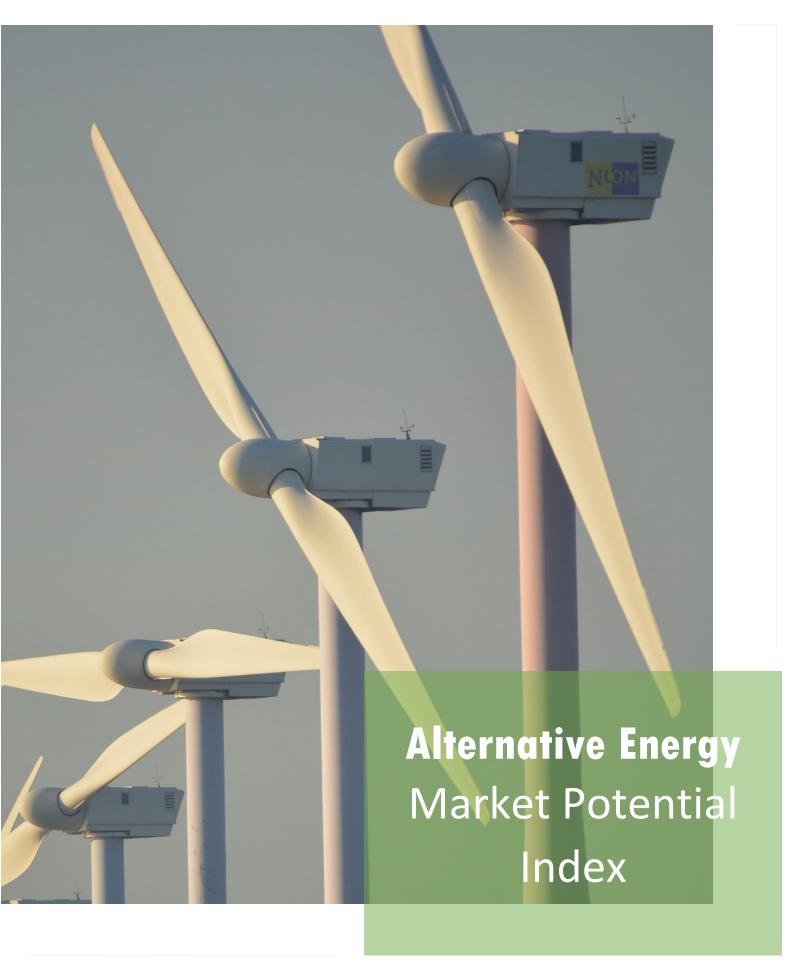
2017

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Preface

- The Market Potential Index (MPI) for specific industries intends to compare countries identified as having the highest Gross Domestic Product (GDP) globally, based on several dimensions.
- In the 2016, the number of countries used for these rankings was 89, but has increased to 97 for 2017. Countries removed from the MPI rankings include Iraq, Luxembourg, Malta, Myanmar, and Papua New Guinea; while those added are Angola, Bolivia, Cameroon, the Democratic Republic of the Congo, Côte d'Ivoire, Ethiopia, Ghana, Jordan, Kenya, Lebanon, Panama, Tanzania, and Uganda.
- The Index compares these 97 countries on six market dimensions: size, growth rate, capacity, openness, current logistics infrastructure, and country risk. In order to measure each of these dimensions, a different set of indicators has been identified for each industry. Secondary data that has been gathered from reputable sources is used for these indicators, as noted. The rankings of the countries are calculated by adding up the dimensions and weighing them based on relative importance.
- While the MPI is a very useful tool for companies in the process of researching new markets for export, it should not be used as the single source of information in the decision. MPIs are designed to support further market research and is intended to be used for verification purposes. The information in this report can be utilized as a foundation to help identify potential countries for which more detailed research should be conducted.
- The Market Potential Index is calculated with the most recent data that is available, so it is important to note that the results represent the current state of the identified 97 countries, not a forecast.
- Industry specific MPIs are updated annually, and can be accessed at: <u>https://globaledge.msu.edu/mpi</u>

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Market Overview

Middle East

The Middle East, with its oil-focused economy in a world withdrawing from fossil fuels, has shifted focus towards renewables. Both Saudi Arabia and the United Arab Emirates, ranked 17th and 19th respectively, increased significantly in the rankings and have recently announced large investment plans for renewable energy. Solar power offers a regional climate advantage in the Middle East as well.

Saudi Arabia: Saudi Arabia is becoming a new market for renewable energy, jumping 33 places in the rankings. Saudi Arabia faces large opportunity costs by using oil for domestic power generation that could be instead exported. In early 2017, the government announced a USD 50 billion renewable energy program, creating opportunities for businesses. Saudi Arabia plans to boost wind and solar energy to meet growing demand. Additionally, the state-owned oil company Saudi Aramco installed the country's first wind turbine to power their operations.¹

United Arab Emirates: The United Arab Emirates is geographically advantaged for both wind and solar energy, with high rates of sun exposure and frequent wind. Their growing economy and population have led to an increase in demand for energy. The current energy capacity can only meet half of the energy demand forecast for 2030. Therefore, adding renewable energy is a necessity. 2 The United Arab Emirates announced in 2017 plans to invest USD 163bn towards alternative energy. They aim to generate nearly half of the country's power from renewable sources.³

Asia

Energy demand is estimated to almost double in the Asia and Pacific region by 2030 due to a rising population. There is a large need for both environmental and economical energy to meet these demands. According to World Bank, Asian countries are making a vital contribution to achieving global sustainable energy goals.⁴

Japan: Since the Fukushima nuclear crisis in 2011, Japan's power sector has been marked by significant turmoil. Japan has since significantly decreased nuclear energy production, creating an important opportunity for renewable energy developers. Japan has increasingly turned to renewable resources to meet its energy needs and has announced targets for renewables capacity of 22.0%-24.0% of its total generation by

¹ EY Renewable energy country attractiveness index: http://www.ey.com/Publication/vwLUAssets/EY-RECAI-49-May-2017.pdf

² Export.gov

³ BBC: http://www.bbc.com/news/world-middle-east-38575244

⁴ World Bank: http://www.worldbank.org/en/news/press-release/2015/06/18/asian-countries-are-among-top-achievers-on-sustainable-energy-progress

2030 from the current 12.0% level.5 Demand has helped U.S. companies receive large interest from Japanese buyers despite it typically being a hard market to penetrate.⁶

The Japanese government introduced a Feed-in-Tariff (FiT) in July 2012 to boost renewable energy initiatives. Feed in Tariffs works to accelerate investment in renewable energy by guaranteeing payments to producers for the electricity they produce. The system has boosted the introduction of solar power. The FiT for wind energy has been extended to 2019, so continued strong levels of investment should be expected. However, solar volumes may fall slightly as they have moved from FiTs to auctions.

India: India, ranked 25th but growing, has set goals for renewable energy that are beyond their current domestic capacity. This has increased investment in the sector and promoted increased implementation, particularly in solar energy. US suppliers enjoy a surprisingly high market share in India despite India being a difficult market to navigate.

Bureaucratic issues, infrastructure weakness, and local content restrictions are all obstacles to be faced. India's underdeveloped transmission and distribution (T&D) system also remains an issue to projects. Losses stemming from the inefficiency of T&D are estimated at almost 17 percent of total electrical output. ⁸

China: Ranked #1 in 2017, China is both the world's largest producer and consumer of renewable energy technologies. 9 China is increasing its commitment to renewable energy in an attempt to reduce its carbon footprint. China accounted for 29% of the global CO2 emissions in 2016, making it the largest contributor. 10 In order to reduce CO2 emissions, the government introduced the Air Pollution Prevention and Control Law in 2016, which puts in place stricter quality standards and a system of fines, in addition to investing in renewable energy. They plan to invest USD 361 billion into renewable energy by 2020. 11

Although relatively high transportation costs make manufactured goods exported from the United States to China more expensive, U.S. companies can find success exporting high value-added products. According to Export.gov, U.S. exporters are encouraged to view the Chinese renewable energy market by region because each offers different opportunities. West China, including Xinjiang, Qinghai, and Gansu have many resources and are likely locations for many renewable projects in the future. In the east and south,

⁵ Passport Euromonitor:

⁶ ITA Top Markets Report: http://www.trade.gov/topmarkets/pdf/Renewable Energy Japan.pdf

⁷ Japan Times Co.: http://www.japantimes.co.jp/opinion/2015/10/31/editorials/review-feed-tariff-system/#.WUFkrFUrIdU

⁸ ITA Top Markets Report: http://www.trade.gov/topmarkets/pdf/Renewable_Energy_India.pdf

⁹ ITA Top Markets Report: http://www.trade.gov/topmarkets/pdf/Renewable Energy China.pdf

 $^{^{10}}$ Trends in Global CO $_2$ Emissions 2016 Report: $\underline{http://edgar.jrc.ec.europa.eu/news \ docs/jrc-2016-trends-in-global-co2-emissions-2016-report-103425.pdf}$

¹¹ Reuters: http://www.reuters.com/article/us-china-energy-renewables-idUSKBN14P06P

there are component manufacturers and developers for renewable projects that may be potential markets for US products.¹²

Europe

Global renewable energy market share has been shifting away from traditional European markets and more towards developing economies in Asia and Latin America. Europe is a historically difficult market for U.S. suppliers to penetrate. However, with already established business and political relationships, Europe's stable economy provides important opportunities for the United States. Germany, the United Kingdom, France, Italy, and Switzerland all rank within the top 10 this year.

Germany: Germany, ranked #2, has been investing heavily in renewables as part of the government's Energiewende initiative to transition away from fossil fuels and nuclear power to a renewable energy supply by 2050. The country's energy transition aims for at least 80 percent of all power to come from renewables by 2050, with intermediate targets of 35 to 40 percent share by 2025 and 55 to 60 percent by 2035.13 The government provided subsidies that have increased solar and wind projects and decreased their cost. Recently, Germany has decided to phase out subsidies and instead use auctions to drive down energy costs for consumers. The auctions will test if Germany can reach their energy goals when their country is predominantly sourced by fossil fuels and nuclear power.

According to Export.gov, Germany's energy grid has a strong need for modernization and other technologies, creating an estimated USD 628 billion business opportunity for U.S. companies.¹⁴

France: France, ranked #6, has opportunities within the renewable energy industry. This reflects France's renewed interest in clean energy following the Energy Transition for Green Growth reforms in July 2015. The government also intends to hold a quarterly solar auction until 2019. There is some speculation that the reform will not actually be implemented as planned as the bill has been watered down in the political process. 15 According to trade data from 2013-2015, U.S. suppliers have averaged a seven percent share of France's imports of solar PV cell. 16 Therefore, they are well positioned for the increase in investment. However, it is forecast that nuclear power will remain the dominant source of electricity generation in France for the next 10 years.

¹² ITA Top Markets Report: http://www.trade.gov/topmarkets/pdf/Renewable_Energy_China.pdf

¹³ Independent: http://www.independent.co.uk/news/world/europe/germany-renewable-energy-record-coal-nuclear-power-energiewende-low-carbon-goals-a7719006.html

¹⁴ Export.gov: https://www.export.gov/article?id=Germany-Renewable-Energies

¹⁵ BMI Market Research

¹⁶ ITA Top Markets Report: http://trade.gov/topmarkets/pdf/renewable_energy_top_markets_report.pdf

The Americas

The United States captures a large portion of the renewables import market in the Western Hemisphere, aided their proximity and favorable reputation.¹⁷

Brazil: Brazil, ranked 4th in 2017, is the largest renewable energy market in Latin America. They generate around 76% of their electricity from renewable resources.18 Although there is growth in almost every energy subsector, hydropower is the largest source. However, a recent three-year drought in Brazil has brought attention to the need to diversify its generation mix away from hydropower. Solar power has been a focus as of 2015, with the Brazilian Development Bank expecting to invest USD 2.5 billion in solar power through 2018.19 Wind power also presents an opportunity for foreign investors due to Brazil having one of the world's strongest wind resource bases.

Brazil is facing many challenges in their ambitious energy goals, leading to their two spot decline in the rankings. The cancellation of Brazil's A-3 wind and solar auction in December 2016 demonstrates the effect the sharp decline in energy demand has had on the country, due to the severe recession and political instability. Some companies are exiting contracts they won in previous auctions. ²⁰ Brazil is still planning on organizing at least one power auction for clean energy projects in 2017. It is predicted that Brazil will emerge from recession in 2017, but at a very slow growth rate of 0.5%. ²¹ Additionally, substantial import barriers and local content restrictions make the market complicated for American exporters. However, there may be a success in opportunities providing technologies that aren't currently available in Brazil.

Canada: Ranked #7, Canada's vast renewable energy potential and its national commitment to greenhouse gas reductions show great potential. All Canadian provinces have similar strategic objectives in developing renewables and there is no large-scale investment in fossil fuel-based power generation.22 Canada's new capacity through 2017 is expected to be focused on wind, solar, and hydropower development. Canada's long coastlines and vast land mass give it some of the best wind and solar resources.

Canada produces 66% of its electricity from renewables. In 2015, about 60% of Canada's electricity was produced by hydroelectricity with the remaining coming from wind, solar, and biomass, according to the National Energy Board (NEB) report.²³

¹⁷ ITA Top Markets Report: http://trade.gov/topmarkets/pdf/renewable-energy-top-markets-report.pdf

¹⁸ Export.gov <u>https://www.export.gov/article?id=Brazil-Renewable-Energy</u>

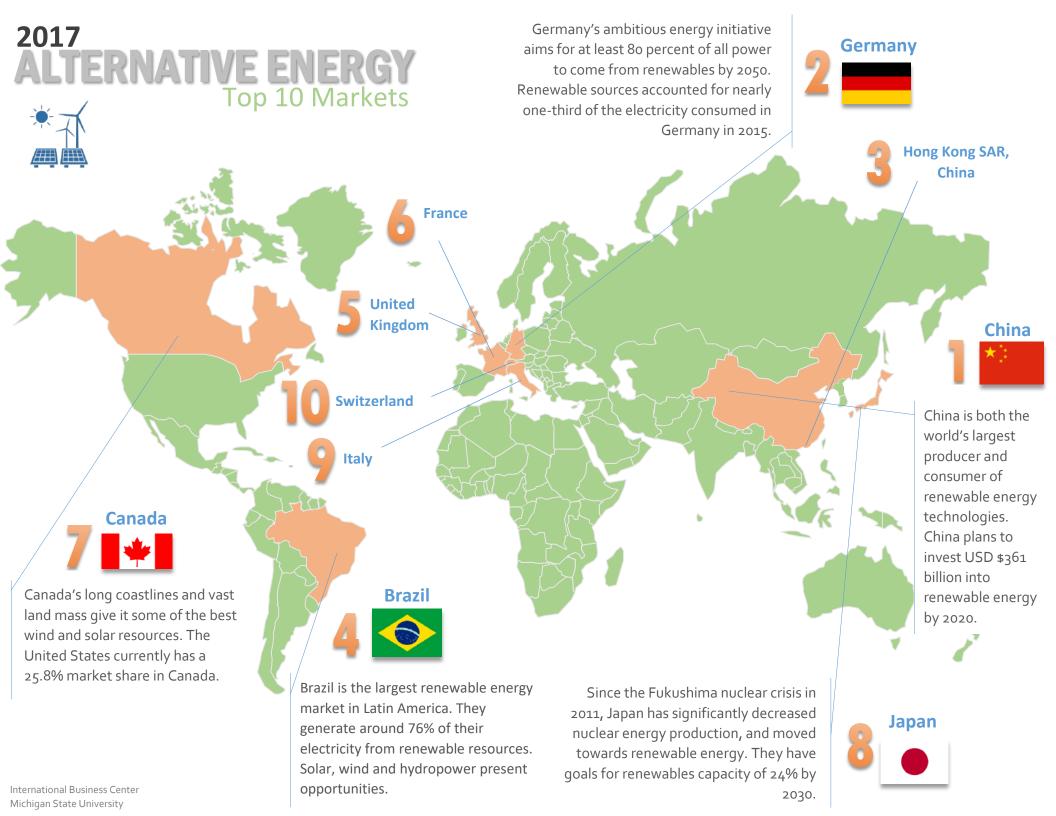
¹⁹ Export.gov: https://www.export.gov/article?id=Brazil-Renewable-Energy

²⁰ EY Renewable energy country attractiveness index: http://www.ey.com/Publication/vwLUAssets/EY-RECAI-49-May-2017/\$FILE/EY-RECAI-49-May-2017.pdf

²¹ Reuters: http://www.reuters.com/article/us-brazil-economy-gdp-idUSKBN16E1EL

²² ITA Top Market Reports: http://www.trade.gov/topmarkets/pdf/Renewable-Energy-Canada.pdf

²³ Independent: http://www.independent.co.uk/news/world/americas/canada-electricity-renewable-energy-66-per-cent-hydro-biomass-wind-fossil-fuels-environment-friendly-a7715166.html



Additionally, Canada is a world leader in collaborative R&D. There are tremendous opportunities to create partnerships in renewable energy between industry, government, universities, research institutes and testing facilities. ²⁴ The United States currently has a 25.8% market share in Canada. ²⁵

Results of the 2017 Alternative Energy MPI

	OVERALL	Market Size (30/100)	Market Growth Rate (15/100)	Market Capacity (10/100)	Market Openness (15/100)	Logistics Infrastructure (15/100)	Country Risk (15/100)
	RANK	INDEX	INDEX	INDEX	INDEX	INDEX	INDEX
China	1	100	23	100	76	86	60
Germany	2	31	8	23	91	90	94
Hong Kong	3	12	70	14	96	68	84
Brazil	4	59	13	21	87	33	39
United Kingdom	5	21	14	19	96	86	87
France	6	25	7	20	92	82	88
Canada	7	25	8	22	86	82	88
Japan	8	22	6	29	87	71	92
Italy	9	32	4	19	86	65	77
Switzerland	10	22	5	14	90	67	100
Belgium	11	11	11	15	93	92	89
Austria	12	20	7	15	94	61	94
Sweden	13	13	5	15	95	78	96
Finland	14	13	8	14	100	72	90
Estonia	15	3	44	14	95	59	86
Netherlands	16	5	5	15	97	100	92
Saudi Arabia	17	8	70	18	67	58	60
Denmark	18	7	10	14	94	77	91
United Arab E.	19	2	51	15	82	73	69
Norway	20	10	5	15	94	63	97
Spain	21	11	5	18	91	81	77
Singapore	22	2	9	15	97	86	88
Czech Republic	23	13	9	15	91	58	85
Poland	24	12	16	16	89	59	76
India	25	19	24	29	78	27	57
Korea, Rep.	26	7	14	20	68	81	79

²⁴ Invest in Canada: http://www.international.gc.ca/investors-investisseurs/sector-secteurs/energy-energie.aspx?lang=eng

²⁵ ITA Top Markets Report

	OVERALL	Market Size (30/100)	Market Growth Rate (15/100)	Market Capacity (10/100)	Market Openness (15/100)	Logistics Infrastructure (15/100)	Country Risk (15/100)
	RANK	INDEX	INDEX	INDEX	INDEX	INDEX	INDEX
Slovenia	27	6	10	14	93	65	76
Hungary	28	17	9	14	91	39	67
Australia	29	8	8	17	85	42	91
Malaysia	30	4	14	16	93	67	69
New Zealand	31	6	4	14	95	46	93
Portugal	32	5	6	14	93	68	77
Israel	33	4	23	14	82	54	78
Ireland	34	2	3	14	92	61	86
Colombia	35	6	36	14	79	59	51
Slovakia	36	4	9	14	90	57	78
Indonesia	37	9	35	17	90	23	54
Oman	38	1	46	14	84	47	55
Panama	39	4	20	12	79	77	58
Thailand	40	14	18	16	77	44	54
Cambodia	41	3	100	7	78	1	29
Croatia	42	11	16	14	91	48	46
Russia	43	17	11	29	64	49	39
Bahrain	44	1	32	14	83	58	48
Kuwait	45	1	53	15	64	31	61
Greece	46	8	8	14	87	58	50
Mexico	47	7	17	18	74	61	51
Romania	48	5	19	15	86	39	59
Latvia	49	2	2	14	91	53	75
Cyprus	50	4	11	14	84	52	65
Chile	51	3	1	15	81	60	76
Morocco	52	5	16	13	78	59	57
Lithuania	53	7	11	14	84	26	73
Bulgaria	54	5	18	14	80	40	58
Vietnam	55	7	34	15	68	41	43
Turkey	56	8	19	17	70	46	44
South Africa	57	6	19	15	71	45	49
Qatar	58	1	30	14	51	50	67
Uruguay	59	2	12	14	73	53	59
Peru	60	3	14	13	71	49	57
Paraguay	61	6	21	14	74	48	32
Costa Rica	62	4	3	14	73	45	59

	OVERALL	Market Size (30/100)	Market Growth Rate (15/100)	Market Capacity (10/100)	Market Openness (15/100)	Logistics Infrastructure (15/100)	Country Risk (15/100)
D. /	RANK 63	INDEX	INDEX	INDEX	INDEX	INDEX	INDEX
Belarus	64	4	15	14	96	59	7
Dominican Rep.		4	13	14	68	57	42
Philippines	65	6	14	13	73	22	58
Cuba	66	5	25	14	92	51	1
Guatemala	67	3	13	12	70	56	41
Ecuador	68	2	15	14	76	58	27
Kazakhstan	69	3	15	15	82	37	31
Argentina	70	14	11	16	57	37	32
Sri Lanka	71	4	17	13	73	39	38
El Salvador	72	2	6	13	76	51	43
Jordan	73	2	11	14	81	40	39
Bolivia	74	4	22	12	73	35	34
Ukraine	75	5	33	16	70	39	12
Tunisia	76	4	23	14	68	30	40
Serbia	77	3	9	14	79	24	38
Kenya	78	4	26	4	70	22	38
Azerbaijan	7 9	1	17	14	65	38	30
Uzbekistan	80	5	9	14	71	45	16
Lebanon	81	4	17	14	60	42	20
Nicaragua	82	4	18	11	66	27	24
Honduras	83	4	6	12	71	22	35
Bangladesh	84	4	29	8	54	23	28
Egypt, Arab Rep.	85	3	8	16	51	52	25
Angola	86	4	45	3	48	26	16
Cote d'Ivoire	87	1	11	8	58	47	28
Uganda	88	1	23	1	68	26	28
Ghana	89	2	10	10	65	20	36
Algeria	90	4	31	15	23	23	39
Pakistan	91	4	11	15	55	28	21
Nigeria	92	2	32	8	52	24	15
Cameroon	93	4	13	7	43	32	27
Ethiopia	94	2	31	3	44	12	20
Tanzania	95	2	15	1	53	13	30
Venezuela	96	6	3	15	39	3	1
Congo, Dem. Rep.	97	2	22	1	1	40	9

* Overall Rank is calculated by weighting the six dimension values. For Index values, values of the countries are converted into a 1-100 scale based on their relative magnitudes in each of the six dimensions. An index value of 100 indicates a country with the largest (or most favorable) value in a dimension whereas an index value of 1 indicates the smallest (or least favorable). While both the overall rank and index values show the rank order of the countries, the index values also indicate the magnitude of each country in relation to others in that order.

Assumptions

For the market size calculations, the amount of electricity produced by alternative resources is used as an indicator of the renewable energy potential of the countries. Production amount of biofuels is also used as an indicator of market size. The value of electricity imports is used as another market size variable, assuming that it's a good indicator of the country's energy imports market size. Market growth rate is measured by calculating the Compounded Annual Growth Rate (CAGR) of each market size indicator for the last five years.

For the market capacity, both the amount of generated electricity and electricity installed capacity are used as variables, assuming that these are good indicators of electricity capacity of a country. On the other hand, as an indicator of non-electricity related energy consumption, carbon dioxide emissions are used as another variable for the market capacity. And finally, since it's a good indicator of current electricity grid of a country, access to electricity is used for the measurement of market capacity. Along with the other generic export-related indicators, tariff data for Harmonized System (HS) code 2716 (Electrical Energy) is used for the measurement of the market openness dimension as well as the amount of private participation in energy investments. For the logistics dimension, the value of losses that occur during electricity distribution is incorporated with the other generic logistics indicators.

Indicators and Resources

Dimension	Weight	Measures Used				
Market Size	30	 Electricity Consumption (2014) ¹⁰ Electricity Imports (2015-2016) ² Electricity Produced by Renewable Resources (2014) ¹⁰ Production of Biofuels (2014) ¹⁰ 				
Market Growth Rate	15	 CAGR of Electricity Consumption (2009-2014) ¹⁰ CAGR of Electricity Imports (2011-2016) ² CAGR of Electricity Produced by Renewable Resources (2009-2014)^{3,10} 				

		 CAGR of Production of Biofuels (2009-2014) ¹⁰
Market Capacity	10	 Access to Electricity (% of Population) (2014) ³ Total Carbon Dioxide Emissions (2014) ¹⁰ Total Electricity Generated (2014) ¹⁰ Total Electricity Installed Capacity (2014) ¹⁰
Market Openness	15	 Applied Tariff Rate on Electricity (2015) ⁴ Burden of Customs Procedure (2016) ³ Cost to Import, border compliance (2016) ³ Cost to Import, documentary compliance (2016) ³ Investment in Energy with Private Participation (2015-2016) ³
Logistics Infrastructure	15	 Electricity Distribution Losses (2014) ¹⁰ Distance of Country from US ⁵ Linear Shipping Connectivity Index (2014) ³ Quality of Port Infrastructure Index (2015) ³
Country Risk	15	 Business Risk Rating (2016) ⁸ Economic Risk Rating (2016) ⁷ Intellectual Property Rights Protection (2016) ⁹ Political Risk Rating (2016) ⁶

Data used are those available for most recent year. All sources were accessed in May-June 2017.

¹ Passport GMID, Global Market Information Database

² UN Comtrade, <u>Commodity Trade Statistics Database</u>

³ World Bank, <u>World Development Indicators</u>

⁴ World Trade Organization (WTO), <u>Tariff Database</u>

⁵ Happyzebra, <u>Distances</u>

⁶ Credimundi, Country Risks

⁷ Coface, <u>Economic Studies</u>

⁸ Swiss Export Risk Insurance, <u>Cover Practice for Countries and Banks</u>

⁹ International Property Rights Index, <u>2016 IPRI Report</u>

¹⁰ U.S. Energy Information Administration (EIA), <u>International Energy Statistics</u>

Year To Year Comparison

	RANK			
Country	2017	2016	2014	
China	1	1	1	
Germany	2	3	3	
Hong Kong	3	4	13	
Brazil	4	2	5	
United Kingdom	5	5	15	
France	6	13	14	
Canada	7	9	12	
Japan	8	6	2	
Italy	9	8	9	
Switzerland	10	12	4	
Belgium	11	7	17	
Austria	12	10	18	
Sweden	13	14	8	
Finland	14	11	6	
Estonia	15	23	34	
Netherlands	16	15	7	
Saudi Arabia	17	50	10	
Denmark	18	17	21	
United Arab Emirates	19	30	19	
Norway	20	38	24	
Spain	21	16	27	
Singapore	22	22	16	
Czech Republic	23	18	26	
Poland	24	20	44	
India	25	36	25	
Korea, Rep.	26	32	11	
Slovenia	27	37	39	
Hungary	28	29	38	
Australia	29	26	23	
Malaysia	30	35	30	
New Zealand	31	19	20	
Portugal	32	27	40	
Israel	33	21	35	
Ireland	34	25	41	
Colombia	35	49	65	
Slovakia	36	43	37	
Indonesia	37	42	33	
Oman	38	51	28	
Panama	39			
Thailand	40	39	45	
Cambodia	41	72	89	
Croatia	42	33	70	
Russia	43	41	42	
Bahrain	44	63	32	
Kuwait	45	70	36	
Greece	46	47	67	
Mexico	47	44	46	
Romania	48	48	69	
Latvia	49	53	49	

		RANK	
Country	2017	2016	2014
Cyprus	50	24	63
Chile	51	66	48
Morocco	52	34	43
Lithuania	53	52	57
Bulgaria	54	61	55
Vietnam	55	54	50
Turkey	56	40	51
South Africa	57	31	52
Qatar	58	46	22
Uruguay	59	62	31
Peru	60	56	47
Paraguay	61	58	54
Costa Rica	62	65	60
Belarus	63	59	79
Dominican Republic	64	60	61
Philippines	65	57	68
Cuba	66	73	81
Guatemala	67	55	53
Ecuador	68	71	77
Kazakhstan	69	83	80
Argentina	70	69	62
Sri Lanka	71	68	73
El Salvador	72	67	66
Jordan	73		
Bolivia	74		
Ukraine	75	76	59
Tunisia	76	64	56
Serbia	77	78	76
Кепуа	78	/-	, -
Azerbaijan	79	80	86
Uzbekistan	80	89	88
Lebanon	81	09	
Nicaragua	82	84	74
Honduras	83	79	7 4 75
Bangladesh	84	82	73 71
Egypt, Arab Rep.	85	74	64
Angola	86	/4	04
Cote d'Ivoire	87		
Uganda	88		
Ghana	89		
Algeria	90	75	72
Pakistan	91	75 77	83
Nigeria		77 86	84
Cameroon	92	00	04
Ethiopia	93		
Tanzania	94		
Venezuela	95 96	87	85
		٥/	υ ₅
Congo, Dem. Rep.	97		

For More Information

For the indexing methodology, please refer to:

"Measuring the Potential of Emerging Markets: An Indexing Approach" - S. Tamer Cavusgil, Business Horizons, January-February 1997, Vol. 40 Number 1, 87-91

"Complementary Approaches to Preliminary Foreign Market Opportunity Assessment: Country Clustering and Country Ranking" - S. Tamer Cavusgil, Tunga Kiyak and Sengun Yeniyurt,

Industrial Marketing Management, October 2004, Volume 33, Issue 7, 607-617