

Competitiveness in global wind energy: A comparison study between Southeast Asia and India

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Abstract

The purpose of this paper is to analyze the competitiveness factors that are currently supporting the wind energy industry on a global scale, with a special focused on the trends to grow in Southeast Asia and compare its development with the Indian panorama. This qualitative research looks to explore the areas to increase the capacity or reinforce the participation of firms in the industry as manufactures, service providers or investors for wind energy projects in the region and in a global scale. For achieving this, interviews with stakeholders in the field were conducted under the concept of Porter's diamond model for competitive advantage, that includes, market factors, industrial factors, social factors and political factors plus the environmental factor.

Findings showed a relationship between modernity concept and wind energy, large corporations and countries are adopting energy mix systems to cover their energy needs, this is bringing one or two turbines at least for companies that want to create a positive environmental impact in the community, but also create a technological advance image for their stakeholders. The environmental factor is specially playing an important role in places like China and India where the wind turbine is seen as a related solution to air pollution.

Keywords: Competitiveness, Wind energy, Developing countries

Introduction

While in advance economies like the United States governments are taking serious steps to mitigate the effects of climate change, for example including not just schools but also farmers and traditional industries to turn to better practices (Monroe, Plate, Adams, & Wojcik, 2015). Adaptation is essential for people to create new ways to perceive and change attitudes for global warming concern, and when the greatest level of concern is met, the wiliness to participate is shown by the group that was exposed to this information and accepts, subsequently the training and modification process. Institutional support is still needed worldwide to create this first step for democracy and participation in the developing countries.

In the Southeast Asian region of the planet, in countries with coastal lines and island territories, studies are being conducted for the population to learn how to react or mitigate the effects of water due to sea rising levels or monsoon. But it is specially people that live in urban areas in these countries those who suffer more constantly of inundation and risk for the contact with polluted flood water, as it happens in Bangkok, Thailand and Ho Chi Min City in Vietnam (Tran Than Tu, 2011).

Governmental control and marketization are then opposite forces when the goal is to achieve national priorities, but the corporations are looking specifically for profits without a social or conservationist concern, then the effectiveness of the state is not proved, as it has happened in East Asia, either the development is moving where the market wants, or

where the policies are heading (Preston, 2000).

Globalization impacts have not been uniform and they have widened disparities on social perspectives (United Nations, 2002). The mutual dependency from one country to another is making some states to adopt more severe rules to fight climate change; European countries lead the way in natural preservation and regulatory frames for sustainable development, after more than 50 years proving that economic development alone does not guarantee wellbeing, what includes money but also the possibility of living a good life (Goulet, 2002). These measures are not just strategically crafted for the good of the citizens, but are also presenting business opportunities that are affecting less the global resources in their countries, and at the same time showing better paths to economic performance that are slowly adopted by the developing countries, what Goulet (2002) calls a 'just economy in a globalized world', especially China and India, the new powers in the international trade that are starting to create a political balance along with Russia to contrast the western power nations.

Energy is the tipping point in the consumption side today, but also on the production side of the global market, as electronic transactions are growing in importance and market coverage against traditional trading methods. We have at least three dimensions for the analysis of the role of energy in the present: the macro-economic influence, geo-political implications, and the environmental concerns (Bhattacharyya, 2007).

With development, the increase of the middle class in developing countries, including India and the countries in

Southeast Asia is bringing a more accelerate consumption for more products, but when this is not accompanied by high education and environmental concern, individual level mitigation measures are not taken (Semenza, et al., 2008).

Commercial integration processes are taking energy as a priority area, ASEAN is currently building different pipeline regional projects and grid extension following interconnectivity areas, mainly going from Thailand to Malaysia, and further with Indonesia. But these are still programs on a government side, very far from the scenario that the European Union is facing today, following the European Commission, their market is changing a lot due to the renewables share in energy increasing rates, expected to increase from 25% today to 50% in 2030 (European Commission, 2014), they might still need to regulate access to traditional fuel energies in order to fulfill their consumption needs.

India is living the transition from traditionally rural sources of power, to electricity for cities, three quarters of the projected increase will be driven by residential areas in 2040, on a different perspective industrial energy consumption is expected to increase in 50% to that year. Despite the efforts to establish more than 50% of the energy supply by renewable energies in 25 years, the rest is expected to be covered by coal-fired plants, what will account to the major growth of this source of energy in the world. Some 340 GW are expected to be installed by Solar and Wind in India in that period of time (International Energy Agency, 2015).

Energy security is also worrying nations that are the global manufactures of the

global industries, like China, this country will face many challenges in their supplying sector in the upcoming 20 or 30 years and probably will extend to the long term, due to present characteristics oil prices are low, but as soon as the global energy sector will not be able to account into the demand side, oil prices can be increased on the final stage of the production curve in the future, in this stage, even China's main source coal and its availability can be put in risk for their domestic market (Liu & Jiang, 2009).

The research academic and managerial contributions

This study tries to answer whether it makes an economic sense to engage in wind energy activities, mostly for wind turbine, along the sustainable value chain, on a global perspective. Comparing the wind energy technology, on its modern conception, better known as wind turbine, with other products or industries, for example car manufacturing, or aviation; it is transiting the early period in many countries, the establishment of the sector in others, and the repair or replace time (Xie & Simon, 2006) is starting now for old facilities in Europe and United States, so understanding the demand needs for energy in the future on a macroeconomic sense is vital to participate as suppliers in the energy market to generate profitability for local economies and multinational corporations.

The contribution of this study is isolating wind energy from other renewables, and create a framework of study specialized on it, in which intrinsic characteristic can be discovered making changes in the dynamics for this industry. This study creates a non-technical approach to



analyze a commonly engineering related subject, into a marketing perspective.

Implication of the study for stakeholders

The countries from Southeast Asia in this study will be considered, under the parameters exposed, as competitive in wind energy, or non-competitive in wind energy, in the international market, once the methodology for data analysis has been done.

This research project brings a new element to the traditional Porter Diamond for National Competitive Advantage, considering environmental concern as a factor to help in the transition to renewable energies in all parts of the sustainable value chain, in this particular case wind energy.

The result of this research will provide an updated analysis and conclusions about the position to compete for the Southeast Asian region and for selected countries in a global perspective, when it is compared with India. The results will indicate in which aspects of the competitiveness Porter's model more efforts should be done to increase participation in the industry to compete in the global sustainable value chain, and in which the region or the selected countries show advantages to promote the industry growth.

Traditional manufactures of plastic and similar materials could start manufacturing wind turbine parts to export, service providers could find opportunities due to remote or in-site services for the industry, and private financial institutions, or investors could find a way to diversify their operations, value for money scheme for increasing

sustainability in energy projects (Atmo & Duffield, 2014), and use this growing industry to benefit Southeast Asia on a regional or national scope.

Review of the literature

For the related literature revision, journal articles were retrieved from online research journals databases like Emerald and ERIC, articles in google scholar were used to explore open academic sources, official websites were consulted, like The World Bank for statistics, and semiofficial sources like The World Economic Forum and International Energy Agency for specialized articles and scenario analysis. Finally, specialized web sites about business, marketing, technology and engineering provided specific information about technical references and examples of current corporations involved in the industry.

The literature related was first analyzed under a competition scope, moving to the industry itself, and the propositions and trends about it, to explain the need to analyze the need for this industry to gain more dynamism in developing countries to be more integrated and competitive globally, and to understand what are the economic factors stopping its advance.

In his approach to explain the relationship between the origin of wealth and the function of the state, Adam Smith (1776) disregards the main concepts concerning to gold and silver held by the states. By linking the way, the real wealth comes from the activities that citizens develop, and how they impact the national economy, and when these activities are more than enough to satisfy

the local markets, these goods start an expansive distribution that brings economic benefits to the production center (Smith, 1776).

Smith (1776) then assume that each country is more competitive to produce one good, then it is better for that country to focus to produce what they can produce cheaper and trade it for what a second country can produce at a lower cost, bringing benefits for them while the transaction is completely and on a regular complementary base.

A complimentary theory comes from David Ricardo, in his manifest about the comparative advantage of countries, where he promotes the specialization of nations in producing certain goods, for what they have a natural advantage when compare to the trading partners; by doing this the world output for one product could raise bringing benefits, but the real value of his contribution is related to the opportunity costs that are associated to carry the production of one good while giving up on producing others (Ricardo, 1819). Trade based on comparative advantage arises from differences between both countries and in which prices are equalized to be considered as international measure (Brakman & Heijdra, 2003) of choice for the demand's side of the operation.

While the international theories suggest that the competitive advantages of a country to compete in the international market are inherited, factors related with land, natural resources, population size, labor specialization, Michael Porter (1985) introduced different concepts that can be achieved through a national initiative, led by the government, or the powerful and leading force to create the basis of economic development of a

sector, what today is considered a cluster, and enhance productivity. These conditions to be set are: factor conditions, demand conditions, related and supporting industries, and firm strategy, structure and rivalry (Porter, 1985).

The importance of regions as a factor of national strategy, including international connections, supported on national policies to improve productivity and increase attractiveness, brings the cluster-based economies for the export industries, following master economic plans that became popular and are still being the starting point for many countries today (Ketels & Memedovic, 2008).

International marketing plays today an important role while discussing how to attract investments, place orders to export or provide services in the international arena, the national identity, as the time and references started to relate certain products to the image of a country it has create a country-brand that is today a parameter to bring consistency to the national competitive advantage firstly suggested by the Porter's model for the international competition in today's world, what is known as the country-of-origin effect (Jaffe & Nebenzahl, 2001).

When it comes to developing countries, attitude plays an important role, and it is contagious due to phenomena like relativism and imitation, but it is always bypass with the price effect (Arli, Tjiptono, & Porto, 2015), when it comes to choosing between morals and consumption, price might lead consumers to find alternatives to acquire high technology in a way that can maximize their resources.



The factors taken in the account for the national competitive advantage of nations by Porter (1990) are divided into two groups, the foundation of prosperity in the microenvironment represented by the basic factor conditions: Natural resources, physical resources, unskilled labor and capital resources. Secondly the advanced factors taken into account are: Modern data communication infrastructure and highly educated human resources, the efforts that a nation is taking to improve innovation.

The demand conditions are the forces surrounding the consumption levels for products or services in any sector or industry, represented by the composition and sophistication by local consumers, innovative needs to be served, and specialized segments to be served domestically and internationally. The movements in both dimension for the market are also relevant for these measures, the dimension of the market growth and the way the market is growing.

For the related and supporting industries Porter's ideas for measuring competitiveness are located in the locally

based suppliers and firms engaged in related activities or fields; and the presence of clusters instead of isolated companies.

In terms of the firm strategy, structure and rivalry the managerial style to run companies in the country and the organization of firms determines competitiveness. The goals the organization pursue; the way new business enter in the market and the domestic rivalry increase the level and aggressiveness of competitors leading to refined markets and innovation.

Porter includes two exogenous factors to the diamond, chance and government. Chance is described as the factors out of control for the firm, or groups of firms, bringing discontinuity to the competitive position that the country is holding.

Government is important in this model as the policies apply by certain country help to increase or decrease competition, taxation and cluster formation facilities are examples of these initiatives to boost production, and further consumption and specialization.

Conceptual Framework

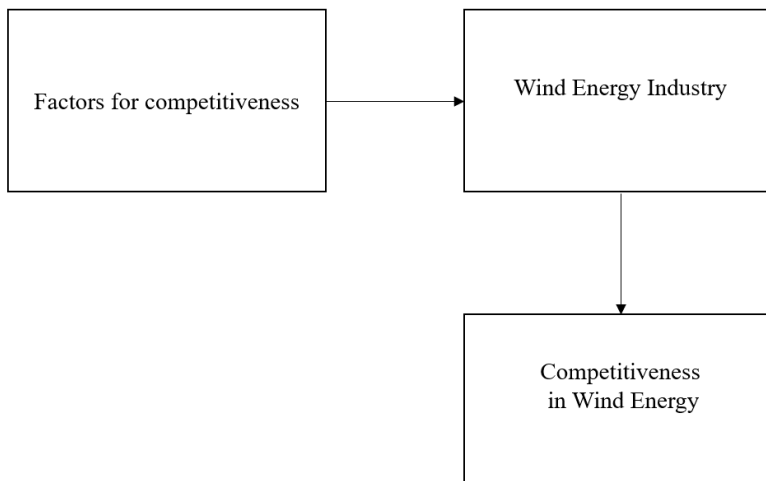


Figure 1 Conceptual framework for the research.

To apply a qualitative model research, and integrate statistical information to use the resulted factors, the factor chance has been replaced by environmental concern after conducting the interviews,

a relationship with culture, that has impacts on innovation, as Hofstede (2001) claims when he refers to the diffusion of the new technologies.

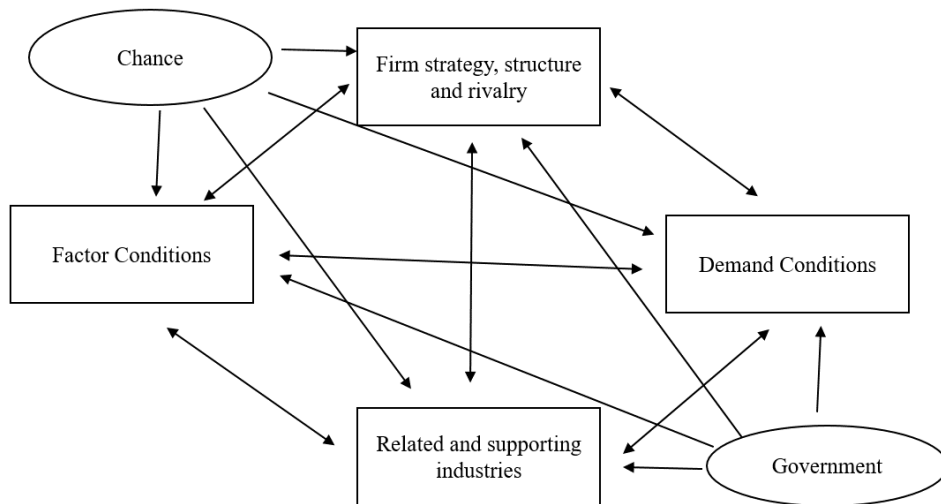


Figure 2 Graphic representation of Porter's Diamond for competitive advantage of nations. Porter's Diamond for competitive advantage of nations. Porter, M. (1990)

The following propositions were considered after analyzing the model to calculate the National Competitive Advantage in a given industry or market.

1. Porter's Diamond Factor Conditions of a country affect competitiveness in wind energy sector.
2. Porter's Diamond Demand Conditions of a country affect competitiveness in wind energy sector.
3. Porter's Diamond Related and Supporting Industries concept affect competitiveness in wind energy sector.
4. Porter's Diamond Firm Strategy, Structure and Rivalry concept affect competitiveness in wind energy sector.

5. Porter's Diamond Government concept affect competitiveness in wind energy sector.

6. Society's Environmental Concern affects competitiveness in Wind Energy Sector.

7. Southeast Asian countries are suitable to compete as suppliers of the global wind energy sustainable value chain.

Methodology

This is a qualitative research, that used the inductive method taking the theoretical assumption that the Porter's Diamond is a framework to group the data and look for relationships. The criteria for selecting this model was

based on the possibility to group the results of the interviews to analyzed the industry in a holistic way, bringing all the characteristics surrounding the industry a similar degree of importance during the analysis. In this way, the researcher can extrapolate to the region of the study, to other similar studies, focusing in certain type of factors when the propositions change to study this industry. See Figure 2.

The information was obtained based on semi-structured interviews to validate the categories (Paler-Calmorin & Calmorin, 2007), that are the Porter's Diamonds axis, except the factor 'chance', that is substituted by the category proposed for this study, 'environmental concern'. As an add-on to apply the study results secondary data is used to analyze the six propositions that have impact in the unit of study, wind energy industry, in terms of competitiveness based on the qualitative information obtained through the stakeholders in the industry in the interviews, and subsequently using discriminant analysis, separate the counties use for the application example, six countries in Southeast Asia and India as point of comparison, in two groups, competitive and not-competitive.

The stakeholders in the industry were selected based on a sustainable perspective for the value chain, with special focus on the technical side, but balanced by public policies and environmental services providers and experts, with a global vision, and experience and vast knowledge in the industry regarding their connection with it. To find the experts a mix of internet based search was used, LinkedIn and Facebook, and personal contacts provided information through the

snowball approach to reach interviewees. The criteria for the technical and marketing experts followed the moment and geographical approach meaning current work in the industry, and the work zone to be Southeast Asia. For the policy makers and sustainability experts the criteria followed international knowledge and/or projects in the field, like the European Commission on Energy Policies and Environmental Assessment for Infrastructure projects. The number of interviewees was reduced to six because of reachability and not repetition of the profiles, as this is a qualitative- interview-based research.

The researcher used interviews starting with the general question about the factors in the opinion of the interviewee to assess competitiveness in wind energy in the conditions that global scale demands today. With this the researcher explores the stakeholders view and creates an optimized way to continue relating the opinions into categories for further analysis.

Under an adapted framework of Porter's diamond model for competitive advantage of nations, changing the exogenous factor chance for environmental concern as suggested by Polonsky & Mintu-Wimsatt (1995), and consequently by Bang, Ellinger, Hadjimarcou and Traichal (2000), with a similar approach to the way 'culture' is used by Van Den Bosch and Van Prooijen (1992) to be more appropriate for the wind energy industry and the innovation it represents. Interviews are used on this part of the research to collect data to confirm the model or gather information that could be integrated to the model; and finally, test the accuracy of the independent variable



environmental concern to the proposed model and how to weight it in relation to the other independent variables or factors affecting competitiveness in an industry.

The step of applying the information obtained brings an example to the model that is the result or the qualitative research, and creates the base for using the model to compare other countries for this specific industry.

Following a previous research made by Dogl, Holtbrugge and Schuster (2012), where Porter's diamond is used for the general renewable energies industry, the

researcher scopes down to focus only on wind energy following the data sources previously used to make qualitative parameters to measure traditional factors explained by Porter (1990). In this way interval scales are applied to match with Porter's intentions to develop an analysis for competitiveness in a simplified quantitative model (Cartwright, 1993). Proxy variables are assigned to measure each factor based on official and semiofficial sources like the World Bank, and the World Economic Forum.

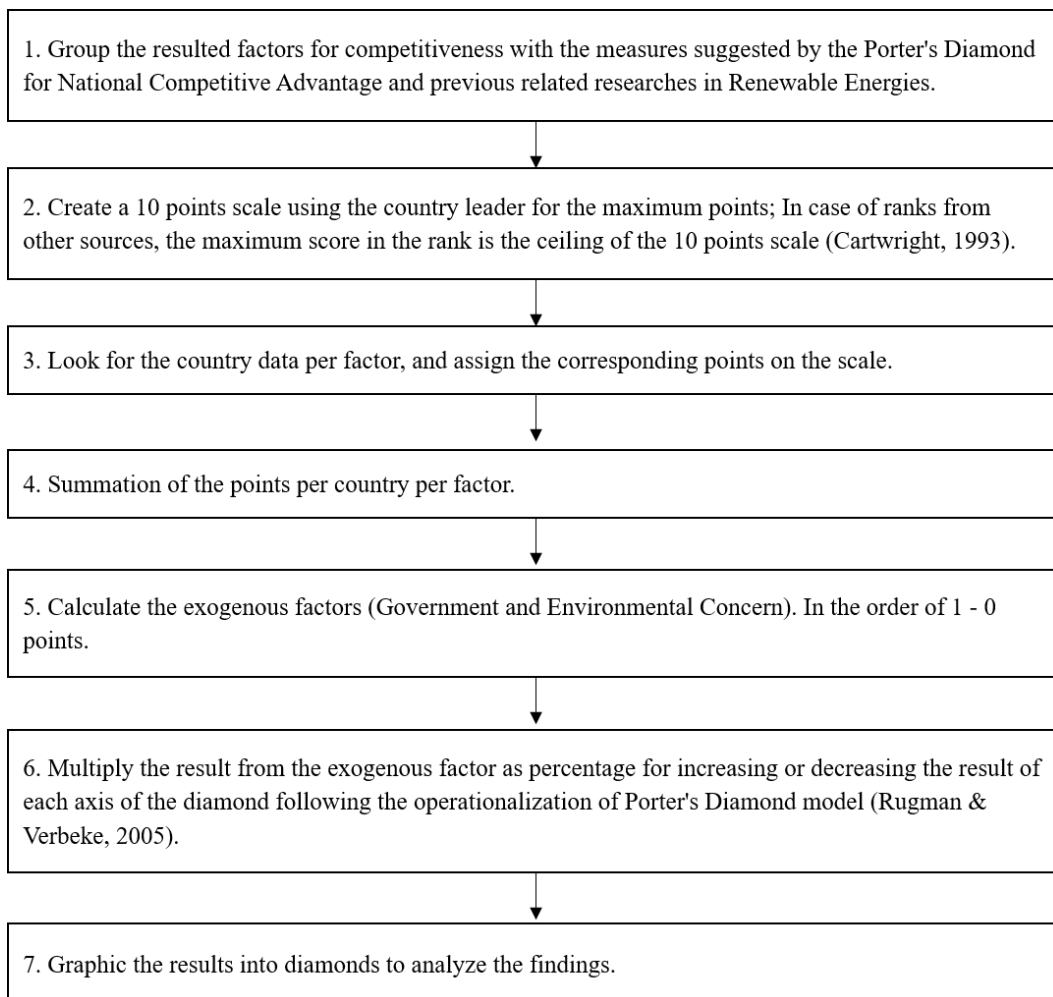


Figure 3 Steps to apply the result model.

After the data for each factor is collected, the information is converted into a minimum of zero and maximum of ten, and for those factors having more than one proxy variable the arithmetical average will be calculated to bring a final number in the determined scale. For the exogenous factors, Government, and Environmental Concern to be considered in this research, a three-point scale is considered, a change from the previous model used by Dögl, Holtbrügge, &

Schuster, in the previous study when they also considered biomass and solar (2012) and after the answers obtained on the interviews, to weight the exogenous factor Government heavier than the cultural factor; in the order of minus three (-3), for only one of three indicators to favor wind energy governmental support, zero (0) for two of three indicators to favor wind energy governmental support, and three (+3) for a full coverage of the three elements for a government that

facilitates the diamond development for competitiveness (Cartwright, 1993). For the Environmental concern, a three-point scale is also used, accounting for minus one (-1) for countries that showed a not concerned opinion, zero (0) for neutral concern, and one (+1) for countries who showed concerned opinion in the used measurement instruments. These values are calculated to increase or decrease in the order of ten percent for the axis in the diamond by each point to be represented graphically, a variant from the SWOT Analysis calculation proposed by Michael Porter, and for further conclusion about the possible upcoming scenario for wind energy in each market in terms of competitiveness (Rugman & Verbeke, 1993).

Klecka (1980) suggest the discriminant analysis as a profitable technique to be

applied to studies trying to find economic differences between geographic regions, as far as there are two or more groups and we presume have differences in several variables, and those variables can be measured at an interval or ratio level, helping us to classify these cases into groups where they most closely resemble. According to Srivastava and Rego (2011) a discriminant analysis works by creating a new variable called the discriminant function score, which is used to predict to which group a case belongs. In this study we use India as the discriminant function score, as this country is facing a positive energetic transition to renewable energies among the developing countries (World Economic Forum, 2014).

Table 1 Selected countries to apply the result model.

Country	IMF Classification 2015
Singapore	Advanced Economy
India	Developing Economy
Indonesia	Developing Economy
Malaysia	Developing Economy
Philippines	Developing Economy
Thailand	Developing Economy
Vietnam	Developing Economy

Non-probability sampling is used in the application of the model, based on the purposive sampling, for this type of sampling the quality of data gathered

brings reliability and competence to the study (Tongco, 2007). Following Porter (1990) sample to analyze the diamond model for the competitive advantage of

nations, this paper considers developed countries and newly industrialized countries (Bozyk, 2006), including Vietnam for its potential in the industry (Prajogo, Laosirihongthong, Sohal, & Boon-itt, 2007) in Southeast Asia region, and India for research design purpose to apply this framework. Due to lack of sufficient data and representation through the sample Brunei Darussalam, Cambodia, Lao P. D. R., Myanmar and Timor-Leste are not included.

To measure the Porter's Diamonds different axis, we related secondary data according to previous schemes used under this methodology (Dögl et al, 2012) based on operationalization model (Rugman & Verbeke, 1993) and as the result of the information collected with the experts' opinion for the interviews to test the model.

The qualitative data obtained from the interviews is coded by grouping the answers relating them in similarities or contrast with other interviewees responses, then analyzed them in context of the framework used to categorize the factors for competitiveness, following the research propositions.

For the applied complimentary exercise with the result model with the selected countries, the data was analyzed first with descriptive statistics mean, media, mode and standard deviation for each factor in Porters Diamond for Competitive Advantage of Nations considering all the units of analysis or countries in the sample (Beri, 2010) except for India, as it is the discriminant function score. The four dimensions of the diamond were calculated with a simplified quantitative model based on

interval scales (Cartwright, 1993), from zero (0) to ten (10) to assign points for each compared with the leader in the sector, China (World Wind Energy Association, 2015) or taking the maximum parameter in the index and then were compared with the results for India country by country, and finally in a regional diamond introduced by comparing more than two countries as it is introduced by Dunning (1993) and refocused by Rugman and D'Cruz (1993) by recognizing international and global competitiveness.

In order to rank countries depending on their governmental support, the statistical information used is related with the policies and targets creation, and policies enacted, countries were graded depending on their status and time that the policies have been carried out, one point for each positive indicator; this measure is completed with type of incentives per country (International Energy Agency, 2016), better scores went to countries with specific policies for wind energy development, based on a catalogue of different type of incentives and tax reduction (KPMG, 2011). No policies for renewable energies minus one (-1), general policies for renewable energies zero (0) and for specific policies for wind energy one (+1). The result was a conversion to the three points scale previously explained in the methodology.

For the factor tested and validated for this research, environmental concern as an external factor for competitiveness, environmental concern, the concepts related to this measure are consumer concern, knowledge, beliefs, and

attitudes toward renewable energies. The measures were taken from climate change awareness, climate change cause, climate change perceived as a threat (The Gallup Group , 2009); and level of concern that global warming can harm me personally (Pew Research Center, 2015). Positive attitude toward environmental concern was accounted when more than 50% of the respondents of polls showed it. As a result, the three points scale calculated assigned for four to three negative concern attitudes, minus one (-1), for three positive concern attitudes, zero (0) and one (+1) for four positive concern attitudes.

Scores for Southeast Asian countries are averaged to compared them as a group and individually against India's score for each factor, and multiplied for .5 per axis of the diamond model to be able to bring graphic conclusions, and amplifying the diamond using the result for government and environmental concern.

Finally, the statistical measures of mean, media, mode and standard deviation were calculated to show more information about the data in terms of similarities between countries and dispersion.

Analysis

The results of the interviews suggested that Porter's diamond for competitive advantage of nations is still accurate to measure the level of competitiveness of wind energy in a global scale, and specifically with an industry in nascent stage in Southeast Asia. These factors also imply conditions for new entrants for wind energy on a global scale, as the market moves taking care of the presence of these factors independently of their presence level, the industry is adaptable in this case to natural conditions due to technology.

Table 2 Summary of interviewee's profile.

Interviewee	Profile
MB	Sales Manager for Southeast Asia for one of the world leading Wind Energy Turbines manufacturer.
RT	Sales Manager for Southeast Asia for a global off-grid turbine manufacturer.
DP	Renewable energies consultant for Southeast Asia for one of the world leading consultancy firms.
PC	Manager of an Environmental Impact Assessments bureau working with wind energy projects.
CL	International development consultant for a global NGO.
PG	Renewable energies policies in an international governmental office.

In the interviewees' point of view for this research answers related with the four main factors were found: factor conditions, such as the environmental conditions, by taking care of the energy sources we have today and we need for the future (PC, personal communication, February 13, 2016) we ensure more competitiveness for wind energy; and technology innovation, that is helping to create products for fewer wind conditions, (MB, personal communication, February 19, 2016); demand conditions in terms of market volume with the energy needs and the sophistication with investment interest, countries are looking to move in a direction that allow them to maintain their development, and wind energy needs skilled labor (MB, personal communication, February 19, 2016), this skilled labor is increasing with engineers in different parts of the world, including Southeast Asia (RT, personal communication, March 11, 2016), at the same time this is making the industry attractive for investors with a sustainable vision, like ethical banks (CL, personal communication, January 20, 2016); environmental concern as a personal attitude is transcending to business decisions from stakeholders, that despite focusing on profits, find in wind turbines a way to show their companies as sustainable oriented (RT, personal communication, March 11, 2016), related and supporting industries need to exist for wind energy as it is a complement to cope with the energy needs, there is a huge corporate support for clean energy these days (DP, personal communication, February 9, 2016). The future to compete is related with what is around the turbine, as the turbines have reached a point of efficiency that is

difficult to continue improving without increasing the manufacturing or operation cost, but good results are coming from weather forecasting software accuracy and reinforced of the transmission grid (RT, personal communication, March 11, 2016).

For the firm strategy, structure and rivalry, the need to compete despite the intensity with own capability, and the access that innovation brings along with the openness of the market to compete, are vital in wind energy and the whole energy industry today (DP, personal communication, February 9, 2016; MB, personal communication, February 19, 2016; PC, personal communication, February 13, 2016).

For the exogenous factors government is still fundamental with policies (CL, personal communication, January 20, 2016; MB, personal communication, February 19, 2016) and the desire of not lagging behind compared to other countries to attract investments and for good image (DP, personal communication, February 9, 2016).

For the factor proposed as a measure to increase competitiveness, environmental concern, is fundamental these days for an academically advanced society (PC, personal communication, February 13, 2016) while in developed markets it has been considered an important factor that has supported the changed, in countries where the democracy is not the system, like China, it has not really been of an impact to increase their competitiveness (CL, personal communication, January 20, 2016). Environmental awareness extents more to consumer products (DP, personal communication, February 9, 2016) people agree about the change to

renewable energies, but when it comes to actually doing it, it faces some challenges (MB, personal communication, February 19, 2016). The way companies can engage more consumers will have a bigger impact (CL, personal communication, January 20, 2016), that is why companies in wind energy don't want to base their business on this purely (MB, personal communication, February 19, 2016). For the whole interview results see appendices 1.

In contrast, new business opportunities are coming as the wind turbine is seen as a modern and sustainable symbol, that is making companies invest in one or two turbines to deliver an image of environmentalist that is more and more important for the final consumer. In the near future consumers, will demand companies for transparency in their production systems input to manufacture products, and they are expecting percentages in renewable energies for any industries that are energy intensive, including the general industry, like food processing and appliances for personal consume (RT, personal communication, March 11, 2016).

While examining the interviews closely we found that there are different relevant aspects concerning to the general aspects, that is why the Porter's Diamond model serves in an accurate way to make groups of the answers obtained.

For the general question about the factors affecting competition in wind energy the stakeholders are more and more interested in shifting their energy resources to greener options, not only governments but also shareholders looking for investment options, and development organizations, meanwhile

the consumers are still far from getting more awareness of the sources of their domestic power. Countries want to participate in a more modern market, and wind energy has a lot to offer for this transition, participating in the economy and job creation coming from relatively new industries. The fact that the equipment is mainly from US and Europe brings a sophistication idea about the related operations. Other important factor to move to renewables is the oil prices fluctuation (DP, personal communication, February 9, 2016).

The dynamics we have today as societies and communities are only possible to maintain with new energy sources to complement the traditional ones and also to cope with the increasing trends for consumption. Population keeps increasing and the energy resources need to align with these needs, that is why more natural resources are used, but the impact should not mean an environmental contradiction to the live conditions of life (CL, personal communication, January 20, 2016).

At the same time wind energy turbines are more competitive using the technology adaptation to adapt with the wind conditions available no matter the location in the world. The industry does not depend anymore on government incentives, competing with other traditional sources creates a more adaptable industry that is not just reacting to the market, but building its own markets using the research of the wind operational conditions, bringing even better costs. The goals are perceived on a customer percentage from the industry, a 3% of their consumption, therefore the industrial market and consumer market

awareness of the source will be more relevant in the upcoming years. The experts see a change in the consumption, first in developed countries where the percentage of renewables used for the production will be part of the product information, something similar is already happening in transportation comparisons between a train ride and car use in the European Union. Other forces in the political arena are concentrating the power in the oil industry, like Russia, so independency of traditional resources is also a force that is moving western powers to develop new ways to keep development levels at the same or even a better pace (RT, personal communication, March 11, 2016).

The importance of the environmental message that has accompanied the wind energy is still present and it is a necessity for people, in countries like China, where the air in the atmosphere represents a risk for the public health. (RT, personal communication, March 11, 2016). So the two conditions are now a need that is making the governments to really change their view about wind energy, as the cost is not anymore an excuse to continue using traditional combustibles like coal or oil to generate power (MB, personal communication, February 3, 2016).

The narrative and discourse of climate change is still favorable to create political changes favoring the wind energy industry and other renewables, the Paris Agreement on Climate Change is the reflection of the relevance of the topic, and certain factor like poverty are bringing these not centralized power technologies the opportunity to integrate lower income communities into the

markets (CL, personal communication, January 20, 2016).

The society is still unable to choose in the market about their preferred power source, despite it is getting more and more popular, most of renewable energies, including wind energy are not really known as realistic alternatives in the developing countries. In the developing world government incentives are still part of the schemes to include renewables, this has brought variability on demand and competition, what is driving the industry to become self-sufficient despite financial aid from the government. (MB, personal communication, February 3, 2016; PG, personal communication, April 29, 2016).

The social response is favorable always for the positive relations that communities and the general public have about the renewable energies, they want turbines, and this social force has been pushing not only governments for a broader adoption, but also corporations that continue diversifying their energy sources with the objective of create a greener image, but the cost being more competitive it is also a benefit in terms of fixed costs for them (MB, personal communication, February 3, 2016).

Investors are looking for long term benefits and certainty for their shares, industries like oil and other that rely on international prices, are opening doors to non-marketable fuels, like wind, bringing investment profitable results, sustainability practices are bringing benefits in the long term for organizations (CL, personal communication, January 20, 2016).

The technological development in the global market are bringing benefits to this and other industries, in the case of wind energy these technological changes in the turbines, are making the technology more accessible to areas previously considered not relevant for wind energy. (MB, personal communication, February 3, 2016). The market is still sustained on a non-strong enough base as the grids are still fragile, and this creates space for alternatives to prevent shortages that causes an unstable economy, so renewable energies are filling these gaps that traditional power plants have never filled (RT, personal communication, March 11, 2016).

The industry is getting into a higher level of specialization, that is requiring professionals in a global scale, today these engineers are available in different areas of the world and this has reduced significantly the costs for planning, installation, operation and replacement stages (RT, personal communication, March 11, 2016). Once the organizations, like central governments, urban planners and private corporations, understand the expanded system that wind energy uses to be implemented they understand that the industry brings benefits on a dispersed way providing employment and power supply stability extending the power grid and the coverage, hence the market grows along the electric system, in a stakeholder inclusive way, contrary to traditional fuel generation (MB, personal communication, February 3, 2016).

Awareness brings more social participation and saying in the government policies and decisions to open spaces for renewable energies, in countries like Denmark and the Netherlands, this has been a force that used the tradition of farmers to be able to generate their own energy systems, so the transition phase was smoother than in any other regions (CL, personal communication, January 20, 2016; MB, personal communication, February 3, 2016).

The territories are experimenting an adaptation process that is the result of the natural resources scarcity, that it is making necessary an even larger use of them, such as the power use for weather mitigation for mankind, either for high or low temperatures. We see examples like Germany and France where the countries started welcoming the wind energy due to people's desire of modern and greener technologies that other neighboring countries were already implementing (DP, personal communication, February 9, 2016).

The results of the calculations are shown in Table 3, with all the internal and exogenous factors. To measure the national competitive advantages of the countries in the study, and find how suitable they are to compete in the global wind energy value chain, the results were compared with India and it is also possible to notice their similarities and areas of differences. See table 4.

Table 3 Results after the secondary data calculation per country per factor of Porter's diamond for national competitive advantage in wind energy.

Factors	IN	ID	MY	PH	SG	TH	VN
1. Factor conditions	13.5	8.0	7.3	8.0	1.8	5.7	7.0
1.1 Basic	7.5	5.0	5.0	3.0	0	4.0	5.0
1.2 Advanced	6.0	3.0	2.3	5.0	3.3	1.7	2.0
2. Demand conditions	5.5	4.0	8.0	8.5	8.5	11.5	4.0
2.1 Market volume	3	1	5	5.5	5	8.5	1.5
2.2 Sophistication	2.5	3	3	3	3.5	3	2.5
3. Related and supporting industries	7.0	3.0	9.0	4.0	18.0	5.0	2.0
3.1 Related companies	3	3	4	4	8	4	2
3.2 Support	4	0	5	0	10	1	0
4. Firm strategy, structure and rivalry	11.5	11.0	16.0	13.0	18.5	15.5	15.0
4.1 Strategy, structure	7	7	9	8	10	9	9
4.2 Rivalry	4.5	4	7	5	8.5	6.5	6
5. Government	3.0	0.0	-3.0	3.0	-3.0	3.0	-3.0
6. Environmental culture	0.0	-1.0	0.0	0.0	0.0	1.0	0.0

To calculate the diamond model, it is necessary to combine the axis, to numerically and graphically find the intersection of the different forces in the market, as it is shown in Table 4.

After applying the exogenous factor, amplifying or decreasing score for

Government and Environmental Culture, to multiply the results in Table 3 for the percentage given by 10 percent for each point we have the following results in Table 4, this is the information used for descriptive statistics, using exclusively the Southeast Asian countries.

Table 4 Countries comparison to make the equation to combine the axis of the diamond.

Areas of the diamond	IN	ID	MY	PH	SG	TH	VN
ASD = firm strategy, structure and rivalry * 1/2 demand conditions	31.6	22.0	64.0	55.3	78.6	89.1	30.0
ARD= related and supporting industries * 1/2 demand conditions	19.3	6.0	36.0	17.0	76.5	28.8	4.0
ARF= related and supporting industries * 1/2 factor conditions	47.2	12.0	33.0	16.0	30.0	14.2	7.0
ASF= firm strategy, structure and rivalry * 1/2 factor conditions	77.6	44.0	58.7	52.0	30.8	43.9	52.5
Area sum	175.7	84.0	191.7	140.2	216.0	176.0	93.5
Difference with India	0.0	-91.7	15.9	-35.5	40.2	0.2	-82.2

On table 5 the exogenous factors government and environmental culture are summed up and then adjusted to compare with India, the difference in the

table shows negatively or positively depending on the case for the Wind Energy industry.

Table 5 Applying the exogenous factors government support and environmental culture to adequate the final result, and difference between countries and India.

Factors	IN	ID	MY	PH	SG	TH	VN
Government support	3.0	0.0	-3.0	3.0	-3.0	3.0	-3.0
Environmental culture	0.0	-1.0	0.0	0.0	0.0	1.0	0.0
Total adjustment	228.5	75.6	134.2	182.3	151.2	246.3	65.4
Difference with India	0.0	-152.9	-94.3	-46.1	-77.3	17.9	-163.0

Finally, the result for each of the axis and intersections of the diamond were adjusted by the exogenous parameters to create the graphic results for the research. In this table, we can see where

the potential is found compared to India for the Southeast Asian countries and increase their possibilities to compete in the wind energy sector on a global scale. See Table 6.

Table 6 Adjusted results for each factor applying the exogenous parameters Government and Environmental Culture.

Factors	IN	ID	MY	PH	SG	TH	VN
Firm strategy, structure & rivalry	41.1	19.8	44.8	71.8	102.2	115.9	39.0
Demand conditions	25.0	5.4	25.2	22.1	99.5	37.4	5.2
Related & supporting industries	61.4	10.8	23.1	20.8	39.0	18.4	9.1
Factor conditions	100.9	39.6	41.1	67.6	40.1	57.1	68.2

Conclusion

The results of the interviews showed that competitiveness characteristics are all in the radar of Porter's diamond model for competitive advantage, as they can be grouped in market, social, political and industrial characteristics, innovation and technology, resulted particularly relevant in the analysis of wind energy, as well as availability of skilled labor force. See figure 6.

The proposition of the category environmental concern under an approach of culture, was concluded as important for all of the interviewees, but the conclusion is that it brings an unbalanced measure for competitiveness as it is only the basic principle for the industry introduction, and it is really important for countries that are feeling the impacts of climate change, but for others is not anymore a factor that brings reliability in the industry, but creates uncertainty in markets where the governmental decision factor is still very high (MB, personal communication, February 3, 2016). Nevertheless, this proposition is adequate at this moment when countries will start to put pressure and monitor the use of funds to shift to

environmentally friendly practices like wind energy for the signing countries for the Paris Agreement in December 2015 (RT, personal communication, March 11, 2016).

The information collected in the interviews shows a new dynamic between the relationship of the wind energy related with traditional fuels, where the climate impact of continuing using these sources is met with a more competitive price that is leaving the tendency of being complimentary technologies, and becoming first options in many countries for development projects no matter the dimension, as the technological conditions are even coping with the traditional variability concern factor for investment.

Related with the market, energy security and data sharing through social media and internet applications are raising the need for more renewable energy input in the grid, the wind turbine is a symbol of sustainability and health in countries like China as breathing is related with air and there is a relationship with breathing and the wind (RT, personal communication, March 11, 2016).



In relation with the industry, technology surrounding the turbine is getting improved in order to minimize costs even more and contrast the effect of variability that comes with the operation of wind farms or installations powered by wind. Cost efficiency is creating new dynamics to minimize government subsidies dependency, or the environmental relationship to access the fossil fuel traditional markets in the developing world (DP, personal communication, February 9, 2016; MB, personal communication, February 3, 2016).

On the side of the political factors, the differences between the developing world and the developed economies, mainly in Europe, resides on the determination of the authorities to shift to green sources, such as wind, the transition from subsidies to laws and regulations is seen in projects to power the home energy supply, manufacturing processes and transportation systems, including percentages for renewable energies by law (PG, personal communication, April 29, 2016). There are also important ties between the political system in developing countries and the fossil fuels corporations that still exercise power on the policy makers (DP, personal communication, February

9, 2016; RT, personal communication, March 11, 2016).

The social factors are today centered on a more proactive discussion of the need of the renewable energies coming from the general public related with climate change, the prove is the Paris Agreement on climate change actions in 2015, and the stakeholders in companies who are moving to bring environmental image for the consumers, or working under a sustainable perspective to be able to continue having their business operation and financial returns (CL, personal communication, January 20, 2016; PC, personal communication, February 4, 2016).

The findings of these research can be summarized on six conditions that imply opportunities in the wind energy global market: 1. Energy Security and growing consumption; 2. Competitive prices with other types of energy sources; 3. The Paris Agreement on Climate Change 2015 (COP 21); 4. Availability of Experts in all Regions; 5. Technology adaptation to the Regional Wind Conditions; 6. Regional Economic Growth needs to be powered by energy. See figure 4.



Figure 4 Conditions in the global wind energy market that imply opportunities to compete in.

Discussion of the Research

In Southeast Asia, the traditional factors like governmental policies and tax incentives are still very important to compete, and the image factor as renewable energy is still seeing as the right thing to do, but not commercially viable when it is compared to the traditional sources, under a debatable vision that remains in national administration for development. This represents an obstacle that keep renewable energies, in particular wind energy unable to demonstrate the power of the industry in countries like Malaysia and Indonesia.

Wind energy is today a serious industry, with their own resources, financial

support, big corporations and middle and small scale companies in the sustainable value chain, that brings employment for middle and highly skilled workers, a critical difference from other industries like agriculture and textile manufacturing or electronic assembly.

The industry is moving from the instability that public opinion has brought to wind energy expansion and competitiveness, especially in countries where democracy does not exist or the political regimes are authoritative (CL, personal communication, January 20, 2016). The people interest to receive cleaner energy is still important because it is the base of related services like

applied logistics and engineering education, and it create a more sophisticated market that is mostly related with consumer products but advanced to more specialized products

related with energy, like the preference for hybrid or electric cars by environmentalist consumers (RT, personal communication, March 11, 2016).

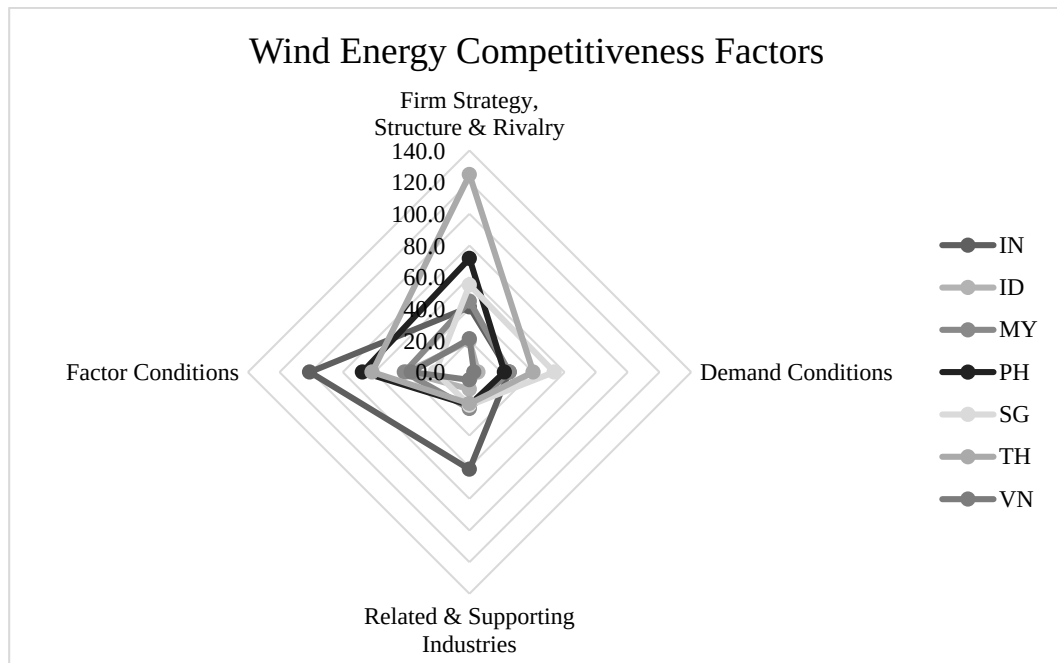


Figure 5 Graphical result of the Porter's diamond for the competitive advantage of nations applied for wind energy for the countries in the study.

In Southeast Asia, countries like Thailand and Philippines are as competitive in terms of factors as India, there are positive possibilities to continue investing in wind energy and make it part of their developing plans for the extended benefits that this industry brings, as China has made by seeing the whole industry as interconnected possibilities to create and maintain business, in terms of investment, services, infrastructure and

products for wind energy growth and maintenance.

Singapore is creating connections to be linked to this energy source by providing research and development for the industry, as it realizes the potential and need for energy for the whole region, despite deciding to invest in tidal energy for its own consumption primary when it comes to renewables it has created its own space to participate and get financial benefits from wind energy.



Malaysia is transitioning in a way that is focusing efforts in other sources of energy different than wind, but this lack of interest in this sector can reduce the chances to find a way to participate in the most dynamic industry in energy sources nowadays.

Indonesia and Vietnam are still weak in the region in different factors, especially in policy adoption, but they have similar characteristics than India, and that creates good starting point that could benefit from more efforts in research and development of technology for renewables and supporting industries from the government.

Implication for business

The Southeast Asian region has fundamental instruments to create an important zone to reach their energy needs and create options to supply other countries once their demand is balanced, this demand is increasing when it is considered per capita, major energy consumption is needed as technology advance, for domestic consumption through digital dependence and the internet of things (IOT); transport, with aerospace industry setting more challenging goals, like flying cars and faster aircrafts; and finally to continue the development pace in development countries for producing goods and power infrastructure. Exporting energy is not new in the Southeast Asian region for business purposes, through fuels from Malaysia and hydro-power from Lao P. D. R., countries in Europe today are exporting energy from their wind energy infrastructure connected to the grid to neighboring countries, like Denmark with a surplus of energy of 40%.

Wind energy represents opportunities from cross border business in the ASEAN zone, to produce parts for the industry, transportation and services for turbines on-shore and off-shore, and the new devices like the airborne wind turbine or off grid systems. Off-shore wind energy presents great opportunities for coastal countries in the region (MB, personal communication, February 3, 2016; RT, personal communication, March 11, 2016).

In order to maintain the development pace in these countries more production and infrastructure need to be powered, wind energy is a clean option that is also cost efficient, labor intensive and extensive in a geographical sense instead of energy plants, this industry creates more markets along the way (MB, personal communication, February 3, 2016).

Investment is becoming more attractive as the technology is bringing new ways to adapt the traditional wind energy system with simple solutions, basically centered on scale.

The most important characteristic of the consumption trend for wind energy is coming from the private industry as the use of turbines is seen as a positive characteristic for sustainability in the whole world, and impact positively in annual reports or consumers acceptance of the firm strategy to grow, there is also a modernity and innovative idea related with the wind energy, specifically with the wind turbine as a symbol, and a psychological relationship between wind energy as a solution for polluted air (RT, personal communication, March 11, 2016).

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Appendices

Interviews

The interviews were conducted based on the semi-structured questions type, with open questions, applying clarification techniques. The objective of conducting the interviews was to test the accuracy of the Porter's Diamond for National Competitive Advantage Model for Wind Energy's current market, bringing the factor environmental concern instead of chance. The media used was face-to-face interview or videoconference. The interviews were recorded.

Prior to each of the interviews it was explain the purpose and confidentiality of the research. For this reason, the audio files were just shared with the research adviser and are referenced in Chapter 4 and Chapter 5 of this paper, mentioning the personal communication, initials of the interviewee and the date when the interview was conducted.

From the total interviews, two were conducted face-to-face in Bangkok, and three were made through videoconference. From the prospected six possible interviews, five were completed, including the main three contacts in the plan, sales of turbine and project management, sales of turbine parts and small turbines in Southeast Asia, and wind energy consultancy for the region.

Participants in the interviews

The profile or the interviewees is explained in this part of the research to demonstrate their characteristics and connection with the research topic.

Interviewee 1. February 9, 2016

DP is a manager consultant in renewable energies in Bangkok, who works for a global consulting agency headquartered in New York City. He has more than 10 years working specifically in renewable energies, including wind energy in Asian projects as the advisor of both the government and the contractor.

Interviewee 2. January 20, 2016

CL is part of an international organization that groups non-governmental organizations, with presence in 94 countries, to monitor international policies to improve sustainable development. The interviewee is based in Oxford, United Kingdom, and has studies in public policies and global development.

Interviewee 3. February 19, 2016.

MB is the sales manager for Southeast Asia of the leading company in wind turbines production and installation in the world. Based in Singapore, he has been working in the industry for more than five years and oversees current projects in Thailand, Vietnam and Philippines. And also coordinates the communication with suppliers from India and China, and the rest of this European organization.

Interviewee 4, February 13, 2016.

PC is the owner and manager of an environmental services company in Latin America, that produces environmental impact assessments for energy projects, including wind farms. She has



participated in the studies analyzing the environmental impacts inner and surrounding areas to develop several projects about wind energy.

Interviewee 5, March 11, 2016.

RT is the business manager for Southeast Asia for a European company that sells turbines off-grid, and other wind energy systems. He has experienced of more than 20 years in Asia in the energy industry, that includes interactions with

Japan and China, and the Southeast Asian region.

Interviewee 6, April 29, 2016.

PG is the head of a governmental institution in charge of the renewable energies policies in Europe, he works in the process of creating new measures and the compliance of those regulations for the implementation of the green technologies for energy supply.

Questions for the interview

Competitiveness in global wind energy: A comparison study between Southeast Asia and India

Semi-structured interview	To be able to discuss emerging findings with the interviewees and test out ideas with them, without being held within a rigid structure to explore on the subject.
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Type of questions:	Open questions, applying clarification techniques.
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Objective of the interview:	Test the accuracy of the Porter's diamond for national competitive advantage model for wind energy's current market bringing the factor environmental awareness instead of chance.
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Media:	Face-to-face / Electronic media (Videoconference)
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Questions:	1. What are the factors creating a more competitive market for wind energy in a global scale? 2. What are the political and social factors that you consider are affecting the wind energy or renewable energies growth or steadiness? 3. What are the market and industrial factors that you consider are affecting the wind energy or renewable energies growth or steadiness? 4. How is the relationship that you find between democracy (people's demands) and renewable energies adoption in developed countries?
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5. How is the relationship that you find between democracy (people's demands) and renewable energies adoption in developing countries?

6. How important is the environmental concern of the population in a country as a tool for the countries to adapt renewable energies in their energy matrix?

7. Would you have any other thought that you consider relevant to the factors that are currently creating more global competition in wind energy?

