MSc Dissertation Thesis

MSc in Sustainable Energy Systems

Prospects for community wind projects on the Tehuantepec Isthmus, Oaxaca, Mexico

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Mission statement

Objective proposal:

This dissertation will aim to analyse the potential of Tehuantepec Isthmus communities to be drivers for wind energy project schemes in this region. The research will be conducted under an interdisciplinary perspective, taking into account the proper integration of the main wind energy actors in Mexico under community owned schemes and the financial, social and environmental feasibility of such projects.

Justification:

Wind generation projects are nowadays a polemic topic in Mexico's energy scenario. Mexican government it's strongly relying in the countries wind resources in order to achieve its objective of 50% of renewable electricity by 2050 according to the LAERFTE (Law for the use of renewable resources and financing energy transition). This is a big challenge as 83.9% of the country electricity is generated by non-renewable sources at the moment, being hydroelectric energy the one with the biggest share with 12.9 %.

Under this context Mexico policy initiated great investments and opened the market to private developers in order to create wind energy projects. The installed capacity grew rapidly going from 86.8 MW in 2011 to 597 MW on 2012 and is forecasted to continue growing until 7,460 MW are installed on 2027 meaning an increment of 8,500% of installed capacity in 16 years.

According to the AMDEE or Mexican Association for wind Energy only Oaxaca has the potential for installing 10,000 MW of wind power. And within Oaxaca we can find the Tehuantepec Isthmus region with an average wind speed of 10 m/s at 50 meters of altitude, and an average capacity factor of 42%. Because of this around 90% of the wind projects have been placed until now in the Istmo de Tehuantepec region in Oaxaca.

In this specific area there had been many conflicts between the communities and developers. However, it seems to be that the communities are not inherently against wind projects but they are not pleased with the way wind project schemes had been arranged. The most common complaints from the actors involved in the wind energy production scene seem to be:

1. Low compensation for renting the land in 30 years contracts. Normally the rent for wind farms in Mexico is 10 to 20 times less than the international standards.
2. Communities or land owners feel insecure about developer's negatives to share information about electricity sales. Some of the contracts between developers and landowners are based on a share of the electricity being sold to the grid.

3. Misinformation is one of the most common issues reported by the CONACyT study in the Isthmus. Most of the developers focus on the economic advantages of renting the land letting aside the possible implications for the communities, creating wrong expectations and further frustration. There are also reports of contracts being celebrated without legal representatives, or just between developers and community "representatives". The law demands for translators if some of the persons doesn't speak Spanish but many times this kind of contracts are signed without any translators so people which speaks other languages are not able to understand what they are signing.
4. Wind energy projects produce economic growth for communities mainly under the construction part, which last in average one year. However after this, the specialized jobs are very few and normally are taken by persons outside the community because of its technical nature.
5. Social degradation through the unequal distribution of wealth generated by the rent of turbines in the Ejido community. Ejidos are structured in a highly participative decision making scheme, which most of the times involves the whole community in the decision making process. Lately Mexico's government launched a program in order for individuals to certificate their private lands, so contracts with developers could be made in a much more efficient way. However this caused internal problems in the community as the wealth of the wind turbines deployed inside the COMMUNITY land are being hold by particular individuals instead of the whole community.
6. The traditional economic activities of the Isthmus are agriculture and cattling. Without the land many of these communities have experienced strong transformation processes, which normally tends to disrupt the community scheme, promoting social degradation and immigration.
7. Most of the benefits of the renewable electricity being generated by the wind turbines are not capitalized by the community. Normally these projects are orientated to self-supply for big industries and not for providing clean electricity to the general grid or public service. Also, as the generation permissions are owned totally by developers the community don't get any benefits from emission reduction certificates or clean energy generation.

Discussion:

These issues have created a complex and difficult scenario for developing wind energy projects in the Tehuantepec Isthmus. On the last years many communities began mobilizations against private wind energy projects on the Isthmus, leaving until now many injured people and one reported casualty.

The best example is the largest wind project programed in Latin-American, in which the firm "Marena Renovables" was planning to install a 396MW wind farm in the Tehuantepec Isthmus. The future of this project remains uncertain until now after the strong opposition of communities. Many international civil

organizations, such as Peace Brigades International and Greenpeace are highlighting the human rights violations related to these projects execution.

Wind energy development it's currently a banner for big scale renewable energy projects in Mexico. This is why creating integrative project schemes which involves communities, developers, government and international founding institutions will not only mean feasible local projects but also could assure long-term healthy development of renewable energy projects in the country, increasing the probabilities to achieve the national targets of LAERFTE.

Communities are not inherently against wind projects, moreover they have reported many beneficial economic impacts just from renting their lands (even if it's 10 to 20 times below the international standards). On 2009 the first community wind project was proposed to the CFE (Federal Electricity Commission) and it was also rejected due to the legal impossibility for communities to sell energy to the general grid. Until now this 100MW contract for distribution is being held until the legislation clarifies the status of community electricity generation in Mexico.

It has being proved during the short experience of wind energy in Mexico, that the support and welfare of local communities is fundamental for the project success and more important for the possibility of generating future projects. Under this context the community project scheme has been suggested by some independent and governmental analysers as a strong possibility to drive wind energy projects in Mexico. Normally public acceptance for renewable community projects is much higher than those coming from private developers or the state.

The Ejido structure and social land ownership, which prevails in the Tehuantepec Isthmus, could be used as an easy way to involve the whole community in energy project generation schemes instead of involving several unarticulated private landowners and creating social disruptions. By letting communities to take a major role in managing projects and the natural resources of their lands we could also inherently solve some of the main problems existing in the Tehuantepec Isthmus Projects.

Conflicts between developers and communities, lack of information about the plant energy production and total revenues, misinformation because of idiomatic differences, impacts during the construction phase involving environmental externalities or important local roads for communication. All of these negative impacts which now affects the wind energy industry development in Mexico could be diminished or eliminated in community owned projects as the community itself would own and the project and therefore would be involved since the very begging in the planning stage.

This will also impact in the general welfare of the community as the resources would be owned and managed by the Ejido or the community instead of being held privately. This could also imply many other indirect positive effects such as cheap and clean energy generation for supplying both: communities or private industry, economic development in the community through reinvestment of the

revenues in public infrastructure for the municipality: health clinics, roads, schools, technical institutions focused on wind energy management such as the UNISTMO university located in the Isthmus region who has now three master programs all related with renewable energy management.

These positive effects at a local level could settle the bases for further national level projects in other parts of the country, incentivizing people to get involve and invest in renewable energies and reframing renewable energy production not just as some distant process unrelated to its social contexts. But could in fact create a new potential way of life for the isthmus communities which could mean a driver for a sustainable scheme of development in the Tehuantepec Region.

The possibility to unlock the transformation potential of renewable energies to communities could help the government to meet the target objectives for renewable electricity production at the same time it addresses other important issues as energy security, energy cost, energy empowerment and accessibility and create suitable conditions for a healthy economic development in some of the most isolated regions of the country.

Research focus:

In order to create feasible renewable energy projects not only the technical, economic and environmental aspects should be taken in to account, but also how the society influences in the further development of these projects has proved to be really important on Mexico's context.

This dissertation should aim to analyse not only the technical and economic feasibility of the possible projects (which has been intensively studied by private companies over years) but also how Ejidos social structure have special potential in order to act as drivers for renewable energy projects.

This involves the research of a wide basic requirements to develop community projects in Mexico's context:

1. Possible financial mechanisms which would allow communities to develop energy projects. Under these contexts international founding institutions such as the World Bank or the Inter-American Development Bank are important actors, such as other financial institutions available to give financial credit to the communities in order to develop these projects. Even relations with private developers could be taken into account for further scheme analysis.
2. Schemes as Community Interest Company (CIC) Limited by Guarantee, or other similar still non-existent in Mexico. This allows communities to create and manage energy projects and sell electricity to the grid. Therefore, legalization of community energy projects in the Mexican constitution is crucial and its present process of validation and further implications should be analysed. Currently these has come to revision, since the case of the Ixtepec Community project by the YANSA group in 2012, as many communities are now putting great pressure on the government to accept this regulations.

3. Analyse not only the financial, environmental and technical feasibility of these projects but also the beneficial indirect effects of community project schemes in the Tehuantepec Isthmus and the region such as economic development, improvement of life quality and social infrastructure such as health clinics, public roads, public light system, technical universities, etc.
4. Analyse how the expertise and knowledge of communities about their direct environment could improve the project outcomes, from the early stages of planning until decommission, diminishing the possible social, economic and environmental local impacts.
5. Analyse the way in which the different actors of Mexico wind energy scene could create synergies and work towards common objectives in a long-term win-win approach where communities could remain owners of their land and resources becoming drivers for renewable energies in Mexico, helping towards the government targets of renewable electricity production, involving international finance institutions and also benefiting the private sector being consulted (or possible partners???) with developers and also incentivizing a manufacturing wind energy industry as it happen with the solar energy manufacturing industry in which Mexico now is leader in Latin-America.

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ABSTRACT OF THESIS

The international shift towards energy systems based on cheap, clean native renewable resources is leading countries all over the world to restructure its energy regimes. Mexico has officially joined to this crusade, aiming to achieve 50% of clean electricity production by 2050. (Mexico Government b 2013) The country aims for installing 11-15 GW of wind energy by 2027, (SENER a 2013, AMDEE 2015) while struggles for the economic, technic and human resources to succeed on the greatest energy reform since the last 77 years.

This work shows how a "too much, too deregulated" early development on Tehuantepec Isthmus wind energy has derived on increased tensions between stakeholders, creating a conflictive regional scenario and endangering the access to half of the wind energy resources in the country. (NREL 2003)

This research, supported by field work and international stakeholders interviews, assess the current barriers and opportunities for Tehuantepec Isthmus communities to become drivers for community wind energy projects, concluding that such community wind energy projects are not only a feasible solution for the current conflictive wind energy scenario. Moreover, they have the potential to create inclusive business schemes, aligning different stakeholder objectives, promoting wind energy acceptance and regional development through economic diversification.

Statement of Originality

'I declare that this thesis is my original work, except where stated otherwise. This thesis has never been submitted for any degree or examination to other university.'

Signed: *Adolfo Mejía Montero*

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List of Acronyms and Abbreviations

AEE- Spanish Wind Energy Association

AMDEE- Mexican Wind Energy Association

BID- Inter-American Development Bank

CCC- Civic Collaboration Centre

CDI- National Commission for Indigenous communities Development

CDM- Clean Development Mechanism

CDPIM- Dialogue commission with Mexican Indigenous Commission

CENACE- National Centre for Energy Control

CESOP- Social Studies and Public Opinion Centre

CFE- Electricity Federal Commission

CIEDD-Statistical and documental information centre for development

CONABIO- Biodiversity National Council

CONAFOR-National Forestry Commission

CONASAMI- National Minimum Salary Commission

CONECA- National Coordination of Ejidos and Agrarian Communities

CONEVAL-National Council for Social Development Policy Evaluation

CRE- Energy Regulation Commission

EWEA- European Wind Energy Association

FTE- Energy Workers Front

ILO- International Labour Organization

IMCO

INEGI-National Institute for Statistics and Geography

INER- National Institute for Renewable Energies

LAERFTE- Law for renewable energy and energy transition financing

NREL- National Renewable Energy Laboratory

PBI- Peace Brigades International

PEMEX- Mexican Oil

PNUD- United Nation Development program

PROCEDE- Ejidal Rights and Terrain Titling Certification Program

PRODESC- Social, Cultural and Economic Right Program

SEMARNAT- Natural Resources and Environment Secretariat

SENER- Energy Secretariat

UAM- Mexico Autonomous University

UNAM- Mexico National Autonomous University

US EIA- United States Energy Information Agency

Introduction

I. Energy transition worldwide and Mexican context: Comparative analysis on the development of renewable energies

Only during the second half of the XX century humanity its beginning to understand the true magnitude of the anthropogenic stress on global ecosystems. On 1952 London one of the emblematic cities which gave birth to the industrial revolution suffered the "Great Smoke" which was responsible for silently killing around 4,000 people overnight (UK GOV 2015), and giving one of the first attention calls for jet another coming revolution.

On 1972 the Massachusetts Institute of Technology, under the finance of the Rome Group, shocked the world by publishing "The limits of growth" (Meadows *et al.* 1972) which showed the limits of modern civilizations due to environmental and physical restraints, challenging the prevailing anthropocentric paradigms and axioms of neoclassical economy in which global development relied at the moment.

It wasn't until 1983 with the Brundtland commission in Stockholm Sweden, when member countries of the UN took the environmental issues as a proprietary topic on the global agenda.

Almost 40 years have passed since then, and until now, humanity as whole remains in this struggle, battling on an infinite different battlefronts over the world, taking under consideration an overwhelming variety of economic, social and environmental landscapes.

Under this highly dynamic panorama and during the last decades renewable energy generation its showing to be one of the most outstanding and successful examples of sustainable productive schemes. Due to the high investment on the sector and its consequent technologic development, this sector has experienced a rapid expansion which on a general basis has allowed countries to increase energy security, decrease Greenhouse Gas Emissions (GGE) and reduce long term electricity costs by relaying on clean native renewable energy resources instead of the volatile economic nature of scarce fossil fuels.

The success of renewable energy worldwide has been clearly evidenced since 2013, when 56% of the new installed capacity worldwide came from renewable sources, beating the fossil energy for the first time.(REN21 2014) This trend has not only continued, but increased on 2014 with 58.5% of the total new capacity installed coming from renewable sources. On 2014, despite the rise on energy use and for the first time on four decades, the world registered stable carbon emissions while the global economy grew. This stabilisation has been attributed to an increase on the penetration of renewable energies on the energy matrix along with energy efficiency improvements. (REN21 2015)

Under this panorama, Mexico, which is the 15th largest economy of the world, home of the once richest man on the world (Forbes 2014), with 52.3% of its population living under the poverty line (The World Bank 2012), joined to the crusade for decreasing emissions.

Mexico has proven to possess enough natural renewable resources to ensure avoiding these lock-ins and engaging on a healthy and strong renewable energy transition as we can see on **table 1**.

TableI.1. Table containing the possible, probable and proved renewable energy resources in Mexico (SENER a, 2013)

Electric generation potential using renewable energies

(GWh year)

Resources	Geothermal	Mini Hydraulic	Wind	Solar	Biomass
Possible	16,165	-	87,600	6,500,000	11,485
Probable	95,569	1,805	9,597	-	391
Proved	892	1,365	9,789	542	579

Source: National inventory of renewable energies

Based on the strong position which renewable native resources gives to the country and the global landscape which calls for regional leaders in order to sum efforts, Mexico is now part of the SE4ALL (Sustainable Energy for All) programme of the UN, which aims to compromise the country members for achieving three main objectives:

-Provide total cover for electric energy worldwide by 2030

-Double renewable energy importance on the global energy matrix

-Double the global energy rate of energy efficiency

Mexico currently reports 99% of its population with access to electricity. (SENERa 2013) Therefore, policies are focusing on increasing renewable energy use and energy efficiency. For this research we will focus on renewable energy increase and penetration on the energy matrix.

Table 2 shows us the current importance of renewable energy in Mexico.

TableI.2. Table showing the existing differences between Mexico, the global scenario and the leading countries on renewable energy penetration on the electricity production on 2011. (SENERa 2013) *The data from Denmark was a correction introduced by the author as the document from SENER showed Spain as the leader with 14.56%

	Hydro (%)	Wind (%)	Photovoltaic (%)	Geothermal (%)
Mexico	12.3	0.56	0.01	2.2
Leader Country	Brazil (80.6)	Denmark (39.00)*	Germany (3.18)	USA(0.41)
Worldwide	16.1	1.96	0.29	0.312

By looking at **table I.1,** of renewable energy sources available in the country, and **table I.2,** which shows current status of renewable energy production in Mexico, it's evident that the country encloses an enormous potential for a strong energy transition towards a cleaner energy regime.

However, Mexico as many other developing economies lacks the economic, human and technologic resources in order to access to these windows of opportunities. This ambitious transition also struggles with the complex and unstable landscape which characterises most Latin-American countries. These constitute an excellent opportunity for incurring into a too much too soon, or too much to deregulated scenario, which could endanger the creation of a long term truly sustainable energy regime.

The renewable energy landscape, which early stage is being based mostly on wind energy projects led by private companies, has already show the first symptoms through increasing conflicts, alerting about lack of regulation. These processes are subtracting momentum for the transition process, compromising the national targets for diminish fossil fuel dependency, and losing an important opportunity for creating strong regional development based on renewable energy in some of the most deprived areas in Mexico.

This is scenario of abundance of natural resources, lack of regulation, engagement and opportunities and a market being cornered by big international companies is a common place on Latin-American countries. However, there are many different stakeholders which could help the market and the industry to avoid this "curse of abundance" which seems to tie Latin American economies to a mere extractive workforce in order to provide primary resources or revenues for more technologically advantaged countries.

The key probably rests on the opportunity which the processes of global energy transition and national energy reform offer in order to merge objectives, by creating synergy between different stakeholders integrating the sociotechnical system. This could possibly led Mexico towards a sustainable, long term energy regime, which besides enabling the country to attain its objectives for renewable energy generation, also promotes a strong long-lasting structure for regional economic and social development.

II. Dissertation objectives and questions

This dissertation will analyse the current landscape of wind energy on the Tehuantepec Isthmus in order to assess the potential of Tehuantepec Isthmus communities to become drivers for wind energy project schemes. The research will be conducted taking into account the main wind energy stakeholders in Mexico and its possible role under community owned schemes, taking into consideration the strengths, weaknesses, opportunities and threatens for developing such projects.

1. Does community wind energy projects represent a feasible solution for the current conflictive landscape of wind energy in the Tehuantepec Isthmus, Oaxaca?

2. Could community energy projects act as drivers in order to merge common objectives from stakeholders on wind energy sector towards a healthy and inclusive energy market on the Tehuantepec Isthmus, Oaxaca?

3. Which are the main strength, weaknesses, opportunities and barriers involved on the development of community wind energy projects on the Tehuantepec Isthmus, Oaxaca?

4. It would be possible for these community wind energy projects to act as motors for economic diversification and regional development?

5. How does community projects worldwide can benefit from the experience of Tehuantepec Isthmus, Oaxaca?

III. Dissertation structure

Chapter 1 is constituted by an introductory literature review in order to give context to the research. Firstly on an historic and social introduction for understanding the ongoing energy reform process which the country is experiencing. Second, a geographic delimitation of the study region and the main social, economic and environmental characteristics, considered relevant for the research development. On this section the wind energy resources will be also described.

The literature review continues describing briefly the evolution of wind energy industry on the Tehuantepec Isthmus, its consequences on the energy regime, Isthmus population and the aftermaths of such processes. Finally, the chapter will end with a brief description of the current perception of wind energy which dominates on the Isthmus region.

Chapter 2 will describe briefly the methodology used on the present research work in order to obtain information and to get in touch with important Mexican stakeholders which are involved on the energy transition process or into the still on-going projects of community wind energy projects in Mexico. The comparative analysis bases used for the discussion would also be presented.

On chapter 3 the concept and role of community energy projects will be described, taking into account specific study cases from different perspectives: Countries which have been successful on integrating of community ownership schemes under the energy regime and its consequences. Developed countries which haven't been successful to integrate communities on the energy regime, but have strong policy frameworks and programs to achieve such objectives. And developing countries following two approaches: the ones developing policies which facilitates development of community ownership schemes and countries without such policies.

Chapter 4 will aim to use the information given on the last two chapters in order to create a comparative analysis and discuss the possibility for developing community projects in Mexico as a feasible solution for the conflictive existing scenario in the country and as motors for regional development on historic isolated and excluded communities. An analysis about the strategic advantages existing on the region, and how these projects could also mean an opportunity for merging objectives between different actors from the Mexican wind energy industry and creating win-win schemes in order to overcome important barriers which are at the moment limiting or slowing down the energy transition process in Mexico.

Finally the dissertation will close with a conclusion chapter followed by the appendix.

Chapter1.Literature Review

1.1- Mexico's energy regime context

1.1.1- Government, fossil resources and development: The pre reform Mexican energy regime landscape.

Mexico's regulatory and energy landscape is evolving dramatically due to the greatest process of reform since the fossil fuel industry nationalization 77 years ago. The current process of reform aims to give greater access to private and foreign investors to the energy sector.

Many different countries are currently immersed or have being through the same process of liberalization during the last decades. However, Mexico characterises for a historic strong popular opposition against national market and fossil resources liberalization.

This process response to a long historic process which has its roots on the Mexican revolution of 1910. This was a popular armed movement aiming mainly to defeat the prevailing 35 year dictatorship, to create a democratic political system and specially an agrarian reform towards a more equal scheme of lands and revenues distribution. This was a long and painful process which claimed the life of about 1.9 to 3.5 million people from 1910 to 1920. (McCaa 2001)

After this revolution process Mexican political landscape was highly unstable, Mexico sustains a record for a president lasting only 45 minutes on the presidential chair on February 19th, 1913. (UAM 2015) The revolutionary ideals behind the agrarian reform, and the new government influenced heavily on the structuration process of the modern Mexico's institutions.

As a result, in 1938 ex-general and president Lazaro Cárdenas del Rio claimed that the oil as the land must be property of the Mexican people, the government impulse a strong campaign involving population directly through fund rising into the nationalization process of the oil industry which was mostly on hands of USA and British companies. Short after the electric system was also nationalized in 1956, which state management scheme remained until only a couple years ago before the reform, with the CFE (Electricity Federal Commission) controlling almost every aspect of the electric market as it can be seen on figure 1.1. (Ovalle 2007)

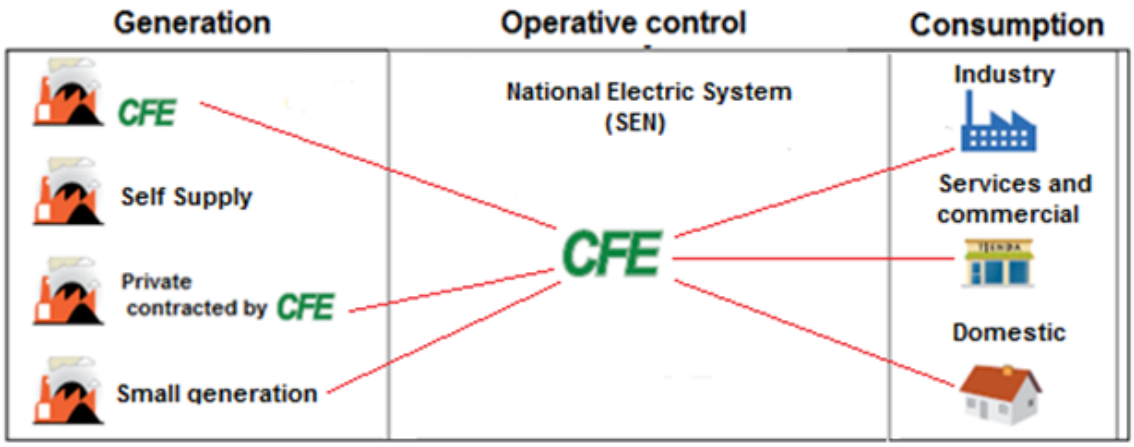


Figure1.1. Graphic representation of Mexico´s pre-reform energy market, adaptation from (Mexico Government 2014)

The following years of Mexican economy were known as "the Mexican miracle", where most of the infrastructure for the modern Mexico was built and GDP grew at a rate of 6% until the 60's, based on the revenues from the national oil industry (Hansen 1998). This process created one of the most endurable images of prosperity and good governance on Mexican history, and therefore created a strong bound between fossil resources, state owned companies and development, shaping the Mexican socio-cultural landscape until nowadays.

This bound means cultural and institutional lock-ins around the regime energy behaviour, affecting the build of momentum for the transition. However, at the same time this lock-ins could mean a protection veil against privatization processes which could affect general population. In developing regions, such

as Latin-America, population vulnerability is a key factor to analyse before letting the market take care about public goods and potentially affect general welfare.

As an example we have the privatization of Bolivian water system on 1999. This process resulted in high pricing problems for a vulnerable population, which caused riots and demonstrations. At the end the scenario turned to be unsustainable and the government took the control of water sector back (Coleman, 2012).This means an important lesson about the sociotechnical systems complexity and how the socio-cultural lock-ins related to public good markets can not only influence, but determine the success of these transitions.

It's because of this that under the current process of transition the Mexican government should provide the necessary regulatory mechanisms to define the ground for a healthy and competitive market, aiming always to protect the vulnerable population and also enabling them to access to the transition benefits.

1.1.2 Mexican energy regime reform process and its similarities with the UK

The UK went through an energy regime nationalization process shortly after Mexico, also after a major armed conflict: the Second World War. Aiming to strengthen energy security through direct control of native energy resources, to provide energy for a regenerating economy. (UK National Archives 1946)

However, this time is Mexico which is currently under an energy reform based on the "British Model" as we can see on **Figure 1.2**. As we saw, on the Mexican context this process must be strictly regulated to avoid negative impacts on a vulnerable population. At the same this process opens strategic opportunities for renewable energy and private-community based enterprises, meaning a change of paradigm for the general population, for which fossil resources and state owned companies are inherently bonded with a sense of national identity. (Fuentes 2007)

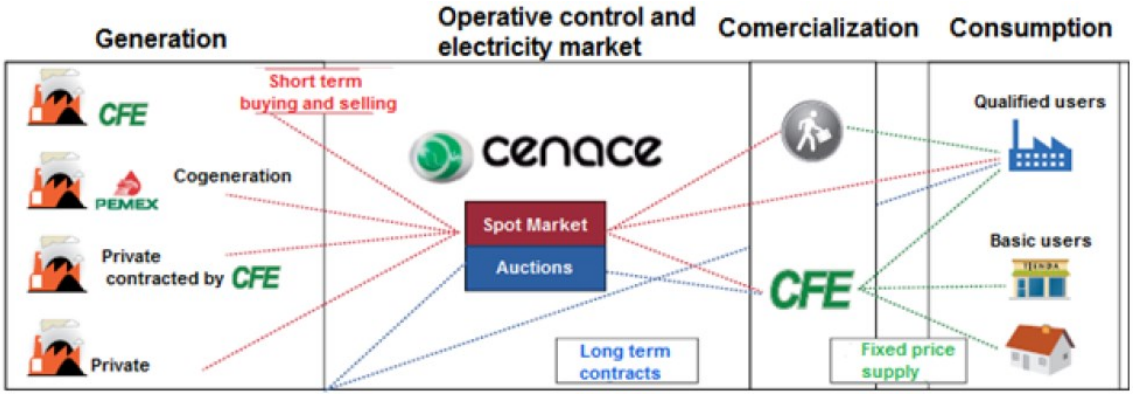


Figure1.2. Graphic representation of Mexico´s post-reform energy market, adaptation from (Mexico Government 2014)

The reform has being promoted strongly by the government and aims to bring resources from private and foreign actors, allowing them to act as drivers on the energy sector transition. However, Mexico can learn from the reform and renewable energy transition experience on the UK energy regime, always taking into account the remarkable differences between both countries landscapes. In this way Mexico could avoid mistakes, and effectively incentivize different stakeholders to engage on the energy transition process.

In UK the reform was followed by a "Dash for Gas". This process reduced electricity generation costs by replacing coal power plants with more efficient, and by the time cheap, gas plants (Pearson 2012). This also meant decreasing GGE and a reduction on costs of electricity generation because of low prices for natural gas at the moment.

The positive outcomes on the 90's have encouraged a second "dash for gas" on the UK. However, this has been considered as a carbon lock-in, inhibiting investment in new energy technologies in which UK has an strategic advantage, such as off shore wind, marine and CCS (Carbon Capture and storage). A "dash for smart gas", where gas will still be considered as an important component of the energy sector while the country develops the technological niches for using the opportunity windows that these strategic energy resources offer, has been pointed out as viable solution. (Bassy 2013)

In Mexico the "dash for gas" has also been the main energy transition, **Figure1.3**, even if it currently remains as a net gas importer with possible reserves on the top 10th of the world (US EIA 2013). Therefore, this "Dash for Gas" could led to energy security issues by increasing the dependency on foreign companies for gas extraction. This will also create a carbon lock-in which will slow down the achievement of its international targets on renewable energy installation.

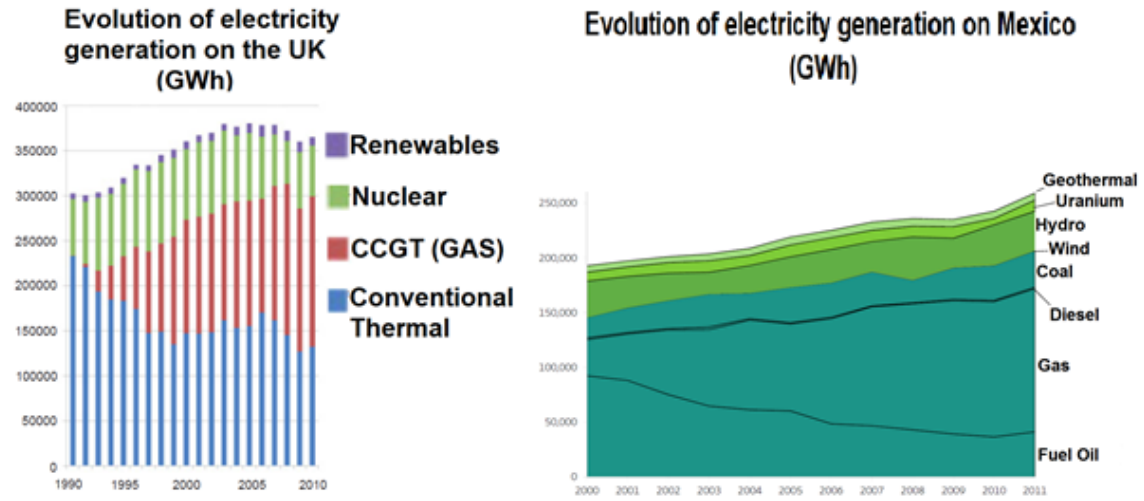


Figure1.3. Graphics showing the "Dash for gas" phenomenon in both UK and Mexico from (Pearson 2012) and (SENER 2012)

Mexico must use UK experience to build strategies and regulatory frameworks based on the national landscape, aiming to develop the technologic and institutional niches in order to open different windows of opportunities resting on the vast renewable resources for the stakeholders which could benefit from the reform process. In this way the country would avoid important lock-ins, using the existing political momentum and it's strategically position to avoid going through repeating processes of continuous liberalization and central planning, as in the case of UK. (Robinson 2013) This would create a more stable, democratic and healthy energy market inviting different private and civil stakeholders to join.

1.1.3 Mexico´s energy transition: Policy review, targets and prospects

Electricity generated by natural gas represented 50.0% of the total generation for public service on 2012, which accounts for 85.2% of the total electricity consumption in the country. This mean a dramatic increase from the 29.4% on 2002, showing the Mexican "dash for gas" impact. (SENERa 2013)

The regulatory policy frame for renewable energy began to be developed in 2008 with the LAERFTE (Law for renewable energy and energy transition financing). It aims to restrain electricity production by fossil fuels to 65% by 2024, 60% by 2035 and 50% by 2050. (Mexico Government b 2013)

Later in June of the same year the federal government released the General Law for Climate Change (LGCC), which also sets the target of producing 35% of electricity by clean sources on 2024. (Mexico Government a 2012)

Current prospects for renewable energy are to install 21,000 MW of renewable energy from 2013 to 2027. This means the whole electricity capacity of developed European countries such as Belgium. (USA EIA 2012)

Currently on the country the projects which have a smaller capacity than 500kW are able to connect directly to the grid without permits from the Electricity Regulation Commission (CRE), these projects would only need to accomplish CFE technic normativity. However, larger projects need a long process in order to receive an interconnection contract to the general grid or a self-supply scheme.

Regulations for accessing to an interconnection contract aim to accomplish regulations for environmental impact, land ownership, historic heritage, interconnection feasibility studies, water usage, and financial contracts. However, all of these policies are still under development and most of them do not consider social impacts or potential for regional development.

One of the greater challenges faced by renewable energy in Mexico, especially in remote areas such as the Tehuantepec Isthmus is the lack of grid connectivity. Since 2007 the government, through the CFE, created an open season process for addressing this issue for wind energy projects. (SE 2013)

Under this scheme, the CFE estimates the electric capacity to be installed on accordance to the national energy plan. This capacity is then designated by CFE to different companies which compete under a

bidding process to offer the lowest cost for electricity to secure an interconnection contract. Companies are therefore compromised to pay for the transmission capacity used on transmission lines and associated substations and CFE builds the required infrastructure. (ICEX 2009)

Under this scheme CFE assures low electricity prices at the same time it controls directly the new transmission capacity installed on the country. However, the requirements for allowing the participation of different stakeholders need to be developed, as right now this is an important barrier for different stake holders, others than transnational companies, to participate on the open season.

1.2- Wind and People: Tehuantepec Isthmus and its role in fulfilling wind energy prospects.

The region known as Tehuantepec Isthmus Mexico is the narrowest part across the country, where only 220 km of land divides the Pacific Ocean on the west from the Atlantic Ocean on the east. However, narrow would be the last adjective in order to describe Tehuantepec, which is one of the richest in natural resources, history and cultural diversity.

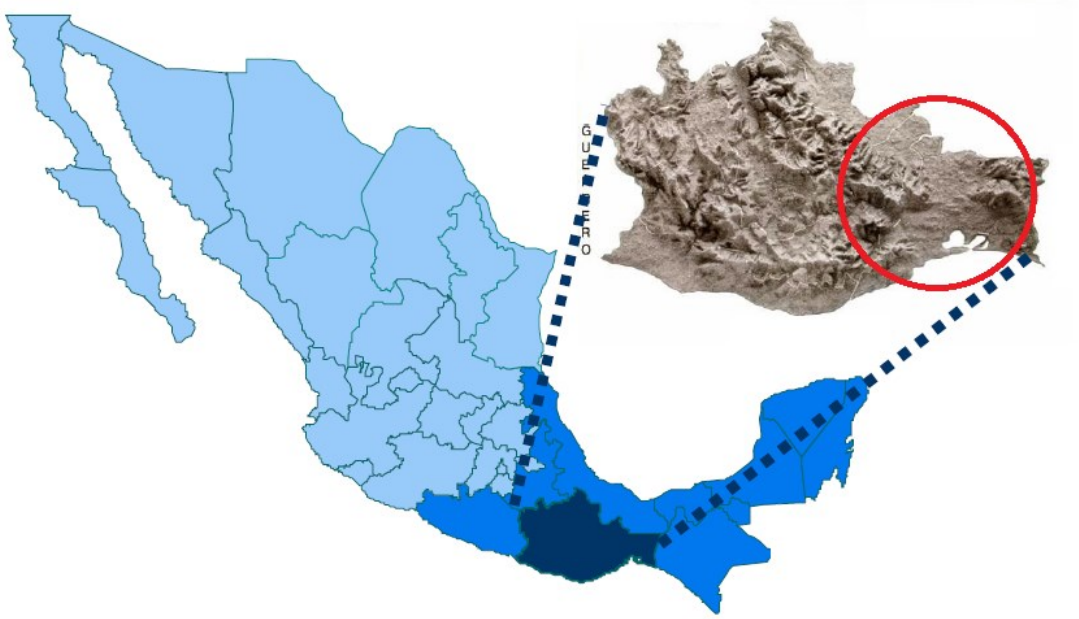


Figure1.4. Map of the Mexican Republic and geographic delimitation of the study area. From (SCT 2006)

According to the AMDEE (Mexican Wind Energy Association) 40% of the renewable energy to fulfil the LAERFTE targets depend on wind energy, which are mostly located at the Tehuantepec Isthmus. It's expected for 9,800 MW of wind energy to be still installed in order to reach the target for 12,300 MW by 2027. (SENERa 2013)

However, beyond the technical resources for wind energy this region possess a very complex social, cultural and economic landscape in which many different indigenous communities interact on the cities, communities and rich ecosystems. Avoiding the proper integration of these very complex communities on the energy transition process has been one of the main causes for conflicts in the region.

1.2.1- An introduction the Tehuantepec Isthmus region

Society and land ownership

Since Pre-Hispanic times the Tehuantepec Isthmus has been of strategical importance for commerce in Mesoamerica, coming along with cultural and social exchange which across the centuries forged one of the richest regions in Mexico, expressed through the multiple indigenous groups, organizations and structures which constitute this microcosm. (Gomez 2008)

This fractal integrated by hundreds of communities, languages, costumes and autonomous organizational structures has impacted on the political division of the Oaxaca state municipalities. Oaxaca, is now the state with the greatest number of municipalities, where 3.8 million inhabitants are distributed on 570 municipalities, in contrast of Mexico DF (The capital of the country) which 9 million inhabitants are distributed in 16 municipalities. (INEGI a 2010)

However, as in many Latin-American countries indigenous communities live mostly on disadvantageous conditions, the average Human Development Index (HDI) in Mexico is 0.756, while in Oaxaca is about 0.681 (PNUD 2014). In average a Mexican citizen completes 9 years of formal education, while in Oaxaca the average is about 6.9 (INEGI b 2010). This influences on the percentage of illiterate population which in Mexico is around 6.9%, whilst in Oaxaca reaches 16.3%, especially on vulnerable groups such as women (19.9%) or indigenous communities (around 31.7%, reaching even 76% in some cases).(CIEDD 2012)

The Tehuantepec Isthmus represents the second region with the highest population on Oaxaca State as it counts with 596 thousand inhabitants distributed on 41 municipalities and two mayor municipal entities: Juchitan de Zaragoza and Tehuantepec (INEGI 2010). The Isthmus has 22 municipalities considered as indigenous, 3 with indigenous presence and 16 has dispersed indigenous population. (CDI 2006)

This has a great influence on the Isthmus languages. Only on the Isthmus region there are around 30 languages, with 16 of them as main languages, used by 601,400 people, which represents around 18.69% of the total Isthmus population (Not the Oaxaca Isthmus but the extended Isthmus region which also includes regions from the states of Chiapas, Veracruz and Tabasco). (Gomez 2008)

On the Oaxaca Isthmus around 169 thousand people older than 5 years speak an indigenous language (28% of the population), moreover, 149 thousand of these people speak also Spanish, meaning that 25% of the Isthmus population is bilingual, against 9.05% on the national level (Valencia 2011, FMB 2011)

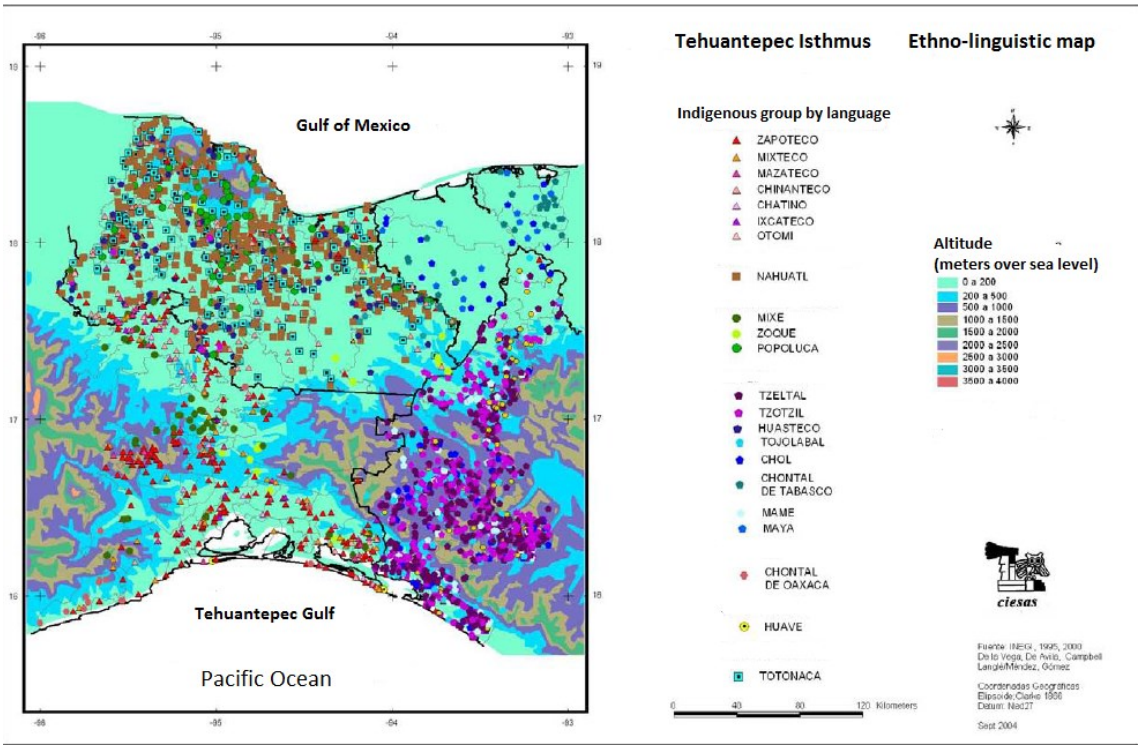


Figure1.5. Ethno-linguistic map from the Tehuantepec Isthmus, showing the great cultural diversity in the region. From (Gomez 2005)

Even in the presence of strong regulatory programs financed by the government in order to regularize and register the land across the country, Oaxaca territory remains almost exclusively registered as social territory. (PROCEDE 2003)

It's of vital importance to understand that in Mexico, due to the strong presence of indigenous culture, "Communities" are not understood as in most of the countries, as simply a group of people living in the same place or having a particular characteristic in common. Communities in Mexico are special entities with specific rights, local authorities and considerations under the law. There exists essentially two

different schemes for “Communities” which are based on social land according to the INEGI (National Institute for Geography and Statistics):

Ejido: Is the portion of land, forest or water which the government gave to a peasant community or population for its benefit. The Ejido territories are non-seizable, imprescriptible and inalienable.

Community: Is the population nucleus integrated by the lands, forests and water which were recognized or restored to such community, and which its population has been owner since unmemorable times under community costumes and practices.

The central demand from indigenous communities in Mexico has been always focused on the defence of territories and maintaining its internal governance structures. (INEGI 2015) This issue has historically defined communities as the Ejido is the result of land distribution under the agrarian reform. However, communities results as a restitution of lands which where expropriated on the dictatorship previous to Mexican revolution, from a population which on the past used to manage this land under traditional community uses and customs, generally indigenous. (Renteria 2011)

From the 9,536,400 ha on Oaxaca, around 7,174,154 ha (75.23% of the total) are registered as social property under the control of ejidos or communities. Under this context the land registered under the control of communities is 76.2% of the total social property. (Fernandez 2002) Therefore, we are mainly focusing the research on communities.

This community owned land is under the control of a basic community structure known as “poligono”, which has a local authority structure recognized by the Mexican government on the 27 article of the constitution(Mexican Government 2015) and the agrarian law.(Mexican Government 2012)

This local authority gathers people from the community under an assembly, integrated by the members and is in charge of the consulting and decision making processes. However, many kinds of assemblies can exist. Depending on the quorum and the assistants the power that this particular assembly has in order to approve decisions which affects the whole community also changes, as enounced on the article 23 of the agrarian law (Mexican Government b 2012). For instance in order to approve an agreement which will affect the whole community the law asks for a “hard” assembly or legally known as Assemblies for a qualified majority (Which has to gather at least 90% of the community representatives).These special Assemblies have to include the presence of legal attorneys and representatives.

Communities also count with representative authorities such as the commission, integrated by a president, secretary and treasurer. Their task is to represent effectively the interest of the community, and their activities are under the eye of a vigilance council, integrated also by community members. (CONAFOR 2012)

The “poligonos”, are the base for every social land structure in Mexico and are represented on **Figure1.6**. These basic structures can join in order to create an agrarian nucleus which is not limited by the municipal or state borders.

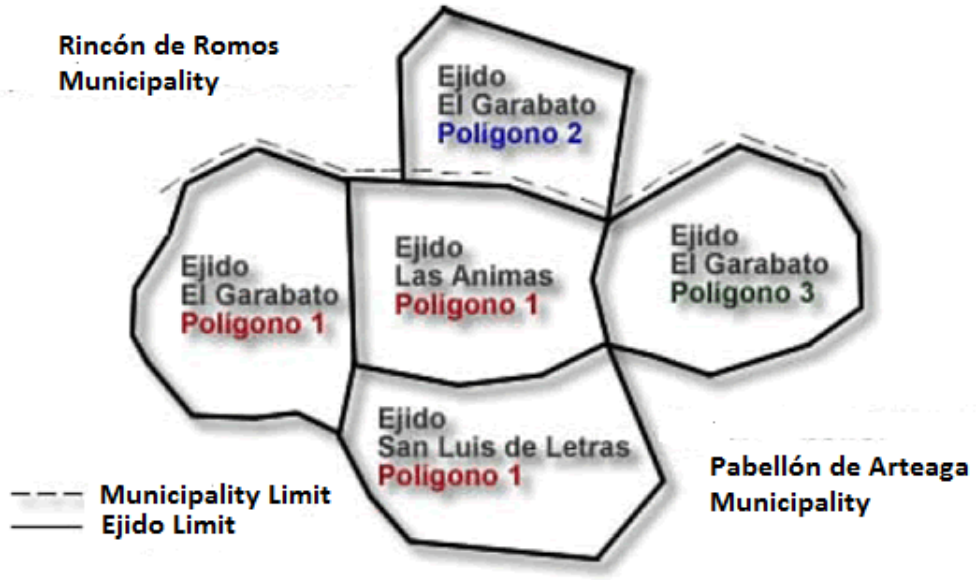


Figure1.6. Graphic representation of an agrarian nucleus, integrated by “polígonos”. From (INEGI, 2015)

The internal structure of these “polígonos” can be at the same time divided into three different categories depending on the land use according to the PROCEDE: Land for residential use, plotting land for agriculture and common use lands which constitute the economic sustain for communities on the agrarian nucleus. These lands are the one which still haven’t been reserved by the assembly to residential or agricultural plotting area and are owned by the whole community.

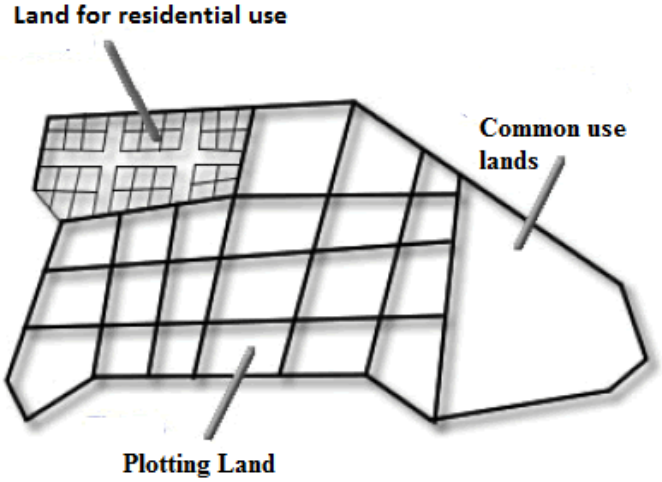


Figure1.7. Graphic representation of the different land uses which a “polígono” can possess. From (INEGI 2015)

The “poligono” can be constituted by only one of the before described land uses or by a combination of them, this matter will be decided by the community as a whole. (INEGI 2015)

However, this complex local community structures have been replaced or weakened overtime by the influence of modern political parties of the municipal governments. One of the most interesting cases in the context of wind energy in the Tehuantepec Isthmus is the case of the Juchitan Ejido, which since 1981 has no local authorities. This is interesting as until nowadays from the existing 21 wind farms in the Tehuantepec Isthmus in Oaxaca, around 12 are located in the lands of Juchitan. (PRODESC 2015) This suggests a possible tendency of private wind avoiding territories with existing local authorities

Economy

Economy on the Tehuantepec Isthmus is based on activities related to the service and primary sector such as low intensity agriculture, cattle and fishing. Currently in the region of the Oaxaca Isthmus there are 154,802 men and 63,380 women which are economically active, representing 47.9% of the total population.

GDP and competitive levels of Oaxaca have been on the bottom of the national list since 2000, changing sometimes places with Guerrero or Chiapas for a small margin. (SCT 2006, IMCO 2010)

Around 70% of the Economic Active Population, 410,900 people, lives with one or two minimum salaries, which mean around 66.45-132.9 MXN (4-8 USD) per day (CONASAMI 2015), while most of the wealth is concentrated on 2% of the population meaning 12,394 people earning more than 10 minimum salaries or 664.5 MXN (40.5 USD) a day.

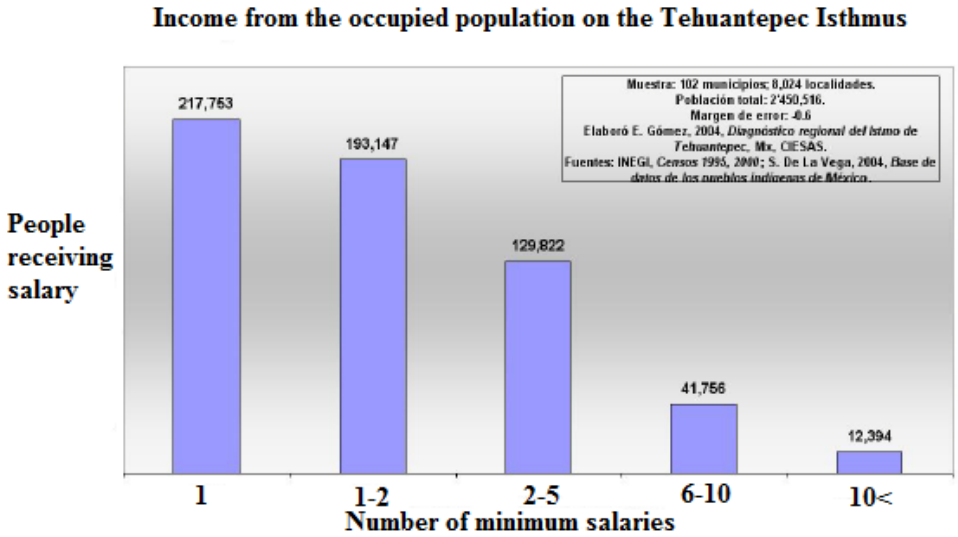


Figure1.8. Graphic representing the average income from the occupied population on the Tehuantepec Isthmus. From (IMCO 2010)

In Oaxaca 10.37% (989,000 ha) of the land is used for agriculture, mostly for corn, coffee, beans and sugar cane. Another 7% (667,500 ha) is used for extensive cattle on the grassy areas. (SCT 2006) However on 2005 around 55 from every 100 persons working on the primary sector did not received any salary, this means a mere subsistence activity to fulfil the basic needs and trade what is left for other goods. This many times change the logic for economic resource management on communities.

The absence of technic and economic resources, lack of innovation which impulse productivity or make it more efficient, and the great number of intermediaries to sell the final product have until now made of the main economic activities in the Isthmus low intensity extractive activities almost limited for self-subsistence.

After Mexico signed the North American Treaty for free trade (TLCAN) migration to United States from Oaxaca increased due the impossibility to compete with highly technic agricultural companies. (Kurt 2006) This migratory effect is intensified by the lack of offer in education and job opportunities coming from the low diversification of economic activities in the region. (Gómez 2008)

Environment and resources

Mexico is on the list of the 5 countries with greater biodiversity in the world (CONABIO 2009). Oaxaca represents the state with the greatest biodiversity in the country, with 40% of the total plant species and only 40% of the potable water of Mexico only on the Chimalapas region. (UNAM 2005)

Some of the primary traditional activities are in conflict with the resource management, for example cattle. However, there is also great examples for an adequate management of natural resources in communities, when sticking to the use of traditional management techniques such as the rotational cattle or traditional farming (Gomez 2008)

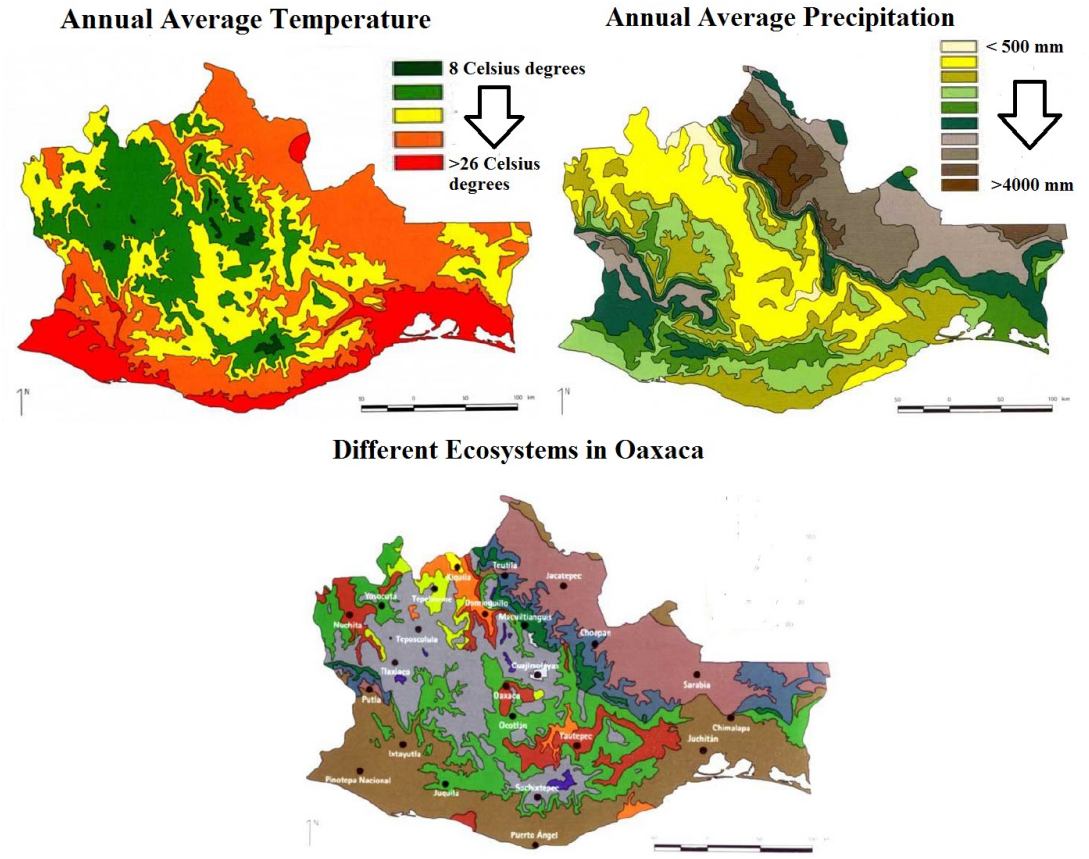


Figure1.9. Maps showing the climatological differences existing in Oaxaca. These differences contribute to the cultural and biological diversity in the region. From (UNAM 2005)

The same topography which gives birth to the great diversity of ecosystems is also responsible for giving to Oaxaca an incredible energy resource: the wind. On 2003 an exhaustive analysis produced detailed resource maps which could be used as tools for the effective planning of the electric system in Mexico and help in order to attain the first regional targets for energy transition as the 2GW of wind energy planned to be installed in Oaxaca by 2010. (Oaxaca Government 2004)

The results of the studies showed the great wind potential awaiting in Oaxaca especially in the Isthmus region. According to these studies Oaxaca has a theoretical potential of 44,350 MW (NREL 2003), this means more than half of the total country wind resources calculated around 87,600 MW. (SENERa 2013). This figures only take into account areas with wind speeds over 6.1m/s at a hub height of 50mts and 5MW installed for each km^2. (NREL 2003) The map and the wind energy resource chart are shown on **Table1.1.**

Table1.1. Table and map showing the wind energy resource distribution over the Oaxaca Isthmus region. From (NREL 2003)

Wind resource from moderated to Excelent at 50 mts hub height

Wind class	Power density (W/m2)	Wind Velocity (m/s)	Total surface available (Km2)	Total surface (%)	Possible instaled capacity (MW)
3	300 – 400	6.1 – 6.7	2,234	2.4	11,150
4	400 – 500	6.7 – 7.3	2,263	2.5	11,300
5	500 – 600	7.3 – 7.7	1,370	1.5	6,850
6	600 – 700	7.7 – 8.5	1,756	1.9	8,800
7	> 800	> 8.5	1,248	1.4	6,250
			8,870	9.7	44,350

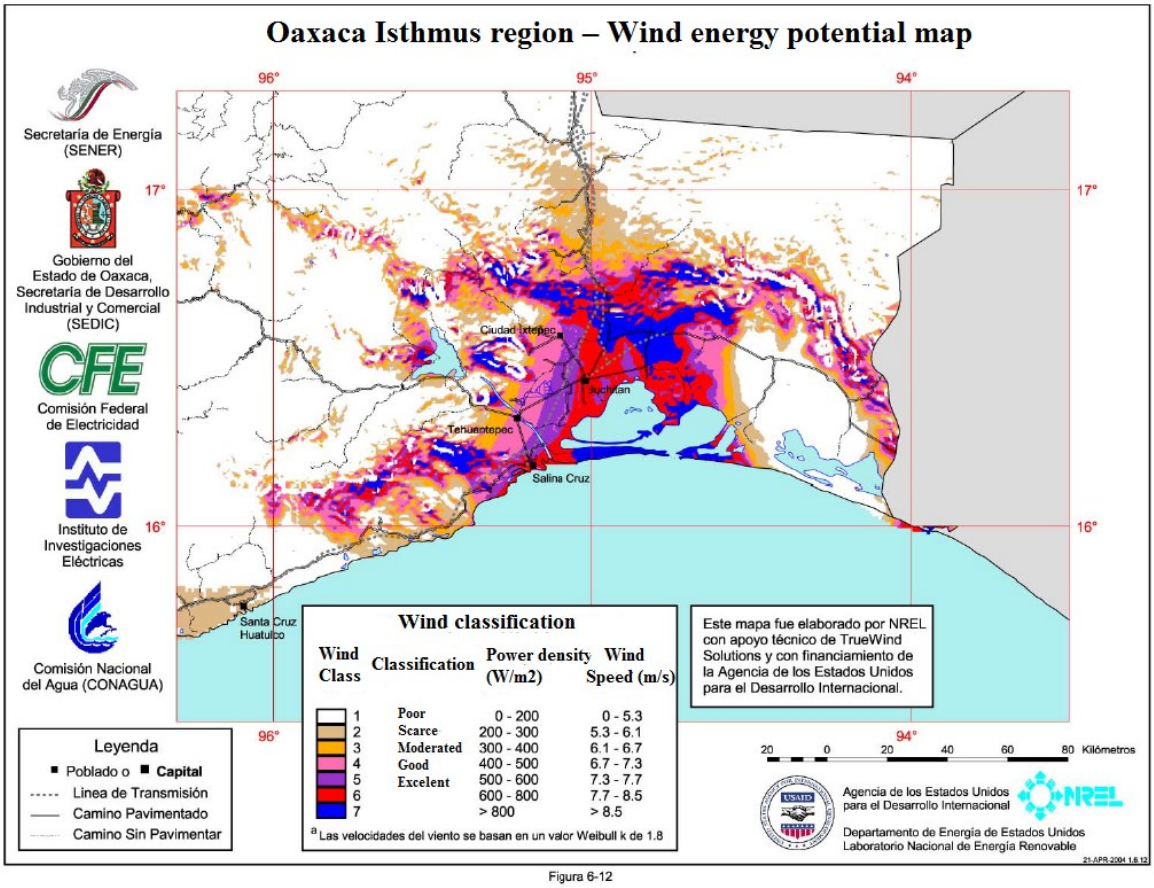


Figura 6-12

If Mexico used these whole theoretical potential the gross electricity production in the Isthmus would be around 194,253 GWh (Oceransky 2010) this would mean around 48% of Mexico's electricity consumption for 2027, estimated to be around 403,000GWh. (SENERa 2013)

These incredible resources combined with political inertia of a country compromised with international climate change agreements attracted a great number of private developers around the world, paving the road for the current Mexican wind energy landscape.

1.2.2- The Mexican “wind rush”: Fulfilling the targets for the transition and opening the floodgates for private investors

Wind energy prospects have been especially high since the beginning of the energy transition in Mexico, and because of this and the excellent wind resources existing on the Oaxaca Tehuantepec Isthmus the installed capacity grew rapidly. (SENERa 2013)

Since 2000 the government of Oaxaca and several major wind private project developers began to negotiate about the future of the wind energy industry in the Tehuantepec Isthmus, 8 years before the creation of the first law for renewable energies. Oaxaca government and the private investors were aiming to install 2000 MW of installed capacity in the Isthmus by 2010 using 2000 million USD of private investment. (Oaxaca Government 2004)

Under this scenario and as a result of the colloquiums the government from Oaxaca and the different private companies came to an agreement for land distribution in the Isthmus in order to avoid competition between different developers. The resultant division of areas is shown on **Figure 1.10.**

Figure 1.10. Map showing the territorial distribution between private developers and the Oaxaca government in order to avoid competition between companies. From (Oceransky 2010)

These negotiations left communities aside (Oceransky 2010). Moreover, opposition groups argue that this process violates the convention 169 of the International Work Organization (IWO), which "requires that indigenous and tribal people are consulted on issues that affect them" and also states that "these people are able to engage in free, prior and informed participation in policy and development processes that affect them." (ILO 2015)

Shortly, in 2005 after the first colloquium in 2000, the AMDEE (Mexican Asossiation for Wind Industry Development) was created. The association aims to represent wind energy developers before authorities, economic sectors and general society. (AMDEE 2015)

The first commercial sized project began to be built on 2006. The wind farm better known as La Venta II was on charge of CFE which then adjudicate it by a bidding process to Iberdrola and Gamesa for 112.5 million USD. On 2009 there was 85.25 MW of wind energy in Mexico, on 2013 it grew to about 2,500MW, meaning an increase of 2,900% in only 4 years. For 2027 prospects are aiming to have around 11,000-15,000 MW of installed wind energy capacity on 2027(SENER 2013a, AMDEE 2015).

Until 2012 around 97% of the functional wind projects installed capacity was placed in Oaxaca (CRE 2012), this makes evident the importance of the region for wind electricity production, its role on the energy regime transition and the interest of private companies for using its wind resources.

Wind energy in Mexico is dominated by private companies (90% of the installed capacity) and 65% of this private installed capacity belongs to just two main developers Iberdrola and Acciona Energia, both from Spain (Juarez, *et al* 2012).

According to the prospects for renewable energy of the SENER in 2027 we will have around 24.61% of the total electricity produced by non-fossil sources (Including nuclear and clean coal production with Coal Capture and storage). However, this might not be enough in order to attain the targets of LAERFTE and LGCC due to the "Dash for gas" trend. (SENERa 2013)

These schemes of accelerated and exclusive grow on wind industry, lacking an appropriate regulatory framework resulted on environmental, economic and social conflicts surrounding wind industry and having strong socioeconomic impacts on the Isthmus population.

¿Too much, too deregulated? The aftermaths of the Mexican wind rush first years

The development of wind energy industry in the Isthmus was conceived under the context of The trans Isthmic corridor, which is nowadays the greatest Project involving different states of the country and aims to impulse regional industry, at the same time it diversifies the economy improving opportunities and life quality for its population. (Mexican Senate 2013)

The most direct benefit for the population regarding wind industry is the revenues derived from land rental, which usually surpasses the income generated traditional activities. The same happens with construction works or services for the increasing number of personnel due to the wind industry development in the region. Until now, the construction of wind projects have generated between 4700 direct employments and 4900 indirect employments in the Isthmus. (AEE 2013)

There have been also positive environmental impacts due to the increase of renewable energy production in the Tehuantepec Isthmus. It was estimated that until 2012 the emission reduction due to the use of wind energy was around 5.6 million t-co eq/year. (CDM 2013)

However, in a parallel way while the number of wind projects raises it also does community opposition. This conflicts are becoming into substantial game changers for wind energy industry development in the region and have a different nature from those confronted on developed economies. On developed economies social opposition focuses on negative visual or sound impacts, (Rogers 2008), however, in the case of Tehuantepec Isthmus the main problem has territorial dimension as wind resources are inherently attached to the territory which most of the times is communities only possession.

Conditions of historic isolation and exclusion created strong economic, cultural and social bonds with their territories. This territorial exclusion also led to independent and autonomous social structures tuned to work specifically in each region. In this way, the territorial dimension in the wind energy conflict in Tehuantepec Isthmus goes further than traditional land ownership or contractual problems.

Table1.2 show the main causes for conflicts on the Tehuantepec Isthmus region organized categorically. These causes are analysed further on this research using the latest reports of conflicts on the Tehuantepec Isthmus,(Nahmad 2014, CCC 2015, Juarez 2013, PBI 2014, Oceransky 2010) and direct fieldwork experience in Mexico through interviews with stakeholders which are enlisted on **Appendix 1.**

Table1.2. Table showing the main causes for conflicts on the Oaxaca Tehuantepec Isthmus region.

Territorial	**Community engagement**	**Regional Development**	**Social and environmental impacts**
Scarce information regarding contracts and wind energy	Lack of previous consult process	Lack of inclusion on wind energy projects for potentially productive stakeholders	Migration
Lack of assessment and information during negotiation	Negotiation through representatives instead the community assembly	Unilateral benefits for private developers	Division between and inside communities
Low income for land rental	Communicational barrier (Languages, technical language, cultural and omitted information)	Lack of opportunities for local population	Lack of environmental and social impact regulatory frameworks
Individual revenues scheme working on a community scheme	Different business practices between communities and developers	Negative impact on primary economic activities	Impacts on bats and birds
Contractual implications for land use and access	Lack of education	Lack of grid connectivity and adequate mechanisms for accessing to it	Possible impact on local land and water ecosystems
Uncertainty on land legal status			Increased violence

Wealth distribution

Using private and individual schemes for wealth distribution and contract negotiation in a landscape where everything else from land ownership, authorities, work and society are arranged under a community structure has been one of the main sources of problems on the Isthmus wind energy development.

The present scheme creates economic asymmetries and an effect of polarization between the ones who possess a land rental contract and the ones which doesn't. Under this logic individuals stop purchasing community benefits, changing the paradigm of distributive logic and affecting effectivity of communal structures, such as the assembly, to take decisions for the greater good. These could affect society from the family nucleus, damaging a community social structure from its core. (Nahmad *et al* 2014)

Due to the lack of management skills, in general revenues are used on dispersed family expenditures, making of individual compensation schemes something similar to a low impact poverty subsidy, as individual compensations alleviates poverty but lack specific weight to create productive projects.

However, cumulative benefits in about 5 or 8 years could create a perceivable economic and social gap between different families, increasing polarization in the community and damaging its structure. These are long term impacts as contracts are normally signed for 20-30 years open to automatic renewal.

Migration

Extreme poverty is a limiting factor for migratory moves, mostly on the context of international migration. (Alvarado 2008) However, despite extreme poverty, Oaxaca was in 2010 the seventh state in Mexico with most international migrants, with USA as the final destiny of 98 from every 100 migrants. (INEGI 2010) The number of households in Mexico receiving some income from USA went from 4.35% to 3.63% from 2000 to 2010, meaning an overall decrease of 0.72%. However, in Oaxaca this statistic went up from 3.1% to 4.3%, meaning an increase of 1.2% (Oaxaca Government 2012).

Migrating from Oaxaca means a more substantial investment than migrating from other state, just based on the distance. This trend can be reinforced in the future by the creation of a migration network, reducing costs and risks by using existing contacts or family relations. This increase on migration and the increasing outsider population due to the development of wind energy projects is creating a strong process of social restructuration in the Isthmus and creating strong cultural gaps identity loss. Opposition groups believe that in the next 20-40 years, which is the time the contrasts lasts, there will be no remaining population to reclaim the territory.

Contract negotiation process: Communication barriers and lack of legal assessment.

Social and cultural diversity in the Tehuantepec Isthmus creates communicational barriers between different actors of wind energy industry interfering with the contract negotiation process between developers and community members. Negotiation carried out by private developers has been considered as not inclusive and disrespectful with local customs and community authority structures in the Isthmus, being even accused of using illegal practices in order to achieve successful negotiations.

The first communicational barrier to overcome is cultural. Community representatives are commonly the only persons being contacted, leaving general population aside and avoiding assembly processes. This might be attributed to ignorance of the local governance structure and culture. However, it has been reported as a strategy to agile land and permits acquisition processes. At the long term these practices damage thrust bonds and create tensions between the people which has been included in the process and those who haven't.

Negotiation processes on indigenous communities are obliged by law to be assisted by an official translator. (Mexican Government 2015) However, it has been argued that translators which doesn't speak the regional variation of the language or which translate only selected information from the contracts, have been attending to the negotiation processes, or sometimes not attending at all. (PBI 2014)

Lack of education implies difficulties when engaging with communities. Technic language is another important barrier when it comes to explain projects and a clear understanding of crucial information such as impacts, rights and obligations, creating false expectations or misinformation which could derive on future problems. On the case of La Venta Community, Alejo Rincon, which is member of the solidary group for this community, reports that approximately 76% of the population is illiterate and couldn't therefore, read or fully understand the contract. (Oceransky 2012)

The last barrier to overcome is one intentionally created to hide information, such as possible negative impacts. These subjects are conveniently avoided, using more attractive examples. For instance a common strategy to illustrate wind energy is by explaining how many households a wind turbine can provide with electricity, even if communities are not going to receive any electricity from the projects.

This alerts about the vulnerable situation in which these communities are immersed during negotiations, due to the lack of supportive institutions or organizations to assess them, as in the long term they create conflicts when false expectations not match the real scenario, destroying once created trust bonds between communities, developers and government and putting projects into danger as in the case of Union Hidalgo were 30 land rental contracts were nullified by the company Energias Renovables Preneal. (National Wind Watch 2008)

Landownership legal status and cultural differences on the concept of territory

Business practices common in the financial markets are really strange for communities. For instance, there are some specialized companies for land acquisition, which sell the contracts to another companies for construction and a third company buys the project in order to operate it. This contract transfer is perceived with mistrust by communities where agreements are normally based on the person credibility.

Intermediaries called "coyotes" acting during the land acquisition, construction and operation processes retaining important parts of the revenues. In La Venta there are reports of handwritten signed checks given to the population signed by persons instead of companies. (Oceransky 2010) These actions treat the community territory represented by a contract, as simple exchangeable goods creating tension the business relationships and undermining future negotiations and communication between both actors.

Legal land status.

Some of the territories are registered on the federal records as community or private land and in the state records with the opposed status. The land use status of the terrain is also a concern for the population, when the contract goes to the companies the land status sometimes changes to industrial or mix use, and therefore it changes the legal clauses, taxes and possible economic activities to develop. Communities are also afraid of losing the land from expropriation or legislation of irregular terrains, taking away their properties and expelling them from their land.

PROCEDE gives possibility to regulate the territory or transform community land into private land. These governmental programmes have been criticised as strategies to fragment agrarian communities, dissolve the figure of community assembly and facilitate the land access for private companies (Perez 2013). We can see this perception in comments of an Iberdrola representative which comments: "with the agrarian law the ejidos which are included in PROCEDE can now sign individual contracts without an assembly". (Nahmad 2014) However, this process also needs to be approved by the assembly under special requirements as is an "instauration, modification or cancelation of the community exploitation regime", explained on article 23, section XIV of the Mexican agrarian law. (Mexican government 2012)

Unilateral benefits for foreign companies and lack of regional economic development

Companies are compelled for the well-being of communities and its economic drive is to maximize profits. However, is important to take into account the vulnerable conditions of population in countries like Mexico and specifically in regions as the Tehuantepec Isthmus. As one representative of the wind industry says: "all the expenses on community benefits are voluntary and we do it as part of our corporate responsibility policies. The responsible for investing is the government, we are not their substitute, and they can't oblige us. People need to understand that". (CCC 2015)

Until now around 5,100 million USD have been invested on the country for developing wind energy projects.(AMDEE 2015) However, estimates point that only around 1-6% of the total investment on a wind energy project is related with civil works (Juarez, *et al.* 2013), which is the sector with highest impact in on the country. On the other way 74-82% of the investment is destined to generators, which coming from foreign countries, meaning that even if some components are produced in Mexico, most of the investment does not impacts the country or its industry.

Construction has the higher impacts of a wind energy development for local communities as people doesn't need high technical skills, the regional workforce is cheap and payments are normally higher than those earned on the traditional economic activities. However, after construction phase is calculated that for every tree wind generators only one job is created. (AEE 2013) These jobs are not accessible for community members as they require technic skills which most of them won't have. Sometimes developers promote the project claiming that these projects will bring many jobs to the region. This is another cause for creating tensions and conflict in the Isthmus when reality doesn't match expectations.

It has been reported that as part of its introductory speech, developers use the example of how many households do a single wind turbine is capable of providing with electricity. This creates expectation in communities for lowering the existent electric tariffs or providing electricity directly from the turbines. On 2010 Oaxaca had the highest number of households without electricity in the country with about 5.1%. (CONEVAL 2011) In reality, most of the energy on the Isthmus is under self-supply schemes, which allows the final electricity consumer can also generate its own electricity. (ICEX 2009) However, all final electricity consumers are private industries and no communities as they couldn't afford to build the wind projects and the infrastructure for distributing electricity.

This self-supply scheme is perceived by many people as a way to trespass law by selling electricity from private company to private company, creating enclosed minimarkets without positive impact for the region. Benefits for private companies will also include the revenues from the clean energy certificate market which will be operational on 2018 (Mexican Government 2015)

On Tehuantepec Isthmus the contracts which pay an steady amount of money by year are the most popular, as they avoids as sometimes developers refuse to show information regarding the total revenues from electricity sells. These annual payments can be as low as 150 MXN (9.1 USD) per hectare per year. (Wind Watch 2008)

However, payments have increased along with opposition. First contracts to be signed in La Venta agreed to pay around 1500 MXN ha/yr, which after social pressure increased to 3,000 MXN ha/yr. Projects which arrived after to la Venta had an average payment of 6,000 MXN ha/yr, recently some projects pay around 12,000 MXN ha/yr, folding by the initial revenues. (Ocersansky 2012).

However, these payments are still low in comparison to international standards. For instance in the USA developers are paying to land owners around $4,000-$8,000 USD per installed Megawat and in Galicia, Spain about 3,500 Euros ha/yr. This means that in comparison to USA, taking into account the actual currency change from (1 USD=16.4 MXN), with a conservative value of 5 MW per ha and comparing the best case scenario in Mexico against the worst case in USA there would still exist a difference of 26.1 times between the earnings from a land owner in USA and in the Tehuantepec Isthmus.

Industrial tariffs in Mexico on 2010 cost about 0.10 USD Kw/h (CESOP 2013) which overpassed tariffs offered in countries like USA, Switzerland, Sweden, Norway and Canada. Nowadays these industrial tariffs are around 0.14 USD kw/h after a 2% reduction on the last months. Meaning the market has opportunities for charging high tariffs to industry, which is the main consumer (El economista 2015) Also Tehuantepec Isthmus wind farms average capacity factors are around 41-45%, while the average in Europe is around 24% and worldwide is 26%. (EWEA 2014)

On EU these values are around 3-6%, in Galicia 3.5% and countries like Netherlands and Denmark are around 4-10% (Regueiro 2011). The Bii Nee Stipa wind farm Iberdrola obtained gross economic benefits for 7 million 148 thousand USD and paid for land rental 23,600 MXN, equivalent to 0.025%. (La jornada 2012)

Another source of positive social impacts is building public infrastructure, this is also an obligation for most private developers as part of their programs for social responsibility, compelled by international founding institutions such as the World Bank or the Interamerican Development Bank, which until 2012 financed the installation of 300 MW in the Isthmus.

However, most of the research works until now identify the social infrastructure derived from the social responsibility programs as low social impact projects as the case of the baseball park tribunes for la Venta community, wall painting or building areas such as playgrounds. (CCC 2015)

Lack of consulting processes and community involvement

Lack of consult processes not only derives in misinformation of local communities, but also is considered illegal by breaking international conventions as the convention 169 of ILO and national laws such as the article 21 from the LAERFTE.

lack of regulatory or observer institutions on this field makes possible for consult processes to be simulated or avoided, there are many examples of different projects where private developers assure to summon assemblies or carry on consult sessions among communities and community members assure that they never heard about such informative or consult process. A clear example happened in San Dionisio del Mar, in which lack of consult with the community was one of the main sources of conflicts which later derived on stalling the project. There are reports of some cases in which private developers have simulated express community assemblies in order to land acquisition. (CDPIM 2012)

Developers normally think that the consult process should be carried on once the contracts are signed with landowners to discuss details and benefits distribution. On the other hand, communities express that consult process should be done as a first approach to the whole community to show the advantages of the project and to accept or reject the project as a whole.

Avoid community assemblies to negotiate directly with representatives is creating long-term problems as representatives change every 3 years along with the term of the contracts , so it's necessary to return to negotiation phase.

Corruption, lack of authority on the regulatory processes and partnership between government and private developers

Until now the government has played a major role on the early stages of wind industry in the Tehuantepec Isthmus. However, this role has been focus on promotion for private developers and the later absence of regulatory activities. Close exclusive collaboration between private developers and government has blocked alternative projects in the Tehuantepec.

On municipal level there are reports about money generated from permit process, signed by municipal authorities which stay on the hands of municipal authorities as the case of Juchitan. (CCC 2015) However, municipalities are absent in almost any other procedure or regularization process. This also includes reports about municipal or local authorities being bribed in order to agile processes or to use local authorities or representatives influence over communities. This creates mistrust among community members, as some people begin to receive economic incentives in order to support wind energy projects.

On the federal level influence traffic and privileged information is a major concern, creating uncertainty regarding the mechanisms for accessing to concessions or interconnection contracts to the public service. The fact that the government through CFE is also responsible for paying the electric grid maintenance is also seen as an indirect subsidy for private developers.

These facts along with systematic negation for accessing to justice or even the use of public force and violence in order to suffocate protests against wind energy developments have created an image of authorities being guardians of private companies interest in the Isthmus.

Lack of regulation for social and environmental impact studies or good practice: Complains and possible consequences to primary activities

The lack of studies regarding social or environmental impacts to consider for adapting wind energy international standards or good practices to the Mexican context led to an unregulated landscape which hasn't been able to set clear guidelines. This regulatory void has been one of the main reasons for creating chaotic conditions with the current unplanned social, economic and environmental impacts.

In many cases the scarce regulations are not specific, creating opportunities for some stakeholders to take advantage of the situation or simulate these assessments which at the end are not useful in order to know, restrain or mitigate negative impacts.

On the first wind energy projects, no social impact study was made by any the companies. Apparently Acciona Energia was the only one with a social impact and consult program for communities.

Platforms and roads construction has been reported to affect arable land due to the lack of good practice and planning. Concrete platforms also heats up with the intense sunrays of the Tehuantepec Isthmus, drying the surrounding land and therefore the crops, meaning a lack of food for the population or the cattle. These concrete structures could also affect underground water wells (artesian) which are very important for the ecosystems health.

Also lacks of regulation and good practice for the the ground levelling process affects directly the territory mostly during the rain seasons, creating or worsening the actual floods in the area due to the strong rains impacting on agricultural production.

Contracts many times also forbid landowners to grow up crops or plants which could affect wind speed or quality, and the same happens with structures such as houses or animal shelters. This affects traditional activities such as agriculture or cattle. Sometimes control from private developers over the rented territories are so strict that security is hired in order to restrain access to the land, creating serious difficulties for working the land on a community or familiar scheme as is traditional in the Isthmus.

Fishing communities have already suffer from other industrial or energy projects such as the Salina Cruz refinery where oil spillages decreased production on the fishing industry. Dangerous waste, as the oil used in the breaking system, is one of the major concerns for fishing communities, as one single turbine can use hundreds of oil litters during its lifetime. Environmental assessment is also needed to measure impacts due to heavy machinery works on shrimp population, which are susceptible to vibrations, and on the reproductive cycles of molluscs or capillarity processes between land and estuaries in the region.

The Tehuantepec Isthmus is also an important migratory route for many bird species. A monitoring realized between 2007 and 2008 in the wind farm La Venta II showed that the mortality rate of migratory birds could be around 20 or more individuals by installed MW by year, meaning an unacceptable value for international standards. (Ledec et *al.* 2011) This could also mean impacting local ecosystems due to the change of migratory routes on bird population.

The effects of acoustic and visual impacts haven't been studied or regulated until now. Other issues as the electric cables which are lying on the ground without being covered, are also causing concern to the people, not only because of the acoustic pollution but also for potential damage to the people or communities due to lack of security measures.

The dust on the construction phase also affects people in the communities and it's reported to affect crops. The complete lack of regulation or institutions have also created some degree of paranoia among community members. Many different diseases or phenomenon are attributed to the wind farms without any kind of scientific or logic bases.

Violence

Until now one casualty from a member of an opposition group has been reported in the Isthmus. Because of these and the increasing violence, international human rights organizations such as Peace Brigades International have decided to intervene and act as observers of the process in the region.

Many opposition groups have responded using protests, blocking roads and riots which are suffocated by public forces, ending on aggressions and intimidation. There have been also reports of stealing documents on the offices from Human Rights offices in the region, or destruction of Juchitan Popular Assembly basecamp. (PBI 2009)

This lack of authorities is now affecting private developers as many caciques (or influential leaders) which at the beginning are bribed by private developers in order to influence communities, at the end blackmail or intimidate private developers in order to increase their revenues or maintain their status quo. Machinery kidnapping is also common under this context.

Mareña Renovables and San Dionisio del Mar study case: The indigenous community which stalled the 396MW project

The study case of the Huave community in San Dionisio del Mar show how community opposition and the current conflictive landscape can mean a great barrier for all the stakeholders.

The project from the found Mareña Renovables was a shared found integrated by diverse countries (FTE 2013),in which the Macquire Mexico fund had 1,150 million MXN, representing 32.5% of the total investment (El Economista b 2015). The project aimed to be the largest in Latino America at the moment with 396 MW.

Conflicts raised as the environmental and social management report from Mareña clarified that they went through a consult process among the indigenous groups from the region in conformity to the Mexican legal framework and the principles from the Interamerican development bank in order to finance the project. (BID 2011). However, on the other side community members reported that none of these consult processes where carried out, neither where the agreements for renting 1 643 ha of community lands for 30 years.

This created strong opposition groups in the region and attracted the attention from national, international media and organizations involved with wind energy. In this way the inhabitants from San Dionisio managed to push the wind energy project away from their lands, forcing it to start a long wander

through the Isthmus looking for new areas in which the project would be accepted, consuming the project capital and putting in great danger the whole project.

Representatives from the project commented on the national press that these problems could result in a future damage to the investment value, including its possible reduction to zero. (El economista 2015) This fact could mean a branching point for the development of wind energy industry in Mexico as many other private developers are already concerned about the stability and financial risks of the projects.

It is also changing policy making in Mexico with the creation of new regulations aiming to do specific valuation of the social impacts which are now compulsory according the law in order to approve the projects.

International Funding Institutions are also strengthening regulations as companies reported that the access to these international resources it's being more difficult over time as a result of social tensions in the region and its relation to wind energy development.

Current perception of wind energy by the Isthmus population

Even under the current conflictive scenario community opposition representatives and institutions declared that they are not inherently against wind energy development in the Isthmus, (CCC 2015, Nahmad 2014, CONECA 2014) but the current disruptive schemes, which are not compatible with their social structure, way of life and its associated consequences on the community and the region.

They highlight that private developers need communities and that communities also need private developers. In order to change the actual panorama communities are asking for opportunities to get involved on the energy transition, and an inclusive and healthier energy market which allows the creation of better schemes for distributing revenues.

The letter for support towards the mobilization of Ejidos and Communities for an Inclusive and Just Energy Reform, resumes the posture of many different communities in the Tehuantepec Isthmus by asking to include mechanisms which allow communities to become renewable energy generators for selling it to the general grid, through contracts or permits designed specifically for that purpose, considering its special circumstances and potential. (CONECA 2014)

Many communities are already aware of the economic potential which lie on the energy transition and the strategic advantage which their territories give them on the wind energy industry development.

Chapter 2.Methodology

Wind energy development and its consequences over communities have been studied intensively on the recent years in Mexico. However, until now the research aiming to find possible solutions haven't been explored due to the novelty of this field. Under this context publications from academia, government, international organizations and communities have proposed greater community integration as a necessary condition in order to walk towards a possible solution. I pretend to cover the following steps:

1. **Analyse the current scenario present now on the Tehuantepec Isthmus** in order to define the current stakeholders, the region and underpin the main causes of conflict which could endanger the wind energy development. This would be used in order to identify the main problems so they can be later handled separately.

   In order to do so we travelled to Mexico and to the Tehuantepec Isthmus in order to talk with the most relevant stake holders involved on wind energy development. International organizations, volunteers, consultants, politicians and general population was interviewed in order to access to information which is hard to access by other means.

2. **Analyse specific case studies** for different countries which are at the moment engaged with community energy projects or which are on a similar conflictive situation as in Mexico. This analysis will include developing and developed economies which have been successful into integrating communities in to the wind energy development, as well as developed and developing countries which are now struggling with conflictive landscapes or with community integration.

   In order to do so an extensive bibliographic investigation was carried on cooperation with Scene consulting and Community Energy Scotland which provided documents and information from wind energy projects related with communities in the UK, South Africa and Denmark. Researchers in Mexico provided also valuable information from Kenya in order to do the analysis.

3. **Analyse the impacts related to community energy projects on the countries** which are currently based mostly on community owned wind farms. What impacts does these ownership structures had on wind energy penetration and their economic regional development? Will be the main two questions to answer.

4. **Analyse the different ownership schemes which has been developed on the international context** and analyse its feasibility under the Tehuantepec Isthmus conditions, this would be also compared to the project schemes in which the current developing community energy projects are based in order to identify the main characteristics in which community energy projects on the Isthmus varies on contrast with those being used in other regions.

5. **Analyse both Yansa and InTrust** community scheme project structure through the direct information provided by these organizations.

6. I will use the information gathered on steps number 1, 2 and 3 in order to know how the impacts of community energy projects on other countries could represent feasible solutions to the conflictive wind energy development in the Tehuantepec Isthmus, when adapted to the Mexican context.

   Current community projects feasibility hasn't been proved so far in Mexico as they don't exist anywhere in Latin-America. That's why based on information from step number 5 I will also prove its economic feasibility.

   With this information will answer question 1 of the research question list.

7. I will use the information from steps number 2, 3 and five in order to find the key stakeholders which can participate on the development of community energy projects on the Tehuantepec Isthmus, its interests and possible benefits to give an answer to question number 2 on the research questions list.

8. I will use information on steps number 1 and 3 in order to match the current problems of the Tehuantepec Isthmus region and the reported positive impacts in other countries in order to find potential solution for the problems and the possible creation of productive projects.

   I will also use information on step number 5 in order to know from first hand how would the revenues be allocated and in which kind of productive projects these will be use, these would give information about the potential of community energy projects to become motors for economic diversification and regional development on the Tehuantepec Isthmus and give an answer to question 3.

9. I will use information on steps number 4 and 5 in order to analyse the differences existing between the project schemes used on the country study cases and the ones used on the Tehuantepec Isthmus in order to give an answer to question 4.

10. Finally I will use the previous information to identify the key strengths, opportunities, weaknesses and threatens which community projects have on the Tehuantepec Isthmus region and synthesize this information under the format of a SWOT analysis.

Information about wind energy development on the highly dynamic landscape of wind energy in the Tehuantepec Isthmus has proven to be difficult to access and sometimes difficult to corroborate even for international institutions such as the world bank or the inter-American development bank (IDB), this can be proven by the latest reports on irregularities of environmental and social impact assessment incurred by private developers and reported by international organizations.

However, the project used field work and direct interviews in order to facilitate the engagement with the highly dynamic context of the Mexican energy regime under the reform. With the support of the GESA (Global Environment and Society Academy) and the School of Engineering of The University of Edinburgh, I was able to contact and interview institutions, organizations and individual which are now immersed on this reform process and also share the vision for an energy regime which includes communities as a strong driver for the transition and renewable energy projects.

Until now, even the experienced people on the Mexican renewable energy field are under the expectancy of the latest changes in policy and structure of the energy market, and probably many other changes will take place on the next years for the young Mexican energy market. However, the opportunity of being supported by international community energy organizations based in the UK such as Scene consulting and Community Energy Scotland and the opportunity to contact experts on the renewable energy field in Mexico, interested on community energy projects development such as the Yansa Group and InTrust global, gives to this research the necessary resources to elaborate a quantitative analysis for the prospects of community energy projects in the Tehuantepec Isthmus.

Chapter3. Wind energy, community projects and social engagement: Selected international case studies

Community wind it's a way to refer to specific ownership schemes or structures in which individuals, tribes, universities, cooperatives or business in the state or local area agreed to partially or completely own a wind energy project. (Lantz 2009) These are either created as "facilities-projects", for heating for example or "revenue projects" designed to generate income from the sale of power. (Gubbins 2010) The present work focuses on the second category.

Community wind energy projects can be as large as hundreds of Megawatts or as small as the Kiowa County Memorial Hospital in Greensburg, which began with one single 50kW wind turbine and then acquired a second wind turbine due to its positive outcomes. (NREL 2012)

Nowadays wind energy projects are mainly developed by transnational wind energy companies. This trend is stronger in developing economies such as Mexico, where high targets for renewable energy transition are being set under a context scarce on technic, economic and human resources.

Is normal for exclusively private projects, to leave less than 15% of the construction expenditures in the state which it has been built. (Lanz 2008) In the case of developing economies, which import most of the technology and expertise the profits for the region or community could be even lower, as in the case of Mexico where some estimates point that only around 1-6% of the total investment on a wind energy project is related with civil Works. (Juarez, *et al.* 2013)

However, here is evidence, of advantages on community wind over private projects. These advantages include economic and cultural multipliers that enable opportunity for a sustained regional development. This is of great importance on the context of regions characterized by poverty and lack of economic diversification such as the one of the Tehuantepec Isthmus. The effect of these community accelerators could play such an important role on the creation of just and positive energy transition processes that "it is unlikely that renewable energy and climate change objectives can be met without them". (Harnmeijer *et al*. 2013)

Studies from the NREL shows that community wind projects have an increased impact both during the construction and operations-period of a wind power plant. Employment impacts from completed community wind projects are estimated to be around 4-6 year jobs per MW and 0.3-0.6 long term jobs per MW during operations. This means an increase of 1.1-1.3 on the construction period employment and 1.1-2.8 on the operations period compared to the private projects ratio. (Lanz 2009) This suggests

that on the experience of community wind projects on USA the impacts from community wind compared to private projects are moderated or almost the same for the construction phase, however the impacts for employment on the operation period are much higher for the community under a community wind scheme.

The increased economic impacts of these projects are based on three primary venues:

-The possibility for increased utilization of local labour and materials during the project development and operation.

-The dividends provided to local shareholders

-Support of economic development impacts by relaying on local financial institutions for construction financing and operating loans.

These results may vary between a wide range of populations, labour skills and production potential. This gives community wind project schemes a flexibility to be adapted to the region or community needs in order to maximize profits and its positive impacts. Also, the dividends provided to the local shareholders have a great potential for creating economic impacts at multiple levels: Individual, familiar, communal or regional.

These projects can help to build resilience in communities by giving them transferable skills, increasing volunteering and strengthen existing community groups. When the project involves the population on a community development plan, it enables interaction and team work in order to identify community needs and where revenue will be spent, allowing individual skills to be learnt or teach and creating trust bonds between individuals. This not only means that community would be able to access to the economic resources in order to improve external conditions and local infrastructure, but it also means a great vehicle to promote community cohesion.

Table 3.1 can give us an example on how communities which engaged with a project of this nature perceive the positive impacts regarding the skills they learned as a committee and on the wider community.

Table 3.1 Showing the results from a poll made by CES in Scotland from (Gubbins 2010)

Has your committee learnt new skills in the development of your project (e.g. project management, financial management, managing consultants etc.?)	**Response Count**
Yes, our committee has developed new skills.	**34** (65%)
No, our committee had some skills already and we engaged professionals with other relevant skills.	**10** (19%)
No, our committee had the skills already.	**6** (11%)
No, we engaged professionals with the relevant skills.	**2** (3%)
TOTAL RESPONDENTS	**52**

What impact has your project had on your group and on the wider community? (multiple responses possible)	**Response Count**
Awareness and support for the group and our work has increased	**28** (54%)
The group now has more enthusiasm and a renewed sense of purpose	**25** (48%)
The group is financially more self sustaining	**21** (40%)
More people from the wider community have become involved in our work	**18** (35)
The group has gained new membership	**12** (23%)
There has been no change	**8** (15%)
TOTAL RESPONDENTS	**52**

If you answered yes to Question 6 above, please tell us what new skills your group gained through undertaking this project (multiple responses possible)	**Response Count**
Renewable Energy Technologies & Energy Efficiency	**29** (83%)
Securing Funding	**27** (77%)
Project Management	**22** (63%)
Community Consultation and Engagement	**18** (51%)
Financial Management	**16** (46%)
Managing Consultants	**12** (34%)
Facilities Management	**6** (17%)
Other	**2** (6%)
TOTAL RESPONDENTS	**35**

Even if wind energy industry nowadays is being developed mostly under private exclusive schemes, it actually began with community owned projects at a small scale being supported by government policies. In some countries, a wide range of community project schemes have been created and are actually more abundant that private schemes. These community based countries show an interesting link with wind energy acceptance and penetration into the energy matrix and is analysed on the following chapter as it could be useful to prove the link between social engagement on renewable energy and the creation of sustainable profitable win-win schemes between different stakeholders towards a healthy, just and integrative business schemes which would be easier to build from now, rather than correct in the future.

3.1- Justification for case study selection

Some countries are of special interest for this research as they are already ahead on the race for renewable energy transition, aiming for becoming fossil fuel free on the near future. Such is the case of Denmark which is aiming for 50% of its electricity production to be covered by wind energy on 2020 and the whole energy consumption (transport, heating and electricity)to be supplied completely by renewable energy on 2020 (DMCEB 2012). Other countries like Germany have been number one in Europe for many straight years regarding total installed capacity for solar and wind energy.

These two countries are now leading renewable energy capacity installed per-capita worldwide (not including hydropower). Denmark is the number one country on wind installed capacity per-capita at the time and Germany is on the third position and first position on per-capita PV energy. (REN21 2015) They have been also able to create a robust industry and regional economic development based on renewable energy, specifically wind energy component manufacturing such as turbines and blades. The two top international wind turbine manufacturing companies are Vestas (Denmark) and Siemens (Germany), and along with Enercon (also from Germany) these industries control around 29.8% of the turbines being build worldwide. On 2014 developed countries invested around 41 billion USD on wind industry, however, this was surpassed by developing countries which invested around 58 billion USD.

These two countries also share a great inclusion of community ownership schemes for renewable energy development as can be seen on **Table 3.2.**

Table 3.2. Showing countries by percentage of community or corporate ownership from (MacArthur 2010)

Co-op & Farmer-Owned Wind Turbines

	Farmer	Co-op	Corporate
Netherlands	60%	5%	35%
Germany	10%	40%	50%
Denmark	64%	24%	12%
Spain	0%	0%	100%
Great Britain	1%	1%	98%
Minnesota	0%	31%	69%
Ontario	0%	<1%	99%

Because of these correlations, study cases of wind energy development in Denmark and Germany are of great interest for this research which aims to define the prospects and windows of opportunities for community projects under the context of an energy transition in a still early stage, heavily based on wind energy. Is of special interest for this the process and mechanisms involved on the process.

This chapter also takes into account the case study of UK. Which not only presents many similitudes between its energy reform and the current process in Mexico, but is also investing heavily on wind energy, occupying the 6th place on wind energy installed capacity, and was the second place after Germany on new wind energy installed capacity on 2014. (REN21 2015) Because of this, the case of the UK is of great interest for this research in order to analyse how a country already immersed on a heavy renewable energy transition based on wind energy can deal with policies, programs and institutions created to integrate communities into the energy regime.

Finally we will have the study cases from South Africa and Kenya. Both countries are developing economies which now begin to deal with their respective processes of energy transition in very different ways.

On one hand we have the controversial case of Lake Turkana´s wind energy project in Kenya, a 300 MW wind farm which gathers capital from many different European countries, aiming to provide over 20% of the actual generating capacity in the country. (LTWP 2015) The project is facing strong opposition from local communities and international organizations regarding the rights for communities to be consulted and included on the project scheme which will affect them directly. This project does not aim to integrate communities and presents legal inconsistencies on landownership, over a territory possessed by a vulnerable and poor population immersed on violent conditions. This project is therefore creating strong tensions and conflicts between community members, different communities and communities and developers.

On the other hand the government of South Africa has created specific regulatory policies in order to integrate communities into wind energy projects. The minimum community shareholding in South Africa would be 2.5%. (Baker 2014) Even if this shareholding could seem low for other country standards such as Scotland which is now asking for developers to offer communities at least 20% of the project ownership, we need to take into account different factors such as economic income from people on both countries communities, financial vehicles and institutions and supporting policies. The fact of a developing country to create specific policy for integrating communities into the energy transition process is of great importance as it could set precedence on other developing economies which are already or will be soon facing an energy transition process or great renewable energy installation on the next years.

3.2- Denmark study case

The 9th of July of 2015 Denmark attained another record by generating about 140% of the country energy demand. (The Guardian 2015) The country is currently leader in wind energy development worldwide covering 39.1% of its total electricity consumption by these means on 2014. (DMEUC 2015)

Denmark is also a pioneer on the wind industry by installing the first modern wind energy turbines on the 70´s and the industry has been overwhelmingly community-based since the beginning. Because of these initiatives, Danish government began to create supportive policy frameworks in order to incentivize private individual investors, farmers and cooperatives to install wind energy projects in their lands.

In 1973 an antinuclear movement which lead on a broad public campaign triggered wind energy as a substitute to safeguard the country against energy supply crisis and reduce dependence on imported oil.

On the transition early stages Research and Development programs funded by taxes on electricity prices supported the new growing wind energy industry which was being developed mostly by farmers, individuals and cooperatives. (IRENA 2012)

In 1979 subsidise until 30% of the total project costs. These subsidies decreased gradually as the industry matured until they were completely withdrawn on 1989. (Bolinger 2001) This combination of supportive policy frameworks, social engagement and a market free of corporative competitors allowed grassroots manufacturers to produce wind turbines with a capacity larger than 55kW. As these were too costly for most individuals, the concept of wind cooperatives was developed and integrated into the energy regime. (Grobbelaar 2010)

These famous Danish wind cooperatives were in fact partnerships, as the electricity law required wind turbines to be directly owned by electricity consumers. These were understood as contractual relationships between several electricity consumers in order to pool resources and run a business. This created an attractive scenario for individual owners which invested heavily in wind energy as a business of their own, looking an opportunity to satisfy their energy consumption needs along with selling the excess electricity. (Helby 1995)

A share scheme of about 1000kWh/year was used in order to participate. With financial opportunities provided by mortgage banks in Denmark for market-rate loans for up to 70% of the value of an applicant's real estate. (Bolinger 2001) For many years, incomes from wind turbines were tax free if they did not exceeded 135% of the power costs or 6 shares.

These partnerships were required to operate on a local basis since the negative external costs of wind power are born locally, ensuring those bearing the costs also receive the financial benefits of government subsidies. This was very effective by increasing public support for wind power in Denmark and led to many small clusters of wind turbines on the first years of wind energy development.

This intense grassroots development pushed by a Research and Development program also created a robust industry in the country, not only for regional market, but also for international markets through exportation. Global oil crisis made countries like USA to consider wind energy as an opportunity for increasing energy security through diversification and use of native renewable resources. (AWEA 2015) These facts led to the great California "wind rush" which relied heavily on Danish technology.

Since 1993 Feed-in-tariffs laws were also stablished. This financial support was complemented by environmental tax refund, as CO_2 taxes on electricity consumption and a part of the energy tax were refunded to independent wind generators. These mechanisms provided a strong base for wind energy based on community owned schemes. (Bolinger 2001)

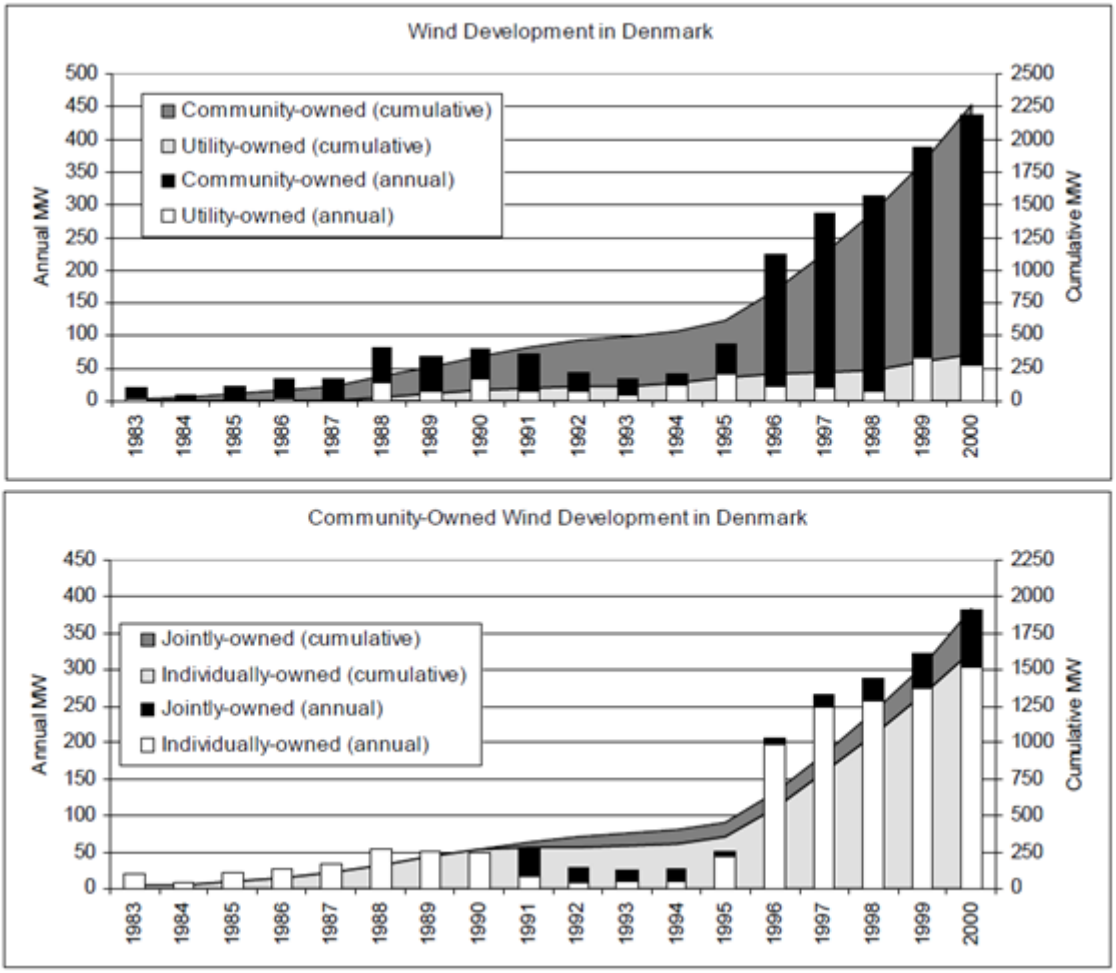
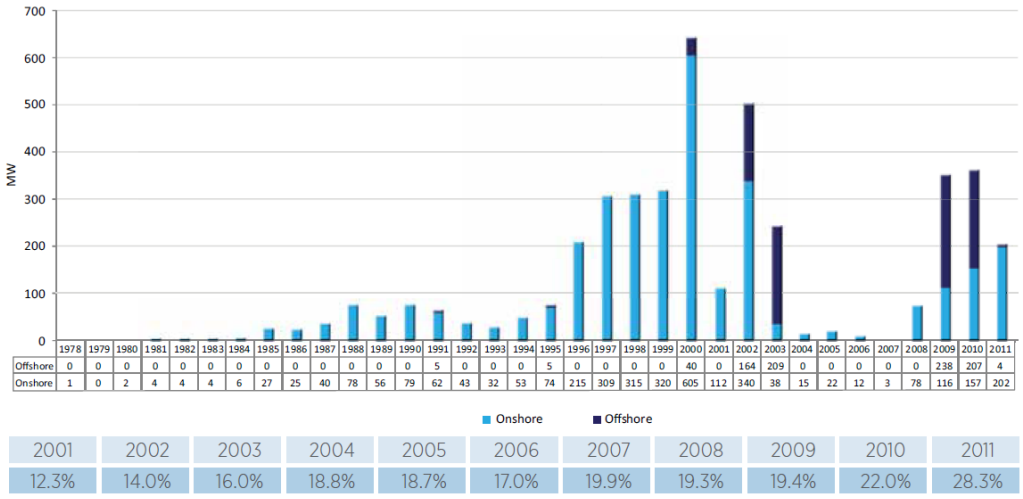


Figure 3.1. Showing the develop of early wind energy in Denmark by total capacity installed and by community owned capacity installed by different ownership schemes (Bolinger 2001)

However, Denmark electricity market went through a liberalization reform starting on 1999 and ending in 2002. On the same year the feed-in tariff support was supressed.On 2009 the country saw a significant rise in installation due to policy support which included an environmental premium and agreements for the grid connection costs for off shore wind farms to be financed by costumers. Therefore, installed capacity changed along with policy support as is possible to appreciate on **Figure3.2**



	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Offshore	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	0	0	0	0	40	0	164	209	0	0	0	0	0	238	207	4
Onshore	1	0	2	4	4	4	6	27	25	40	78	56	79	62	43	32	53	74	215	309	315	320	605	112	340	38	15	22	12	3	78	116	157	202

Figure 3.2 Showing the development of on shore and off shore wind energy by annual installed capacity. (Soerensen 2013)

In 2011 a new political party came strong proposing to reach 100% of gross energy consumption by renewable energies on 2050 and 100% of electricity and heat production to 2020. Under this context, early engagement from cooperatives, created a strong ground of public acceptance needed for achieving an intense process of renewable energy transition, on 2013 public acceptance for wind energy in Denmark was about 91%. (Soerensen 2013)

Nowadays offshore wind energy is being controlled by governmental institutions. However, onshore wind energy planning remains collaborative due to the community based wind energy tradition in the country.

3.3- Germany study case

Germany is currently the European country with most wind energy installed capacity (34,660 MW) and third in the world only surpassed by China and United States. It is also the leader on solar PV (Photo Voltaic) energy installed capacity with 36,338 MW. (IRENA 2013)

The success of wind energy development relayed heavily on the attractive electricity feed-in law which began to operate in 1991, providing a stable and profitable market for wind energy projects. (Bolinger 2001) Before 2001, 100,000 Germans owned a wind turbine individually or jointly (Ecotec 1999). Data from the Deutsche Ausgleichsbank (DtA), which finances around 90% of all wind projects in Germany, indicates that roughly three quarters of wind capacity was based on community ownership schemes, 75% of the loans volume for wind projects between 1990 and 2000 was for jointly-owned projects (63%limited partnerships and 12% to general partnerships of sole proprietors (GbR)).

It's possible to see in **Figure 3.3** that the most noticeable change on the ownership schemes between 1990 and 2000 is the one going from sole proprietors to limited partners. This reflects a

commercialization trend of wind energy in Germany as the size, and therefore costs of the existing wind projects increases.

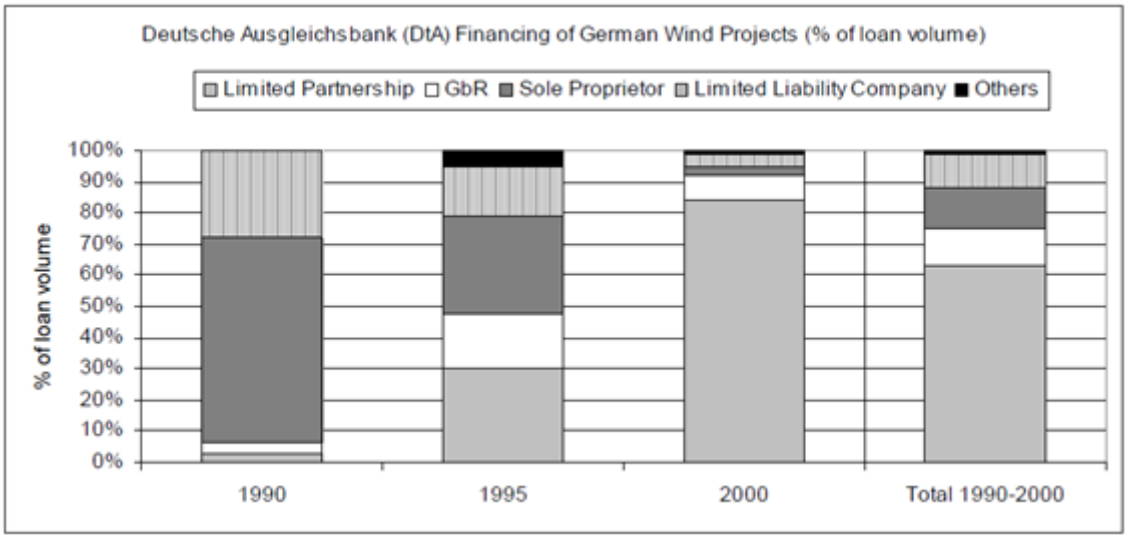


Figure 3.3. Different loaners by percentage which received a loan by the Deutsche Ausgleichsbank for financing wind projects (Bolinger 2001)

Before 1995 there were capital subsidies from the 100MW and 250 MW wind for up to 60% of investments in wind turbines. (Langniss *et al.* 1999) As in Denmark the generator has the obligation to pay the cost to connect for the closest point to the grid, and the grid operator is responsible for any further expenses involving grid reinforcement or interconnection at a more distant location.

The most successful vehicle for wind energy in Germany is the GmbH & Co. KG (limited partnership with a limited liability company as general partner. This partnership is managed and represented by its directors (At least one which doesn't have to be a shareholder). However, share-holders exercise direct influence over the manager director or directors by issuing instructions. (GTI 2015)

Under this model a wind developer initially incorporates his business as a limited liability company (GmbH) and for each specific project a limited partnership (KG) is created, with the liability company as general partner and individual investors as limited partners. However investors are not necessarily local residents, in fact local residents commonly make up around 20-30% of all limited partners. (Ecotec 1999)The revenues from electricity production are then then distributed among partners depending on their investment level.

This jointed venture scheme allows developers to spread the high costs of forming a GmbH over multiple projects and partnerships. It also allows liquidating their part-ownership in one project in order to finance another by offering shares to the public, also potentially reducing planning objections.

3.4- Kenya and conflicts with Lake Turkana wind energy project

Kenya has a population of 46 million people (CIA 2014) with a total installed electric capacity of 1,900 MW. (EIA 2012) About 1,200 MW of this capacity is already coming from renewable resources, mainly hydro and geothermal (IRENA 2013)

The country needs to expand its energy sources to provide electricity. This is why the 300MW wind energy project in Lake Turkana can provide around 16-20% of the actual installed capacity. However, since April 2014 the project has turned controversial when local communities, knew about the letter of allotment which privatized their community land since 2009. (SIPLF 2015)

The Lake Turkana Wind Power Consortium (LTWP), is responsible for the financing, construction and operation of the wind farm. (LTWP 2011) LTWP has obtained loans for almost 500 Million Euros from a wide diversity of IFI's. (SIPLF 2015)

A concession area of 150,000 acres (60,700 ha) has been leased from the Government of Kenya for a 99 year term. The project also includes a 200km road which will be built in order to access to the wind farm area.

The Sarima Indigenous People Land Forum (SIPLF) argues that none of these measures where consulted with the native communities. The project is already contemplating the displacement of communities which are based on the wind farm and the road area. The project will be developed in the poorest district in Kenya. The Sirima encampment located within the Project footprint are typical of Turkana transhumance semi nomad pastoralists.

The report for environmental and social impacts acknowledges that construction hazards on the wind farm site could potentially impact general public, tourists and pastoralists. Taking these into account the company propose a mitigation plan, including speed retardation methods, traffic control persons, dust sheets or other approved mitigation provisions as deemed necessary to mitigate and protect these communities.

However, communities and the SIPLF argue that many of these procedures tend to simulation. Such is the case of community consultation methods which according to the SIPLF are only self-promotion Public Relation exercises. Project developers have been also been accused on deploying divide-and-rule tactics in order to create divisions on the communities, escalating to conflicts and almost violent incidents. These tensions relaxed after the World Bank decided to withdrew its support to the project, throwing its viability into question.

Communities think that the consortium intends to displace them without compensation, based on the argument that "the Project Affected Persons / nomadic pastoralist have customary rights of use to land

pastures, however have no recognisable legal right or claim to the land other than use and are therefore not eligible for land compensation" (LTWP 2014).

The current panorama in Kenya shows jet another conflictive scenario for energy transition on developing economies. These conflicts have proved to be negative for both sides as we can see on both study cases of Mexico and Kenia with the loss of support from the World Bank to the project at Lake Turkana, or with the massive financial losses from Mareña Renovables in San Dionisio del Mar.

The SIPLF also clarifies:

"We are not against establishing a wind power project. We know the power of the wind in our ancestral lands, and we want it to contribute to the sustainable development of our communities, the Marsabit County and Kenya as a whole. We are determined to make this happen on the basis of our communities' ownership and leadership." (SIPLF 2015)

3.5- South-Africa and wind energy development: Policy orientated towards community integration

South Africa has around 48 million people (CIA 2014) and a installed capacity of 45,000 MW (EIA 2012) where 2,700 MW were provided by renewable energy in 2013 (IRENA 2013). Most of its electric power comes from coal, as much as 93% in 2012. (IEA 2012)

South Africa also comes from a similar energy regime structure as Mexico where the country energy regime evaded the liberalization trend of electricity during the 80´s and 90´s. (Tellam 2000) Because of this the project finance through IPPs is occurring surrounded by a monopoly run electricity sector with the national utility Eskom responsible for 96% of generation.

Prospects for renewable energy are aiming to install about 15,800 MW of wind energy until 2030. (EDSA 2011) Similar to the 12,000-15,000MW Mexico aims to install for 2027. South Africa also faces common barriers and challenges of developing economies under an energy transition process: Lack of economic and technologic resources. Because of this they are also procuring an energy transition based on private independent power producers (IPPs).

However, the government is creating policy and regulatory frameworks aiming to maximise the economic regional development, requiring IPPs to contribute to certain economic development criteria: Job creation, local ownership, economic development and social development. (IIED 2013)

Renewable energy project finance in South Africa is also uniquely characterised by requirements for minimum levels for vulnerable population or Black Economic Empowerment (BEE) and community ownership as we can see on **Table 3.3.** This could be parallel in Mexico's scenario as the indigenous population.

Table 3.3. Requirements for community inclusion on wind energy projects in South Africa (Baker 2014)

	Economic Development Elements and Weighting as outlined in the Procurement Document for the First Bid Window.					
	Economic Development Elements	**Description**	**Measurement**	**Threshold**	**Target**	**Weighting**
1.	Job Creation	RSA-Based Employees who are Citizens	Number of Citizens employed Number of RSA Based Employees	50.0%	80.0%	25%
		RSA-Based Employees who are Black Citizens	Number of Black Citizens employed/ Number of RSA Based Employees	30.0%	50.0%	
		Skilled Employees who are Skilled Black Citizens	Number of Skilled Black Citizens employed/ Skilled Employees	12.0%	20.0%	
		RSA-Based Employees that are Citizen from Local Communities	Number of Citizens from Local Communities employed/ Number of RSA Based Employees	15.0%	25.0%	
2.	Local Content	Value of Local Content Spend	Value of Local Content Spend/ Total Project Value	Technology specific		25%
3.	Ownership	Shareholding by Black People in the Project Company	Shareholding by Black People/ Total Shareholding	12.0%	30.0%	15%
		Shareholding by Black People in the Contractor responsible for Construction		8.0%	20.0%	
		Shareholding by Black People in the Operations Contractor		8.0%	30.0%	
		Shareholding by Local Communities in the Project Company	Shareholding by Local Communities/ Total Shareholding	2.5%	5.0%	
4.	Management Control	Black Top Management	Number of Black People in Top Management using the Adjusted Recognition of Gender/ Number of People in Top Management		40.0%	5%
5.	Preferential Procurement	BBBEE Procurement Spend	Amount of Procurement Spend on BBBEE Contributors recognised in terms of BBBEE Recognition Levels/ Total Amount of Procurement Spend		60.0%	10%
		QSEs and EMEs Procurement	Amount of Procurement Spend on QSEs and EMEs/ Total amount of Procurement Spend		10.0%	
		Women Owned Vendors Procurement	Amount of Procurement Spend on Women Owned Vendors/ Total amount of Procurement Spend		5.0%	
6.	Enterprise Development	Enterprise Development Contributions	Enterprise Development Contributions/ Revenue		0.6%	5%
		Adjusted Enterprise Development Contributions	Adjusted Enterprise Development Contributions/ Revenue		0.6%	
7.	Socio-Economic Development	Socio-Economic Development Contributions	Socio-Economic Development Contributions/ Revenue	1.0%	1.5%	15%
		Socio-Economic Development Contributions	Socio-Economic Development Contributions/ Revenue	1.0%	1.5%	
	Total					**100%/ 30 points**

The process in order to develop a wind energy project based on South Africa under these unique requirements can be resumed on:

Operational phase: the project is generating and is now minimal risk. (Baker 2014)

National financial institutions such as national banks played a major role on the first stages of renewable energy development in the country as they were the guarantors of the debts for installing the projects. On later rounds other institutions such as South Africa's Industrial Development Corporation played a major role as both debt financer and equity investor, financing 22 renewable energy projects and investing about 20% of the assets on community participation. (IDC 2014)

However, the nature of these requirements, and the 'newness' of this model – being implemented at scale over a short period of time – has also presented private renewable energy businesses with the significant challenge of engaging with community development processes, an area typically outside their expertise. This is again a common place on renewable energy transition on developing economies.

By definition the South African policies defines that the project beneficiaries must be the communities on a 50km radius from the project. However, this can also bring problems due to overlapping beneficiary areas. Current policies are now aiming to use communication platforms between developers which will inform about the exact location of the projects and also communication with communities and management of their expectations, which is an area of great sensitivity. (Tait, *et al.* 2013)

Developers must also submit a socio-economic development plan for communities. However, engaging community in the project needs assessment and development planning, increasing the difficulty for developers which lack from expertise in these areas. The realities of procurement mean that the proposed projects sometimes are left without approval, depending on the projects financial set up and which monetary profit might only happen many years after the project installation, hindering community development planning.

Developers are also lacking feedback from the submitted development plans and the competitive nature of the procurement also diminishes opportunities for developers to create jointed development projects among communities or projects. This procuring process also diminishes the possibilities for developers to engage fully with communities as it decreases the available time to create trustful communication channels.

These business models and policy framework in developing economies are new for all the actors involved in the renewable energy industry, and until now some strikes and social unrest has been cited in South Africa, however no violent confrontations have been reported.

There are examples of apparently progressive attempts to mitigate this by regular communication with the communities via the establishment of a community liaison office. There are also reports of

approximately ten manufacturing/or assembly plants under development which could potentially result in technological diffusion, innovation and skills development in South Africa.

Until now the project in South Africa has potentially transformative impacts on the social, economic and technology sector, and has already brought a diversity of new players and sources of investment to a country which energy regime was monopolistic.

This is why an economic development and community ownership criteria is fundamental to the renewable energy industry long term success. It is necessary for developers to overcome their competitive nature and find collaborative schemes and engage honest and open communication with local population. The role of the state in regulating the programme and managing these tensions will be crucial and should be at the heart of considering how to achieve a low carbon development transition.

3.6- Scotland's and UK experience with Community energy projects

The UK is a very interesting study case for this research as currently tries to integrate communities under an already mature wind energy industry. On the last 10 years the country has deployed a large amount of wind energy capacity going from 933 MW on 2004 to 11,209 MW on 2013, (IRENA 2013) meaning around 12% of the total 94,000 MW (EIA 2012) installed capacity which provide electricity to over 63.7 million people.

Overall, the UK accounts for 22,400 MW of renewable installed capacity on 2013, meaning that the total renewable installed capacity grew 3.4 times from the previously existent 6,545 MW on 2004. (IRENA 2013) On the other hand community energy capacity grew from 4.1 MW in 2003, to 58.9 MW in 2013 meaning an increase of over 14 times. (Harnmeijer *et al* 2013)

This means that community energy in the UK is growing 4.2 times faster than the overall renewable energy. However, this might not be enough in order to achieve a successful integration of community renewables due to the still low baseline of community energy on the overall renewable energy market, which was around 0.26% on 2013.

Most of the community energy capacity installed is now placed in Scotland, a country on the north region of the UK with very rich wind and marine energy resources and about 5.3 million inhabitants, meaning 8.23% of the UK population. (NRScotland 2014) Until 2013, 29.6 %(6,634 MW) of the total renewable energy capacity of the UK was installed in Scotland, and 51.61% (30.4 MW) of community energy renewables. (Haggett *et al*. 2013)

Scotland is pioneer in UK community energy schemes, the government is one of the few in the world with specific targets for renewable energy capacity owned by community benefits or owned schemes, aiming to reach 500MW by 2020 (SPIC 2012) .Also, the first energy community project in the UK was created in Scotland in the Isle of Gigha in 2003. (Isle of Gigha 2015)

Community energy prospects for the UK indicate the possibility to achieve about 3 GW of electricity generation capacity by 2020. These targets have been set as the UK realized the secondary positive impacts of community renewable energy which could include a greater social cohesion, local economic benefits and increased awareness of energy and climate change issues. (UK Gov 2014)

In order to accomplish its targets, communities have many different schemes in which they can associate with different public or private actors and speed up the process, at the same time both parties have some benefits. On **Table 3.4** we can review a broad definition of such schemes, as it weakness and strengths.

Table 3.4. Broad classification of community projects on the UK, as its weakness and strengths (Gubbins 2010)

Model	1 For Profit	2 Profit and non-profit distributing	3 Non-profit distributing	4 Community benefit
Description	local developments providing opportunities for local private investors and 'small' investors nationally	joint venture arrangements between private and non-profit distributing companies	developments by non-profit distributing bodies on behalf of all people in a community	'community benefit' arrangements with private commercial developers
Developer	E.g.: co-ops, farmers, other rural businesses	E.g.: private landowners and local development trusts	E.g.: local development trusts, community interest co-ops	E.g.: wind farm community benefit payments
Ownership	Individuals, profit distributing companies and co-ops	Special purpose vehicles (joint) or Two separate companies, private and community	Community group	Developer
Legal basis	Companies ltd by shares; Industrial and Provident Society with profit distribution	Companies ltd by shares with both partners owning shares; or separate companies ltd by shares, one owned by community group	Typically company limited by guarantee with trading subsidiary limited by shares	Payments usually to an existing community trust or one established for purpose
Main beneficiaries	Private individuals	Both private individuals and community groups	Community groups and wider community	Wider community
Individual profit.....>Community/non-profit.....>				

MODEL	WEAKNESSES	STRENGTHS
1 For Profit	• No physical asset owned by community • Not for benefit of wider community • Private, investor benefit	• Not reliant on public funds (although tax relief aids attractiveness) • Encourages local support for renewable and green energy
2 Profit /Non Profit **(a) Joint venture with partnership in development**	• Need either a separate Priority Partnership Area (PPA) or separate grid connection agreement • Legal documents can be more complex for community in securing separate loan agreement	• Some grant currently available for pre-development and capital • Community control own asset • Community sense of ownership • Capacity building in community • Lease of land can be used as security for a bank loan • Community secure if other partners sell to big developer/go into administration
(b) Joint venture with ownership in shares	• Community is often minority partner with little control • Access to equity more difficult • If project or partner folds community is left with no return for their involvement	• Access to grant in Highlands & Islands for pre-development • Ease of legalities • Operational and maintenance risk spread over more turbines
3. Non-profit distributing	• Dependant on public grant	• Builds community knowledge and capacity • Benefits wider community • Linked directly to community needs • Strengthens community organisations
4. Community Benefit	• Generally limited sums available (with one exception) • May be little engagement by community • No community asset	• No need for detailed community involvement – minimal volunteer effort required • Some funding available for community 'good causes'

For profit investment co-operatives have been impulse for the E4All (Energy4All) organization in the UK, providing the opportunity for private individuals to join an IPS (Industrial and Provident Society) through share subscriptions. So far this approach has only been used in Scotland by the E4All specifically for wind projects, and all the commissioned projects have been led by Falck Renewables.

These local co-op are not part owners of the actual development as they do not own a physical asset. The IPS only buys the right trough a royal agreement to share the income from the power sale. Local co-ops are encouraged to assign some of the proceeds to local good causes, but these are mostly distributed to shareholders.

These schemes are not dependent on public grants, count with tax exemption and have been also useful in order to promote local investment in wind energy projects reducing local opposition. However, the fact of these projects being called community projects is polemical as the private utility controls the whole development of the project itself. The co-op is managed by a board appointed by shareholders and the wider community has no say in the co-op but might benefit in a small way by donations from the co-op to local good causes.

Jointed ventures between community groups and private companies are created when local communities are invited to participate in a renewable project by a private company. This happens normally under the assumption that having the community on board of the project will increase community support and create a much more stable landscape for developing the project.

A joint venture with ownership in shares is an specific scheme where the wind farm is usually owned and run by a company with that specific purpose, often a LLP (Limited Liability Partnership) or CLG (Company Limited by Guarantee). Profits are then distributed to shareholders after operation begins and the remaining costs have been paid.

Community groups are traditionally the minority shareholder and therefore have less control. In the UK is difficult for projects with a community as a minority shareholder to access to grants as most of public founders support a major shareholding from communities. (Gubbins 2010)

On the other hand a jointed venture with partnership on development implies to sign a collaboration agreement between the community and a private partner to share costs, risks and work involved in developing the wind farm and sharing the benefits from economies of scale. At the end the two partners will own two separated wind farms, usually with different land lease and finance. On the pre development phase the community has shared control of the project with eventual complete control of part of the whole project on the operating phase.

Jointed ventures mean a great opportunity for widening the social inclusion of communities into renewable energy projects, not only by securing an asset that in other instances would be impossible to

obtain, but also for giving communities some true influence and control over the development of the project since the planning phase.

Developments by non-profit distributing community organizations are typically taken forward from scratch by development trusts taking the legal form of companies limited by guarantee with charitable status. They can include all residents in a community as members from a nominal sum of money.

This is a model with strong community involvement as it allows all community members to engage and is highly responsive to community needs as it's defined by the community itself. It also strengthens community based organisations and develops leverage by helping to finance future developments. However, the main barrier to overcome on this model is the dependency on public grant funding.

On the UK for example, the opportunity that these different schemes have opened for both sectors and led the new community benefits protocol to a fivefold increase in the amount that developers pay to communities. It means that, in England, community benefits packages should be worth at least £5,000 per MW of installed capacity for communities every year. (DECC 2014b, Haggett *et al.* 2013)

A study for underpinning the social factors for success in community projects in Scotland reports that success, profitability and effectiveness can depend more on social variables than on the usual technical, environmental or economic factors which private projects normally include. This is of great importance to take into account when developing different projects for communities which live in different landscapes and have different social structures.

Important factors such as longstanding community groups or pre community cohesion could be determinant for the project success as community shared identity underpins group action. (Hagget *et al.* 2013)

Community projects in Scotland, for instance, are more likely to start in less deprived areas in a ratio of 2:1, being also more likely to become operational in such places. However, the main incentive behind creating a community project is financial, but projects which have a further motivation such as lowering carbon emissions are more likely to succeed and get to the operational stage.

Under these statements we can clearly see how social factors and relationships between community energy schemes stakeholders, such as thrust from the community in the local authorities or private developers is determinant for its success. These local factors would also influence heavily in choosing the correct ownership scheme for the project.

In general community projects have a higher ratio of approval over planning stage with 97%, and they're also faster for going through this process. However, they don't do so well on the financial part where community projects expend around 70% more on the preplanning costs.

The experience of UK and Scotland with community energy shows the importance to create adequate financing vehicles and business schemes in order to secure social engagement. This experience also shows that in order to ensure the integration of communities under an on-going and mature renewable energy industry is also necessary to create optimal conditions for engaging other stakeholders as private utilities and governmental institutions to cooperate along with communities on the energy transition process. It also gives important lessons on how communities should be introduced on the energy regime since the early stages of the transition process in order to avoid further difficulties.

3.7- Summary of study cases

Different study cases on developing and developed economies engaging with community wind ownership schemes have been analysed. The main factors influencing the development of wind energy industry in such countries is enlisted as a comparison with the existing key aspects in Mexico **Table 3.5**

Table 3.5. Main factors influencing the development of wind energy industry in the selected study cases.N/I (No Information), C (Controversial)

	Denmark	Germany	Kenya	South Africa	Scotland	Mexico
Early engagement of communities with energy transition	x	x	x	x		
A government and/or industry led strategy for public and community buy-in	x	x		x	x	
Expression of political commitment from government (Renewable targets)	x	x		x	x	x
Effective rule of law; and transparency in administrative and permitting processes	x	x		x	x	
A clear and effective pricing structure	x	x		N/I	x	
Provisions for access to the grid (incentives & penalties for grid operators)	x	x		x		x
An industrial development strategy				x		
A functioning finance sector	x	x		x	x	
An employment development strategy				x		
Main public policies and regulatory tools						
Subsidies	x	x			x	x
Feed in Tariffs	x	x		x	x	
Research and Development	x	x			x	C
Consultation process	x	x	C	x	x	C
Compulsory offer community ownership				x	x	
Community ownership operates only locally	x			x		
Social Impact assessment			C	x		x
Environmental impact assessment	x	x	x	x	x	x

Chapter4. Community projects, social empowerment and engagement in The Tehuantepec Isthmus

4.1- Mexico, renewable energies and social empowerment

1.1.4- Solar energy and its short but integral development in Mexico.

Photovoltaic (PV) energy enables people in Mexico to celebrate interconnection contracts between particular households and government to feed the general grid. These contracts allow people to be directly involved on using the massive solar resources in the country. This approach resulted in an increase of 763% on PV interconnected systems capacity only on 2010 (SENERa 2010).

Mexico is rich in native renewable resources. However, the country lacks technological and economic infrastructure to impulse a strong energy transition, relaying on foreign institutions. Therefore, it's imperative to strengthen national actors through research and development programs such as the PRODIAT (High Tech Industry development Program) used for the solar industry. This would joint industries and academic centres in order to deliver the technological and human resources needed in this challenging transition not only for solar PV technology but for all the renewable energy technologies.

Until now solar industry has achieved a more integral development scheme, allowing a blooming manufacturer PV panel industry to rise in Mexico and become the most important in Latin-America. Even if most of the manufactured panels are destined to be sold to the USA, this industry means a strong base in order to impulse future national PV market which allows to decrease production costs and creates long term stable jobs. Because of this Mexico is now considered one of the 5 best countries to invest in PV development. (SE 2013)

However, it's important to underline important differences between PV and wind energy. Wind energy implies problems mainly related to the territory, as they are land extensive, while solar PV possibility to be installed on rooftops clear this technology from the land extensive list.

Magnitude of installed capacity is also a factor to consider. While solar PV projects in Mexico are mostly orientated to provide electricity to small communities through governmental programmes or international funding, or even smaller distributed generation projects among different householders connected to the general grid, wind energy in Mexico is not socially orientated in order to provide electrification to the wide population or to reduce electric tariffs for house holders or communities

(Except for la Rumorosa case).Therefore wind energy is treated as business and investment, and therefore giving economy of scales an important role on its development, impulse also by the ambitious governmental targets.

Finally there is an important economic difference influencing both technology developments: One supposes a long-term investment by householders or are being financed by external institutions, while wind energy supposes a short term income by poor communities and a long term investment by big private developers. This means that on the perspective of the population, PV energy is linked to the direct investment of Mexican population of the Mexican, while wind energy is linked to economic incentives external to the technology per se, like rent contracts for the land which doesn't make people owners of the technology and the project and therefore decouples population from the interests of its overall performance.

Even if governmental prospects for solar energy are not as high as the ones for wind energy, and they also differ greatly on the different impacts which can potentially produce for society. Solar energy has achieved to unlock important areas which would allow a much more easy transition path once the technology is mature enough. It mainly constructed a robust industry for manufacturing, supply and technologic development in the country which would allow a much fluent market along with job creation on the academic and industrial sector. And it also is allowing general society to access to these technological niches by guaranteeing interconnection contracts and possibilities for society to invest directly.

This will allow a wide variety of stakeholders to invest on this technology creating a more healthy market.

4.2- An analysis for current wind energy community schemes proposals in Mexico

4.2.1- The Yansa study case

Precedent

On 2008 Sergio moved to Mexico in order to work with the Tehuantepec Isthmus communities, which in his opinion needed alternative wind development models. At the same time he started to work with contacts on the US in order to create Yansa foundation, the second part of the Yansa group. As a result Yansa Inc. (aka Yansa Foundation) was created in New York in 2010.

In a parallel way to this international process, on 2008 and being influenced by the "Mexican wind rush" which was filling the Tehuantepec Isthmus with wind energy projects, the community of Ixtepec envisioned a community wind farm of their own, which would allow them to use the wind energy

resources existing in their territories with average wind velocities of 8.0-9.0 m/s at 50m height and average wind energy potentials between 750-1000 W/m^2 (SIGER 2015)

This project was approved by the community goods assembly on the first months of 2009. The community members presented the idea to CFE and some private developers, being rejected. However, the Ixpetec community members remain confident on the project and contacted Yansa on May 2009, having shortly after the first informative event in the community.

On October 2011, two years and 5 months after the first informative event, the assembly approved unanimously to create a 102 MW wind energy farm counting with Yansas expertise under a jointed venture scheme.

Ixtepec has been categorized as a difficult place to access by private developers, due to the negatives from the assembly to collaborate or negotiate with private developers. (Nahmad 2014) In this way the community of Ixtepec and Yansa are challenging existing paradigms on wind energy on the Isthmus of Tehuantepec by proposing a community ownership non-profit scheme which aims to become a breeding ground for an inclusive and just energy transition.

Yansa "envision a sustainable world in which renewable energy production empowers communities and generates positive social change" by "fostering community development and environmental sustainability, ensuring that the transition to renewable energy is equitable, safe and just." (Yansa 2012)

Yansa aims to join communities which have the territorial control and the human resources in order to overcome the existing barriers for community energy projects with their expertise in order to finance, operate, make environmental and social impact assessments, fund management, technical assistance for productive projects until the community develops and obtain the necessary skills.

The foundation is working in Ixtepec through the traditional institutions such as the assembly, trying to integrate not only recognized members from the community but also vulnerable groups inside the community such as women or youngsters in order to provide the tools for giving shape to these community projects and possibly to the future energy regime existing in Mexico.

On a broad way we can say that the Yansa model will be a 50-50 jointed venture between the community and Yansa. Monthly benefits coming from the wind farm will be used in first place to pay the credits for developing the project and payments to directly affected landowners. The share for the community will go to a community trust focused on productive projects and economic diversification, a trust for helping the deprived zones of Zapote and Carrsquedo and a pension fund for old community members which have no social security.

The remaining revenues for Yansa after paying to the investors will be used as a buffer to give financial stability and certainty to the existing projects in case of external negative impacts, such as technical

failures or low productivity on one year. It will be also used to promote new community renewable energy projects, which will also give half of its revenues for Yansa foundation, creating in this way a breeding ground for community renewable energy projects.

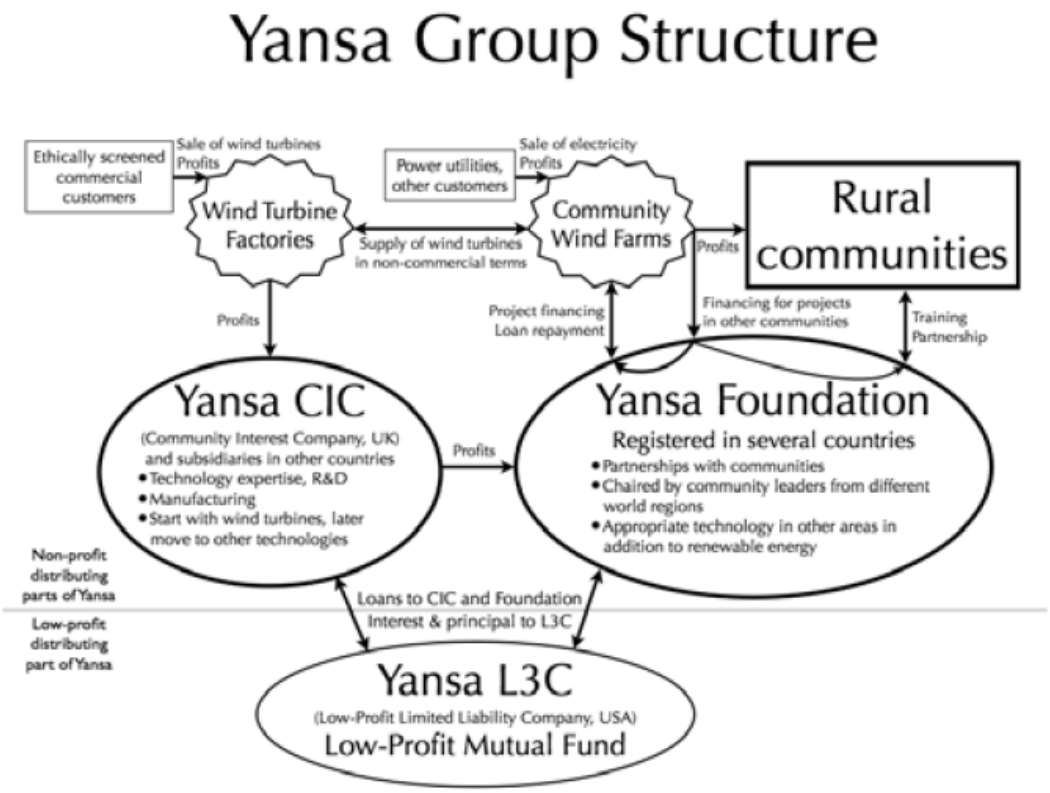


Figure4.1. Diagram of the general structure of the Yansa group integrated by a CIC, L3C the foundation and separately the rural community fund from (Oceransky 2010)

We can see that the structure is integrated by mainly four different entities: Yansa Foundation, Yansa CIC (Community Interest Company), Yansa L3C (Low-Profit Limited Liability Company) and of course Rural Communities.

Yansa foundation

The centre for Yansa foundation is based on the United Stated. However it aims to be composed also by organizations registered in countries where the foundation works. In the preparatory meeting of the foundation, held in September 2008 the Foundations activities where characterized in four areas:

1. - Community projects.

Starting by out reaching grassroots community organizations in order to find engaged communities and develop its potential. Dialogue will be important in order to define community needs and developing the assessment process and the further definition of specific scopes for the economic and project plan, technic requirements and organizational infrastructure.

The foundation will also support the realization of community projects through a combination of loans, grants, technical support, education and training in order to ensure the long term positive changes which would allow communities to address the economic, social and technological transformations needed for communities being able to manage autonomously their long term project development.

2. - Education and training

The foundation will support mutual and participatory processes of education. For these to happen it will be necessary for communities to engage in the process and explain their political, social and economic realities, including their present expertise, and educational needs and desires which could include technology, project management, community participation or financial and economic skills.

The foundation will emphasise the education and leadership development of women and other individuals from other vulnerable groups by global, regional and local learning centres.

3. - Technological and strategic development.

The foundation will support networks involved in strategic thinking and technology development for public domain which supports the principles of the foundation and aim to address the needs from communities.

4. - Communication and Information.

The Foundation will support communication and information sharing through conferences, electronic communications, publications and translations, and strategic exchanges. (Oceransky 2010)

One of the major concerns is that the foundations remain as effective and mission-conscious in the future without its original leadership. Without proper guard limiting authority mechanisms directors could ignore the main aspirational intentions which are expanding the organization model into new communities, by focusing resources on the existing one represented by the board of directors.

It is fundamental to integrate community organizers into the leadership and decision making process. Not only this would means to shape Yansa´s foundation under the guide of the very people which necessities and first-hand experience is leading the project, but it also will give communities a sense of ownership in the organization.

Under this context, to anchor the organization mission Yansa will have a two tiered membership system, which will be the base of the governance structure. The directive board will act as a traditional board with the traditional powers and laws of directors under New York law and will also work with the board of trustees, which will work as an advisory body to oversight the board of directors.

“To keep the Board of Directors acting in line with Yansa Foundation’s mission, Trustees ratify the Foundation Strategy and have control over Board membership. While Trustees are not rigorously

involved, their occasional examination of Yansa Foundation's operations and Board membership serves as an important safeguard against mission drift." (GULC 2013)

Table 4.1 Table showing the characteristics of Yansa foundation board or trustees and directors (GULC 2013)

	BOARD OF TRUSTEES	BOARD OF DIRECTORS
Characterization	Advisory Body	Traditional Board
Powers and Duties as Directors under New York Law		» Manage Yansa Foundation's affairs and property » Produce Foundation Strategy and regular updates for Trustee Approval » Nominate new directors
Powers and Duties as Members under Bylaws	» Review and approve Foundation Strategy » Elect Directors » Nominate and Elect Trustees » Remove Directors	
Major Differences	Meetings only every 2 years Maximum tenure: 18 years Specifically enumerated powers	Annual meetings Maximum tenure: unlimited Duties of active management, writing Foundation Strategy

YANSA L3C

In order to begin operations Yansa will need a substantial sum of capital for creating the first community renewable energy projects. This is exactly the mission of Yansa L3C, to act as a financial start up mechanism for the projects.

An L3Cis a legal form in the USA (approved since 2008), is a hybrid structure combining financial advantages of a LLC (liability company) and the social advantages of a non-profit entity. This structures must significantly further the accomplishment of one or more charitable or educational purposes. It also defines that no significant purpose of the company is the production of income or the appreciation of property. This does not remove the character of profit venture, but makes profits a secondary goal under very low percentages of return between 4-6%, looking therefore for first impact investors more interested on social or environmental project investments.

An L3C can also structure its capital into different categorize in order to attract a wide diversity of investors. In these structures foundations provide the junior capital in the form of PRIs, however they are legally required to accept a below-market return on the risk in order to their investments qualify as PRIs.

As PRIs in the junior tier absorb most of the risk, the L3C will be able to offer attractive conditions to investors in the other tiers. Senior tier investors will have the first claim on the assets of the L3C. The risk levels must be acceptance to investors on different tiers. These investors will retain ownership and management rights in the L3C, and therefore will be part of the decision to provide loans to Yansa projects.

These decisions will not be determined by profit considerations, since the profit obtained by L3C members will be limited by its statutes, and will therefore not be larger for projects with, say, a 10 per cent return than for projects with a 5 per cent return. The L3C should therefore be equally interested in funding all projects that are viable, but will have the possibility to reject projects that are too risky or deemed not to be viable.

However, since it will receive 50 per cent of the profits generated by the projects undertaken with the communities, is expected for the foundation to build a large pool of assets, decreasing dependency on L3C funds as time goes on. In 2011 Yansa Inc. received its first substantial grant (100k USD from Halloran Philanthropies), and in 2012 Yansa CIC received its first institutional loan (an 80k USD Program-Related Investment by the Swift Foundation).

YANSA CIC

A CIC (Community Interest Company) is a company with no proprietaries or share owners existing in the UK since 2005. It can develop profit activities, but it needs to dedicate the revenues entirely to development projects. Therefore, these companies are hybrids between a non-profit organizations and a company. This makes the company able to generate profits and avoid further dependence from external financing bodies, and also would make the company devoted to their social philanthropic objectives.

Therefore the essential feature of a Community Interest Company is that its activities must be for the benefit of the community. CICs are subjected by law to the so-called Asset Lock, "a general term used to cover all the provisions designed to ensure that the assets of the CIC (including any profits or other surpluses generated by its activities) are subject to meeting its obligations, either permanently retained within the CIC and used for the community purposes for which it was formed, or transferred to another asset locked body, such as, another CIC or charity."

A part of the profits will also be paid to the investors of the L3C, but if the projects are run efficiently it could be only a fraction of the overall returns produced by the group. The rest of this wealth will be turned into common resources. These commons will be built at local level, through the part of the profits from community projects that are invested by the community, and at global level, in two forms: the technological and productive assets of the CIC, and the increased capacity of the foundation to fund further community projects and training facilities/programs.

The objectives of Yansa CIC are:

1. To promote the development and use of renewable energies and sustainable development generally, alone or in partnership with other organizations;

2. To engage in the manufacture of renewable energy equipment;

3. To work with community-based organizations by:

- providing access to renewable energy technologies and training

- promoting collective and sustainable use of the natural resources for the common good,

- supporting participatory and democratic processes in which communities define their own development models,

- facilitating access to the resources necessary to fulfil these aims;

4. To support the work of non-profit technology centres that produce knowledge in fields of common interest (such as renewable energy, information and communication technology, agriculture, transport, etc.) and thereby promote not-for-profit use of this knowledge, in particular by community-based organizations following existing and new licensing models such as Free and Open Source Software, Open Hardware and

Creative Commons; and

5. To raise awareness about the challenges facing our planet and its inhabitants, and about ways to overcome them through positive solutions.

Yansa CIC will be in charge of operating the wind farm on an early stage. However, the long term objective of the company is to develop skills and capabilities on the community members so they can take control of the project as soon as possible. The non-profit nature of the CIC makes this a natural step for Yansa to save resources by creating local jobs for community members instead of paying externally to different personnel. The project also aims for 50% of the work opportunities to be taken by women from the community in order to strengthen this vulnerable group.

This approach might not only increase the number of well paid, stable working positions, but would also increase educational opportunities for the wider population which could prepare the new generations to join on the same job positions as operators, technicians or managers in other wind energy projects not necessarily from the community, contributing to the specialized personnel training that the country needs to undertake the transition process.

The opportunity to create grassroots renewable energy innovation and manufacturing contributes to the creation of a strong national industry which could give to the country economic growth and energy security by not only cheapening costs of renewables, but also by creating specialized stable jobs on industry and academy. This could mean also a great opportunity in order to overcome the current existent barriers between industry and academic institutions.

COMMUNITY TRUST

As it was previously explained half of the revenues after paying the debts with initial first impact investors, affected land owners, pension and zapote-carrasquedo fund will go to the community trust.

The objectives of the community trust will be:

-Create integrative and sustainable productive projects for the revitalization of the agricultural sector and securing economic independence of Ixtepec community.

-Reinforce the access to public services such as water and electricity.

-Increase educational opportunities and access to relevant training in order to full fill community needs.

-Protect the environment, as a result of sustainable projects and promotion of environmental conscience.

-Strengthen Zapotec culture through arts and structures and community practices

-Impulse organization and opportunity access for vulnerable sectors such as farmers, women, young men and others.

The community trust and the consequent productive projects will be managed by a structure with three different levels:

Yansa will use the traditional institution of the assembly in order to make a democratic and clean use of the economic resources. The first level of the fund structure will be integrated by the community assembly, the different agricultural association assemblies and the women and young men forum assemblies. On this way the funds would be consulted on an open and democratic background. They will decide which projects will be funded, taking into account that the final decision will depend from the support of the other two levels of the community trust management structure.

The second level will be a technical committee integrated by representatives of the previous organizations and assemblies. They will discuss the proposed projects by the assembly and will choice based on the development criteria the use of the available annual resources. These projects could include some proposals made from organizations outside the community and they will be reviewed under the same objectives.

This technical community will be constituted by women and a man representative from every different assembly or association (agricultural, cattling, Ixtepec community, young forum and citizen forum), two women from the women forum assembly and a Yansa representative. These committee members won't be able to personally propose any project, these projects must be first supported by their respective assemblies.

The third level will be a technical team integrated by community members with the required management capabilities, and representatives from Yansa foundation. This team will be integrated by people from the community and Yansa personnel and they will be in charge of the supervision and direct assessment of the on-going projects funded by the trust in order to assure an efficient and transparent

use of resources. In case these resources are being used for other purposes the technical the Yansa the team will have the power to cut the resources until the problems are fully solved.

The Ixtepec community park will divide revenues on a 50-50 scheme. However, there are some primary areas which the 50% of revenues must cover before going to the community Trust. These areas will be:

Payments for affected land owners.

-Yansa will pay 30,000 MXN annualy per wind turbine, without including the manoeuvre zone but including the cementation (Approximately 24 m of diameter)

-For permanent impacts (Manouevre zones, channels, roads, ditches, etc.) Yansa will pay 15 MXN per square metre

-For temporary impacts 12 MXN per square metre

This means that a community member with a wind turbine on its territory will receive about 30,000 MXN for the generator, 30,600 MXN for the access platform area (2,040 m^2 approx.) and 13,500 MXN for the road (6 m wide and 150 m long), making up a final payment of 74,100 MXN annually. On 2012 Yansa reported more than 100 community members willing to offer their lands for building the project which accounts for 44 wind turbines to complete the 102 MW.

The Bii Ne Stipa 26.3 MW wind farm in la Venta Oaxaca reported about 7,148,000 USD revenues on 2012.(La Jornada 2013) If this is adjusted to the 102 MW community project of Yansa and Ixtepec there would be annual earnings of about 28,000,000 USD, meaning about 360,000,000 MXN (Using the exchange rate of 2012).

If there are 44 community members having wind generators on their territories and other 100 with territorial affections similar to the considered ones for the road and the access area, then the annual payment for affected land owners will be about 7,670,000 MXN (600,000 USD Approx.)

Payments for the association for participant land owners

Separately from the direct payments to landowners which lands are directly impacted by the project development and construction the people who signed a contract in order to lend their lands for the park development. All land owners will be benefited from these payments through a Civil Association managed by them, regardless if their lands have or haven't been directly affected by the wind energy project.

It has been agreed that this land owners association will receive 3,000,000 MXN on the first year as all these payments will also increase according to the national inflation index per year in the country.

Social development fund on Zapote and Carrasquedo

It has been proposed that 250,000 MXN are used in order to promote social development on each of the neighbour communities of Zapote and Carrasquedo. Meaning a total investment of 500,000 MXN.

These funds will be also managed by civil associations created and managed by the corresponding communities.

Retirement fund for community farmers and their widows

A special fund will be created in order to support old community farmers and the widows who don't count with social security or pension. In order to receive the money they will have to be older than 70 years old, don't have any other pension, have dedicated his life to agricultural activities or still be dedicated to them and assist regularly to the assemblies.

The total amount destined to this fund will be 5,000,000 MXN for the first year.

All these priorities will represent around 16,170,000 MXN of investment annually. However under the present business scheme they would only mean around 9% of the total capital integrating the community fund which could be around 180,000,000 MXN.

This would mean that using the information from the reported utilities on the Bii Ne Stipa 26.3 MW wind project and assuming that the Yansa 100 MW would have proportionate revenues per MW, the project would be totally repaid with a 6% interest return to the investors on 16 years, leaving total revenues around 900,000,000 MXN for the Yansa foundation which could be then reinvested on new renewable energy projects and replacing the necessary components in order to maintain the park working, which on the second life cycle of 20 years will produce revenues directly for Yansa and the Community of Ixtepec.

This was made using information from the Bii Nee Stpa 26.3 MW power plant which on 2012 reported revenues for 7,148,000 USD, and from Yansa which needs capital investment of 200 million USD for its project. The annual payment for investors annually therefore was calculated as:

$$Debth = CAPEX + OPEX + \big((0.06)(CAPEX)\big) - \sum_{n=1}^{n=30} AP_n \qquad AP_n = \left(\frac{7{,}148{,}000\ USD}{2}\right)\left(\frac{100MW}{26.3MW}\right)$$

Where CAPEX is the capital cost, AP_n is the annual payment, OPEX is maintenance which is about 25 USD per installed kW and n is the number of years.

At the end of this first 20 year cycle the community would also gain around 180,000,000 MXN annually without taking into account raises on this quantity due to inflation (Which the project schemes also covers).

According to the Mexican government, on 2014 the Ministry of agriculture, cattling, fishing, rural development and alimentation (SAGARPA) invested around 2,295,000,000 MXN on the state of Oaxaca.(SAGARPA 2015) 855,000,000 MXN to the Integral rural development program, 939, 000, 000 MXN for the agriculture program and 35,000,000 MXN for the education, innovation, research and technologic development program.

Under the already discussed arguments the Yansa wind project would be able to annually generate on an autonomous undefined way around 7.8% of the total investments which the government actually did on the state of Oaxaca, for a community which represents around 0.8% of the total population. Also an important situation is that the revenues would be managed and distributed directly by the people of the community and Yansa, which means it will be less probable to suffer from mismanagement, corruption or stealing and it will also have a greater impact due to the more specific use of productive projects.

On 2012 the Yansa group had the compromise of the previous energy minister to have support and access to the grid. However, after 2012 with the change of political parties on power the Yansa group lost this support and therefore the interconnection contract in order to begin with the project. The current financial requirements which CFE is asking to Yansa and the Ixtepec community are the main for the project remaining stalled.

4.2.2- The Intrust Global study case

InTrust Global Investments is a socially-conscious investment advisory firm focused on energy and infrastructure markets and Forging partnerships between investors and rural Mexican and Latin American communities to unleash shared growth. (InTrust 2015)

The firm is currently undertaking a program for applied leadership in renewable energies and energy efficiency along with the Harvard University School of Public Health to train more than 250 public university professors and researchers in Mexico. The program seek to expand the limited pool of project developers and project advisors who have 1) local insight; 2) understanding of global capital markets and 3) knowledge of how to respect local communities. This has the potential to position Mexico's higher education sector as an engine for social innovation and green economic growth.

The objective is that Universities can play a larger role in connecting project ideas with technical expertise, bridging communities and external project sponsors, and ultimately attracting socially-responsible investors to otherwise difficult to access markets.

InTrust Global is now on the first stages for developing a currently confidential community wind energy project on the Tehuantepec Isthmus. The available information states that the project model aims to stablish a private equity fund, granting local communities an equity stake in the projects in exchange for the contribution of their land or natural resources, allowing community members to share in the financial benefits of the investment and a voice in the decision making and operation of the project.

Good practice for community project development includes site visits to ensure local communities to welcome the potential project and include them into direct negotiation of critical issues. This would be realised by engaging community members at the earliest planning stages and adding a community representative on the board of each project and that his or her vote is necessary prior to the sale of the enterprise or change of operator.

InTrust Global also compromises to create a project management model that is specific to each communities' needs, and build capacity of the of the stakeholders to ensure the model is implemented successfully

Even if the actual projects are still on a very early stage of development is possible to realise that the basis in which InTrust Global is relaying to build community energy projects are very reliant on the inclusion of different stakeholders to the wind energy project.

Chapter 5. Discussion: SWOT Analysis

There are deep and important conflicts which has been developing on the early history of wind energy in Mexico. However, alternative models which include community ownership schemes has proven to be successful in other countries in order to increase wind energy acceptance, regional economic development and greater penetration of renewable energy on the energy matrix.

Different approaches and financial vehicles have been created around the world in order to adapt to the country and sometimes the community specific conditions. This would be especially important in the case of the Tehuantepec Isthmus which social and cultural diversity is remarkable.

Due to the recent process of energy reform many different actors have been looking at the renewable energy sector in Mexico with interest, despite most of the reform is focusing on the fossil resources. The lack of technical and financial infrastructure has been acting as an important inhibitor for other groups to take an active role other than large private companies.

On this early development of wind energy industry in the country, some companies and groups are beginning to believe that in order to unlock the full potential of wind energy in Mexico is imperative to include communities on the current regime. This proving to be a difficult task as there are many present barriers to develop such projects under the Mexican context.

Therefore, a discussion of such barriers and opportunities for developing community energy projects through a SWOT analysis must be made in order to identify the main weak spots in which different stakeholders must work to eliminate and underpin the key opportunities which could be unlocked by the creation of such projects.

Table5.1. SWOT analysis of community wind energy projects on the Oaxaca Tehuantepec Isthmus

STRENGHTS	WEAKNESS
-Land owned by communities -Inclusive local authority structure -Long-lasting communities -Knowledge of the surroundings -Easier access to international and national funding -Community based revenue distribution scheme	-Dependency on external finance -Lack of experience, technical and management skills -Complex ownership structure and decision making processes
OPPORTUNITIES	THREATS
-Motor for regional development -Inclusive project nature -Increasing wind energy penetration -Electric tariffs reduction -Extension of the international community energy network	-Grid accessibility -Unstable political landscape - Social conflicts

Strengths:

Land owned by communities:

The most important strength which community energy projects represent on the Isthmus context is that the territory of the Isthmus is controlled almost exclusively by communities under social use schemes.

This territory is the first and most important factor for wind energy projects. Land ownership gives communities the control of these resources. It means an important factor in order to include communities under the ownership schemes for securing stability for the project on long therm.

If given the necessary importance and supported by finance institutions or policy framework, ownership of the lands could give communities in the Isthmus the necessary leverage to seriously engage into negotiations with other wind energy stakeholders.

Inclusive local authority structure:

The special sense of community in Mexico, which comes along with a specific definition by law and with a predefined general local authority's structure, is of much use when it comes to internal organization and promoting community engagement on the project.

On this case the figure of the assembly has proven to be of primary importance in order to define the future success or failure of wind energy projects regarding community engagement and therefore long term support from community members to the project.

These structures are no longer existing in most developed economies and represent perfect vehicles for creating a strong base of community support on Tehuantepec Isthmus communities. Under this context and on the long term perspective, the communication problems existing on the Tehuantepec Isthmus could be solved by creating solid consult process with communities through the existing traditional communication channels which are the assemblies. These structures are already very developed on some communities and are at the same time the maximum authority figure, therefore, they mean a key player on the future success of community energy projects in the Isthmus.

Long lasting communities:

Results of social factors of success in Scotland show that long lasting communities are more likely to succeed through the process of developing a community energy project. (Haggett *et al* 2013) This is mostly because of the simple fact that long lasting communities will have stronger cultural and social bonds between its members, enabling easier ways to create communication channels between its members, define the community targets as a whole and then work in order to achieve them.

Under this logic communities of the Tehuantepec Isthmus are outstandingly long lasting communities as many of them have remained on their territories for centuries and not only share specific cultural features but the community is the whole culture. This creates strong bonds between its individuals which could potentially facilitate objectives identification and a more efficient work through the possible difficulties which the project involves.

These communities not only share a territorial bond as many of the "communities" on the modern world. They share a whole culture, Cosmo vision and sometimes even an own language or dialect. Therefore, they represent a good opportunity to act as solid drivers which could share and envision common objectives in order to give community projects the necessary drive.

Knowledge of the surroundings:

Knowledge of the surroundings could prove to be very useful in order to enhance the results and make the environmental and social impact assessments more efficient. These are required to get access to an interconnection contract.

It is also an important factor under the planning stage in order to create adequate social and environmental impact assessments in order to reduce the negative externalities. This is important when it comes to stablish good relationship with other surrounding communities. This proved to be an important factor for communities to oppose the 396 Marenhas Renovable project which apparently divided the community as many of them used the surrounding territory for fishing but didn't actually owned it.

Understanding the cultural and social differences by having an inside view from the knowledge of local surroundings would mean great advantages on future relations for wind energy development and generating specific business schemes tailored to a specific community needs and the available surrounding resources. Business schemes should embrace the strategic advantages which traditional community structures and social land ownership encloses, instead of fragmenting them and damaging future relationships between communities and different stakeholders.

Easier access to international and national funding:

Community projects could have a relevant advantage for accessing to international funding which aim to sponsor social and environmental sustainable projects. Until now projects like the Marenhas Renovable in Mexico or the LTWP experienced problems with the World Bank due to lack of inclusion of communities and its further consequences.

Environmental and social impact assessments are important requirements in order to access to such funds and communities would be able to assess on the planning process in order to provide key information for a more adequate resource management or project planning. It would be then easier to access to IFI's funds, community member's knowledge of the surroundings will give developers an instant advantage for preparing such requirements and making their application more competitive.

IFI's and also Mexican funds are supportive with inclusive business schemes and on the same line of though, including communities as partners could facilitate the access of the project to diverse national and international funds, mostly if its supported by a well-planned revenue management scheme supportive economic diversification.

Community based revenue distribution scheme:

Polarization due to the unequal revenue distribution among community members is creating great tension and conflicts and therefore is setting the ground for an unstable landscape for future wind project development. People on the reports express its concern for the lack of community schemes for managing the revenues, and as part of the same report we can find that the projects which are looking for the benefits to be distributed among the whole community these divisions have been avoided or minimized, avoiding also future conflicts between community members.

If the economic resource is given to the community as a whole and its distribution is assessed by an experienced organization, is more likely to be used in a more intelligent way as all the community should agree in what that resource is going to be used. Also the money is more likely to be used in solving common problems instead of individual issues, reducing inequity and assuring a fairer and homogeny scheme for distributing revenues or its positive impacts.

This represent an special opportunity for both communities and governments which aim to tackle poverty, through regional development strategies.

Weakness:

Dependency on external finance:

This is one of the most important barriers in order to overcome for community energy projects to be a reality in Mexico. Mexican communities are normally integrated by rural, vulnerable and deprived population which most of the times survive using its agricultural production, leaving no revenues in order to invest at a project and making them extremely vulnerable to the risks implied on an energy project.

Because of this, communities have no possibility to invest capital on the financing for energy projects and would depend completely on an external source providing financial resources. This makes communities to lose leverage under negotiations with private entities as they are not incurring in any financial risk when creating a project.

This research demonstrates the high revenues which a 100MW wind energy project is actually generating on a 20-30 years scheme, and how low the revenues destined for communities are on the current time. This lack of distributive justice has been one of the main sources of conflict and therefore one of the main barriers for wind energy industry development.

Communities are owners of the territory which is the primary strategic resource for creating community energy projects. If could be valuated monetarily, then communities would be able to negotiate better with different stake holders using their lands not only as a territory to rent, but an actual important asset with the one they could negotiate properly.

The possibility to create jointed ventures in Mexico giving stakeholders an stable scenario for investing by having communities on their side and giving communities the financial support they need in order to access to the possibility of partial ownership projects could be a great win-win scheme in order to involve both communities and other stakeholders on overcoming these barriers.

Lack of experience management and technical skills:

The actual conditions of communities on the Tehuantepec Isthmus has originated deep educational problems related with isolation and poverty. Population has a high level of illiteracy, low overall

educational level and poor management skills due to the lack of productive enterprises owned by community members under poverty conditions.

These important deficiencies represent a huge gap to overcome in order to develop the necessary skills and capabilities on community members for undertaking serious responsibility on an energy project.

The potential regional economic impacts from the big community projects being planned in Mexico along with the community historic conditions of isolation and poverty, creates a branching point for the whole region development. However, the extents of this impact would be determined by the transfer of skills and capabilities and by the successful integration of the Isthmus communities under new productive projects being pushed by a strong educational process which aim to strengthen the skills on community members and develop the necessary human resources to undertake such projects.

Community projects in Mexico should be correctly integrated with skills and capabilities building processes in order to transcend the economic impacts and generate sustainable productive projects which can evolve into self-sustaining enterprises managed and directed by the communities on the long term. This would be only possible by integrating different actors on community energy projects which are able to transfer such management and technic skills so communities can adapt them to their own context.

Complex ownership structure and decision making process:

The assembly and other local authority structures which are characteristic for the communities in Mexico could be very helpful in order to create solid and inclusive decision making processes, ensuring the long term support of the community. However, this governance structure are highly complex and cooperative processes could turn into long and trying processes leading nowhere without the necessary clarification, guidance and structure.

Full community engagement and negotiations have been avoided by private investors due to their lack of experience with these governance structures, due to the high complexity of the negotiations and large amount of resources which can be expended by engaging with communities through the traditional local authority structures.

Under this scenario, it would be a great advantage for communities and private developers to have an intermediary institution which enables proper communication channels, at the same time it assess private developers on how to engage with communities and supporting communities in the negotiation process.

The jointed work of international organizations such as Peace Brigades, governmental institutions such as the National Commission for Indigenous Communities development (CDI) and private developers could potentially make more efficient the negotiation and decision making processes under a clear and inclusive environment. On this way each stakeholder would be able to provide part of its expertise to the project.

Opportunities:

Motor for regional development:

The income from selling electricity to the grid could be a game changer for the future development of Isthmus communities. The revenues could be focused on productive project start up mechanisms in order to foster economic development in the region focusing on the specific economic sectors which communities, along with other stakeholders involved on the wind projects, would tag as primary.

Assuring ownership over the projects would also assure more job creation during the construction phase, using local materials from nearby existing business or giving ideal conditions for the community to diversify into other areas such as possible alliances with national or international manufacturers for producing blades, towers or even in later stages turbines and more specialized components. In this way wind energy projects revenues could be used effectively as regional development motors and economy diversification funds.

Under this context it's necessary to create an integrative policy framework and financial vehicles in order to overcome the existing barriers between national industry and academy to develop a national industry which can provide autonomy on the wind energy development and manufacturing.

These programs and policies would make possible for many other stakeholders to be active on the wind energy industry development, and could mean a window of opportunity in order to access to create technological niches for national industries. This won't only mean a possible reduction on costs of wind electricity production at the long-term, but would also open the possibility for creating a solid and integrated national market around wind energy, creating quality jobs and contributing to the regional economic development.

Inclusive project nature:

As it has been possible to realize community projects in Mexico would need the support of a wide variety of stakeholders. Overall, people belonging to communities, national governmental institutions, academics, international organizations, private international institutions, opposition groups and land owners expressed their concern regarding to the lack of opportunities in order to develop community scheme projects in the context of wind energy on the Tehuantepec Isthmus.

This means a niche of opportunity for community projects to be inclusive jointed venture projects which help to integrate different actors into win-win schemes by merging common objectives. Complementing strengths from each stakeholder to bring more efficient project development schemes adjusted to the specific needs of developers and communities.

Leadership from local governments could be an important factor through local networking or meetings for structuring the project for example. (DECC 2014) The support and guidance of trustworthy local

authorities can determine the success or failure of the projects as they can act as guides for the community giving legal advice, guidance, coordination, planning, administrative support or even partnership and investment. However, if the local authorities are unsupportive or no worthy of thrust they can undermine these projects.

Partnerships between communities and local governments can help both to achieve important targets and satisfy different needs. Local governments can collaborate on external funding bids; shared use of public land and property to locate and deliver projects; and by opening up procurement processes for energy services to community groups and other social enterprises, including due differentiation between these and profit making enterprises through analysis of local economic and social impacts.

These actions can provide a financial return for local authorities and establish local supply chains. Investment or partnerships on community projects can also be beneficial for lower emissions and reduce energy poverty, creating positive impacts for communities and local authorities at the same time.

Commercial developers are one of the potentially most important actors on the future community energy scene. Strategic jointed schemes would enhance many of the projects, helping commercial developers to increases acceptance and support for large low-carbon infrastructure at the same time the community develop a stronger sense of ownership. (Schreuer 2010)

Academy would find a place by performing resource studies, environmental or social impact assessments or community capacity building at the same time it opens opportunities for engaging with private developers and members of the industry in order to create jointer research and development programs.

International organizations would also play an important role on the development of community projects by overlooking the whole process on a neutral and partial way, giving certainty and stability to wind energy landscape on the region.

However is important to notice that community ownership and control over the project development must be stimulated through more efficient management structures which also allow communities to influence on the project development.

Increasing wind energy penetration:

Until now revenues for land rental has been much lower than the international standards even though capacity factors on the Isthmus are far above from those on Europe or the world average. However, these scarce profits made by the landowners are already beginning to show some positive impacts on economic diversification by allowing people to stablish more specialized business such as veterinary clinics for the cattle, are also impacting on the next generations education quality by allowing families to keep supporting their children through higher grades in the educational systems which many times

are not close from home and also are becoming an important revenue for families to fulfil their basic needs.

All these changes have made for wind energy to increase its popularity among the people which is being directly benefited by these incomes despite the increasing opposition by most of the communities against wind energy.

If communities are integrated by sharing ownership of the projects, the, revenues from wind energy would have a greater and more direct impact over communities, mitigated also negative externalities by communities inclusion into the wind energy industry. Under this scenario is more likely for wind energy acceptance to rise across the Isthmus paving the path for allowing projects to be built on a more simple and stable way in the future. This could set the basis for a second wind energy rush, which this times includes a wider variety of stakeholders under more just and effective scheme energy regime.

Electric tariffs reduction:

High electric tariffs on the rich wind energy regions is now a problem on the Tehuantepec Isthmus, the reason of why electric tariffs are so high having such good wind resources and having private companies installing wind turbines has been a recursive argument from communities and general population against wind energy development.

This could not be only interest of communities but also of great interest of governmental institutions such as CFE. Mexico has a great number of electricity consumers, on 2012 CFE reported 36 million of clients which were expected to grow about one million per year until the energy reform process. On 2012 about 88.41% of the costumers were residential consumers which where benefited with an electric tariff subsidy between 50%-90% depending on the specific region. These subsidies meant a capital cost equal to 10% of Mexico's GDP on 2010. (CESOP 2013)

Mexico current GDP is 1.282 trillion USD. Just in order to know how much this subsidies money mean, if the trends from 2010 continued on electricity tariffs subsidies this would mean that with one year subsidies money the government would be able to build around 39 wind energy projects of about 100 MW, with a total capacity of 3.9 GW.

On the long-term this would enable the government to increase energy security by ensuring clean and stable energy production in the country, relieving pressure from federal expenditures on electric tariffs on the long-term. This would also mean the opportunity to decrease electric tariff costs on the future when wind energy gets more competitive and keep state companies competitive into the energy market.

It has been also shown on this research that community projects can generate an important income which could alleviate poverty and enhance regional development by creating productive projects or social

security funds. On the long-term the government would be able to merge a series of objectives including energy security, low tariff costs

This is of course only an exercise in order to show the great potential lying on subsidies resources which could be better use in order to support renewable energy capacity installation and regional development. However, the government has already proved successful wind energy projects aiming to reduce tariff expenses.

The wind energy project on the Rumorosa in Baja California is a state owned wind energy project aiming to reduce electric tariffs on the north of the country. (Energy Observatory 2011) On this project the Mexican government through CFE is proprietary of the Rumorosa wind farm, using the revenues partly to subsidise domestic tariffs on summer which is the high consume season in the north of the country. Under the same context, partnership schemes between government or private developers and communities could be explored in the Tehuantepec Isthmus. (Mexican Government 2014)

The federal government is also beginning to create special programs in order to incentivize renewable energy owned by municipalities or private owners. On this document the government highlights the need for economic participation of the population and gives priority to projects with social impacts in order to access to such funds.

Extension of the international community energy network:

The world panorama of energy production is now on a branching point, shifting energy regimes all around the globe towards the before deprived and isolated rural areas, now abundant on renewable resources. Under this context successful experiences of inclusive energy regimes based on renewable resources is necessary to delimitate good practice and study cases for empowering other developing economies to take the initiative towards a community based wind energy industry which aim to include a wide diversity of stake holders, multiplying its potential positive impacts.

In order to enhance community energy, and bring it to a competitive level, it's necessary to find factors of success by sharing best practice, not only at a regional scale but in an international scenario which allow people to underpin these key factors as distilled as possible, independently from the regional context to create general guidelines and international work frames of best practice.

These exchanges would also allow to experiment with new ownership structures as diverse as the number of actors on the renewables energy scene from the countries sharing information. This would open the opportunity to find new finance schemes, partnerships, key institutions and most important: It would show evidence of the feasibility of such projects, motivating and empowering communities, helping to build momentum on the current worlds energy regime transition.

The responsibility for creating this supportive landscape for social inclusion into the energy regime can make the difference between communities to act as catalysers of the energy transition process while creating economic, social and environmental development multipliers, or a complicated opposition towards renewable energy deployment which would slow down the transition processes.

Threats:

Grid accessibility:

Grid accessibility is now a general issue which wind energy projects face on the Tehuantepec Isthmus. The open season mechanism aims to reserve transmission capacity which is regulated by the CFE by a competitive process in which companies commit to pay their part for this transmission capacity and offer the lowest price for selling electricity. However, the selective process and financial requirements for accessing to these transmission capacity or interconnection contracts are impossible to meet by communities excluding the opportunity to create community energy projects on the process.

In order to address this is necessary to take into consideration special dispositions for the inclusion of completely owned community projects. Other possibility in order to address this problem would be to create jointed ventures between private developers and communities, once again these opportunities would unlock many existing barriers for communities on the current Mexican energy regime.

Unstable political landscape:

Political stability it's important in order to allow continuity of supportive public policies for renewable energy projects development, the long term nature and heavy capital investment on the first years of these projects make them extremely reliant on stable these policies for recovering the investment.

This is especially important on the case of community energy projects due to the vulnerability of communities or individuals when doing a major investment. The special conditions of vulnerability for communities on the Isthmus make them even more reliant on a politically stable context.

However, one of the recursive problems on the Mexican context regarding long term projects is the lack of politic stability, change of political parties involves constant changes on development plans and national or state strategies and therefore changes on policies which could greatly affect the renewable energy panorama.

Such political instability is now holding back the Yansa project on Tehuantepec Isthmus, and represent a risk for all renewable energy projects. However, as we already saw, it represent a special threat to community projects which relay mostly on external stakeholders and support for being fostered.

The current reform process is allowing policies and regulatory frameworks to change relatively quickly in order to allow inclusive schemes for individuals or communities in the Isthmus. However, this windows of opportunities are expected to be closed as soon as possible in order to give certainty to the

stakeholders under a more stable regulatory framework. Because of this is necessary to impulse policies which aims to include and support community energy projects and then work under a more stable context.

Social conflicts:

Social conflicts are not something new on the Tehuantepec Isthmus. However, disruptive wind energy schemes have created new niches for conflict generation which has not only affected the future development of wind energy industry on the Tehuantepec Isthmus, but which has also created internal conflicts on communities damaging the social tissue between its members, deteriorating communities and increasing opposition for wind energy on the region as a result.

These social conflicts have been escalating since the last years, being necessary the intervention of international organizations which reported a serious situation of violence which has already taken its first human life.

Chapter 6.Conclusion

Mexico is currently immersed on the greater process of energy reform since the last 77 years. This process is parallel to a process of energy transition which tries to keep up with global trends and international agreements. Under this scenario, the country finds itself on a branching point in which Mexico could be able to use the actual political momentum created by the reform process and align its objectives with the ones of a renewable energy transition based on its abundant renewable resources.

The key for accessing to those renewable resources which will help the country to shape its future economy and energy markets its enclosed on the territory and landownership, which in Mexico is 80% occupied by communities with less than 2,000 people. (InTrust 2015) The lack of economic, technologic and human resources in the country make it necessary to include different stakeholders on the transition process such as private companies and academy. This scenario therefore, would be only feasible by inclusive business schemes, which can successfully integrate these stakeholders under the same energy regime.

Wind energy on the Tehuantepec Isthmus is currently the banner of the renewable energy transition in the country. However, the exclusive and disruptive development of wind energy industries on its earliest stages creates a critical situation with increasing conflicts between stakeholders.

Information from the current landscape of wind energy industry, along with evidence from impacts of wind community projects, and direct information from the pioneers of community wind energy projects in the Tehuantepec Isthmus allowed us to perform a SWOT analysis underlining the strategic advantages and barriers for community projects on the Tehuantepec Isthmus.

These research shows how a disruptively accelerated and unregulated early “wind rush” on the region has left until now, a divided panorama. On one side the limited positive regional economic impacts until now have improved life conditions of some families on the Tehuantepec Isthmus, making communities and stakeholders to realize the opportunity lying on wind energy in Tehuantepec. On the other, the aftermaths of this “wind rush” have created deep problems of social disintegration, violent conflicts and a large list of unassessed environmental and social impacts.

Evidence gathered on this research show a trend on how countries with appropriate policy support and regulatory frameworks for community based ownership on the early stages of wind energy development are current leaders on wind energy penetration, acceptance and owners of a robust national industry. It also show how developing economies following this trend could be successful on minimizing conflicts between stakeholders. Therefore, if supported correctly and still on these early stages of wind energy development community energy projects have the potential to represent a feasible solution for the current conflictive landscape of wind energy in the Tehuantepec Isthmus, Oaxaca.

The research also shows the different advantages which community energy projects represent for regional economic development. This research also calculates that jointed projects with community ownership as high as 50% and 100MW are economic feasible in the region, regardless of the lack of financial supportive regulatory frameworks. These projects have the potential to generate revenues equal to 7.8% of the federal budget destined for economic development of Oaxaca. Therefore, such projects could become motors for economic diversification and regional economic development.

This research concludes that lack of economic, technic and human resources is a great barrier to overcome for community energy projects in the Tehuantepec Isthmus. Therefore it will be necessary inclusive business schemes to integrate different stake holders.

This gives community wind energy projects the potential to become an inclusive vehicle for stakeholders, including the ones which were initially left aside such as academics, independent technicians and consultants, international organizations and communities. This schemes are more likely to merge common objectives on wind energy sector towards a healthy and inclusive energy market on the Tehuantepec Isthmus, Oaxaca.

Therefore, this research concludes that community wind energy projects are facing on the present an innumerable quantity of difficulties and disadvantageous conditions. However, if the political momentum of energy reform creates supportive policies for community energy projects, and they are fostered and supported by a variety of stakeholders. These projects would not only be a feasible solution for the actual conflictive wind energy landscape existing in Mexico. Moreover, they have the potential to become vehicles for a healthy and just renewable energy transition by merging different stake holders objectives, potentially increasing wind energy acceptance and incentivizing regional economic development.

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Appendices

Contact persons for the development of this project

Mexico			
Person	**Position**	**Institution**	**Interaction**
Rosa Marina Flores Cruz	Postgraduate student	UAM	Personal interview
Aline Zarate	Postgraduate student	UAM	Personal interview
Thomas Wragg	Volunteer	Yansa	Personal interview
Beatrice Hugges	Volunteer	Yansa	Personal interview
Sergio Oceransky	CEO	Yansa	Personal interview,email
Gabriel Quadri de la Torre	Writter and ex presidencial candidate	El economista	Personal interview
Francisco Acuña	CEO	InTrust Global Investments	Personal interview, email
Cuauhtemoc Leon	Renewable Energy Consultant	N/A	Telephone interview, email
Maria del Pilar	Academic	Technologic Institute of Colima	email
Manuel Reta	Academic	Autonomus University of Zacatecas	email
Oscar Vazquez	Director of Climate Change	Mexico City Government	Personal interview, email

Scotland			
Person	**Position**	**Institution**	**Interaction**
Nicholas Gubbins	Chief Executive	Community Energy Scotland	Personal interview, email
Georgy Davis	Programme Manager Community Energy International	Community Energy Scotland	Personal interview, email
Benny Talbot	Development officer	Community Energy Scotland	Personal interview, email
Jamie Adam	Development manager	Community Energy Scotland	Personal interview, email
Anna Harnmeijer	Research Associate	Scene Consulting	Personal interview, email
Alan Hobbett	Projects director	BHA group	Personal interview, email