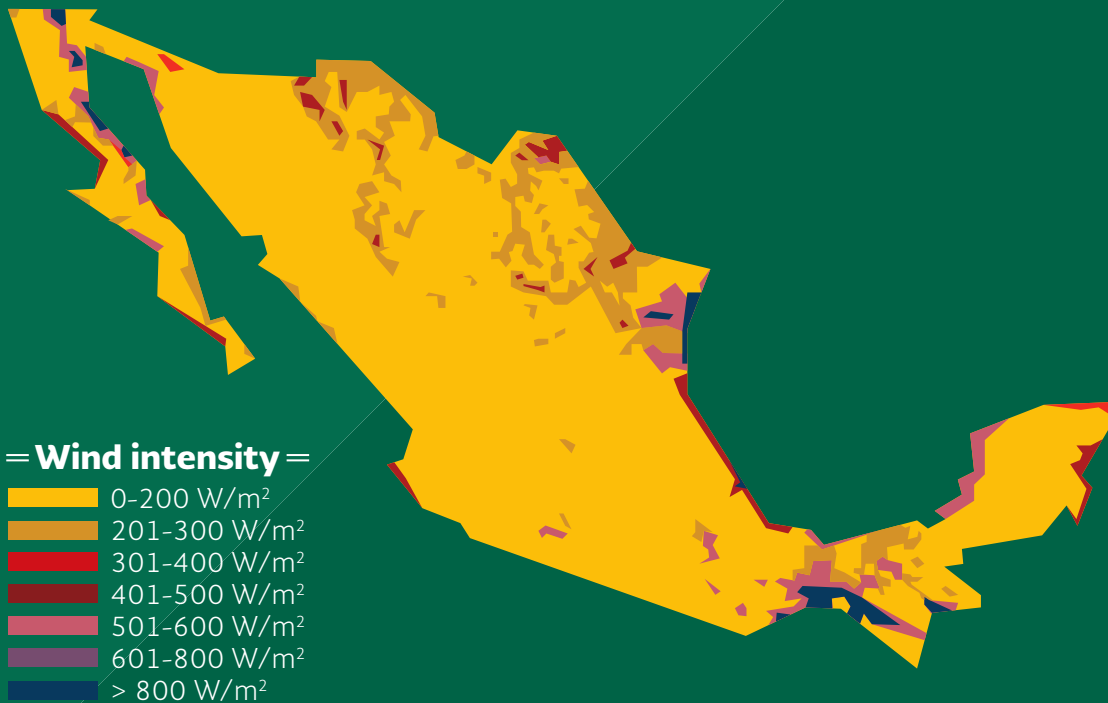


MEXICO is *one of the* **COUNTRIES** *with*
the HIGHEST SOLAR IRRADIATION *in the* **WORLD**

WIND POTENTIAL

Wind potential in Mexico is estimated at about 40,000 MW, with capacity factors between 20 and 25%.

Potential regions for developing wind power projects



Source: AMDEE.

WIND INDUSTRY

WIND PROJECTS

The **installed capacity** of **wind power** reached **2,037 MW** in 2014, of which only **4.3%** is operated by **CFE** while the rest through licensees. Moreover, there are **42 projects under construction** and about to start operations that added up **4,410 MW**.

Table 11. Wind projects

States	Investment (million Dollars)	Amount of projects	Under construction	About to start operations	Total
			MW		
Baja California	1,118	4	529	30	559
Chiapas	40	1	20		20
Coahuila	1,001	2	300	201	501
Durango	241	1	121		121
Nuevo León	604	3	302		302
Oaxaca	2,584	9	896	396	1,292
Puebla	732	3		366	366
San Luis Potosí	400	1	200		200
Sonora	90	2	2	25	27
Tamaulipas	1,206	9	161	442	603
Veracruz	80	1	40		40
Yucatán	400	5	41	159	200
Zacatecas	360	1	180		180
Total	8,857	42	2,792	1,619	4,410

Source: National Inventory of Renewable Energy, Ministry of Energy and the Energy Regulatory Commission.

WIND INDUSTRY

WIND SUPPLY CHAIN IN MEXICO

Table 12. Onshore

Bearings	0
Gearboxes	0
Generators	1
Blades	1
Turbines	0
Project development	55
Construction/installation	1
Power generator	10
O&M	3

Table 13. Offshore

Turbines	
Substation	
Foundations	
Cables	
Project development	55
Construction/installation	
Vessels	
O&M	4
Power generator	10

LEGAL FRAMEWORK

PRIVATE PRODUCTION

In order to **promote investment** in **renewable energy**, **Mexico** has worked to create and amend laws that help to boost their use and **reduce energy** dependency on **fossil fuels**. **Programs and laws** have been **created** or **modified** with the **aim of establishing a specific legal framework** for power generation using renewable sources.

1992	Reform to the Law for the Public Power Service (<i>Reforma a la Ley del Servicio Público de Energía Eléctrica or LSPEE</i>)
1993	Publication of the Regulations of the LSPEE
1995	Approval of the Law of the Energy Regulating Commission (<i>Ley de la Comisión Reguladora de Energía or CRE</i>)
2006	Interconnection contract for RE sources (<i>capacity credit</i>)
2007	Interconnection contract for small scale solar energy sources
2008	The Law for the Use of RE and Funding of Energy Transition (<i>Ley para el Aprovechamiento de las Energías Renovables y el Financiamiento de la Transición Energética or LAERFTE</i>)
2009	LAERFTE Regulations
2013	Energy Reform
2014	Energy Reform's Secondary Legislation (<i>Electricity and Geothermal</i>)

Source: National Inventory of Renewable Energy, Ministry of Energy and the Energy Regulatory Commission.

LEGAL FRAMEWORK

Table 14.1 Pre-Energy Reform vs. Current Law

Generation

BEFORE

Private investment in electricity generation is limited.

Independent power producers can secure contracts of sale with the CFE through tenders (PPAs).

Small producers (less than 30 MW) sell power to CFE through auctions.

Generators under the self-supply scheme can generate electricity and sell it to consumers partners.

AFTER

Private sector participation in the activities of the electricity industry increases.

Private generators may sell electricity on a spot market : Wholesale Electricity Market.

CFE continues generating and selling electricity to residential and small and medium industry consumers (basic service).

CFE will be another competitor in the wholesale electricity market.

The legal framework under which the private sector can participate as geothermal energy generator is established.

Current permits for self-sufficiency , cogeneration, small production, independent production and exports will maintain their status quo or request modification according to the new parameters of the law.

LEGAL FRAMEWORK

Table 14.2. Pre-Energy Reform vs. Current Law

Electricity Market

The market is monopolized by CFE in the purchase and in the generation of electricity.

Limited participation of private sector through self-supply schemes.

BEFORE

The electricity market shall consist of the wholesale electricity market for large users and the retail market for basic service users (residential and small and medium enterprises).

The wholesale electricity market will be operated by the CENACE and regulated by the CRE .

The rules of the wholesale electricity market will establish: transactions of purchase and sale of electricity, Financial Transmission Rights [1] and Certificates of Clean Energy, among others.

This market is integrated by generators, traders of electricity, qualified users and the market of clean energy certificates.

AFTER

LEGAL FRAMEWORK

Table 14.3. Pre-Energy Reform vs. Current Law

Transmission and distribution

BEFORE

The transmission and distribution services are operated by CFE.
Limited participation of individuals through the Open Season Process [2].

AFTER

CENACE will be responsible for coordinating the transmission and distribution of electricity, while the general conditions for the provision of such services shall be issued by the CRE.

The state may form partnerships with private enterprises to perform installation, maintenance, management, operation, and expansion of the necessary infrastructure to provide services for transmission and distribution of electricity.

Individuals may build the required infrastructure projects at their own expense, or may request that CENACE include them in the program of expansion and modernization of the National Network of Transmission and Distribution, provided that there is a net profit to the National Electricity System (SEN) [3].

LEGAL FRAMEWORK

Table 14.4. Pre-Energy Reform vs. Current Law

Renewable energy

Private investment is permitted in the generation of renewable energy .

The main generation scheme is self-supply.

No regulatory framework that allows private investment in geothermal plants, the CFE is in charge of the construction and generation of electricity through these resources.

BEFORE

The requirements for acquisition of energy certificates by qualified users will be established.

The certificates will be tradable through the wholesale electricity market and they will encourage long term electricity contracts.

The specific regulatory framework for recognition, exploration and exploitation of geothermal resources (Geothermal Energy Act). The permits will be issued by the SENER and will last according to the activity:

Recognition : 8 months

Exploration : 3 years

Exploitation: 30 years

AFTER

LEGAL FRAMEWORK

INCENTIVES

Accelerated depreciation:

Allows **depreciation** of **100%** of investments in **equipment** and **machinery** to generate energy from renewable sources.

Zero tariff:

Exempts antipollution equipment and its parts from general imports or exports duties. Covers machinery, equipment, instruments, materials, animals, plants and other items used in technology research and development.

FINANCING

Ministry of Energy (SENER) Funds

Fund for Energy Transition and the Sustainable use of Energy
Sectorial Fund for Energy Sustainability SENER-CONACYT

Financial Institutions

Nacional Financiera, S.N.C. (NAFIN)
BANOBRAS (Banco Nacional de Obras y Servicios Públicos, S.N.C.)
BANCOMEXT (Banco Nacional de Comercio Exterior)

Trust Funds

FIRCO (Shared Risk Trust Fund, Fideicomiso de Riesgo Compartido)
FIDE (Trust Fund for Electricity Savings, Fideicomiso para el Ahorro de Energía Eléctrica)

International Credits

Bank of North America (BNA)
Inter-American Development Bank (IBD)
Global Environment Fund (GEF)
European Investment Bank (EIB)
World Bank Group / International Finance Corporation
German Ministry of Cooperation and Economic Development / Credit Bank for Reconstruction and Development (KfW).

PROMÉXICO WORLDWIDE OFFICES

NORTH AMERICA

Boston

boston@promexico.gob.mx

Chicago

chicago@promexico.gob.mx

Dallas

dallas@promexico.gob.mx

Detroit

detroit@promexico.gob.mx

Houston

houston@promexico.gob.mx

Los Angeles

losangeles@promexico.gob.mx

Miami

miami@promexico.gob.mx

Montreal

montreal@promexico.gob.mx

New York

ny@promexico.gob.mx

Phoenix

phoenix@promexico.gob.mx

San Francisco

sanfrancisco@promexico.gob.mx

Seattle

seattle@promexico.gob.mx

Toronto

toronto@promexico.gob.mx

Vancouver

vancouver@promexico.gob.mx

Washington, D.C.

washington@promexico.gob.mx

48
OFFICES



LATIN AMERICA

Bogota

colombia@promexico.gob.mx

Buenos Aires

argentina@promexico.gob.mx

Guatemala

guatemala@promexico.gob.mx

Havana

havana@promexico.gob.mx

Lima

peru@promexico.gob.mx

Santiago de Chile

chile@promexico.gob.mx

Sao Paulo

brazil@promexico.gob.mx

EUROPE & AFRICA

Berlin

berlin@promexico.gob.mx

Bern

bern@promexico.gob.mx

Brussels

belgium@promexico.gob.mx

Casablanca

casablanca@promexico.gob.mx

Frankfurt

germany@promexico.gob.mx

Istanbul (Pacific Alliance)

turkey@promexico.gob.mx

London

uk@promexico.gob.mx

Madrid

spain@promexico.gob.mx

Milan

italy@promexico.gob.mx

Moscow

moscow@promexico.gob.mx

Munich

munich@promexico.gob.mx

Paris

france@promexico.gob.mx

Stockholm

sweden@promexico.gob.mx

The Hague

netherlands@promexico.gob.mx

ASIA-PACIFIC

Beijing

beijing@promexico.gob.mx

Doha

doha@promexico.gob.mx

Dubai

dubai@promexico.gob.mx

Hong Kong

hongkong@promexico.gob.mx

Kuala Lumpur

kualalumpur@promexico.gob.mx

Melbourne

melbourne@promexico.gob.mx

New Delhi

newdelhi@promexico.gob.mx

Seoul

korea@promexico.gob.mx

Shanghai

shanghai@promexico.gob.mx

Singapore

singapore@promexico.gob.mx

Taiwan

taiwan@promexico.gob.mx

Tokyo

japan@promexico.gob.mx



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PROMéxico
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WWW.PROMEXICO.GOB.MX

+52 (55) 5447 7000

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