

Title: Energy Demand and Capacities in Economies: A case study of Cancun, Mexico

Group Members:

Hector Flores – Tohoku University

Yang Wang – Osaka university (r

Aisling Tierney – Bristol University

Ray Edmunds – Leeds University

Context:

Mexico is one of the four MINT countries, along with Indonesia, Nigeria and Turkey. Mexico with its large economic growth and growing power demand faces enormous challenges in the development of its power system. With increasing imports from US the cost of power in Mexico is unsustainable for a developing country and domestic production of energy is required to satisfy growing demand. Cancun was chosen as a city for analysis, because of its global reach with high tourism and attractive site for international conferences, for example the UNFCCC in 2010. Cancun surrounding land is undeveloped and ideal for large scale energy generation technologies. This will benefit both the local economy in terms of jobs and energy resilience in addition to encouraging Mexico's independence from reliance on imports.

Social and Environmental Considerations:

Dramatic social and economic inequalities exist in Cancun. The lack of fundamental social systems (clean running water, electricity, housing, and transport) compared to the wasteful luxuries of internationally-funded hotel chains lead to a sense of social injustice for the local Mayan population. Migrant workers travel from across the Yucatan peninsula to supply the cheap unskilled workforce required to support the tourism industry, but this leads to community fragmentation and a destruction of traditional cultural systems.

The environment suffers due to the waste created by the tourist industry. Over 450 tons of waste travels to landfills every day and is frequently burned as part of the disposal process. Hotel sewage is either stored in septic tanks and illegally dumped in the local lagoon or water systems, or is directly poured untreated into the drainage systems. Sewage purification industry is limited in Cancun.

Objectives:

- 1) Highlight the requirements for a sustainable energy system for a mint country taking as a case study a city in Mexico.
- 2) Provide an example for wholes system approach to system design for all MINT countries.
- 3) Assess the technical, economic, environmental and social aspects of energy system design in a MINT country.

Data Collection and Analysis:

- GIS was used to understand the wind, wave, geothermal and solar resource availability
- The regional demand was approximated by using national and provincial energy statistics
- An energy mix was decided based on the resource availability, efficiency of technologies and system compatibility
- Levelised costs of new technologies were compared to existing cost of the current fuel mix
- The market framework and current reforms were assessed to ensure that Mexico and the Cancun region provided an attractive commercial opportunity for both national and international investors
-

Conclusions and Recommendations

- Fantastic opportunity for development in Mexico
- Great resource and market potential
- Cancun an opportunity to provide example of decarbonised city in a MINT country.

This was pre-feasibility study. A further feasibility study is required, this will take into consideration the following

- Detailed cost and resource analysis
- Detailed analysis of the Mexican electricity and energy markets
- Forecasting of future load requirements in the Cancun region
- System adequacy analysis



Energy demands and capacity in developing economies: A case study in Cancun, Mexico

Group B

A. Tierney (Bristol), R. Edmunds (Leeds), Y. Wang (Osaka) and H.
F. V. Flores (Tohoku)

RENKEI Summer School in Tohoku University

11-Sept-2014

Regional problems

Social

- Demographics
- Labour, migration, community
 - Culture, tradition
- Housing
- (In)equality

Environmental

- Land use (interior)
- Waste, pollution

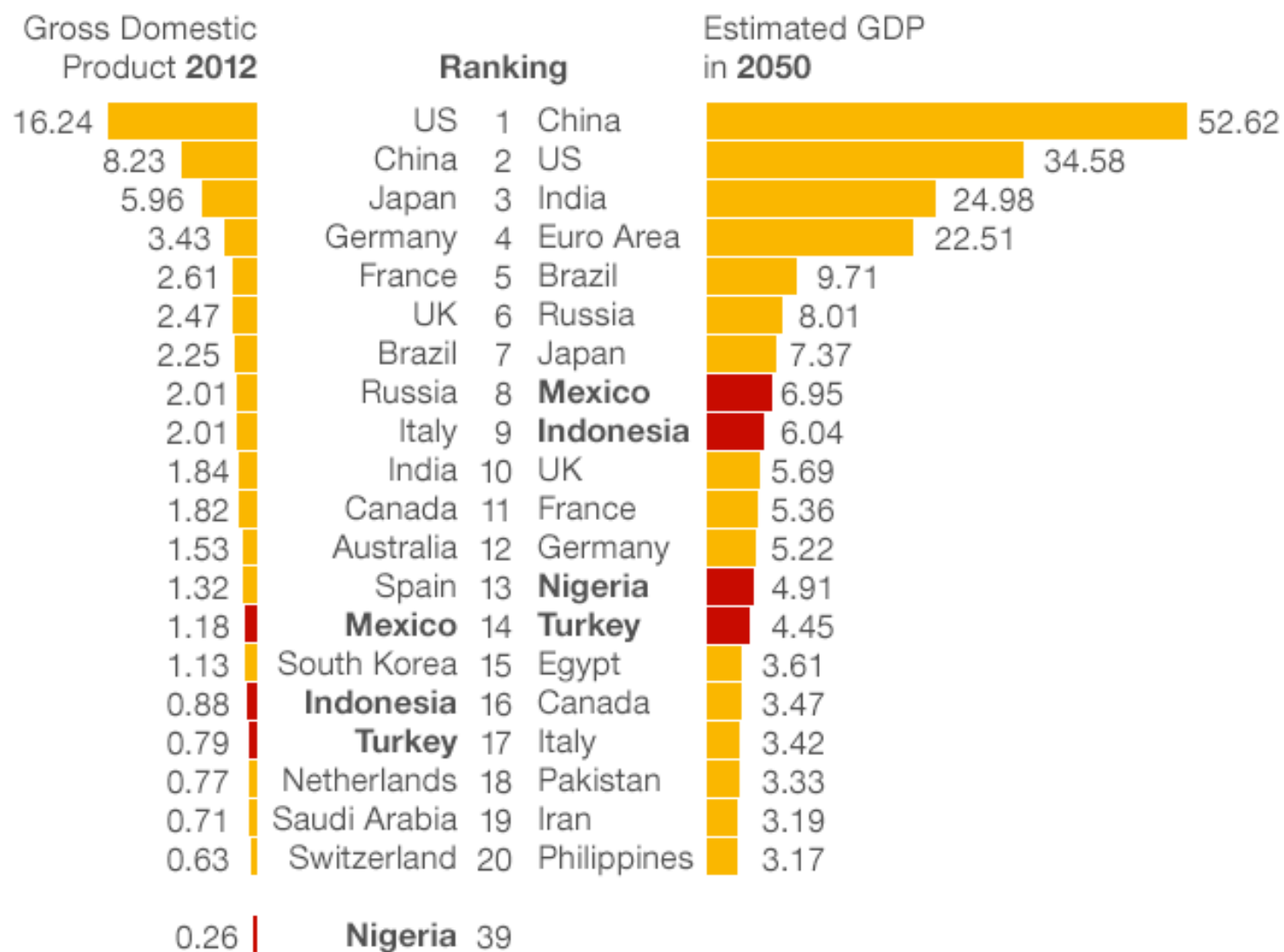
Emerging economies



Brazil, Russia, India, China and South Africa
Mexico, Indonesia, Nigeria and Turkey

Rise of the MINTs

(\$ trillions)



Source: World Bank, Goldman Sachs

United Mexican States



Area: 1,972,550 km² (14th)

Population: 118, 395, 054 (2013, 11th)

GDP: \$1.927 trillion (2014 estimate, 10th)



Cancun



Found: 1970

Location: Yucatan Peninsula, south-east coast of Mexico

State: Quintana Roo

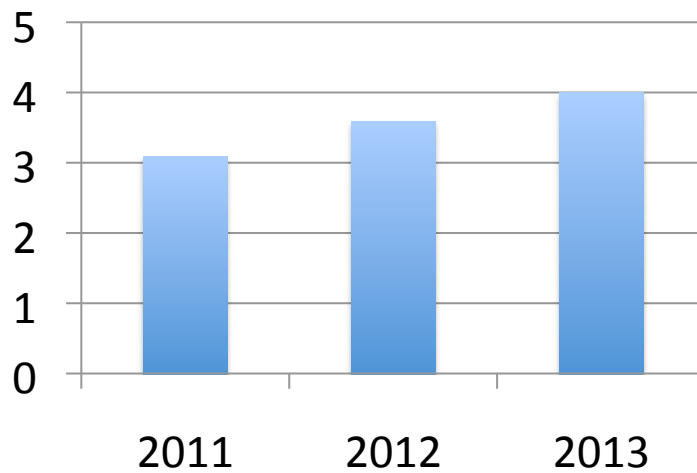
Climate: Subtropical climate, 27° C - 35° C, sunny days throughout most of the year

Population 722, 800 (2010).

UN's Cancun climate conference was held in November 2010 and "Cancun Agreements"



**International Visitors in
Cancun (million)**

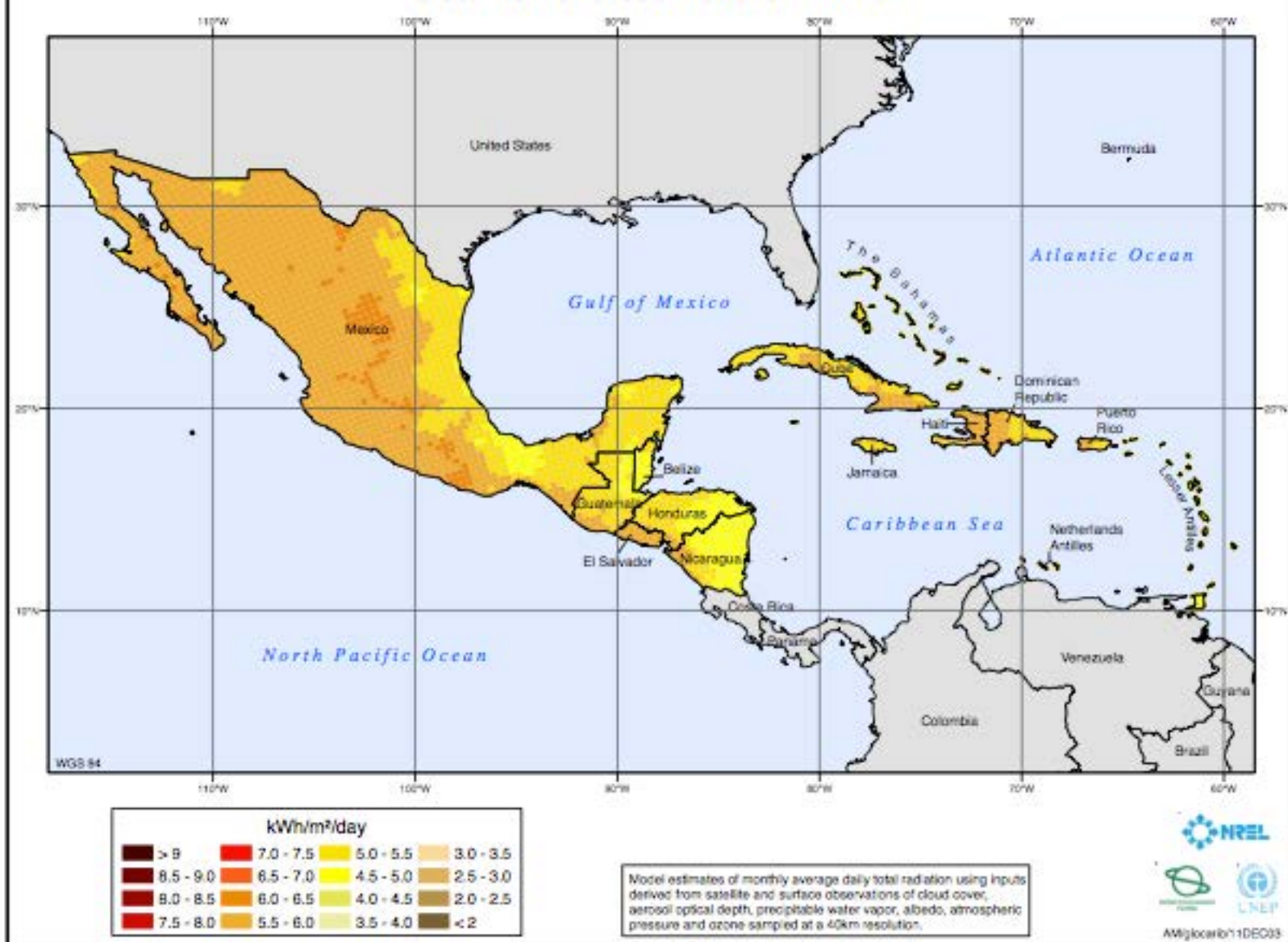


Cancun International Airport

Second largest in Mexico
15, 962, 162 passengers in 2013

Local residence: 0.72 million

Global Horizontal Solar Radiation - Annual



Direct Normal Irradiation

Mexico



solarGIS

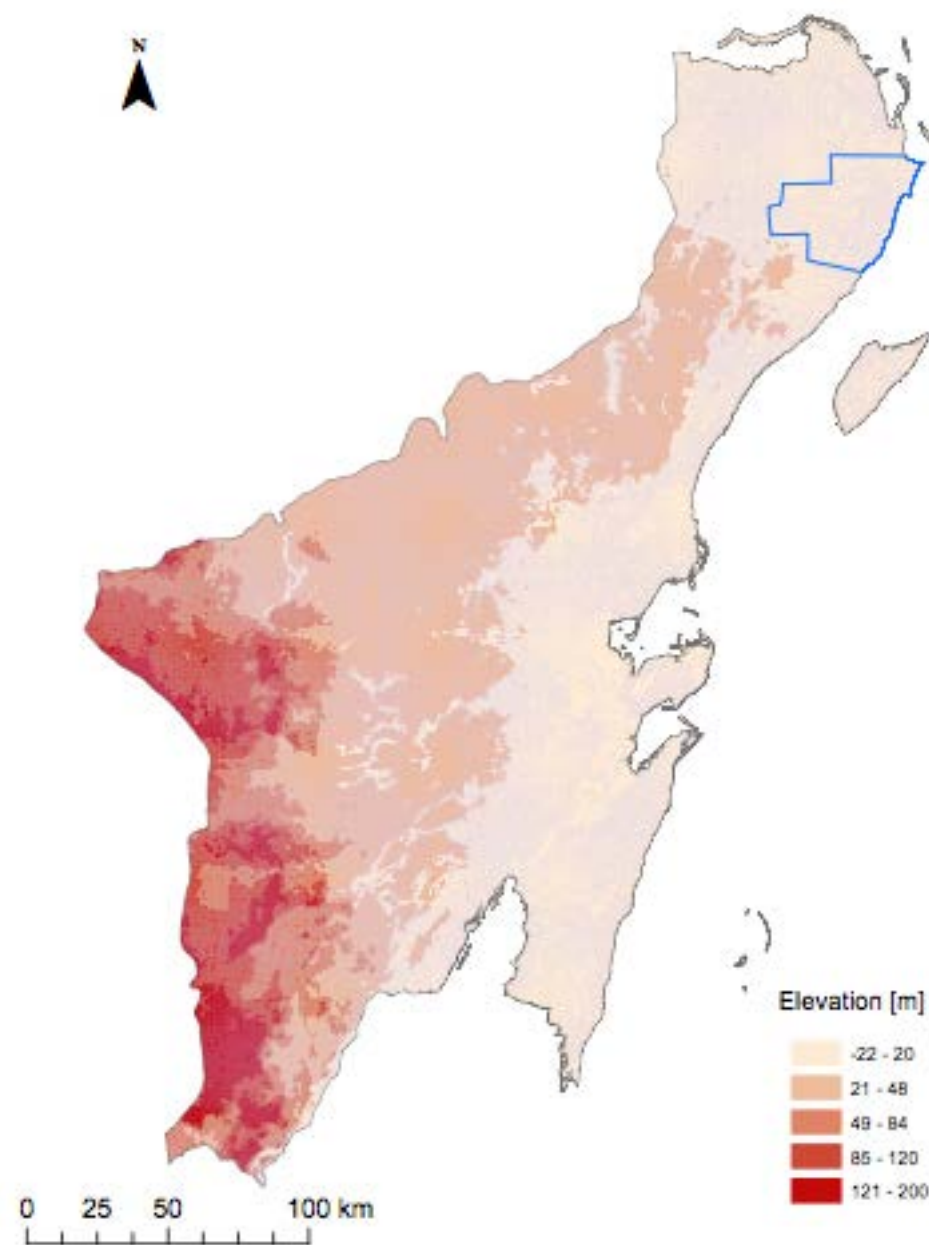
<http://solargis.info>

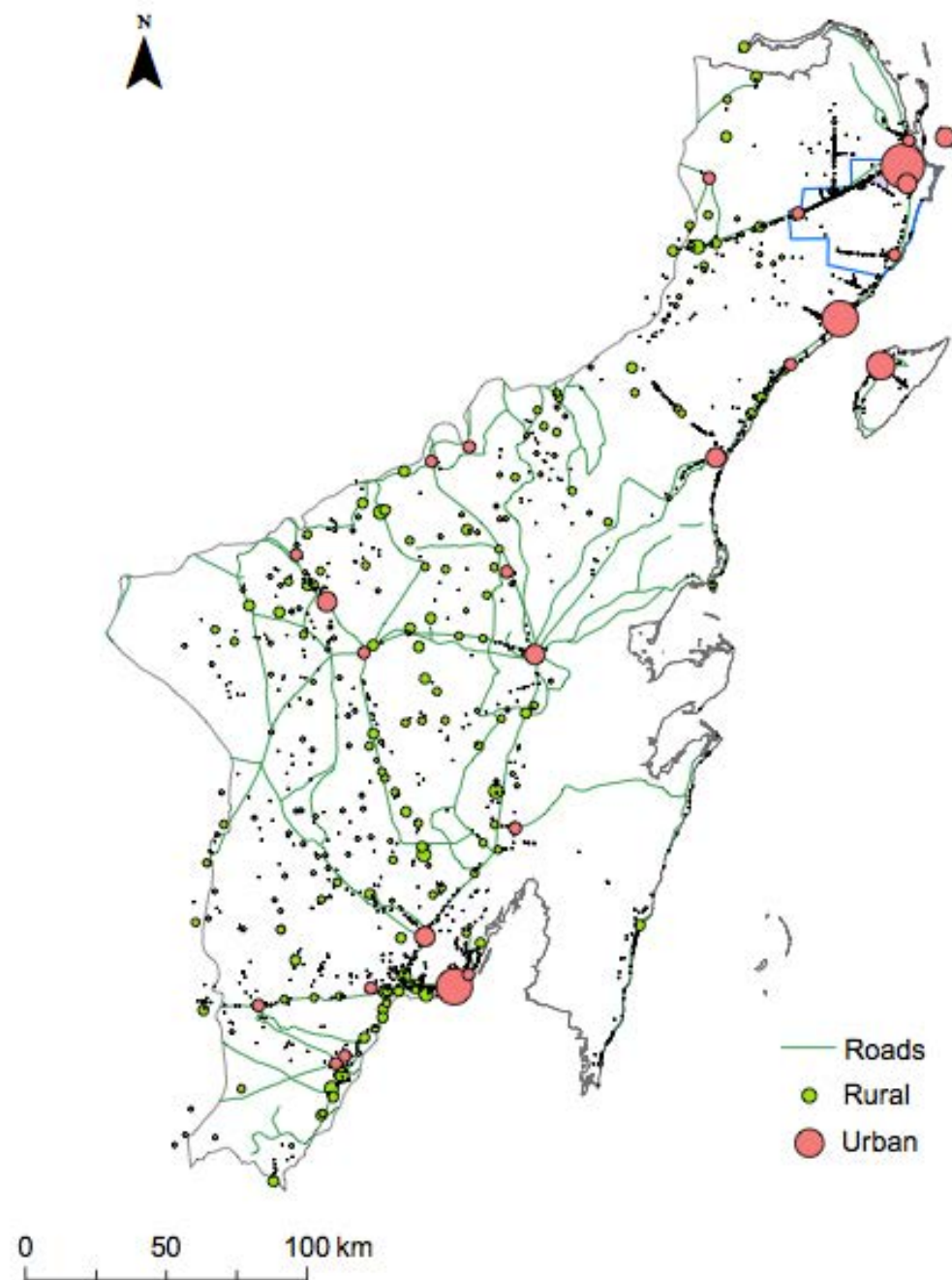
Average annual sum, period 1999-2012

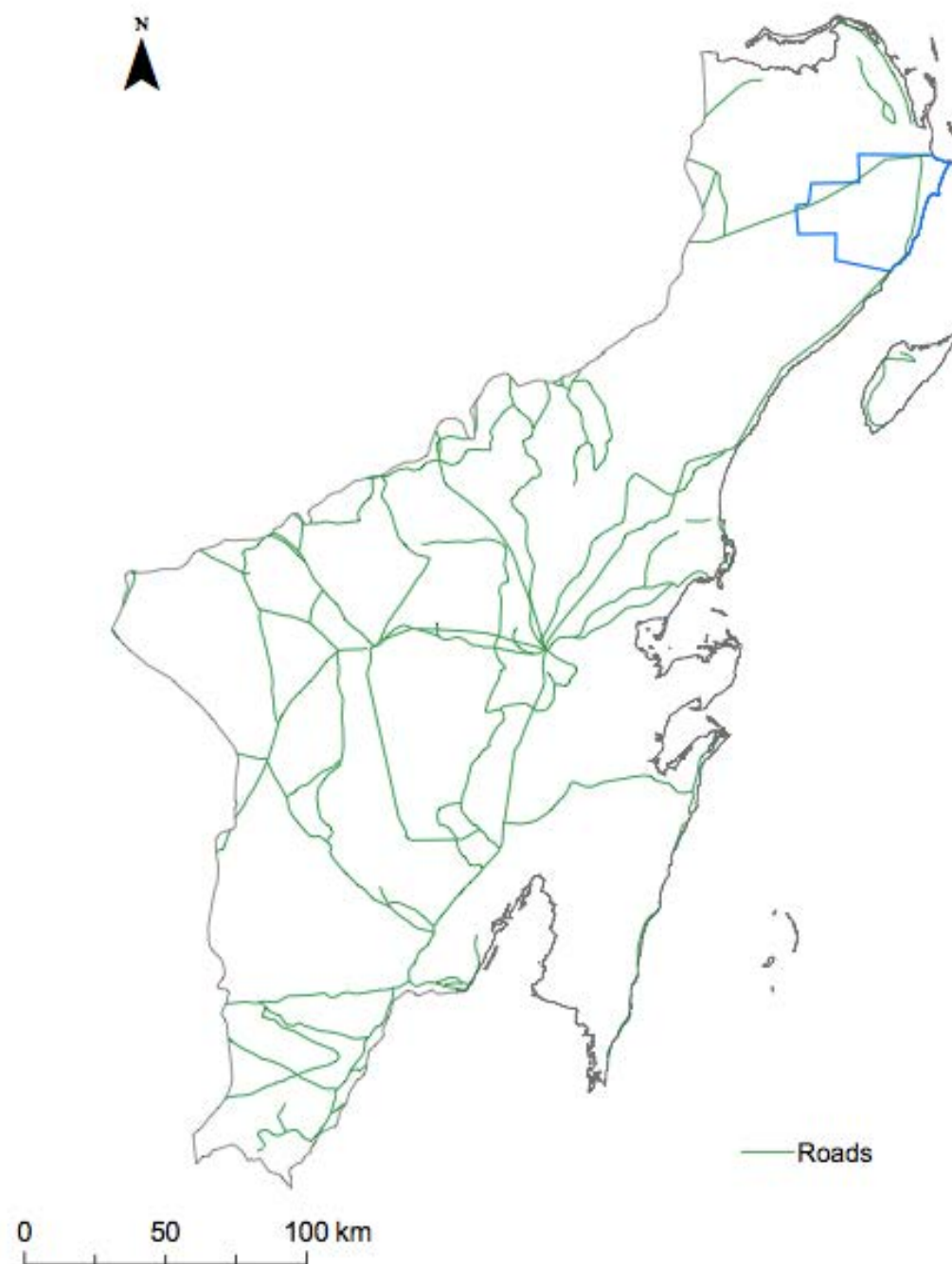


0 200 km

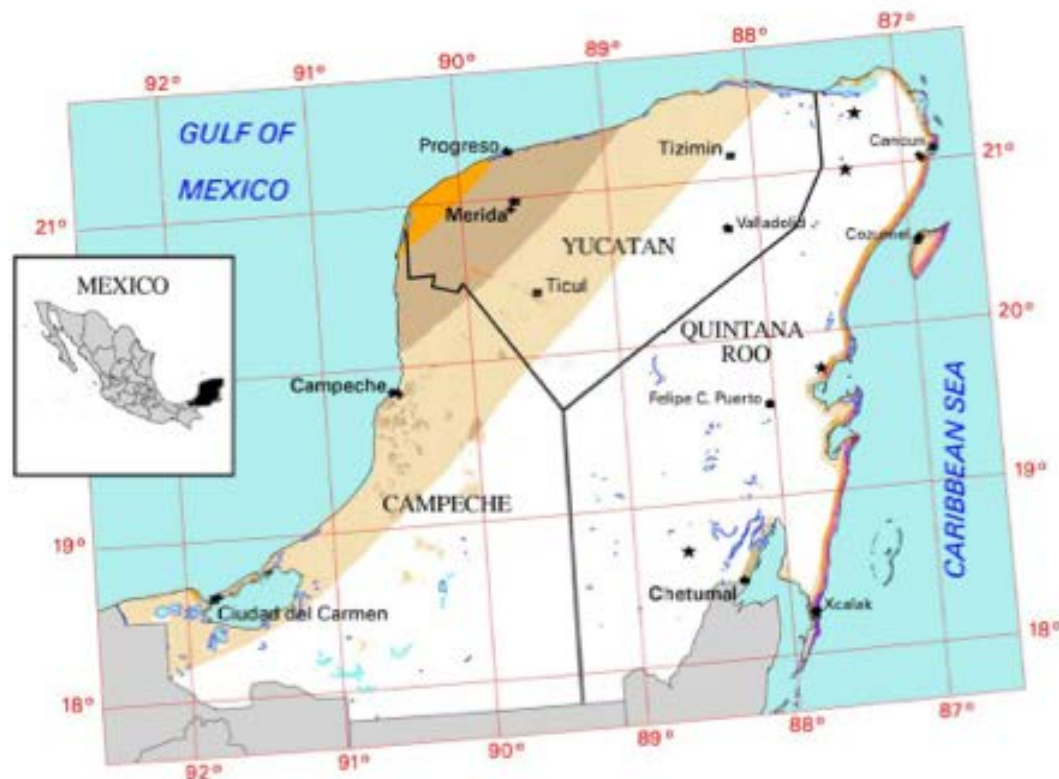
SolarGIS © 2014 GeoModel Solar







Mexico - Campeche, Quintana Roo and Yucatan Wind Resource Map



The wind resource classification is specific for both utility scale and rural applications and applies to areas with low surface roughness. Values of Weibull k in the Yucatan region vary from approximately 1.8 to 3.5, with highest values along the east coast.

50 0 50 100 150 200 Kilometers

Wind Power Classification

Resource Potential		Wind Power Density at 30 m W/m^2	Wind Speed ^a at 30 m m/s
Utility	Rural		
Marginal	Moderate	100 - 150	4.4 - 5.0
		150 - 200	5.0 - 5.6
Moderate	Good	200 - 250	5.6 - 6.0
		250 - 300	6.0 - 6.4
Good	Excellent	300 - 350	6.4 - 6.7
		350 - 400	6.7 - 7.0

^a Wind speeds are based on a Weibull k value of 2.0.

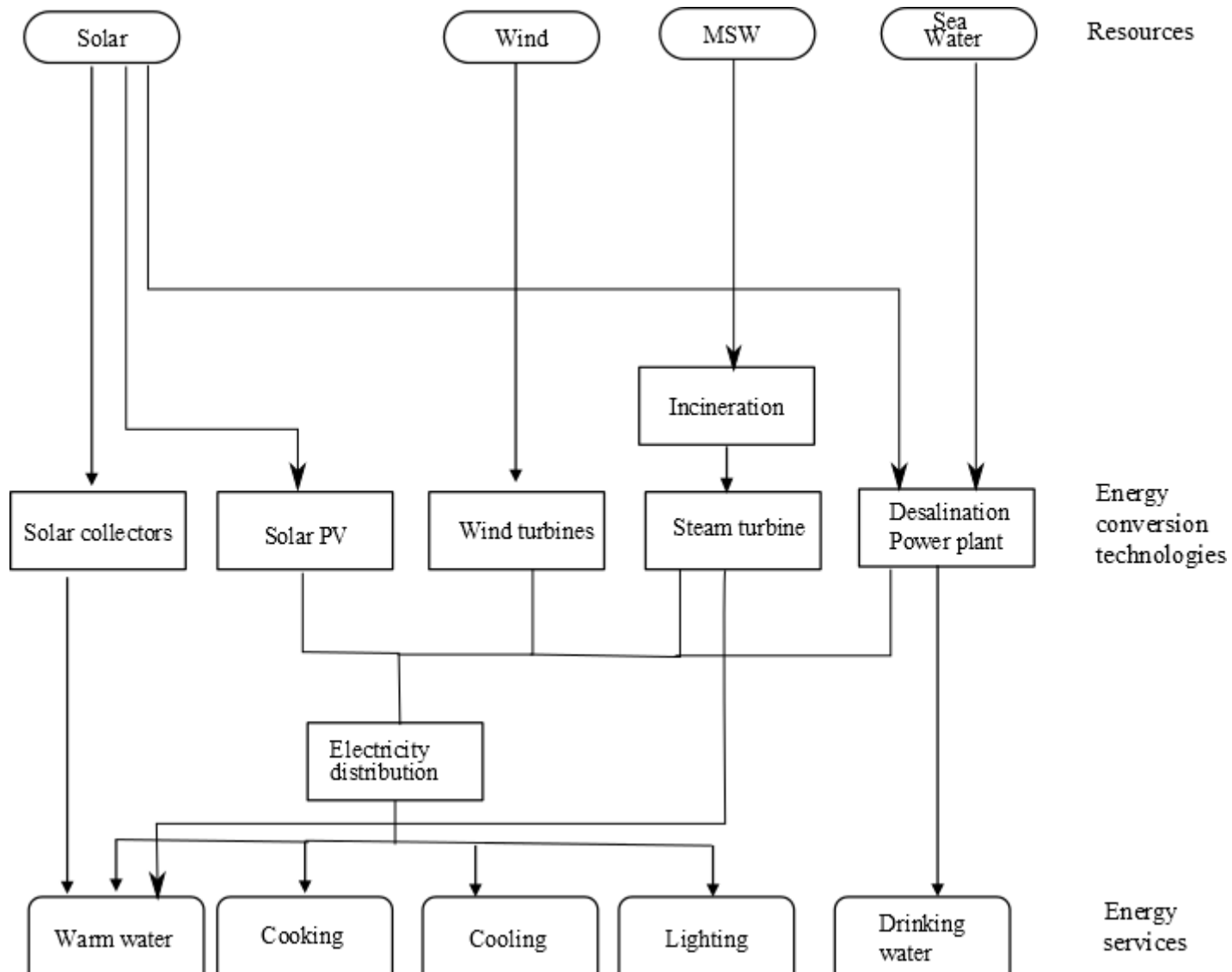
- Meteorological Station with Wind Data
- ★ Additional Wind Measurement Site
- City or Village

U.S. Department of Energy
National Renewable Energy Laboratory



08-DEC-2000 1.2

Technical



Economics

- Imported diesel and oil >200USD/MWh
- New Low Carbon Technologies
 - Solar PV:100-120USD/MWh
 - Onshore Wind: 80-100USD/MWh
 - Waste Incineration: 90 – 100USD/MWh
 - Anaerobic digestion: 100 – 180USD/MWh
 - Solar collectors
- Enabling Technologies
 - Grid reinforcement: 8-10USD/MWh
 - Storage: further analysis required

Political Support

- Mexicans pay 72% more for electricity than americans
- Reforming the energy market to allow greater private investment
- Target of 35% renewable energy by 2024
- Plans to take wind to 20GW+ capacity by 2024....and solar to 8GW by 2014

[Podcasts/ Newscasts](#)

[Webinars](#)

[Downloads/ White
Papers](#)

[Blog](#)

[Features](#)

[News](#)

[Bioenergy](#)

[Energy efficiency](#)

[Energy infrastructure](#)

[Energy storage including
Fuel cells](#)

[Geothermal](#)

[Green building](#)

[Other marine energy and
hydropower](#)

[Photovoltaics \(PV\)](#)

[Policy, investment and](#)

You are here: [Home](#) / [News](#) / [Actis to invest \\$250M in Mexican renewable energy platform](#)

News

Actis to invest \$250M in Mexican renewable energy platform

09 September 2014

Emerging market investor cites Mexico's ample natural resources, an evolving and supportive regulatory framework and a deep project finance capacity.

Actis, A global pan-emerging market private equity firm, is committing US\$250 million to establish a Mexican energy platform, Zuma Energía, which will target over 500 MW of installed capacity in the country.

Zuma Energía 1 recently completed its first acquisition and closed the financing of PE Ingenio, S.A.P.I. de C.V. (Ingenio), a 50 MW wind farm located in the state of Oaxaca. The project will be constructed by Acciona Energía

EXPERIENCE MATTERS

Related Links

[Actis](#)

Elsevier Ltd is not responsible for the content of external websites.



Members' Login

Email Address

Password

LOGIN

[Forgotten login?](#)

[Not a member?](#)

renewable energy
focus

The best way to
stay up-to-
date with the
latest business
and technology
developments in the



Mexico Expected Set Record High in Renewable Energy Investments



Kevin Smead - Renewables - Aug 12, 2014

According to analysis from Bloomberg New Energy Finance, Mexico will set a record high for renewable energy investments this year beating its 2010 record of \$2.4 billion.

For the first half of 2014, investments are estimated at \$1.3 billion, which is nearing the \$1.6 billion overall for 2013. Wind and solar projects are expected to see a jump in spending in the next several years.

Mexico and Central America is expected to install roughly 1 GW of wind energy in 2014. This would top 2010's record of 757 MW. This is expected to increase in 2015 and 2016 to 1.2 GW.



IMEC - Senator Koehler at Enercon Engineering

00:02:20

ENERCON E 82

00:02:00

GIANBRO

changing the way you look at **construction**
through innovation. collaboration. technology.

www.gianbro.com



MOST POPULAR



Mexico's reforms

The power and the glory

[Comment \(26\)](#)[Print](#)[E-mail](#)[Reprints & permissions](#)**Foreigners enthuse over Enrique Peña Nieto's reforms. Mexicans are warier**

Jul 5th 2014 | MORELOS AND QUERÉTARO | From the print edition



124



110



Advertisement





Mexico's Newly Opened Energy Market Attracts Renewables

Nathan Paluck, International Correspondent

May 08, 2014 | 3 Comments



REGISTER TODAY
AND SAVE!

MEXICO CITY -- It is a good time to be in the renewable energy business in Mexico since landmark energy reform opened up the electricity market and prioritized renewables. The government has an ambitious 12-year goal for renewable energy production, and private equity funds and development banks have millions

THANKS FOR YOUR ATTENTION!

ありがとうございました！