

Edited by **Lucas Noura Guimarães**

The Regulation and Policy of
LATIN AMERICAN ENERGY TRANSITIONS



THE REGULATION AND POLICY OF LATIN
AMERICAN ENERGY TRANSITIONS

THE REGULATION AND POLICY OF LATIN AMERICAN ENERGY TRANSITIONS

Edited by

LUCAS NOURA GUIMARÃES

EDP Brasil; Brazilian Institute of Energy Law Studies



ELSEVIER

Elsevier

Radarweg 29, PO Box 211, 1000 AE Amsterdam, Netherlands
The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, United Kingdom
50 Hampshire Street, 5th Floor, Cambridge, MA 02139, United States

Copyright © 2020 Elsevier Inc. All rights reserved.

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system, without permission in writing from the publisher. Details on how to seek permission, further information about the Publisher's permissions policies and our arrangements with organizations such as the Copyright Clearance Center and the Copyright Licensing Agency, can be found at our website: www.elsevier.com/permissions.

This book and the individual contributions contained in it are protected under copyright by the Publisher (other than as may be noted herein).

Notices

Knowledge and best practice in this field are constantly changing. As new research and experience broaden our understanding, changes in research methods, professional practices, or medical treatment may become necessary.

Practitioners and researchers must always rely on their own experience and knowledge in evaluating and using any information, methods, compounds, or experiments described herein. In using such information or methods they should be mindful of their own safety and the safety of others, including parties for whom they have a professional responsibility.

To the fullest extent of the law, neither the Publisher nor the authors, contributors, or editors, assume any liability for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions, or ideas contained in the material herein.

British Library Cataloguing-in-Publication Data

A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data

A catalog record for this book is available from the Library of Congress

ISBN: 978-0-12-819521-5

For Information on all Elsevier publications
visit our website at <https://www.elsevier.com/books-and-journals>

Publisher: Brian Romer
Acquisitions Editor: Graham Nisbet
Editorial Project Manager: Michelle Fisher
Production Project Manager: Sruthi Satheesh
Cover Designer: Christian Bilbow

Typeset by MPS Limited, Chennai, India



Contents

List of contributors	xi
Author biographies	xiii
Foreword by Fereidoon Sioshansi	xxi
Foreword by Luiz Augusto Barroso	xxv
Disclaimer	xxvii
Introduction	xxix

Part 1

CHANGING THE ENERGY LANDSCAPE: POLICY AND ECONOMIC ISSUES

1. Is there a Latin American electricity transition? A snapshot of intraregional differences	
LUCAS NOURA GUIMARÃES	
1.1 Introduction	3
1.2 Different starting points: assessing the electricity matrixes	5
1.3 Different electricity transitions: the case of intended nationally determined contributions	10
1.4 Regionalizing the electricity transition	15
1.5 Conclusion	17
References	18

2. Using market mechanisms for a reliable energy transition in Latin America	
ALEXANDRE VIANA	
2.1 Introduction: Latin America's natural tendency for renewables	21
2.2 Promoting renewable-power markets	22
2.3 Development stage of renewables in Latin America	25
2.4 Using market mechanism: the Brazilian case	30
2.5 Conclusion	34
References	35
Further reading	37
3. Assessing the macroeconomic effects of sustainable energy transitions in Costa Rica and Chile: a multisectoral balance-of-payments-constrained growth approach	
FRANCISCO EBELING	
3.1 Introduction	39
3.2 Brazil's sustainable energy transition experience from the 1950s onward	40
3.3 The balance-of-payments-constrained growth approach	43
3.4 Estimation	44
3.5 Assessing the cases	50
3.6 Conclusion	55

References 56
Further reading 58

4. Energy (and climate) challenges in South America: what planning for what transition?

THAUAN SANTOS AND IGNACIO SABBATELLA

4.1 Introduction 59
4.2 Energy transition and energy planning 60
4.3 Nationally Determined Contributions of South American countries 64
4.4 Regional organizations 69
4.5 Conclusion 72
References 73

5. Prompting an energy transition: how policy entrepreneurs passed Peru's first renewable energy legislation for the grid

HAI-VU PHAN

5.1 Introduction 75
5.2 Evolution of Peru's energy landscape: 1990s–2000s 76
5.3 Passing Peru's first renewable energy legislation for the grid 79
5.4 Prompting an energy transition 84
5.5 Impact on the market 85
5.6 Remaining issues 88
5.7 Conclusion 90
References 91

6. The challenges and contradictions of Peru's *Proyecto Masivo de Energía Solar*

DUSTIN WELCH GARCÍA

6.1 Introduction 95
6.2 Background and current status of the Proyecto Masivo 99
6.3 Ergon and rural solar energy provision 101
6.4 Public distributors' role in the Proyecto Masivo 108
6.5 Conclusion 112
References 113
Further reading 114

Part 2

ENERGY TRANSITION TAKING SHAPE: REGULATORY ISSUES

7. The prosumer legal protection in Latin America: a requirement for an energy transition

MATHEUS LINCK BASSANI

7.1 Introduction 117
7.2 The prosumer as an active consumer: a perspective from the power sector 118
7.3 The prosumer protection in Latin American countries 123
7.4 Conclusion 130
References 130
Further reading 132

8. Challenges of South American energy transition: energy efficiency and distributed generation

MARIA ALEJANDRA ISE, SILVINA CECILIA CARRIZO AND MARIE FORGET

8.1 Introduction 133
8.2 South America in transition: challenges to be faced 134
8.3 National trajectories and experiences in progress 142
8.4 Conclusion 150
References 150

9. Urban microgrids: benefits, challenges, and business models

MARCO AURELIO LENZI CASTRO

9.1 Introduction 153
9.2 How does an urban microgrid work? 154
9.3 Types of microgrids and key drivers 156
9.4 Potential benefits from urban microgrids 157
9.5 Examples of urban microgrids 158
9.6 Challenges for urban microgrids 159
9.7 Business models for urban microgrids 160

- 9.8 Scenarios for urban microgrids: the case of Brazil 163
 9.9 Conclusion 170
 References 171
 Further reading 172

10. Regulatory aspects of energy efficiency in Uruguay

ANA LAURA RODRÍGUEZ D'ESPADA

- 10.1 Introduction 173
 10.2 Regulatory background and historical context 173
 10.3 The national energy policy 175
 10.4 Law No. 18597/2009 179
 10.5 The National Plan of Energy Efficiency 181
 10.6 Conclusion 189
 References 190
 Further reading 190

11. The Ecuadorian energy matrix: *from a fossil-fuel dependency to a renewable production*

PABLO MORALES AND EDISSON MORALES

- 11.1 Introduction 193
 11.2 Developmentalism 194
 11.3 Liberalization 196
 11.4 Neo-developmentalism 200
 11.5 Conclusion 205
 References 207

12. Environmental impact assessment and public participation of geothermal energy projects: the cases of Chile, Costa Rica, Colombia, and Mexico

MIGUEL SALDIVIA OLAVE AND SOFÍA VARGAS-PAYERA

- 12.1 Introduction 209
 12.2 Geothermal energy in Latin America 210
 12.3 Energy and sustainable development 213
 12.4 Environmental protection of geothermal activities 215
 12.5 Public participation in energy projects 218
 12.6 Conclusion 219
 References 220
 Further reading 221

13. Competitive renewables as the key to energy transition—RenovaBio: the Brazilian biofuel regulation

DANIELLE MENDES THAME DENNY

- 13.1 Introduction 223
 13.2 The sugarcane industry in Brazil 224
 13.3 Brazilian regulatory framework 231
 13.4 RenovaBio broader applications and the use technology 239
 13.5 Conclusion 240
 References 240

14. The role and impacts of policies in hampering the biogas transition in Brazil

LUIZ GUSTAVO SILVA DE OLIVEIRA

- 14.1 Introduction 243
 14.2 Problematic factors of technological innovation systems and policy mixes 244
 14.3 The role of policies and regulations in hindering the biogas transition in Brazil 247
 14.4 Conclusion 256
 References 257

Part 3

BOOSTING ENERGY TRANSITION: SOCIO-TECHNICAL ISSUES

15. Foresight for Chile's energy transition—unleashing societal transformations

JONI KARJALAINEN, NOORA VÄHÄKARI AND SIRKKA HEINONEN

- 15.1 Introduction 263
 15.2 The promised land for renewable energy technologies 264
 15.3 Theoretical framework 266
 15.4 The steps of a foresight exercise in Chile 269
 15.5 Results 272
 15.6 Discussion 274
 15.7 Conclusion 277
 Acknowledgments 278

- References 278
Further reading 282
16. Integrating social and justice dimensions to energy transitions: the case of Mexico
CARLOS TORNEL
- 16.1 Introduction 283
16.2 Socio-technical transitions 286
16.3 Framing the energy transition in Mexico: a brief review of the development of the regulatory framework 289
16.4 Narrow configurations: an assessment of energy futures in Mexico 293
16.5 Conclusion 297
References 297
Further reading 300
17. The role of social resistance in shaping energy transition policy in Mexico: the case of wind power in Oaxaca
ADOLFO MEJÍA-MONTERO, LOURDES ALONSO-SERNA AND CARLO ALTAMIRANO-ALLENDE
- 17.1 Introduction 303
17.2 The influence of “Our Common Future” and the fight against climate change in Mexico 305
17.3 Laying the path for wind power in Mexico: a techno-economic phase 306
17.4 The local deployment of wind power projects: conflict brewed from an invisible social dimension 307
- 17.5 Developing mechanisms to include the social dimensions of energy transitions 313
17.6 Conclusion 316
References 317
Further reading 318
18. Energy transition in isolated communities of the Brazilian Amazon
ANTONELLA MAZZONE
- 18.1 Introduction 319
18.2 Context 321
18.3 Methods 323
18.4 Results 325
18.5 Conclusion 327
References 328
Further reading 329
19. An inclusive and participative model for energy transition in Latin America: the case of Chilean *Generación Comunitaria*
FRANCISCO MERINO, ADOLFO MEJÍA MONTERO AND CECILIA DASTRES
- 19.1 Introduction 331
19.2 Context 334
19.3 *Generación Comunitaria* as a partnership framework 336
19.4 An energy justice perspective 339
19.5 Conclusion 343
References 344
Further reading 345
- Index 347**

The role of social resistance in shaping energy transition policy in Mexico: the case of wind power in Oaxaca

Adolfo Mejía-Montero¹, Lourdes Alonso-Serna² and Carlo Altamirano-Allende³

¹University of Edinburgh, Edinburgh, United Kingdom ²University of Manchester, Manchester, United Kingdom ³Arizona State University, Tempe, AZ, United States

17.1 Introduction

Over the last decade, renewable energy has had a dynamic development in Latin America. Investments in renewables in the region have grown 11-fold, and Brazil, Mexico, and Chile are among the top 10 largest energy markets in the world (IRENA, 2016). National energy policies play a decisive role in enabling the deployment of renewable energy systems, and the potentials for increased and sustained economic growth derived from these systems are dependent on the policy instrument and their mechanisms for implementation at play. Without a doubt, Latin America is part of a global effort to transition to a carbon-free world. Nevertheless, clean energy transitions are much more than shifts of technologies and resources; contemporary developments in the energy sector point to a global transformation with historical geographical, technical,

economic, and social implications. Thus attention to the social dimensions of energy transitions is critical to guarantee socially robust policies in the energy sector.

Mexico has set an ambitious goal to produce 35% of its electricity with clean sources of energy by the year 2024. This goal is underpinned by an active leadership within international negotiations and the commitment to adopt mitigation strategies to address some of the most pressing effects of climate change. At the national level, the government has also sought to regulate the renewable energy sector by creating attractive market conditions for private investments. Besides hydropower, wind energy was the first technology to be deployed at a commercial scale. Among the different regions in the country suitable to produce electricity via wind, the region known as the Isthmus of Tehuantepec, in the Southern state of Oaxaca, is the one with the largest

developments of wind energy plants in Mexico (Fig. 17.1). This region is also home to a strong and diverse population that includes indigenous communities, and the deployment of wind farms has faced a series of conflicts between the government, utilities, energy developers, and different sectors of the local population. Several scholars have given extensive attention to these episodes of conflict with a focus on analyzing the social impacts of wind farm deployment as a social justice issue (Dunlap, 2017a,b; Howe and Boyer, 2015; Howe et al., 2015; Huesca Pérez et al., 2016; Juárez Hernández and León, 2014); however, little attention has been paid to the interlinkages between these social movements and the formulation of the policy instruments that are currently guiding the transformation of the energy sector in the country.

The chapter analyzes the importance of the social dimension in Mexico's energy transition. It calls attention to the role of grassroots movements in inducing some changes in the regulatory framework of renewables. It seeks to understand the ways in which top-down public

policies to boost renewables are modified by bottom-up social movements. It is considered that the understanding of these relations can contribute to developing a more comprehensive public policy that effectively incorporates the social dimension of energy transitions. Furthermore, this practical approach can build bridges between the academic sector and policy-makers to contribute to the understanding and implementing of just energy transitions for present and future generations in Latin America.

The chapter is organized as follows:

- The second section explores Mexico's active role within international negotiations related to climate change, which eventually led to the definition of an ambitious goal of decarbonization aiming to produce 35% of the country's electricity through clean energy sources by 2024 and 50% by 2050.
- The third section describes the techno-economic rationale behind the development of wind energy and the top-down development of the first policy framework for the industry. The main concern of the

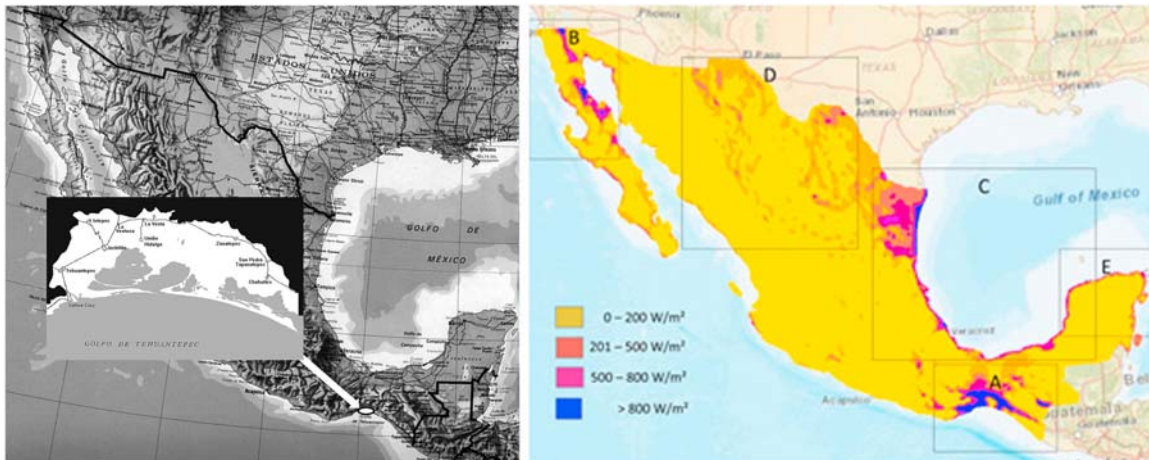


FIGURE 17.1 On the left: Location of the Oaxaca's Isthmus region. On the right: Geographic distribution of the existing wind power resources in Mexico. Source: From (Left) Jaramillo, O.A., Borja, M.A., 2004. *Wind speed analysis in La Ventosa, Mexico: a bimodal probability distribution case*. *Renew. Energy* 29, 1613–1630 (Jaramillo and Borja, 2004) and (right) Alemán-Nava, G.S., Casiano-Flores, V.H., Cárdenas-Chávez, D.L., Díaz Chavez, R., Scarlat, N., Mahlknecht, J., et al., 2014. *Renewable energy research progress in Mexico: a review*. *Renew. Sustain. Energy Rev.* 32, 140–152 (Alemán-Nava et al., 2014).

policy was to give certainty to the international wind power developers that were interested in investing in wind energy.

- The fourth section centers around the implementation of utility-scale projects in the indigenous region of the Isthmus of Tehuantepec and the emergence of movements of resistance to particular wind energy projects. Such emergence, as argued in this chapter, represents the necessity to reconsider the techno-economical framework of wind power development.
- The fifth section looks at the changes in regulation and the introduction of key elements that relate to the social dimension of energy within the existing legislation.
- Finally, the chapter concludes with a reflection on the potential links between the top-down evolution of policy frameworks related to wind power projects in the country and the bottom-up processes of social resistance against such projects.

17.2 The influence of “Our Common Future” and the fight against climate change in Mexico

The 1988 Brundtland report marks a groundbreaking moment in international cooperation, as for the first time, climate change was framed as a global environmental problem that needed global engagement. The report highlighted the human origin of the accelerated depletion of the world’s natural resources, and the global impacts of 200 years of industrialization, particularly from Western societies. The report placed humans at the center stage of environmental degradation and gave birth to the notion of the Anthropocene, as an era in which humans radically transformed the living

conditions of the biosphere (Cléménçon, 2012). In 1992 at the International Summit of Rio de Janeiro, leaders of 100 countries adopted the United Nations Convention on Climate Change and pledged to protect the environment for the present and future generations. This convention acknowledges, “the global nature of climate change calls for the widest possible cooperation [...] in accordance with their common but differentiated responsibilities and respective capabilities and their social and economic conditions” (United Nations, 1992).

In 1988 immediately after the publication of “Our Common Future,” the Mexican government passed the General Law for Ecologic Equilibrium and Environmental Protection (Cámara de Diputados del H. Congreso de la Unión, 2015), whose main objective was to foster the recently coined concept of sustainable development from the Brundtland report. In 1992 it created the Ministry for Social Development to provide a better institutional framework for social and environmental policies; the National Institute of Ecology and the Federal Attorney Office for Environmental Protection. Furthermore, the Ministry of the Environment, Fisheries, and Natural Resources was created in 1994 (SEMARNAT, 2013). These institutions aimed to create mechanisms to ensure the country’s sustainable development and the protection of the natural resources and ecosystems.

The institutional changes adopted in the 1990s exemplify the way in which national policies and institutions are able to adapt to international environmental concerns. However, it was not until 1997 that the causes of climate change were addressed at the international arena and measures to reduce greenhouse gas (GHG) emissions were put in place via the Kyoto Protocol.¹ In this juncture, Mexico, along with other Latin American

¹ The historic protocol implemented a legally binding scheme for developed countries and big polluters to reduce the amount of GHG emissions. However, countries with a low carbon footprint also signed and ratified the protocol and set their own voluntary goals (UNFCCC, 2008).

countries, signed the protocol in 1998, and in 2012, it became one of the first Latin American countries to enact a General Law on Climate Change. Under this law, Mexico pursued a goal to produce 35% of the country's clean electricity by 2024 (*Cámara de Diputados del H. Congreso de la Unión, 2012*).

The Kyoto protocol made of energy decarbonization the fundamental strategy to address climate change. Industrialized countries with heavy energy consumption could focus on energy efficiency to account for emission reductions. However, developing economies such as Mexico still had growing energy needs, giving it a protagonist role to clean energy transition in the fight against climate change. Since then, countries have made a strong focus in renewable energy technologies such as solar, wind, and hydro as the best solutions for an energy transition.

17.3 Laying the path for wind power in Mexico: a techno-economic phase

Renewable energy technologies are currently seen as a silver bullet against climate change and a means for society to satisfy its energy consumption with a more limited greenhouse emission. However, renewable energy technology was not initially developed to tackle climate change. For instance, wind power technological development initiated before the Brundtland report. It was intended as a local alternative to diminish the dependency on fossil fuels (*Pasqualetti et al., 2004*). The development of this technology was related to concerns for energy security, rather than environmental sustainability.

As a result of the oil crisis in the 1970s, Denmark developed large-scale wind farms in a nationwide effort to incentivize wind power and as a response to civil society rejection of nuclear power (*Albizu et al., 2018*, pp. 1–44). Those actions produced the landmark success

in wind energy as hundreds of community-owned wind turbines rose in the country. Currently, wind provides around 40% of the country's electricity consumption and its manufacturing industry plays a key role in the Danish economy accounting for 6.7% of total exports of goods (*Danish Wind Industry Association, 2018*). This early wind energy adoption called the attention of the United States, and in 1986 the first wind power farm with a capacity of 1200 MW was built in California (*AWEA, 2019*). This first wind rush in the 1980s proved to be technical and economically feasible, and it also diminished dependency on imports of fossil fuels. In the 1990s a group of successful wind power utilities was already collecting their first economic successes.

In Mexico the first wind farm, known as La Venta I, was built in the Isthmus of Tehuantepec in 1992. It was a project of five turbines of 225 kW each (*The Wind Power, 2018*). Despite the small installed capacity, La Venta I played a key role in assessing the technical feasibility of wind power in the region as well as its feasibility as an alternative source of energy. Early developments of wind energy are strongly linked to a set of neoliberal policies that started in the 1980s and culminated in the government of Carlos Salinas de Gortari (1988–94) with the signing and implementation of the North American Free Trade Agreement in 1994. As part of this neoliberal restructuring, the regulatory framework of the electric system went through profound changes. The Law of Public Service of Electric Power was modified to allow private companies to produce and sell electricity under the schemes of independent power producers and self-supply (*Vargas, 2017*).

Wind power companies with their *know-how*, capital, and experience were the main beneficiaries of this legal reform. In this context the government of the state of Oaxaca organized six international colloquiums to

promote wind energy in the Isthmus of Tehuantepec from 2001 to 2006.² The federal government saw this as an opportunity to accomplish the international commitments to address climate change and, at the same time, receive the economic benefits from a developing wind power industry, while private utilities would get legal certainty and exclusive access to a region with a high-quality wind for electricity production. In those years the federal government delineated the contracts and tariffs for transmission and distribution for renewable energy companies and provided tax incentives to promote the private investments for more than 6000 MW of renewable energy capacity in the region of the Isthmus of Tehuantepec.³

In 2006 both the government and wind energy companies agreed to the terms of a *temporada abierta* (open-season mechanism) to finance the infrastructure of transmission that was needed to evacuate the electricity produced in the Isthmus. According to experts, the lack of transmission infrastructure was one of the main technical barriers for wind power in the region.⁴ These public–private partnerships laid the foundations for an explosion of large-scale developments of wind energy in Oaxaca. La Venta II became the first large-scale wind farm in the area (83.3 MW). This first phase took off with a narrowly defined regulatory framework that addressed feasibility issues of wind power potential in only technical and financial

terms. In 2008 the government passed the Law for the Use of Renewable Energy and the Financing of Energy Transition, and in 2015, 15 years from the first colloquium in Oaxaca, the Law of Energy Transition was enacted. Overall, it is possible to see the techno-economic rationale that underpins wind energy in Mexico.⁵

17.4 The local deployment of wind power projects: conflict brewed from an invisible social dimension

As mentioned in the previous section, the region of the Isthmus of Tehuantepec, in the state of Oaxaca, has excelled in the production of wind energy. This is the first region in Mexico that holds a high-scale wind energy development, and it is also Mexico's spearhead in its transition to renewables. The Isthmus is a geographical and cultural region in Oaxaca where strong winds are generated by the difference in atmospheric pressure between the Gulf of Mexico and the Pacific Ocean that causes a wind flow through the Isthmus of Tehuantepec. According to the "Wind Energy Resource Atlas of Oaxaca," the coastal plain of the Isthmus of Tehuantepec holds the highest (class 7) wind resource potential that extends over a land area of about 1200 km² that can potentially support about 6 GW of installed capacity.⁶

² Oaxaca Economy Ministry. Invitación para el Coloquio 2010. Available from: <https://www.amdee.org/Coloquio_Oaxaca/invitacion.pdf> (accessed 05.04.19.).

³ AMDEE. Visión del Trabajo Previo, Retos y Oportunidades. Available from: <<https://www.amdee.org/Proyectos/AMDEE-Vision-general-121109prev-1.pdf>> (accessed 05.04.19.).

⁴ Interview February 16, 2018.

⁵ Chapter 16, Integrating social and justice dimensions to energy transitions: the case of Mexico, gives a comprehensive analysis of the legal and regulatory framework to enable the energy transition.

⁶ NREL. Atlas de Recursos Eólicos del Estado de Oaxaca. Available from: <<https://www.nrel.gov/docs/fy04osti/35575.pdf>> (accessed 05.04.19.).

Currently, as of March 2019, there is a network of 24 wind farms in the Isthmus, with 1401 turbines producing over 2756 MW of electricity in an area of approximately 25,000 ha. These projects belong to the first phase of the wind developments in the region; however, plans to install at least 13 new wind farms to reach the 6000 MW of installed capacity that the region can hold are currently underway. To achieve this goal the government announced in 2018 the construction of 1221 km of another transmission line from the Isthmus of Tehuantepec to the Central Mexico to evacuate 3000 MW, but the project has already faced opposition from sectors of the local community.

Wind farms in the Isthmus of Tehuantepec are located in five municipalities: Asunción Ixtaltepec, El Espinal, Juchitán, Santo Domingo Ingenio, and Unión Hidalgo. A large percentage of the population in these municipalities identify itself as indigenous, particularly in Juchitán, where around 60% of the population speaks Zapotec as a first language. As described in previous sections, the development of wind energy was predominantly approached from a techno-economic/top-down perspective, focusing mainly in permits to produce electricity or planning for siting infrastructure in windy areas. This meant that the relationship with the local population had a top-down approach, leaving vast sectors of the population excluded from the debates and decisions of wind energy in the area.

The government of Oaxaca and utilities approached landholders to arrange the terms to lease land to deploy wind farms, selectively. The outreach focused on a dialog with key

representatives of local organizations and not with the entire population. Thus *ejido*⁷ commissioners and representatives of small-holders organizations attended the before-mentioned colloquiums in Huatulco⁸ to negotiate characteristics of investments. They, in turn, would be in charge of informing landlords on the technical characteristics of the wind farms, as well as on the economic, environmental, and social advantages of the industry. However, according to landlords, commissioners, and other representatives often gave incomplete information. Furthermore, some landlords argue that some representatives and commissioners used the information provided in those meetings for their advantage, as they bought land in the areas where they knew wind farms would be deployed.⁹ Thus the relationship with landlords was limited to the lease of land. Some companies visited the region in the 1990s to secure land for the future deployment of windmills. Landholders in areas such as La Venta, La Ventosa, Juchitán, and Unión Hidalgo signed leasing contracts with utilities, but they did not have the opportunity to negotiate the contracts. Furthermore, landlords complained that they did not receive any type of support from the state or federal governments to negotiate higher rents and better benefits for them.

The allocation of the first contracts can be seen as a sign of a land rush. The land was secured years ahead the state conducted the regulation of the wind energy sector. Therefore it was secured before utilities had the permits to produce electricity and before the transmission lines were built. Most of the companies that secured land transferred the contracts to

⁷ Ejido is a form of land tenure created in Mexico in the early 20th century to grant land to peasants who were dispossessed in the 19th century. Although peasants had individual plots of land, they did not have land titles and thus land could not be sold or mortgaged. Each ejido had three governance bodies: the general assembly, the commissioner, and the vigilance council. A constitutional reform in 1992 allowed individual land titles in ejidos.

⁸ Huatulco is a touristic beach resort in the Pacific Coast of Oaxaca.

⁹ Interview January 28, 2018; interview January 29, 2018; interview February 17, 2018.

other utilities that could get the permits and the financial credits to build wind farms. The transfer of contracts is a common practice in the region of which landlords complain because the original companies—locally known as *coyotes*¹⁰—created higher expectations on the economic revenues they could get from utilities, while at the same time offered minimal payments in the contracts they signed, paving the road for a future break of trust.

The first wind farm in La Venta, owned by the state utility, Federal Electricity Commission, fixed the baseline payments to which other utilities had to adjust.¹¹ One of the *coyote* companies in La Venta, a company called Timber and Seeds from the Lagoon, adopted CFE's baseline payments. According to landlords in La Venta, the company approached them individually, and some of them signed the contracts. However, with a desire to negotiate higher rents, a group of landlords organized collectively and formed the Solidarity group of La Venta.

In La Venta, land tenure is *ejido*, and members of Grupo Solidario wanted the contract to be discussed and negotiated by the whole assembly of the *ejido* members known as *ejidatarios*. This idea gained support from the local population; however, the company refused any collective negotiation. As the pressure from the *ejidatarios* increased, the company sought the support of the government to stop collective negotiations. The solution was to oust the *ejido* commissioner, a strong

supporter of collective negotiation. So with the commissioner gone, *ejidatarios* of *Grupo Solidario La Venta* were isolated, and the company simply denied to sign any contract with them and divided the group by advancing some payments to *ejidatarios* that had already signed the contract.¹²

After this first episode of conflict, some members of *Grupo Solidario La Venta* openly criticized how wind energy in the region was being developed. Other sectors of the local population in Juchitán ignited a local debate on the social aspects of wind energy. In 2006 a group of teachers and peasants formed an organization of teachers and grassroots movements.¹³ The group organized regular meetings to discuss the social, economic, and political problems in Juchitán. Members were concerned about the environmental and social impacts of wind farm deployment and a group of peasants joined the group asking for advice to terminate the contracts they had with a company. According to members of the *Colectivo*, they sought for external legal advice and pushed the company to terminate the contracts.¹⁴

This first organization disappeared but very soon evolved into the APIIDTT (Assembly of Indigenous Peoples of the Isthmus in Defense of Land and Territory).¹⁵ To this day, APIIDTT is the most important organization in the region with a very strong critical stance toward wind farm deployments. This organization has some coordinating functions with the social movements against wind energy in

¹⁰ The term *coyote* is used in Mexico to refer to a person who, in exchange for money, carries out some paperwork in a public office. Coyote is also a person who crosses people from Mexico to the United States. In all cases, coyote has a negative meaning, as the duties performed are not legal.

¹¹ Interview February 16, 2018.

¹² Interview March 6, 2018.

¹³ The organization was called Colectivo Magisterial y Popular 14 de junio.

¹⁴ Interview February 8, 2018.

¹⁵ Asamblea de Pueblos Indígenas del Istmo en Defensa de la Tierra y el Territorio.

the region. Furthermore, APIIDTT has been able to articulate a coherent agenda of social aspects of wind energy, highlighting the importance of including the indigenous communities in the social and environmental impacts of a massive deployment of wind farms. The organization underscores that the Mexican government has to enforce the rights of indigenous communities in the development of wind energy. This organization also highlights the unequal distribution of economic profits between utilities and landholders.

Along with APIIDTT, there are other social movements with a critical stance toward wind energy in Juchitán, Unión Hidalgo, and San Dionisio del Mar. In these municipalities, there have been episodes of opposition to the deployment of wind farms. In Juchitán, for example, the APPJ, or Popular Assembly of the Peoples of Juchitán opposed the construction of a wind farm owned by Gas Natural Fenosa. Members of this organization were particularly worried about potential damages to the lagoon, in which a sector of the local population finds a regular source of food and income. APPJ organized in 2013 when the wind farm was under construction, and despite the opposition from different sectors of the local population, the project was completed.

In Unión Hidalgo a group of landholders organized as the *comuneros*¹⁶ of Unión Hidalgo to terminate some contracts with the company *Desarrollos Eólicos Mexicanos*, a subsidiary of Renovalia Energy. This company began the construction of the wind farm in 2011, ignoring the concerns of a group of landlords regarding a large number of trees cut down to install the wind pads and other infrastructure. They were also asking for higher compensation for the damages to their properties; however, the company did not agree to negotiate with the

group, who then decided to seek for legal advice to cancel the contracts. Despite this opposition, the wind farm started its operation in 2012. The *comuneros* of Unión Hidalgo have been fighting in the Agrarian Courts to cancel the contracts and to seek recognition of communal land tenure rights.

In 2012 a large sector of the local population in San Dionisio del Mar opposed the construction of the Mareña Renovables wind farm. This would be the largest wind farm in Latin America, with 132 windmills and a total capacity of 396 MW (REVE, 2015). When the wind farm construction began, a large proportion of the population claimed to have no information on the project and demanded the company and the government not to go any further until the population approved the construction. Municipal authorities conducted some informative meetings, but the information did not satisfy the local population. One of the main concerns was that the wind farm would be located in a sandbar by the lagoon, potentially affecting fisheries, the primary source of food in the region.

The population also complained of the lack of accountability from the local government and the executive board of communal land that granted permits to build the project without informing the population. Although the major attempted to inform the population, he could not satisfy their main demand, which at that stage was to call off the project. After this, the population openly condemned the major and overthrown it from Town Hall, restraining access to the area near the sandbar to stop any attempt from the company to start the construction. Despite all the attempts of negotiation among the government, the group of investors, and the Asamblea de San Dionisio, the conflict turned into a deadlock, with the local population demanding the wind farm to

¹⁶ *Comuneros* are peasants who own land collectively under a form of tenure known as “comunidad.” This land tenure is similar to *ejido*; it has its own governance bodies. As *ejido*, since 1992, *comuneros* can get individual land titles over plots of land.

be called off and the company and the authorities unwilling to address this demand. The conflict escalated to some episodes of violence with the police, drawing the attention of international human rights organizations. After 3 years the company decided to cancel the project and moved inland.

In all cases, the diverse sectors of the population, which identify as indigenous—Zapotecs or Ikojts—were not informed of the projects in the early stages. To those sectors that were informed, such as landlords, the information given was also limited, technical, and, therefore, not easy to understand. Overall, the general demand across all cases of conflict is to uphold the right to free, prior, and informed consent by conducting indigenous consultations according to the 169 International Labor Organization (ILO) Convention. The San Dionisio del Mar case discussed here is the pioneer case in which a large-scale renewable energy project was halted mainly due to the organized social resistance. The social movement grew to such an extent that it gathered national and international attention due to the violations of the ILO Convention 169 and the negative response from the government offices toward the growing unrest.

These episodes of resistance to wind farm deployment are all diverse and include a large list of claims of injustice; however, social movements agree that wind power is not in itself the problem, but “the way in which these projects are being forced and introduced in the region” without previous consultation and a fair distribution of benefits and impacts.¹⁷ These claims, however, have little resonance among the general population in the Isthmus of Tehuantepec, as people actively engaging in social movements are a minority within most communities. Thus the sector of the population

who actively participates in actions against wind farm deployment faces limitations in term of resources and capabilities against the backdrop of the large budgets of transnational companies for legal advice and lobby activities with government decision makers.¹⁸ In counterpart the social movement’s lack of material and economic resources restrains actions as simple as traveling to Mexico City to campaign and meet civil servants.¹⁹ They also rely strongly in their members’ will to volunteer, and in the pro bono advisory skills and legal expertise of civil organizations. For this reason the Mareña Renovables case became emblematic for members of resistance groups, as an example of what would happen if large sectors of the local population engaged actively against wind power projects.

The social movements with a critical stance toward wind energy in the Isthmus are part of a wider network against mega infrastructure projects, such as mining, hydropower, and transport (Silva et al., 2018). This alliance of indigenous groups labels wind energy and the other projects as “Proyectos de Muerte” (deathly projects), in stark contrast with international organizations, government, and the business sector, which frame renewables as climate change mitigation strategies, and the survival of humanity. Therefore under the current scenario, it seems impossible to reconcile the views of these two groups. This is not of minor importance for the Mexican renewable transition, as this labeling could produce an ex ante opposition from communities against renewable energy in other parts of the country. Under this context the Isthmus’ network of resistance against wind power projects is able to provide support and share its experience and strategies of resistance to other

¹⁷ Interview November 5, 2017; interview December 12, 2017.

¹⁸ Interview December 8, 2017.

¹⁹ Interview November 27, 2017.

communities in Mexico where there are new developments of utility scale solar or wind projects. This is the case of Mayan communities in Yucatan that have been supported by

Zapotec social movements and academics which engaged with this first stage of wind power projects (Zarate-Toledo and Fraga, 2016) (Table 17.1).

TABLE 17.1 Wind power projects in the Tehuantepec Isthmus at 2016.

Name	Location	Capacity (MW)	Operational since
La Venta I	La Venta	1.125	1994
La Venta II	La Venta	83	2006
Parques Ecologicos de Mexico (La Ventosa I and II)	La Ventosa	80	2008
Eurus, Juchitan de Zaragoza Oaxaca	La Venta	251	2009
Instituto de Investigaciones Electricas	La Ventosa	0	2010
Bii Nee Stipa I	El Espinal	26.35	2010
Electrica del Valle de Mexico (La Mata- La Ventosa)	La Ventosa/Asunción Ixtaltepec	68	2010
Energías Renovables Venta III, La Venta III	Santo Domingo Ingenio	103	2011
Energias Ambientales de Oaxaca, Oaxaca I	Santo Domingo Ingenio	102	2012
CE Oaxaca Dos, Oaxaca II	Santo Domingo Ingenio	102	2012
CE Oaxaca Tres, Oaxaca III	Santo Domingo Ingenio	102	2012
CE Oaxaca Cuatro, Oaxaca IV	Santo Domingo Ingenio	102	2012
Fuerza Eólica Del Istmo I and II	La Ventosa	80	2012
Stipa Nayaa	Juchitan	74	2012
DEMEX 1	Union Hidalgo	90	2012
Bii Nee Stipa II (Eólica El Retiro)	La Ventosa	74	2012
Bii Nee Stipa III (Zopiloapan)	La Ventosa	70	2012
Parques Ecológicos de México (La Ventosa III)	La Ventosa	22	2013
Eoliatic del Istmo	Juchitan	164	2013
Eoliatic del Pacifico	Santo Domingo	160	2014
Bii Nee Stipa IV (Eolica Dos Arbolitos)	Juchitan	70	2014
Fuerza y Energia Bii Hioxo	Juchitan	234	2014
DEMEX 2	Union Hidalgo	138	2014
PE Ingenio	Santo Domingo Ingenio	50	2015
Energías Renovables La Mata, La Mata (Sureste I fase II)	Asunción Ixtaltepec	102	2015
	<i>Total</i>	2348	

DEMEX, Desarrollos Eólicos Mexicanos.

17.5 Developing mechanisms to include the social dimensions of energy transitions

In 2013 a constitutional reform paved the way for an aggressive set of policies aimed at advancing the deployment of clean and renewable energy systems through various public–private partnership schemes with very ambitious objectives. These objectives, measured for the most part in terms of a gradual reduction in GHG emissions, have vast implications in the controversies and social resistance based on an articulation of indigenous autonomy and the rights of communities living in and around these energy systems. The speed with which these legal changes took place was only matched by the magnitude and transcendence of what was proposed, as within just 1 year, the Mexican congress discussed and changed key articles of the constitution (articles 25, 26, and 28), including a package of secondary laws.²⁰ The legislation that was enacted, coupled with the growing attention to social resistance to renewable energy projects, illustrates the unresolved tension between the carbon emission reduction goals, the exploitation of Mexico’s vast renewable energy potential, and the notion of free, prior, and informed consent by communities directly affected by those developments.

The ILO Convention 169 (ILO, 1989), ratified by the Mexican State in 1990, was the first international legally binding instrument to recognize indigenous peoples as a collective subject of rights. The signature of this instrument contributed to recognizing the highly diverse ethnic composition of Mexico. This acknowledgment was later introduced in the Mexican constitution, and it endowed a degree of

autonomy to indigenous communities. On the other hand the United Nations Declaration on the Rights of Indigenous Peoples of 2007 is an instrument for the states to guarantee the rights of indigenous peoples, in particular, the right to own their lands, territories, and resources. Although this declaration is not legally binding, it obligates states to create mechanisms to prevent any form of dispossession of land, territory, and resources of indigenous communities. Both the UN Declaration and ILO Convention 169 have taken a predominant place in both the claims from resistance groups against wind power projects and the later analysis around the applicability of free, prior, and informed consent in infrastructure and resource extraction projects in indigenous territories. The regulatory framework derived from the energy reforms in regards to the consultation and social assessment processes are defined in two documents—The Law on the Electricity Industry and the Regulation of the Electricity Industry Law. Article 119 of the Electric Industry Law states,

In order to take into account the interests and rights of the communities and indigenous peoples in which projects of the electricity industry sector are developed, the Ministry of Energy shall carry out the necessary consultation procedures and any other activity necessary for their safeguarding, in coordination with the Ministry of the Interior and the corresponding agencies.

In an effort to reflect on the social dynamics around energy developments and to incorporate the social dimension within the final version of the new energy legislation, the federal government and congress conveyed national dialogs with experts across a multiplicity of sectors and expertise, which allowed for the

²⁰ Article 25 refers to the participation of private companies in strategic sectors to incentivize competition, economic growth, and development in the country. Article 26 refers to mechanisms of civil consultation, planning, and evaluation for development programs and projects. Article 28 refers to monopolies and competition, opening the generation and consumption to private companies and reserving state ownership for power transmission and distribution.

design of a regulatory proposal on the social impacts and land occupation for electrification projects.

As some of the social controversies around wind energy projects already existed at the time of negotiations in 2013, representatives from NGOs, unions, academics, and energy experts provided input, and as a consequence, the General Direction of Social Impact and Surface Occupation was created in 2014 under the Ministry of Energy to ensure that companies incorporate principles of sustainability and human rights into the planning of energy projects. New regulation, produced after the energy reforms, obliged companies to conduct an Social Impact Assessment²¹ related to the potential impacts that an energy project might have in the population in the surrounding areas of the project and to propose measures to prevent or, in case of inevitability, to mitigate negative impacts to the local population.

Even though this requirement for a Social Impact Assessment was published in 2014, the specific guidelines that the social impact assessment ought to follow were not defined but until June of 2018, when the Ministry of Energy published them after 3 years of public comment process on the first draft of the document (*Cámara de Diputados del H. Congreso de la Unión, 2018*). The purpose of the social impact assessment is to ensure that projects have a continued beneficial and productive relationship between impacted communities and the electric industry, in this case the wind energy developers. The lack of clarity on the normative applications of the new standards for social assessment practices has not contributed to reducing social resistance. Indigenous groups such as APIIDTT, which were not invited to the negotiations of the energy reform, keep gaining notoriety in the public perception of wind energy projects as their social demands are unsuccessfully met with an

increasing number of energy projects in their territories.

Correspondingly, the Regulation of the Electrical Industry Law stipulates in articles 86–92 that the permits for projects related to the generation and distribution of electricity will be granted once the social impact assessment is submitted for review to the Ministry of Energy. When the projects locate in indigenous territory, the ministry will be the sole responsible for consultation procedures with the local population in accordance to article 119 of the Electric Industry Law and in cooperation with other federal, state, and local agencies. According to article 91 of the referred Law, the consultations are guided by the principles of good faith, cultural relevance, transparency, and compromise. These principles match the highest international standards on this matter. The consultation is divided into six phases: delineation of the consultation protocol, prior agreements, informative phase, deliberative phase, consultative phase, and monitoring and following up on agreements.

In 2014 and 2015 took place the first consultation in the Isthmus of Tehuantepec. The wind farm of Eólica del Sur, comprising the follow-up project of Mareña Renovables, relocated to the municipalities of El Espinal and Juchitán. Various public offices from the federal, state, and municipal branches were involved in the development of the Protocol. The process in Juchitán extended for 9 months, from October 2014 to July 2015, and it was highly contested. The social movements in the area, such as APIIDTT and APPJ, participated in the processes and highlighted anomalies during the different phases of the consultation. First, they argued that the fact that the consultation was taking place after the companies got the permits to produce electricity and the leasing agreements with landholders, violated the very essence of the free, prior, and informed

²¹ Evaluación de Impacto Social.

consent. The strongest critiques from these movements, as well as some NGOs and groups of scholars, maintain that the consultation aimed to legitimize projects with tick-box simulacive processes.²²

Furthermore, the fact that the DGISOS and other government offices elaborated the protocol and set the format of the consultation, constrained the role of indigenous communities in actively engaging in the consultation. According to the international standards and other national protocols, the indigenous consultation is an exercise of autonomy in which the indigenous communities design and conduct the whole process with the minimum interference from government offices (*Instituto Estatal Electoral y de Participación Ciudadana de Oaxaca, 2014*). The active role of the federal government throughout the process was a permanent issue of contention with the social movements, and it was one of the main reasons for them to question the legality of the consultation. After 8 months of a complex process, a sector of the population in Juchitán accepted the construction of the wind farm; however, other sectors of the local population and members of APPIIDTT and APPJ called for a *writ to amparo*.²³ However, in the end, even if the *writ to amparo* stalled the project for some months, the wind farm was built.

On the other hand, the Mexican government has also addressed the demands from landlords that rent land to utilities. Landlords complaints relate to compensations for damages in their properties and on the amount of rents that utilities pay. The Ministry of Energy published the *Action Protocol on Shared Social Benefits of Energy Projects* (*Mexico Energy*

Ministry, 2018). This document provides a minimal set of rules for the distribution of revenues from energy projects. This minimal set of rules intends to create the conditions for a horizontal and open dialog among social groups, dwellers, and communities that conform to it. This document also aims to widen the social acceptance of energy projects by providing a minimal set of economic benefits to the wider population. However, the appeal to social movements that oppose wind energy might be limited as this instrument, among others such as the indigenous consultations, are labeled as mechanisms to give legitimacy to energy projects (*Dunlap, 2017a*).

In parallel to these top-down mechanisms, there have been attempts to develop pioneer community wind projects in the region. However, a lack of financial and planning support mechanisms combined with a regulatory framework exclusively tailored for utility-scale private wind projects has kept community-owned schemes out of picture in Mexico (*Oceransky, 2010*). However, there are other examples of countries in Latin America, which are aiming to develop comprehensive policy mechanisms in order to include indigenous communities cosmovision in the energy transition (*Ministerio de Energía de Chile, 2017*) or to facilitate the partnership of private renewable companies and local indigenous communities to develop jointly owned energy projects.²⁴

The creation of the General Direction of Social Impacts and Land Occupation in 2014 within the Ministry of Energy was a step forward in the policy-making formulation efforts to account for ongoing controversies in

²² Interview November 21, 2017.

²³ *Writ to amparo* is a legal procedure in the Mexican Law that seeks to protect individuals or groups against the violation of human rights.

²⁴ *Chapter 19, An inclusive and participative model for energy transition in Latin America: the case of Chilean Generación Comunitaria*, presents a case of public policy to favor communities.

indigenous territories; however, the complex dynamics involved in the implementation of public consultation mechanisms leaves that office with the conflicting position of both determining the need for a consultation to be made but also to push an attractive ecosystem for investments as part of the Ministry of Energy. The legal framework that followed the energy reform of 2013 seeks to prevent nuances related to the social impacts derived from energy projects; however, the promotion of new investments in the sector reinforces the techno-economic perspective. The historic reforms in the energy sector of 2013 deal mostly with two issues: energy security and a sustainable transition toward a carbon-free economy. As it has been shown, social resistance stems not from a disconnection with these two issues but with a broader problem of governance of the energy systems.

17.6 Conclusion

The first experience with wind power has made of the Tehuantepec Isthmus a laboratory for the Mexican energy transition where the rationale followed by policymakers did not incorporate the social dimension. The latest reforms in the energy framework aim to include the social dimensions to the energy transition. However, opposition to renewable energy projects in Mexico, and the resistance movements that characterized this opposition, are only one of many ingredients that contributed to the inclusion of instruments within the energy policy ecosystem that account to the social dimension of energy. Policy processes are influenced and shaped by a multiplicity of actors, interests, values, and contexts and Mexico accounts for a long history of resistance movements against energy infrastructure and extractive projects.

However, this chapter shows a clear before-and-after regarding the existence of a social

dimension in the Mexican policy-making for energy transition, suggesting that the influence of claims coming from bottom-up resistance movements toward wind power can be found printed in new policy frameworks and mechanisms developed after the Mexican energy reform.

There is still a gap between current policy and claims from resistance groups, manifested through conflicts around wind power in the Isthmus. However, it remains to be seen the long-term consequences of the incorporation of a nuanced understanding of the social dynamics around the newly built energy systems in Mexico. As the rules of engagement continue to change and adapt to the complexities of the relation between social organizations, investors, and government actors.

It is even possible that the episodes of conflict brewed from the wind power rush in the Isthmus of Tehuantepec has produced an irretrievable opposition to wind energy from the social movements referred in the chapter. This would mean that opposition groups would disqualify in advance the new instruments introduced in the law such as the social impacts assessments and the indigenous consultations.

However, interests from transnational renewable companies and national government targets for climate change mitigation are strongly aligned. Even if it has been proved that social resistance movements have had some influence in modifying energy policy frameworks, it seems unlikely that they can put a brake to the accelerated Mexican renewable transition. Therefore there is a big risk that in its impulse to reach the targets of renewable energy capacity in the country, the essential issues related to due process, human rights, transparency, and accountability are overlooked a second time.

In this scenario, stakeholders looking for a just and fair transition process must support the development and implementation of

comprehensive policies that conciliate local population interests with global goals to address climate change and to incorporate a social dimension in the energy transition.

Therefore this chapter finalizes with a call for empirical, interdisciplinary, and multiactor research aiming to deepen in understanding between top-down policy-making and bottom-up resistance processes in energy transitions in Latin America. Academics and policymakers must cooperate toward more just renewable energy systems that truly enforce due process through transparent and participative mechanisms. This would allow for wider population to be properly informed and actively involved in the development of clean energy projects, avoiding the threat that current conflicts comprise for both local populations and energy transition.

References

- Albizu, L.G., Pagani, D., Brink, T., 2018. Denmark. In: Identifying Success Factors for Wind Power. World Wind Energy Association, Germany, pp. 1–44.
- Alemán-Nava, G.S., Casiano-Flores, V.H., Cárdenas-Chávez, D.L., Díaz Chavez, R., Scarlat, N., Mahlknecht, J., et al., 2014. Renewable energy research progress in Mexico: a review. *Renew. Sustain. Energy Rev.* 32, 140–152.
- AWEA, 2019. History of wind: 1980's—turbine timeline. Available from: <<https://www.awea.org/wind-101/history-of-wind/1980s>> (accessed 04.04.19.).
- Cámara de Diputados del H. Congreso de la Unión, 2012. Ley General de Cambio Climático. Cámara de Diputados del H. Congreso de la Unión, México.
- Cámara de Diputados del H. Congreso de la Unión, 2015. Ley General Del Equilibrio Ecologico y la Proteccion al Ambiente. Cámara de Diputados del H. Congreso de la Unión, México.
- Cámara de Diputados del H. Congreso de la Unión, 2018. Acuerdo por el que se emiten las Disposiciones Administrativas de Carácter General sobre la Evaluación de Impacto Social en el Sector Energético. Cámara de Diputados del H. Congreso de la Unión, México.
- Clémence, R., 2012. Welcome to the Anthropocene: Rio + 20 and the meaning sustainable development. *J. Environ. Dev.* 21, 311–338.
- Danish Wind Industry Association, 2018. Employment, export and revenue. Available from: <<https://en.windpower.org/wind-in-denmark/statistics/employment-export-and-revenue>> (accessed 04.04.19.).
- Dunlap, A., 2017b. 'The town is surrounded': from climate concerns to life under wind turbines in La Ventosa, Mexico. *Hum. Geogr.* 10, 16–36.
- Dunlap, A., 2017a. Counterinsurgency for wind energy: the Bii Hioxo wind park in Juchitán, Mexico. *J. Peasant Stud.* 0, 1–23.
- Howe, C., Boyer, D., Barrera, E., 2015. Wind at the margins of the state: autonomy and renewable energy development in Southern Mexico. *Contested Powers. The Politics of Energy and Development in Latin America.* Zed Books, London, pp. 92–115.
- Howe, C., Boyer, D., 2015. Aeolian politics. *J. Soc. Theory* 16, 31–48.
- Huesca Pérez, M.E., Sheinbaum Pardo, C., Köppel, J., 2016. Social implications of siting wind energy in a disadvantaged region – the case of the Isthmus of Tehuantepec, Mexico. *Renew. Sustain. Energy Rev.* 58, 952–965.
- ILO, 1989. C169—Indigenous and Tribal Peoples Convention, 1989 (núm. 169). Available from: <https://www.ilo.org/dyn/normlex/es/f?p=NORMLEXPUB:12100:0::NO::P12100_INSTRUMENT_ID:312314> (accessed 15.03.19.).
- Instituto Estatal Electoral y de Participación Ciudadana de Oaxaca, 2014. Guía de actuación para juzgadores en materia de Derecho Electoral Indígena. México. Available from: <<http://www.ieepco.org.mx/archivos/documentos/2016/Gu%C3%ADa%20de%20actuaci%C3%B3n%20para%20juzgadores%20en%20materia%20de%20Derecho%20Electoral%20Ind%C3%ADgena.pdf>> (accessed 19.05.19.).
- IRENA, 2016. Renewable Energy Market Analysis: Latin America. IRENA, Abu Dhabi. Available from: <<https://www.irena.org/-/>> (accessed 10.04.19.).
- Jaramillo, O.A., Borja, M.A., 2004. Wind speed analysis in La Ventosa, Mexico: a bimodal probability distribution case. *Renew. Energy* 29, 1613–1630.
- Juárez Hernández, S., León, G., 2014. Energía eólica en el Istmo de Tehuantepec: desarrollo, actores y oposición social. *Probl. Desarro.* 178, 139–162.
- Mexico Energy Ministry, 2018. Protocolo de actuación sobre beneficios sociales compartidos de proyectos energeticos. Mexico Energy Ministry, Mexico.
- Ministerio de Energía de Chile, 2017. Capitulo Indígena. In: Política Energética 2050. Santiago de Chile, p. 94.
- Oceransky, S., 2010. Renewable energy as a common resource. In: Sparking a Worldwide Energy Revolution. p. 670.
- Pasqualetti, M., Righter, B., Gipe, P., 2004. History of wind energy use. *Enycl. Energy* 6, 419–433.
- REVE, 2015. Anuncia SENER construcción de parques eólico en Oaxaca. Available from: <<https://www.evwind.com/tags/marena-renovables/>> (accessed 15.03.19.).

- SEMARNAT, 2013. Antecedentes: Secretaría de Medio Ambiente y Recursos Naturales. Available from: <<http://www.semarnat.gob.mx/conocenos/antecedentes>> (accessed 04.04.19.).
- Silva, L., Munro, P.G., De Lourdes, M., Zurita, M., 2018. Proyectos de Muerte: Energy justice conflicts on Mexico's unconventional gas frontier. *Extr. Ind. Soc.* 5, 481–489.
- The Wind Power, 2018. La Venta II (Mexico)—Parques eólicos. Available from: <https://www.thewindpower.net/windfarm_es_4093_la-venta-ii.php> (accessed 04.04.19.).
- UNFCCC, 2008. Kyoto protocol reference manual. Available from: <https://unfccc.int/resource/docs/publications/08_unfccc_kp_ref_manual.pdf> (accessed 04.04.19.).
- United Nations, 1992. United Nations Framework Convention on Climate Change. Available from: <<https://unfccc.int/sites/default/files/conveng.pdf>> (accessed 14.05.19.).
- Vargas, A.M., 2017. Estructura de la industria eléctrica mexicana: El Modelo de Comprador Único. *Economía. Teoría y Práctica* 46, 71–95.
- Zarate-Toledo, E., Fraga, J., 2016. La política eólica mexicana: Controversias sociales y ambientales debido a su implantación territorial: Estudios de caso en Oaxaca y Yucatán. *Trace. Travaux et Recherches dans les Amériques du Centre* 69, 65–95.

Further reading

- AMDEE, 2012. Visión del Trabajo Previo, Retos y Oportunidades. Available from: <<https://www.amdee.org/Proyectos/AMDEE-Vision-general-121109prev-1.pdf>> (accessed 04.04.19.).
- NREL, 2004. Atlas de Recursos Eólicos del Estado de Oaxaca. Available from: <<https://www.nrel.gov/docs/fy04osti/35575.pdf>> (accessed 04.04.19.).
- Oaxaca Economy Ministry, 2010. Invitación para el Coloquio 2010. Available from: <https://www.amdee.org/Coloquio_Oaxaca/invitacion.pdf> (accessed 04.04.19.).