



Wind energy analysis in use and implementation in Mexico

Análisis de la energía eólica en uso e implementación en México

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ABSTRACT:

There is a lack of research into the way that wind power can be used in Mexico. The purpose of this systematic literature review is to highlight how the government of Mexico has developed and implemented projects aimed at harnessing wind power. The PRISMA methodology was implemented. Results showed that wind energy is a growing industry in Mexico and the nation has the potential to become a force in Central America with regards to wind energy generation.

Keywords: Clean energies, renewable energies, wind energy.

RESUMEN:

Hay una falta de investigación sobre la forma en que la energía eólica se puede utilizar en México. El objetivo de esta revisión sistemática de la literatura es destacar cómo el gobierno de México ha desarrollado e implementado proyectos destinados a aprovechar la energía eólica. Se implementó la metodología PRISMA. Los resultados mostraron que la energía eólica es una industria en crecimiento en México y la nación tiene el potencial de convertirse en una fuerza en Centroamérica con respecto a la generación de energía eólica.

Palabras clave: Energías limpias, energías renovables, energía eólica.

1. Introduction

Ever since the advent of the 21st century, scholars and practitioners alike have documented and raised concerns with regard to issues surrounding energy security and environmental pollution. The concerns have prompted private and public entities to develop and implement renewable energy sources that are not only environmentally friendly but also those which can help in cutting down on costs incurred during the creation of energy. By definition, renewable energy sources are said to be those which are replenished naturally with examples provided by Miller and Spoolman (2012) being inclusive of wind, solar, or even geothermal heat.

The subsequent analysis will lay a primal focus on the use of wind energy, which describes the process by which wind is used to generate electricity. Wind turbines convert the kinetic energy in the wind into mechanical power. A generator can convert mechanical power into electricity (Golfman, 2012). Estimations from scholars show that at least 35% of the wind on the earth's surface can be harnessed for energy purposes (Climate Action Tracker, 2016; Miller & Spoolman, 2012). The 30% availability of the natural form of energy means that at least 1.26x10⁹MW amounts of energy can be produced, which can meet the entire demand and supply needs of the international community (Boyd, Turner, & Ward, 2015). Comparative analyses show that wind energy comes intact with a myriad of benefits and merits compared to traditional energy sources (Rodríguez, Jesús, Jaramillo, & Martínez, 2015). With wind energy, governments can be sure to cut down on the amount of harmful gases emitted into the atmosphere as it is clean and environmentally friendly (Robinson, Thresher, & Veers, 2008; Kalmikov, 2017). In addition, the energy source is free and inexhaustible, meaning that it is available in copious amounts. The utilization of wind energy can help in reducing the demand rates for fossil fuels and other kind of energy, atomic for instance, with the estimated cost per kWh of wind energy being low compared to that of other energy sources.

The main objective of this systematic literature review is to highlight how the government of Mexico has developed and implemented projects aimed at harnessing wind power. The research paper will evaluate the literature from a prescriptive and analytical overview addendum to highlighting any gaps in research. Furthermore, the research analyses the various challenges faced by the government during the formulation and subsequent passing of wind energy-related projects. Finally, the paper will underscore the divergent regulations set up by the government for the overarching aim of controlling the wind energy market in the nation and how this has helped in the continued growth of the nation.

2. Methodology

The researcher implemented the PRISMA methodology (Moher et al., 2015) to collect all the requisite data with regards to wind energy in Mexico. This methodology was chosen primarily because it helps researchers to improve the quality of the systematic review results. Also, the tool is vital in the determination of the necessary articles through the use of a 21-item checklist. The selected period ranged from the years 1970 to 2019. The electronic databases such as SCOPUS, Environment Index, Google Scholar, Semantic Scholar as well as Web of Science were used.

3. Results

The implementation of the PRISMA technique for the identification, selection as well as the determination of the best papers for the overall research led to the collection of at least 61 papers. Twenty-two of the identified papers were reports with 29 being research papers. At least five were journal articles, while 1 of them was a case study. There were three articles and one book from the identified papers. All of the articles met the set metrics by the STROBE checklist with the Web of Science website authenticating their quality (Table 1).

Table 1.
Literature selected

Title	Type of document	Authors and date	Comments
Strategies for the Development of Renewable Energy in Mexico	Report	ANES (2000)	The report evaluates the divergent strategies to be implemented by private and public entities in the development of renewable energy in the nation
Accommodating wind power in a hostile landscape	Book chapter	Pasqualetti (2002)	The chapter provides a step by step overview into the types of strategies that can be used when communicating to communities with regards to the implementation of wind energy projects
Renewable Energy for Protected Areas of the Yucatan Peninsula	Research paper	Romero-Paredes Rubio et al. (2003)	The paper espouses on the strategic initiatives set up by the Mexican government, which can help improve the use of renewable energy
Wind Force 12: a blueprint to achieve 12 % of the world's electricity by 2020	Report	Global Wind Energy Council (2005)	This report analyses the various steps to be taken by the international community in the implementation of wind energy for electricity production purposes
Project Appraisal Document On A Proposed Purchase Of Emissions Reductions By The Spanish Carbon Fund And The BioCarbon Fund. In the Amount of US\$ 17,473,211 From The Comision Federal De Electricidad (Mexico) For The Wind Umbrella (La Venta II) Project	Report	World Bank Group (2006)	The report appraises wind energy projects and how they have helped in curbing the emission of gases
Central Eoloeléctrica La Venta II	Research paper	Cadenas Tovar and Saldivar Urquiza (2007)	The research highlights how wind energy can be harnessed in power plants and which factors need to be considered prior and after implementation
Hedging Mexico's Electricity Bets: The Case for Renewable Energy	Report	Farchy (2007)	The report analyses how electricity is generated in Mexico through the use of renewable energy sources
Grassroots Resistance: Contesting Wind Mill construction in Oaxaca	Article	Sanchez (2007)	The article provides a step by step overview into the types of strategies that can be used when communicating to communities with regards to the implementation of wind energy projects
Short term wind speed forecasting in La Venta, Oaxaca, México, using	Research paper	Cadenas and Rivera (2009)	The paper evaluates the key factors to be taken into account when harnessing wind

artificial neural networks			energy
Barriers to clean development mechanism renewable energy projects in Mexico	Research paper	Lokey (2009)	The research analyses the different challenges facing the Mexican government when setting up wind energy projects
Wind Conflicts In The Isthmus Of Tehuantepec. The Role of Ownership and Decision-Making Models in Indigenous Resistance to Wind Projects in Southern Mexico	Research paper	Oceransky (2009)	The research analyses the different challenges facing the Mexican government when setting up wind energy projects
Why we still don't understand the social aspects of wind power: a critique of key assumptions within the literature	Research paper	Aitken (2010a)	This research analyses the various challenges faced by the Mexican National Government in the development and implementation of wind energy sources
Wind power and community benefits: Challenges and opportunities	Journal Article	Aitken (2010b)	The article evaluates the various challenges to be faced in setting up wind projects and how the government can use them to their benefit
Power in Mexico: Renewables Remain More Desired than Real	Article	Bonetto and Story (2010)	The article evaluates how wind energy is growing to become a key tenet of the overall Mexican economy
Wind speed forecasting in three different regions of Mexico, using a hybrid ARIMA-ANN model	Research paper	Cadenas and Rivera (2010)	The paper analyses how firms in Mexico can measure and collect wind energy in 3 different regions
Use of Renewable Energy in the Electric Power Generation Sector in Mexico: Political, Regulatory, Economic and Technical Issues from 1965 to 2018	Report	Elizalde Baltierra et al. (2011)	The report analyses how electricity is generated in Mexico through the use of renewable energy sources
Mexico Wind Energy Sector in 2010 and 2011	Report	Landa (2011)	The report analyses how electricity is generated in Mexico through the use of renewable energy sources
Power to the People? How World Bank Financed Wind Farms Fail Communities in Mexico	Report	Reyes (2011)	The report evaluates how the wind energy projects in Mexico have been met by divergent challenges
GLOBE climate legislation study	Report	Townshend et al. (2011)	The report analyses how the international community has set up legislation to manage the development of renewable energy projects
The Social Power of Wind: The Role of Participation and Social Entrepreneurship in Overcoming Barriers for Community Wind Farm Development	Master thesis	Hoffmann (2012)	The thesis provides an overview of the different strategies that can be implemented to mitigate any barriers facing the implementation of wind energy projects
Sempre Anticipates 'Windfall' Just Beyond the U.S. Border in La Rumorosa, Mexico	Article	Kaften (2012)	The article analyses how the implementation of wind energy can be beneficial for the Mexican government
A Comparative Assessment of Wind Turbine Innovation and Diffusion Policies	Book chapter	Neij and Andersen (2012)	The chapter analyses how wind energy systems have grown to become efficient in the creation of power
The 'wind rush': Green energy blows trouble into Mexico	Article	Vance (2012)	The article analyses how the development and implementation of wind energy projects have led to divergent conflicts between the government and its people
Wave modeling performance in the	Research	Appendini et al.	The research evaluates the divergent

Gulf of Mexico and Western Caribbean: wind reanalyses assessment	paper	(2013)	strategies to be implemented by private and public entities in the development of renewable energy in the nation
Renewable energies full report. Mexico City	Report	Cardona (2013)	The report analyses how Mexico has grown into becoming a key force to reckon with in the wind energy industry
National Climate Change Strategy: 10-20-40 Vision	Report	Federal Government of Mexico (2013)	The report evaluates the strategic initiatives put in place by the national government towards the development of renewable energy source facilities
Renewable Energy in Mexico: Policy and Technologies for a Sustainable Future	Book	Romero-Hernández et al. (2013)	The book evaluates how the Mexican government has set up regulations to manage the energy industry
Renewable energy research progress in Mexico: A review. Renewable and Sustainable Energy Reviews	Journal article	Alemán-Nava et al. (2014)	The article evaluates how the Mexican government sets up renewable energy schemes and their benefits, challenges, and subsequent opportunities
Wave climate and trends for the Gulf of Mexico: a 30-year wave hindcast	Research Paper	Appendini et al. (2014)	The report evaluates the divergent strategies to be implemented by private and public entities in the development of renewable energy in the nation
IEA WIND: 2013 Annual Report	Report	Borja (2014)	The report analyses how Mexico has grown into becoming a key force to reckon with in the wind energy industry
Mexico's Energy Reform: A Game Changer in the Nation's History (An Upstream Perspective)	Research paper	Enríquez (2014)	The paper espouses on the strategic initiatives set up by the Mexican government, which can help improve the use of renewable energy
Energy Justice, a Whole Systems Approach	Research paper	Jenkins et al. (2014)	The paper analyses how wind energy systems can be used in the promotion of social justice in society
Analysis of Mexico's New Electric Industry Law	Report	Mayer (2014)	The report evaluates how the Mexican government has set up regulations to manage the energy industry
Assessing Intended Nationally Determined Contributions to the Paris Climate Agreement – what are the projected global and national emission levels for 2025–2030?	Report	Admiraal et al. (2015)	The report analyses how the international community is working towards the implementation of renewable forms of energy for long term sustenance
Pathways to deep decarbonization in Mexico	Report	Tovilla and Buirra (2015)	The report highlights the different schemes that can be used to mitigate the growing levels of carbon emissions in Mexico
Mexican Energy Reform, Climate Change, and Energy Justice in Indigenous Communities	Research paper	Baker (2016)	The research analyses how wind energy systems can be used in the promotion of social justice in society
Mexico's Clean Energy Auction: Material Provisions of the Power Purchase Agreements	Report	Mayer (2016)	The report evaluates how the Mexican government has set up regulations to manage the energy industry
Mexico's Climate Change Mid-Century Strategy	Report	SEMARNAT-INECC (2016)	The report evaluates the strategic initiatives put in place by the national government towards the development of renewable energy source facilities

Pathways to Mexico's climate change mitigation targets: A multi-model analysis	Research paper	Veysey et al. (2016)	The research highlights the divergent schemes that can be used to mitigate the growing levels of carbon emissions in Mexico
On the role of climate change on wind waves generated by tropical cyclones in the Gulf of Mexico	Research paper	Appendini et al. (2017)	The research analyses how climate change has an impact on the manner through which wind energy is generated in Mexico
Integrating local knowledge for climate change adaptation in Yucatán, Mexico	Paper	Audefroy and Cabrera Sánchez (2017)	The paper analyses the importance of creating communication channels aimed at elucidating the merits of adapting to climate change for the Mexican people
Contesting energy transitions: wind power and conflicts in the Isthmus of Tehuantepec	Journal article	Avila-Calero (2017)	The article evaluates how the government is facing a myriad of challenges in the setting up of wind energy projects in Mexico
Energy democracy: Goals and policy instruments for sociotechnical transitions	Research paper	Burke and Stephens (2017)	The research analyses how wind energy can help in bridging the social, economic gap between the Mexican people
Investor Briefing: Renewable Energy Impacts On Communities	Report	Business and Human Rights Resource Centre (2017)	The report analyses why it is important for private and public entities to inform communities on the benefits and demerits of energy projects to be set up in or around them
Wind energy: toward a "sustainable violence" in Oaxaca	Research paper	Dunlap (2017)	This research analyses the various challenges faced by the Mexican National Government in the development and implementation of wind energy sources
A turbine is not only a turbine: The role of social context and fairness characteristics for the local acceptance of wind power	Research paper	Liebe et al. (2017)	The paper analyses how wind energy systems can be used in the promotion of social justice in society
Renewable Energy Tenders and Community [Em]Power[Ment]	Report	Lucas et al. (2017)	The report analyses how wind energy systems can be used in the promotion of social justice in society
Mexico's efforts to phase out and rationalize its fossil fuel subsidies	Report	Organization for Economic Co-operation and Development (2017)	The report evaluates the divergent strategies set up by the Mexican government that are aimed at managing the energy industry
Environmental Impact Assessment in Mexico and Canada: Comparative Analysis at National and Regional Levels of Federal District and Quebec	Research paper	Perevochtchikova and André (2017)	The paper analyses the benefits of using wind power for Mexico
Competing coalitions: The politics of renewable energy and fossil fuels in Mexico, South Africa, and Thailand	Research paper	Rennkamp et al. (2017)	The paper analyses how various nations are coming together towards the creation of a conglomerate aimed at harnessing renewable energy
Renewable Energy in Mexico - Update on the auctions and investment opportunities	Report	Ross (2017)	The report evaluates how far Mexico has set up renewable energy projects
Tricky Business: Space for Civil Society in Natural Resource Struggles	Book	Terwindt and Schliemann (2017)	This book, in part 2 number 4, analyses the various challenges faced by the Mexican National Government in the development and implementation of wind energy sources

Mexico's Energy Reform	Report	Vietor and Sheldahl-Thomason (2017)	The report highlights the strategies set up by the Mexican governments and how they are aligned towards the realization of the national goals and objectives
Insurrection for land, sea and dignity: resistance and autonomy against wind energy in Álvaro Obregón, Mexico	Research paper	Dunlap (2018)	The paper evaluates how the wind energy projects in Mexico have been met by divergent challenges
Wind Energy Development in Mexico: At What Cost?	Research paper	Kim (2018)	The paper explores the various costs incurred by private and public entities during the setting up of wind energy farms
The Big Mexico Renewable Energy Report	Report	Yaneva et al. (2018)	The report evaluates how far Mexico has set up renewable energy projects
Emerging challenges in the global energy transition: a view from the frontlines	Book chapter	Baker (2019)	The research analyses the challenges faced by the global community when adopting renewable forms of energy
Ecologics: Wind and Power in the Anthropocene	Book	Howe (2019)	The erudite work evaluates how wind energy can be collected and turned into a source of power

The literature showed that wind energy, despite being novel, is fast gaining popularity in Mexico since 15 were selected in the period 2000-2010 and 43 in 2001-2019, for this research, because they met the methodological criteria established in this paper. Most scholars argue that the growth of the wind energy industry started at the advent of President Felipe Calderon's tenure with the requisite resources being provided. The systematic review shows that more literature is required into the projects and potentially held by Mexico. Addendum to this, the main challenges highlighted in the researches are not entirely substantial thereby leaving questions to be answered.

3.1. Current and Potential Wind Energy Projects in Mexico

Despite being nation that is rich in energy resources that are fossil fuel oriented, Mexico lacks the requisite resources that can be used in their extraction (GWEC Global Wind Energy Council, 2005; Farchy, 2007). Global Wind Energy Council (2014) indicates that the nation is still dependent on the use of conventional energy sources that help them in meeting their inherent demand and supply rates (Global Wind Energy Council, 2014; Federal Government of Mexico, 2013). Summations from the systematic literature review shows that the Mexican government estimates that the setting up of renewable energy systems is bound to mitigate the emission of over 700 million tons of greenhouse gases (Cadenas & Rivera, 2009; Howe, 2019; ANES, 2000). Cadenas and Rivera (2009) argue that the implementation of the schemes has gone a long way in enhancing economic prosperity as well as the advancement of the society in the short- and long-term period (Bonetto, 2010).

The growing interest in wind energy is, however, hindered by the fact that other forms of renewable energy are preferred due to their efficiency. Wood, Lozano Medecigo, Romero-Hernandez and Romero-Hernandez (2012) show that renewable energy sources like hydropower take up 74.3% of the national economy with geothermal power constituting 13.6%. Wind power comes in third at a percentile rate of 7.7%, with solar energy being set at 0.1% (Wood et al., 2012; Aitken, 2010b). The first-ever wind power project in the nation was set up in 1994, with the installation capacity being at 1.57 MW (Appendini et al., 2017; Appendini, Torres-Freyermuth, Salles, López-González, & Mendoza, 2014). The government at the time was not well versed in the benefits of the system, with the second wind project being set up in 2006 at the advent of Felipe Calderon's presidency (Cardona, 2013). The administration of President Felipe Calderón was at the forefront of ensuring that the nation taps all the necessary resources it has at its disposal for renewable energy generation (Elizalde Baltierra et al., 2011).

Substantive results show that the electricity generated from wind energy in the nation during his tenure has shown an average annual growth rate between 2002 and 2012 of 85.1%, which equals to 3,298 GWh. Furthermore, scholars argue that the installed capacity of wind energy resources was at 71,000 MW in 2013, with the numbers being expected to increase over the years (Veysey et al., 2016; Worldwide Electricity Production from Renewable Energy Sources, 2013). The nation has also witnessed continued interest from potential investors with Veysey et al. (2016), stating that it has heightened levels of untapped potential.

As it stands today, the nation has over 1000 wind turbines, which have allowed it to reach an accumulative capacity of close to 2000 MW (Landa, 2011). Its average capacity factor has increased by 30% since 2006, with expectations from practitioners showing that the wind energy capacity will increase to over 10,000 MW by the start of 2024 (Enríquez, 2014). This increase in the wind energy capacity will be sparked by an influx in the number of projects set up by the government and will be aimed towards meeting the national demand for energy (Cadenas & Rivera, 2010; Cadenas & Rivera, 2009).

Wood et al. (2012) identify the Eurus Wind farm as one of the notable energy projects that can help the government in the attainment of its overarching goals. The wind farm churns an average of 990 GWh of energy annually, which in turn, prevents the emission of close to 700,000 tons of carbon dioxide (Wood et al., 2012; Cadenas Tovar and Saldívar Urquiza, 2007). The wind farm is cited for having a positive interaction with its social

environment, thus making it easy for the parent company to utilize it without any hassles whatsoever (Baker, 2016).

A diachronic analysis of the commencement date of the project shows that it was laid out during the tenure of Calderon with results indicating that the president set aside the necessary resources to see it through (Baker, 2016). The administration also identified a number of potential areas that are viable for the setting up of new wind energy projects (Reyes, 2011). The first area is located in the Chihuahua state, area with the production of a wind map in 2008, providing private investors with an insight into what the state holds (Organisation for Economic Co-operation and Development, 2017; Townshend, Fankhauser, Matthews, Feger, Liu, & Narciso, 2011).

Baker (2016) indicates that the area has a heightened level of potential with private investors only being allowed to set up wind turbines not exceeding 10 MW. The project is shown to be vital in minimizing the costs incurred by the national government in the provision of electricity to the people in the surrounding areas (Baker, 2019). Companies like the Preneal Energias have cited interest in the area with their long-term goal being the installation of over 800 turbines, which will allow for the production of 2,000 MW worth of energy.

The second area with potential is situated in Coahuila state, which, despite lacking any wind projects, has benefitted largely from the wind energy boom. The third area is located at the Nuevo Leon state, which uses the same resources for the generation of wind as Tamaulipas. The national government previously showed interest in the local government's potential when it evaluated the patterns of wind apparent in the municipalities of Guadalupe and Santa Catarina (Wood et al., 2012). The state government then sought financing from the ESM firm, which prepared at least 48 million that would help in installing 2.6 MW turbines in the area. The energy from the plant would provide electricity to 4 municipalities in the vicinity (Cadenas & Rivera, 2009; Neij & Andersen, 2012).

The fourth state is Tamaulipas, with the state government set up a plan that allows for the construction of a 161 MW wind facility, which will be supplied with energy from 70 turbines. The El Porvenir Wind Park in the state started construction in 2012, with a 54 MW turbine being put in place (Wood et al., 2012; Vance, 2012). The national government provided the parent company with the necessary funds making it the first-ever wind project to be fully financed by the administration without any external investors.

3.2. Challenges facing wind energy project implementation

Despite the numerous strides made by the Mexican government towards the setting up of wind energy projects, the plans have been affected by external exigencies. The first exigency is politically motivated with the lack of stability in most of the identified areas, making it hard for the government to set up the facilities (Admiraal et al., 2015; Federal Government of Mexico, 2013; Jenkins, McCauley, Heffron, & Stephan, 2014). Furthermore, there is a lack of effective communication channels between the municipal, state, and federal governments, which leads to a lack of implementation (Oceransky, 2009). SEMARNAT-INECC (2016) argues that most government institutions in the nation have refused to back the development of wind projects citing personal and state reasons (Tovilla and Buirra, 2015; Liebe, Bartczak, & Meyerhoff, 2017; Lucas, Leidreiter, & Muñoz Cabré, 2017; Hoffmann, 2012).

The second influence stems from the lack of communication between private investors and the communities (SEMARNAT-INECC, 2016). Wood et al. (2012) denote that most companies find it hard to communicate and negotiate with the community when trying to set up projects. This leads to the deals breaking down, thereby affecting the implementation process. Social influences come in third with the communities not agreeing with the stakeholders as they find them not worthy of being trusted (Lokey, 2009; Pasqualetti, 2002; Sanchez, 2007). There is a general consensus among most communities in the identified areas that the wind projects will disrupt their lifestyles, thereby meaning that they cannot agree for the companies to set them up (Zárate-Toledo, Patiño, & Fraga, 2019; Aitken, 2010b).

Activists have thus far propped up with the communities backing them. The clarion calls from the groups show a widespread mistrust against the wind farm projects. Aitken (2010b) argues that the activists raised issues such as land ownership as well as the communal sharing of land. The traditions of most Mexican communities require the government to respect their land and how it is used or shared (Baker, 2019; Baker, 2016; Vietor & Sheldahl-Thomason, 2017). This means that the communities will be paid with the due basis being drawn on the power generated in terms of plots of land and hectares (Terwindt & Schliemann, 2017; Aitken, 2010b). The revenues would be shared equally without any corruption involved. Such an ideology did not sit well with most of the private companies leading to some projects stalling. The activists also indicate that the turbines lead to noise and aesthetic pollution (Reyes, 2011; Dunlap, 2018; Avila-Calero, 2017). Comparisons drawn highlight that conventional forms of energy generation produce lower noise compared to wind energy. Lastly, wildlife activists denote that the turbine blades are dangerous with regard to local wildlife. Dunlap (2017) shows that many birds have been killed, as they tend to fly into the blades (Business & Human Rights Resource Centre, 2017).

The fourth challenge is based on the issue of social and economic inequality, with the government being unable to bridge the gap between the communities (Dunlap, 2017). This is detrimental to the overarching nature of the project as it requires a cohesive understanding between the parties involved for it to be successful (Borja, 2014). The fifth challenge is the issue of transmission challenges, with most of the wind energy projects lacking the necessary transmission lines that can help them in the supplying of energy. Surveys presented by Kim (2018) show that the government has taken over the monopoly when it comes to transmitting power as set in the constitution (Kim, 2018; Audefroy & Cabrera Sánchez, 2017). The state is accorded exclusivity with regards to the generation, transmitting, transforming as well as distributing wind energy when and if it is intended for the general public (Appendini et al., 2017; Appendini, et al., 2013). States like Baja California have it hard primarily because their wind energy projects are not connected to the national grid, which in turn leads to private consumers having to pay copious amounts of money for them to use the systems (Alemán-Nava et al., 2014).

3.3. Regulations

Burke and Stephens (2017) highlights that even though the national government has a constitutional-provided monopoly over the systems, they have formulated a myriad of regulations that are focused on the creation of a viable environment for every party involved (Burke & Stephens, 2017; World Bank Group, 2006). The first law is the General Law of Climate Change, which requires the government and private investors to set inspirational goals that can be achieved in the shortest time possible. The general law indicates that any new wind energy system has to help generate close to 35% of energy, which will minimize the number of emissions in the atmosphere by 50% (Mayer, 2014; Mayer, 2016; Perevochtchikova & André, 2017; Ross, 2017). The second law identified is the Law for the Use of Renewable Energy and Financing of Energy Transition, which provides private and public investors with the necessary incentives when and if they set up energy systems that will help in the achievement of the set goals and objectives. The law comes intact with economic and regulatory policy instruments that call for entities to work towards reducing their dependence on fossil fuels (Yaneva, Tisheva, & Tsanova, 2018).

The energy reform of 2013 is shown by Enríquez (2014) to have been vital in amending sections 25 through to 27 of the Mexican constitution, which then creates a conducive milieu for private investors (Enríquez, 2014; Romero-Paredes Rubio, Foster, Hanley, & Ross, 2003; Veysey et al., 2016). The reform was aimed at improving the number of wind projects in the nation, which would, in turn, spur economic growth. In addition, it also regulates the participation of private entities in the industry, with the government still having a monopoly over major structures (Romero-Hernández, Romero-Hernández, & Wood, 2013; Organisation for Economic Co-operation and Development, 2017). The law requires the government to plan and monitor any energy-related operations with a primal focus being drawn on the development of requirements that will be applied for low carbon technologies (Rennkamp, Haunss, Wongs, Ortega, & Casamadrid, 2017).

4. Conclusions

The key findings derived from the paper are that wind energy is fast growing in the nation as well as the fact that they have the tools and potential to harness and distribute the energy. The study also highlights that the implementation of wind energy will help in the reduction of fossil fuel demand rates and the costs incurred. The paper argues that the renewable energy systems will minimize the production of greenhouse gases in Mexico on top of enhancing economic prosperity and societal advancement. Social inequality, economic issues, activist claims, lack of communication and stability have all been identified as key challenges undermining wind energy project implementation in Mexico.

The paper is important in that it bridges the gap of knowledge when it comes to challenges facing wind energy. Furthermore, it shows that there are copious amounts of information focused on how the industry can grow into becoming a key force in Central America and the international community. Special emphasis is drawn by most researchers on the potential of over ten states in Mexico and how the government can use existing structures to harness wind energy.

The main implication of the research is that it provides scholars and practitioners with an overview into the potential of Mexico with regards to energy production and sustenance. The research undertakes an authoritative overview into the merits and demerits of the energy projects and how far the nation has come. This will inform research and practice into what needs to be avoided and what has to be implemented. In terms of the society, the preceding systemic review highlights the importance of working in tandem with the government for heightened efficiency and productivity. The review denotes that conflicts between the government and its people oft have a negated impact on the implementation process of wind energy plans.

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