LOW CARBON BUSINESS ACTION IN MEXICO

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EU-MEXICO CLUSTER COLLABORATION: EXPERIENCES AND TOOLS TO INTENSIFY TRANSATLANTIC COOPERATION

EU-Mexico Cluster Collaboration: Experiences and Tools to Intensify Transatlantic Cooperation

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Enric Pedrós, an international expert associated with Quatre Partners SL, prepared this Paper at the request of the European Cluster Collaboration Platform (ECCP).

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Key words: Mexico, European Union, Green Technologies, renewable energy, energy efficiency, waste management, wastewater management, SMEs, cluster, internationalization, international cooperation.

Introduction

The Low Carbon Business Action in Mexico project, funded by the European Union (EU), aims to contribute to the reduction of CO2 emissions in Mexico through increased cooperation among clusters and SMES from Mexico and Europe; however, the international networks between the clusters and SMEs are still poorly developed. The aim of this article is to analyse the preconditions for European cluster and SME cooperation in the field of Low Carbon Technologies, in particular: renewable energy, energy efficiency, waste management, and wastewater management.

The research material for this desk study was collected from various sources, including journal articles, official reports, the European Cluster Collaboration Platform (ECCP), media, and other publications.

The results of the study indicate that the increasing bilateral contacts within the Low Carbon Business Action in Mexico (LCBAM) have a significant potential in terms of providing business opportunities for both the European Union and Mexico in these specific sectors. However, differences in the development stages of green technologies, and some lack of understanding in regards to the real needs and the best offer and technical capacity, lead to certain difficulties in achieving these objectives. In conclusion, the author will identify the factors that both facilitate and inhibit networking between the participants of the Event.

Overview

of the Strategic Significance to Mexico of Low-Carbon Development

Mexico has the potential to move rapidly towards a future with low carbon. On December 11th 2009, Mexican President Felipe Calderon, as part of the UNFCCC Copenhagen Accord, declared Mexico was ready to take the challenge of achieving a reduction from its trend emissions of greenhouse gases (GHG), up to 30% below business-as-usual (BAU) by 2020. A commitment given sufficient financial and technological support from developed countries as part of a global agreement.

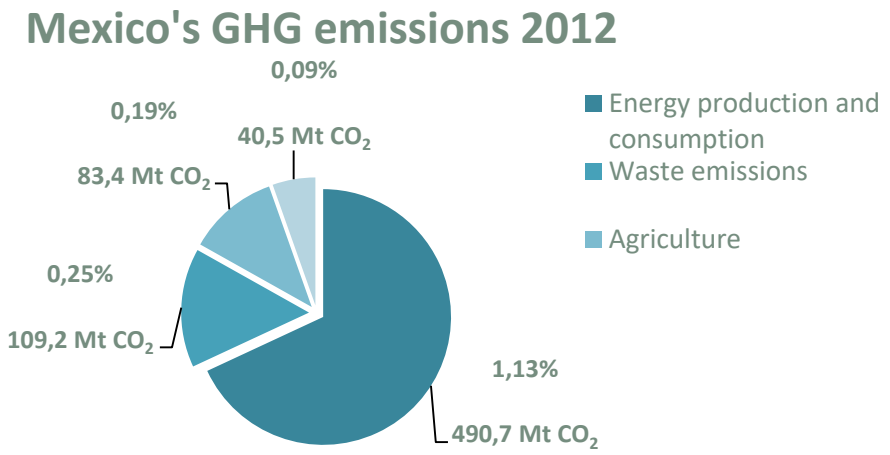
As a baseline for this commitment, the National Institute of Ecology (INE) thoroughly reviewed and evaluated together with McKinsey the assumptions and estimates concerning low-carbon

growth for Mexico, in order to determine the mitigation potential to 2020. This work was also a key input for elaboration of the "Strategy for Low Emission Development-LEDS" of Mexico.[1] A plan or long-term strategy that articulates actions, policies, programs and plans to promote development through economic growth based on activities that result in lower emissions of GHG and contribute directly and indirectly to adapt to the impacts of Climate Change.

In Mexico, the LEDS focused on specific technical areas where the country indicated the program could add the most value. Two examples of working areas within the EC-LEDS-Mexico partnership were deploying clean energy and decreasing GHG emissions in land-use sectors such as forestry and agriculture. Addressing the financial and technical barriers to clean energy deployment is a priority for the Mexican government. The Mexican LEDS intend to help the country overcome those barriers by creating a roadmap to meeting renewable energy targets and supporting private investment in the renewable energy sector.

With a strong commitment by the President of Mexico, the LEDS is based on an inter-sectoral institutional structure that allows for cooperation across ministries (in the case of Mexico this is the Inter-ministerial Climate Change Commission, supported by an advisory council on climate change). It was presented as a voluntary program undertaken with national resources, and contained about 100 qualitative and quantitative targets. The LEDS includes voluntary GHG emissions reported by businesses and the establishment of a comprehensive system for GHG inventories. In addition, the document presented a long-term vision and scenario until 2050.

Mexico is Latin America's largest fossil fuel-consuming country. It represents 1.67% of global greenhouse emissions, 723.9Mt CO_2e. The majority of the country's GHG emissions come from energy production and consumption, with a 1.13% of GHG, 490.7 Mt Co_2e. Waste emissions represents a total of 109.2 Mt Co_2e (0.25 % GHG), Agriculture 8.4 Mt CO_2e (0.19% GHG), and industry 40.5 Mt CO_2e (0.09% GHG).



[1] For the purposes of this document, LEDS and LCD (Low Carbon Development) are interchangeable terms.

Figure 1: Mexico's GHG emissions 2012[2]

Climate change is a central part of Mexico's national development policy and it has made a commitment to reducing GHG emissions. Now that Mexico has pledged to reduce emissions by 30% by 2020, subject to financial and technological support from designated countries[3], the INE has started to prepare a comprehensive program to lower CO_2 emissions. Mexico is in the process of preparing sectoral strategies in order to achieve its mitigation and renewable energy targets. The country has also decided to reduce emissions from deforestation and forest degradation (REDD+) in the wider context of sustainable rural development, seeking to create policy synergies with non-forest policies and to strengthen governance.

Mexico is planning to implement an important Energy sector reform to liberalize its market and open up opportunities to foreign investors. This is in addition to the implementation of sustainable transport interventions. Mexico is also in the process of preparing sectorial strategies in order to achieve its mitigation and renewable energy targets.

In order to estimate the economic cost to achieve a "low carbon development - LCD" as well as the costs of each of the alternatives implemented in different sectors of the economy, the Marginal Abatement Cost (MAC) for reducing one more unit of pollution will be used. The Marginal Abatement Cost or MAC Curve is the economic cost of reducing emissions one unit of CO_2e, generally expressed in US dollars or euros per ton of CO_2e reduced. The potential for abatement in turn is the total CO_2e emission reductions that would occur when applying correspondingly. Through this exercise one can prioritize key mitigation sectors.

In the review made by INE-McKinsey, it was estimated that Mexico could mitigate up to 261 Mt CO_2e in 2020, representing a reduction of 30%, and ~ 523 Mt CO_2e in 2030 representing a reduction of 53%. Compared to a baseline reference, the Identified abatement potential was distributed across sectors as follows:

- Electricity Generation: 60 Mt CO_2e (23%)
- Forestry: 58 Mt CO_2e (22%)
- Transport: 37 Mt CO_2e (14%)
- Waste Management: 26 Mt CO_2e (10%)
- Industry: 25 Mt CO_2e (10%)
- Agriculture: 20 Mt CO_2e (8%)
- Oil and Gas: 19 Mt CO_2e (7%)
- Buildings: 17 Mt CO_2e (6%)

[2] Source : World Resource Institute

[3] Annex I: Refer to Annex I of the United Nations Framework Convention on Climate Change (UNFCCC / UNFCC). In this annex the list of 35 developed countries (industrialized) that agreed to limit their emissions of gases that increase the effect (GHGs / GHGs).

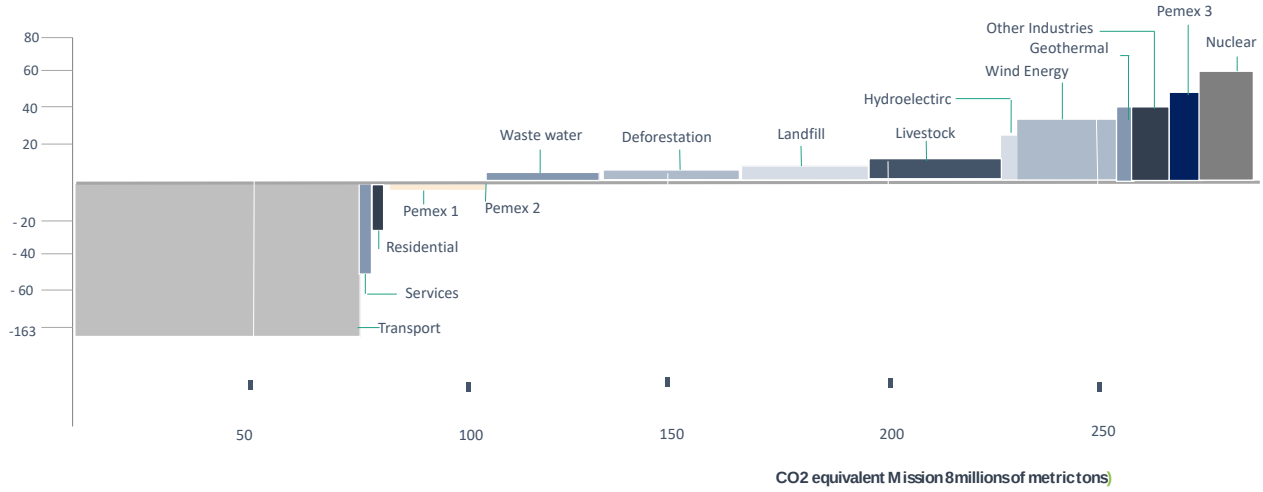


Figure 2: Marginal Abatement Cost curve – MAC Curve[4]

By knowing the cost and potential for abatement, it is possible to know which measures have a lower cost and high impact on emission reduction that would be the most efficient and attractive in a mitigation strategy. For instance the transport, electricity, energy efficiency and forestry sectors have low or negative net costs; but regulatory barriers, institutional type and market development prevent their implementation.

Figure 2 shows a series of measures abatement or reduction of emissions. The vertical axis of the graph shows the euros per tonne it would cost to cut CO2 emissions by 2030 using various measures. The horizontal axis indicates the giga tonnes per year reduction in CO2 emissions using these measures.

Mexico is the 15th largest economy in the world, and the 11th taking into account power purchasing parity, according to the World Bank GDP global ranking (World Bank, 2015). The EU is Mexico's third-largest trading partner after the US and China. Around 7.7% of Mexico's total trade took place with the EU in 2015. EU trade with Mexico accounted for 1.5% of its total trade in 2015, with a total trade surplus of around €14.4 bn. In 2015, the EU was Mexico's second largest export market.

[4] Source: McKinsey GHG abatement Curve v 2.0 ; Analisi Equipo de Trabajo. SEMARNAT,INE 2010

RUSSIA	74 MEU
SPAIN	75 MEU
FRANCE	84 MEU
BRAZIL	121 MEU
JAPAN	207 MEU
UK	300 MEU
INDIA	339 MEU
CHINA	421 MEU
USA	5.101 MEU

Figure 3: Mexico Imports – Top 10 trade partners of low Carbon environmental goods and services (€M)[6]

Mexico and Renewable Energy Generation

With a strong commitment to the development of renewable energies, Mexico is seeking to meet its energy needs and at the same time display global responsibility by contributing to the reduction of emissions causing the greenhouse effect.

Mexico has set a goal of generating 35% of power in the country from renewable sources by 2024. In this regard, numerous opportunities are emerging in the area, to which the recent energy reform must be added.

Mexico had 14.5 GW of renewable energy capacity installed at the end of 2012, satisfying approximately 20% of its total electricity production. This figure is dominated by hydropower followed by wind, which has a 10 times smaller share (PROMEXICO Trade and Investment, 2013).

The Department of Energy (SENER) issued a Five-Year Plan (2015-2019) to develop the sector, specifying the areas where the different projects are to be implemented (2013).[7]

[5] Recycling and waste, Materials, Carbon capture and storage (CCS) Air, water & environment Manufacturing/Industrial Other energy generation Low carbon buildings Other Transportation Energy infrastructure & storage Other renewables Energy efficiency Renewable energy.

[6] Source: Carbon Trust analysis of kMatrix LCEGS data 2012

Figure 4: Main states with installed capacity in 2013 Stations in operation and under construction)[8][9]

[8] Source: Promexico Trade and Investment, 2013
[9] (*) Only includes hydroelectric plants with installed capacity of 30 MW or less

Wind Power

Mexico can achieve the goal it has set itself by increasing wind power alone. However, it is expected that as part of the goal, it will also enjoy a boost in power generation from other renewable sources

Mexico has abundant wind resources with a total estimated wind power potential of 71GW according to CFE estimates. In particular, the region around Oaxaca has extensive wind resources of up to 33 GW in total with wind average plant factors at 50%; while the State of Baja California, which has up to 10 GW of potential wind resources, is an ideal location for wind farms supplying energy to the neighbouring USA (UKTI Mexico, 2014).

This sector is dominated by leading EU-Spanish wind companies in the world, such as Gamesa and Acciona; while unusual players form USA corporations like Walmart and Mexican Grupo Bimbo are coming into this market.

Geothermal

Geothermal energy, for example, presents low relative costs. If geothermal resources are achieved equivalent to the quality of steam deposits found to date, geothermal generation could amount to 2.3% of total capacity by 2026.

Today, Mexico is the fourth largest producer of electricity from geothermal energy, with a global share of 8.7% in 2012, behind only to the USA (28.7%), the Philippines (17.3%) and Indonesia (10.9%).

There is already an initiative of public and private bodies in place to set up three research consortia focused on renewable technologies that support sustainable energy.

Solar Energy

As reported by the European Photovoltaic Industry Association (EPIA), Mexico is among the three most attractive countries in the world to invest in photovoltaic projects. States like Sonora, Chihuahua, Durango and Baja California situated on the “sunbelt” have the land area and potential for installing electricity-generating capacity using solar concentration fields. Similarly, the levels of solar radiation along the Pacific coast and the states in the north eastern region permit further expansion of solar panel installations in the country.

According to the Mexico National Association for Solar Energy (ANES, 2010), Mexico had 29 MW of cumulative installed solar capacity (up to 2010) and has the potential to reach 6.5 GW capacity thanks to the country’s abundant solar resources. Solar Photovoltaic (PV) is expected to contribute up to 5% of the energy mix by 2030 and to double to 10% by 2050.

Leading EU-Spanish solar companies have been investing in opportunities in Mexico. For example, Iberdrola was recently awarded a contract for a 300 MW combined-cycle solar plant in Baja California. The company has committed $270 million to build the plant (which is expected to come online in August 2016) and has signed a 25-year power purchase agreement (PPA) with the CFE (Iberdrola, 2014).

Waste Management

Each year there are generated in Mexico around 44 million tons of waste, of which 38.3 million are Municipal Solid Waste (MSW) and it is estimated that between 5 and 6 million tons of hazardous waste (RP). Infrastructure to provide adequate management of urban and hazardous waste is still insufficient, and the integrated management of these represents a great challenge and a great opportunity area for conducting economic activities, especially in urban areas.

Management of solid waste in Mexico lies generally in local authorities and the management in Mexico is defined as "clean and service garbage collection ", considered as a public service. Due to this public stance, not all wastes are treated by private companies, in some cases they are operated by the municipal or state agencies. Among the companies that manage solid waste and have greater representation in the market there are two big players, with some presence of Spanish companies through joint ventures. Nevertheless, the providers consist of mainly small and medium enterprises, little differentiated from each other and competing primarily on price with limited technological development and innovation.

The technologies used in waste management are imported, primarily from the USA, followed by Germany, Italy and Spain.

Energy Efficiency, Infrastructure and Low Carbon Buildings

Mexico sees urban energy efficiency as critical for sustainable growth, liveable cities and competitiveness buildings are an important part of the sustainability picture for Mexico City. At least 20% of Mexico City's total greenhouse gas emissions come from buildings, with growth in coming decades expected to increase energy demand. This means that improving energy use in buildings must be part of any comprehensive strategy aimed at helping the city hit its ambitious goal of decreasing greenhouse gas emissions by 30% by 2020.[10]

Mexico City, in partnership with the federal government of Mexico, was one of five global cities to make an early commitment to participate in the Accelerator during the UN Climate Summit in September 2014.

Energy efficiency and resource-saving technologies represent large and growing market opportunities for EU SMEs with more than 80% of these technologies currently being imported by Mexico.

Mexico is also implementing ambitious plans to renew its infrastructure and strengthen its position as a regional logistics hub. The National Infrastructure plan of 2013-2018 is expected to result in £65 billion investment in roads, railways, ports and airports.[11]

[10] Jennifer Layke and Eric Mackres - April 01, 2015
[11] UKTI Mexico, 2014

Biomass

In Mexico, biomass accounts for 4.22% of total primary energy (SENER, 2014). This source has the highest potential: around 2,635 to 3,771 PJ/year. 77.9% of it would come from plantations, 20.1% from liquid bioenergetics, and 2% from biogas.[12] Based on the official outlooks, it is expected that in the coming two decades, this potential might slightly increase, since the biogas potential from organic residues from municipalities and livestock (i.e., animal manure) might rise due to the increase in food production for the growing population. These figures represent between 45 and 67% of gross domestic supply of energy in 2014. On the other hand, the land available for energy crops production and the provision of forestry wood residues are expected to decrease due the same premise.[13]

Corn is the top seed cereal in Mexico, followed by sorghum and wheat; while, the harvests generate more than 36 million tons of dry matter, about half of them untapped.

Water Management in Mexico

In Mexico, the national government has the original ownership of waters within the limits of the territory. The Water National Commission -CONAGUA, and its agencies are in charge of issuing titles concession through which individuals can use and exploit national waters. It is in charge of developing the Water Strategy for the country, an investment program for the water sector for approximately 529,200,000,000 pesos (24.000 MEU) related to 1,154 infrastructure projects, including the rehabilitation of 115 dams. For such purposes, the national government has established a public-private scheme to finance this investment (30% public, 70% private).

The biggest area of opportunity for EU enterprises is the sector of optimization of water resources, design, construction, operation and management in areas such as sanitation, water treatment, desalination and energy production among others to also guarantee supply and provision of water services, recover aquifers and boost economic development.

Agriculture and Forestry

The agricultural sector is still one of the mostly undeveloped sectors in Mexico's economy. According to SAGARPA (Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca, y Alimentación), measures to reduce emissions from agriculture and forestry are among the main GHG mitigation options in Mexico. 85% of this potential lies in forestry-reforestation, commercial plantations and measures to reduce emissions from deforestation and forest degradation (REDD).

The biggest opportunities to reduce agricultural emissions in farming practices, are mainly improving crop management practice, such as improved fertilizer management and conservation tillage. Both offer the greatest reduction potential at relatively low costs. Better management of grazing lands, such as by rotational grazing and altering forage composition, and restoring degraded lands and cultivated organic soils into productivity are also important.

[12] Dr. Roberto Parra Saldívar Centro del Agua Para America Latina y el Caribe, Instituto Tecnológico de Monterrey, México

[13] Rios, M. & Kaltschmitt, M. Biomass Conv. Bioref. (2013)

In regards to the livestock production system, this system contributes to global climate change directly through the production of methane (CH4) from enteric fermentation and nitrous oxide (N2O) emission from manure management. There is a great opportunity for its use as a source of renewable energy.

Opportunities

for international cooperation

There is potential for cooperation on low carbon technologies between the EU and Mexican companies.

International cooperation allows companies to capitalize on economies of scale by having access to larger markets. It increases competition by forcing SMEs to focus on areas where they have a real competitive advantage. This spurs SMEs' internationalization, boosts productivity, spreading knowledge, skills and innovation cross-country.

The EU has recognized the central role that international cooperation has to play in putting the EU Low Carbon sector at the forefront. At the same time, the EU has a strategic interest in stimulating plausible efforts in Mexico, to adequately tackle the climate change challenge by assisting it in a shift towards decoupling economic growth from CO2 emissions and enabling a greener economy.

LOW CARBON BUSINESS ACTION IN MEXICO

The Mexico market represents a major growth opportunity for European SMEs, due to a boost in domestic demand for low carbon goods and services, and with favourable regulations. The EU can play a leading role in low carbon technologies and solutions. A key objective of EU industrial policy is to promote internationalization of EU companies, in particular SMEs by facilitating their entry into new markets.

Yet despite their potential, low carbon EU SMEs face disproportionate challenges such as a shortage of working capital to finance exports sold overseas and difficulty in identifying the right local partner. The Low Carbon Project represents an opportunity for small EU enterprises and by extension the EU economy, in terms of creating local jobs and driving growth in the low-carbon goods and services sector by further ramping up export capacity to Mexico. The LCBA is about inspiring Clusters and their SME members across low carbon sectors, setting up of European Strategic Cluster Partnerships in low carbon and related sectors and value chains to put in place a field of competent partners. In this way, the Cooperation Partnerships would benefit from the broad range of competences available in more than 52 clusters across Europe related to low carbons industries and solutions and from business support networks reaching out to a large number of highly relevant research organizations and innovating enterprises to match the identified technology needs.

Table 1: List of EU Clusters[14]

	CLUSTER	COUNTRY	MEMBERS	WEB
1	ACLIMA - BASQUE ENVIRONMENT CLUSTER	Spain	98	http://www.aclima.net
2	AMEC - ASSOCIATION OF THE INTERNATIONALIZED INDUSTRIAL COMPANIES	Spain	355	www.amec.es
3	AMEC URBIS	Spain	65	http://www.amec.es/urbis
4	ARCHENERG CLUSTER	Hungary	55	http://www.archenerg.eu
5	AVAESEN	Spain	129	http://www.avaesen.es
6	AXELERA	France	322	http://www.axelera.org
7	BASQUE ENERGY CLUSTER	Spain	104	http://www.clusterenergia.com
8	BIOECONOMY CLUSTER CENTRAL GERMANY	Germany	111	http://www.bioeconomy.de
9	BIOENERGY FOR THE REGION	Poland	84	http://www.bioenergiadlaregionu.eu/
10	BIOMASTEC	Germany	31	http://www.biomastec.com
11	BIONIAN CLUSTER	Greece	23	http://www.bionian.com
12	CAP 2020	Belgium	185	http://clusters.wallonie.be/cap2020-en/
13	CAPENERGIES	France	500	http://www.capenergies.fr
14	CATALAN WATER PARTNERSHIP	Spain	46	http://www.cwp.cat
15	CD2E	France	150	http://www.cd2e.com
16	CHORUS CLUSTER	Greece	15	http://www.choruscluster.org
17	CLEAN	Denmark	166	http://cleancluster.dk/
18	CLÚSTER D'EFICIÈNCIA ENERGÈTICA DE CATALUNYA	Spain	121	http://www.clustereficiencia.cat
19	CLUSTER OF BIOENERGY & ENVIRONMENTAL OF WESTERN MACEDONIA (CLUBE)	Greece	34	www.clube.gr
20	CLUSTER SMART CITITES DE LA REGIÓN DE MURCIA	Spain	25	www.clustercitizem.com
21	CREA HYDRO&ENERGY Z.S.	Czech Republic	30	http://www.creacz.com
22	CZECH PELLETS CLUSTER	Czech Republic	84	http://www.ceska-peleta.cz/klastr-ceska-peleta/czech-pellets-cluster/
23	EA ÉCO ENTERPRISES	France	128	http://http://www.ea-ecoentreprises.com/
24	ENERGY AND CLEAN TECH (POLIGHT)	Italy	156	http://www.envipark.com/2015/06/18/polight-monitoraggio-e-rendicontazione/
25	ENERGY CLUSTER OF THE VALENCIA REGION	Spain	28	http://www.clusterenergiacv.com
26	ENERGY SAXONY E V.	Germany	68	http://www.energy-saxony.net/
27	GREEN CURRENT RENEWABLE ENERGETIS AND INOVATION CLUSTER	Hungary	32	http://www.zoldaramlat.hu
28	GREEN ENERGY ROMANIAN INNOVATIVE BIOMASS CLUSTER	Romania	70	http://greenenergycluster.ro
29	GREEN SYNERY CLUSTER	Bulgaria	29	http://en.greensynergycluster.eu/
30	GREENTECH SOUTH	United Kingdom	130	http://www.greentechsouth.com
31	GREENWIN	Belgium	187	http://www.greenwin.be/
32	INBIOM	Denmark	1030	http://www.inbiom.dk/en
33	INNOSKART ICT CLUSTER	Hungary	62	http://www.innoskart.eu
34	INNOVATION NETWORK FEMERN BELT	Denmark	200	http://www.femernbelt.net
35	LOMBARDY ENERGY CLEANTECH CLUSTER	Italy	120	http://www.energycluster.it
36	MADAN PARQUE	Portugal	68	www.madanparque.pt/en
37	MARINE SOUTH EAST LTD	United Kingdom	1800	http://www.marinesoutheast.co.uk
38	NANOPROGRES Z.S.P.O.	Czech Republic	35	http://www.nanoprogres.cz
39	NATIONAL ENERGY CLUSTER Z.S.	Czech Republic	17	http://www.msek.cz/
40	OEKOENERGIE-CLUSTER	Austria	160	http://www.oec.at
41	OSLO RENEWABLE ENERGY AND ENVIRONMENT CLUSTER	Norway	80	http://www.oreec.no
42	POLE EAU-FRENCH WATER CLUSTER	France	148	http://www.pole-eau.com
43	POLE MER BRETAGNE ATLANTIQUE	France	325	http://www.pole-mer-bretagne-atlantique.com
44	SEANERGIA BALTIC CLUSTER	Poland	311	http://www.seanergia.eu
45	SILESIAN WATER CLUSTER	Poland	80	https://slaskiklasterwodny.pl
46	SUSTAINABLE INFRAESTRUCTURE CLUSTER	Poland	75	http://www.klasterzi.pl

[14] Source: European Cluster Collaboration Platform. Filtered by "Environmental Services"

	CLUSTER	COUNTRY	MEMBERS	WEB
47	THE WATER CLUSTER (ANGLIA RUSKIN UNIVERSITY AND OPPORTUNITY PETERBOROUGH)	United Kingdom	78	http://thewatercluster.co.uk
48	TRANSYLVANIA ENERGY CLUSTER-TREC	Romania	26	http://trec-cluster.ro
49	TWEED	Belgium	110	http://www.clustertweed.be
50	VENETIAN HERITAGE CLUSTER	Italy	852	http://veneticancluster.eu
51	WATER ALLIANCE	Netherlands	85	http://www.waterallliance.nl
52	ZINNAE	Spain	34	http://www.zinnae.org

On the other hand, Mexico does not have a specific cluster policy, but has supported some individual initiatives. In Mexico, there are more than two thousand companies in 38 clusters, registered in the National Chamber of the Electronics, Telecommunications and Information Technology (www.canieti.org), with most-likely more that are not registered. The most predominant number of clusters are in the IT sector, and there are an important cluster presence in the automotive and aerospace sector as well.

Despite this, the cluster structure in Mexico in the sector of Low Carbon technologies is very limited or inexistent; although, one can find some positives examples in developed industry regions. Oaxaca is at the forefront of renewable energy in Mexico and is in a good position for developing an important cluster on renewable energies. Increasingly transnational companies belonging to the renewable energy sector prefer to invest in this state, considering it an attractive and reliable destination. Both project developers and equipment suppliers have a presence in Oaxaca and various national firms have entered the local market in development of small-scale projects, manufacturing and marketing of renewable equipment and have decided to diversify their businesses in support of a sustainable energy sector.

In Baja California, where there exist some important IT and other industrial clusters, there could be established cluster in renewables energies, as it has economic conditions and a strong industry community.

Therefore, the LCBA Project is well positioned to facilitate industrial cooperation between low carbon solution providers from the EU and industrial partners in Mexico resulting in long-term cooperation between clusters and their member SMEs, in the field of low carbon technologies and related services. This kind of collaboration provides mutual opportunities and benefits for both parties collaborating with low carbon SMEs and for the development of innovative new models to help low carbon SMEs in Mexico to implement new technologies successfully.

Within the EU clusters identified in Environmental Services, Table 1, there are around 9,257 members, including 6,761 SMEs, 643 large companies and 704 research institutes. These EU SMEs with high innovative capacity, supported by the well-developed clusters structures, national innovation systems, and sector networks within the EU are rather well connected through natural business networks at international level, which facilitates the internationalization of their companies.

In Mexico, on the other hand, there is no official register at the national level of companies that are involved in this sector. One can see however, the Mexican Low Carbon industry is formed by a number of different small and medium companies, with a presence of multinational companies. Unfortunately, the associations related to this sector are dispersed. Consequently, in addition to a

very disperse number of associations, one must take into account the two countries are quite different in terms of policy framework, market structure and level of technological development.

Preconditions for inter-cluster cooperation

The EU-Mexico Cluster & Business Cooperation Seminar and Matchmaking Event consists of a series of sessions to provide the European cluster delegation a chance to gain knowledge on the Mexico low carbon sector opportunities and network with relevant Mexico organisations in order to pursue cooperation on behalf of the European clusters' SME members. In this regard, the European cluster delegates will conduct matchmaking meetings with Mexican associations and possibly Mexican companies that will hopefully lead to the signing of agreements of cooperation and to the implementation of cooperation projects involving the European clusters' SME members.

There are several factors that can contribute to increased inter-cluster and SME cooperation while other factors might hinder in building these types of partnerships, such as:

In terms of *competitive advantages,* EU SMEs are in very good position in the Low Carbon sector in Mexico, as they have a good quality-cost ratio, and are competitive in their market segments. Long experience in this field combined with modern technology solutions and efficient project management, can ensure a very successful EU project participation. On the other hand, labour cost in Europe is much higher than in Mexico, and might decrease competitiveness against other South American solutions.

The *Growth potential* in Mexico for LCD Technologies is large enough for EU enterprises, and it is driven mainly by significant state investments to boost the LCD sector. Other positive factors, such as business-friendly environment and the fact that government plays an important role and it has adopted special policies for supporting the SMES' development in this field.

Nevertheless, most SMEs are mainly focused on the national and EU markets and have relatively solid market shares in their own segments there, but the lack of internationalization, real interest and experience in Latin America, limits their growth potential for the Mexican market. The potential might be also limited by the lack of International funding schemes to bankable the proposed CPAs.

In regards to the Mexican cluster structure, there are limited advantages due to the low number of clusters representing the Low Carbon technologies sector. There is a clear decompensating situation between EU and Mexican Cluster framework that may affect the cross-country cooperation. But on

the other hand, SME internationalization and Cluster cooperation are supported through various projects and funding mechanisms than can help to consolidate a long term EU-MEXICO relationship.

Referring to the Governance and market structure, large international companies dominate for instance wind, solar and hydropower energy sectors in Mexico, which can represent a market barrier for EU and smaller operators to get into this promising market.

Also Mexican SMEs in the Low Carbon sector, where there are a wide range of industries and sub-industries, produce a variety of goods and services and are smaller companies often with low specialization and limited involvement in Innovation activities.

Finally, some key items that may be issues when pursuing opportunities in Mexico should be acknowledged. The investment in Low Carbon Technologies might be considerable, and Mexican companies may not be able to come up with solid enough bankable business plans to get private and public funds, and financial institutions may not be interested in providing financial support to the proposed projects, as they may not perceive their overall potential of greener technologies.

Financing Mechanisms

The following table is a sample of financing mechanisms relevant to the Low Carbon sector, which may be of interest to both the European and Mexican participating clusters and SMES:

Table 2: List of financing mechanisms

Institution	Name of the program/ Mechanism	Type of mechanism	Eligible project phase	Eligible geographic area	Website
BANOBRAS	Project structuring	Credit	Construction	Nation-wide	www.banobras.gob.mx
NAFIN	Sustainable Projects Support Program	Credit	Construction	Nation-wide	www.nafin.com
IDB	Clean Technology Fund/Climate Investment Fund	Credit	Studies Construction	Nation-wide	www.climateinvestment-funds.org
World Bank	International Finance Corporation	Credit	Construction	Nation-wide	www.ifc.org

Institution	Name of the program/ Mechanism	Type of mechanism	Eligible project phase	Eligible geographic area	Website
BANOBRAS	National Infrastructure Fund	Credit	Studies Construction	Nation-wide	www.fonadin.gob.mx
North American Development Bank	Border Environment Infrastructure Fund	Credit	Studies Construction	US-Mexico border	www.nadb.org
BANOBRAS	Financial guarantee	Guarantee	Construction	Nation-wide	www.banobras.gob.mx
NAFIN	Guarantee programs	Guarantee	Construction	Nation-wide	www.nafin.com
FONADIN	Financial guarantees	Guarantee	Construction Operation	Nation-wide	www.fonadin.gob.mx
BANCOMEXT	FOMECAR	Credit	Construction Operation	Nation-wide	www.bancomext.gob.mx

Case Study

Hybrid Energy Generator whit Syngas Hydrogen Feedback

EU PARTNER:

The Mind EcoSolution (Italy). The Mind Ecosolution is a private company, which offers solutions aligned to the Urban and Industrial Waste Management area. They are currently offering a technology based in Thermal Molecular Disintegration (TMD) to generate energy from waste.

MEXICAN PARTNER:

Einnovación S.A. de C.V. (San Luis Potosí, México). Einnovación is a private company aimed at the research, development and promotion of clean technologies applied through the design and manufacture of machinery working with hydrogen, plasma reactors and other.

PROJECT /INITIATIVE DESCRIPTION:

This project is intended to introduce new technology integration for Hydrogen- and Thermal Molecular Disintegration of urban solid waste (USW) based energy generation for a commercial mode in Mexico. Both technologies can be the solution of two big problems in Mexico. In the integration of these two technologies doing energy systems 100% autonomous and lower emissions operation. This is the first project in Mexico power generation by feedback from hydrogen.

PROJECT OBJECTIVES:

1. To elaborate a preliminary study on the integration in two technologies (thermal molecular disintegration and advance electrolysis), to generate hydrogen or hidroplasma as a catalyser for the syngas.
2. To develop and initial Prototype at industrial scale to contrast the market potential.
3. To develop Field Testing: the expected result of this integration of two technologies as a feedback whit hydrogen gas. Making energy from industrial and urban waste, whit a cleaner gas than syngas.
4. To test and implement its commercial application.

IDENTIFICATION OF THE "LOW CARBON BUSINESS ACTION" TECHNOLOGICAL AREA

Thermal Molecular Disintegration (TMD) /Advance Pyrolysis

Pyrolysis is a thermochemical decomposition of organic material at elevated temperatures in the absence of oxygen (or any halogen). It involves the simultaneous change of chemical composition and physical phase, and is irreversible. The word is coined from the Greek-derived elements pyro "fire" and lysis "separating". Pyrolysis is a type of thermolysis, and is most commonly observed in organic materials exposed to high temperatures. It is one of the processes involved in charring wood, starting at 200–300 °C (390–570 °F).

Syngas, or synthesis gas, is a fuel gas mixture form the pyrolysis process. This gas consisting primarily of hydrogen, carbon monoxide, and very often some carbon dioxide. The name comes from its use as intermediates in creating synthetic natural gas (SNG). Syngas is usually a product of gasification and the main application is electricity generation. Syngas is combustible and often used as a fuel of internal combustion engines. It has less than half the energy density of natural gas.

Hydrogen technologies have proven like the cleanest fuel or most efficiently energy carrier. In terms of combustion it is the only fuel whit zero Co or CO2 a low NOx emission. In this process, generate almost zero harmful emission. For hydrogen generation through and electrolysis process. The electrolysis of water requires passing and electric current through water in an electrochemical cell (called electrolyser) to split hydrogen and oxygen in the water molecule. The hydrogen for this will be obtained from the energy generators of the process of Thermal Molecular Disintegration (TMD) to generate energy from waste.

PARTNERSHIP DESCRIPTION and COMPOSITION

The participant in this Cooperation Partnership Agreement will provide their expertise with various aims that range from commercial service provider up to R&TD and eventually technology transfer. Both participants come from different sectors. **Einnovación S.A. de C.V** is focused in hydrogen businesses, and seeking for innovation in these emerging technology-based applications. **The Mind EcoSolution** is focused on Thermal Molecular Disintegration (TMD) businesses, and it will be seeking to develop and transfer technology to industrial interested businesses, Development of prototype, testing the results, and reducing the carbon footprint almost to 0% and land pollution.

PROJECT PLAN

The Project Plan will consist on an 11 months Project, and formed by a Feasibility study, to define a Business plan and strategy to integrate the design in the Mexican market on cogeneration energy; Preliminary study of proposed technologies and they final design, and evaluating the integration Prototype development Field and testing with different materials/ results analysis.

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Abbreviations

LCAM:	Low Carbon Business Action
ECCP	European Cluster Collaboration Platform
INE:	Instituto Nacional de Ecologia
SENER:	Secretaria General de Energia
IRENA:	International Renewable Energy Agency
SEMARNAT:	Secretaría de Medio ambiente y Recursos Naturales
LEDS:	Low Emission Development Strategy
SAGARPA:	Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca, y Alimentación
LCD:	Low Carbon Development
GHG:	Greenhouse Gas
CO_2e:	CO_2 equivalent
MACC:	Marginal Abatement Cost Curve
NAMAs:	Nationally Appropriate Mitigation Actions
SEDEMA:	Mexico City's Ministry of the Environment
CPA	Cooperation Partnership Agreement
TMD	Thermal Molecular Disintegration