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The wind is a renewable energy source that we can use for a variety of purposes. If you've ever wondered what the uses of wind energy actually are, then this article is well worth a read. We'll explore the different ways we can make use of the wind's kinetic energy. Some of these uses might even come as a surprise to you. One of the most popular uses of wind energy is to generate electricity. During this process, a wind turbine harnesses the energy of the wind. As the wind starts to move the blades of the turbine, a generator starts to turn which then produces electricity. Wind power has increased in both popularity and efficiency since the first electricity-generating turbine was created. Back in 1887, Scottish academic James Blyth built the world's first wind turbine to provide electricity for the lighting of his holiday home. Today, the technology exists to allow us to build vast wind farms. Both onshore and offshore wind farms can power millions of homes depending on their size. Another use of wind energy is in transportation. Civilizations have for many thousands of years made use of wind energy for sailing. Researchers believe that sailing has been in existence in some form since as far back as 5000 BC. In more recent times, we have seen both small and large ships capable of sailing under the power of the wind. It may surprise you that some modern shipping companies are beginning to embrace wind energy once again. Vessel's including fishing trawlers and even cargo ships have had large kites installed. These can help to reduce fuel consumption on long journeys by as much as 30% under the right conditions. This is an obvious attraction for companies that spend significant amounts on fuel and for those looking to reduce their carbon footprint. Wind energy has long been used in transportation. A more enjoyable use of wind energy is for sports and activities that rely on the power of the wind. Here are just some of the uses of the wind's energy: Windsurfing - This uses a mast and a sail that's attached to a surfboard on which a person will stand whilst operating the sail.Sailing - This more traditional use of wind energy can be used in sports where individuals or teams will race each other.Land Sailing - Similar to sailing only this is performed on land with a small vehicle that has wheels and a sail.Kitesurfing - A person who kitesurfs will stand on a surfboard whilst holding on to a kite. They then ride both the waves and the air, reaching significant heights in the process.Kiteboarding - Similar to kitesurfing only kiteboarding is performed on land and the surfboard is replaced for a smaller wheeled board.Kitebuggying - This is similar to kiteboarding only a small buggy is used in replace of a board and the person sits instead of stands. A kitesurfer making use of wind energy. Whilst you may think that sports such as parachuting and gliding make use of the wind's energy, this is actually incorrect. These sports are classed as 'air sports' and don't necessarily make use of wind energy for propulsion. Wind energy has been traditionally used in food production. Prior to the industrial revolution, windmills were widely used for milling grain so that it could be used for producing food such as bread. In more recent times, the introduction of electricity and motors has eliminated our need for such structures. As a result, factories can now produce items such as flour much more efficiently. You may not be aware that wind energy can also be used for pumping water through the use of a wind pump. Wind pumps have a similar look to a traditional windmill but instead of milling grain, they can pump water. These structures were historically used for the draining of land. Just like windmills used in food production, wind pumps have almost all been replaced due to the introduction of electric motors. So there we have five of the most popular uses of wind energy. Whilst some are more popular than others, each use has its own benefits. We can use wind resources for our own enjoyment, to reduce our carbon footprint or even to reduce our dependence on fossil fuels. Nowadays, wind energy technologies that generate electrical power are by far the most popular use. Historically, sailing has been the most popular use of wind energy. Windmills were also very popular, grinding grain for food production. Climate change is one of the top serious issues we are currently facing. Many countries from across the globe use renewable energy sources such as wind energy to lessen carbon emissions, greenhouse gas emissions, and resilience to fossil fuels. So what exactly is wind energy, and why do many countries use it? Also, what are some advantages of wind power and some disadvantages of wind power? Keep reading to find out more. Wind energy is one of the fastest-growing renewable energy sources. It has a renewable power source that does not pollute the surroundings nor produce greenhouse gases. In a nutshell, wind energy is consumed when we use the wind to produce usable electricity using kinetic energy created by the air. The wind is one of the most abundant and inexhaustible resources. Wind energy is becoming increasingly popular and widely used as an alternative source to generate power and electricity worldwide. It provides a clean, sustainable energy source that is cost-effective and accessible to communities worldwide. Now that you're familiar with wind energy, let's hop into the wind energy pros and cons. The massive use of wind energy continues to provide numerous benefits, so there are numerous wind energy advantages. One of the best wind energy advantages is how it provides a free, green, and renewable source of energy. The energy generation from wind turbines can avoid up to 327 million metric tons of carbon emissions annually. That is equivalent to 71 million cars! In 2013, the operating wind energy capacity avoided over 250,000 tons of air pollutants such as nitrogen, nitric, and sulfur dioxide. Scientists predict that wind energy could avoid about 12.3 gigatons of greenhouse gases by 2050. A wind turbine electrician is one of the fastest-growing jobs in the US. Across all 50 states, nearly 117,000 American employees are in the wind energy industry. The wind energy industry has also provided 24,000 wind manufacturing jobs in over 500 facilities. Wind energy benefits the people residing in rural areas where it's hard to generate energy. The location of wind turbines provides excellent generating power for remote or isolated areas, especially those living "off the grid." The price in the wind industry is less sensitive to volatility, unlike using natural gas and coal fuel. As consumers using traditional electricity, we pay more. Shifting to wind energy consumption makes energy prices decrease. On the other hand, here is a list of the cons of wind energy. Larger land space is needed to cater to large-scale wind farms. Don't worry; you're still free to roam around on the solid ground. Here, we are talking about the space intervals in each wind turbine in wind farms. Wind turbines can only operate when the wind blows. There is a direct relationship between how much a wind turbine can produce energy to its wind speeds. If the wind blows slowly, the energy produced would be less, and if the wind blows faster, the more power it can produce. Although wind turbines are tall enough not to hurt any humans on the ground, the rotor blades and power lines can be extremely dangerous to birds. Due to their height, wind turbines are highly susceptible to damage from natural causes such as lightning. Reducing the noise a wind turbine produces is one of the best technological advancements for these machines. The noise is minimal, like the so-called white noise — the one we hear at home from electrical appliances. The call for generating electricity using renewable energy is multiplying as we find ways to combat climate change. Today's top three renewable energy sources are solar panels, wind turbines, and nuclear power plants. Wind energy relies on kinetic energy used to power wind turbines. One of the best wind energy pros is that it can generate electricity on a bigger scale. We use wind turbines for industrial, commercial, and even residential purposes. With this, operating costs and maintenance costs are higher. Solar energy uses solar power called solar cells. It works when sunlight is converted into fuel using solar cells (photovoltaic cells). The design of solar panels is for residential purposes. Compared to wind turbines, solar panels have low operating costs. Additionally, you should hire installers that reputable solar companies employ for the best equipment. Nuclear energy is another electricity generation option that provides clean energy for everyone who uses nuclear power plants. A nuclear power plant is a location where nuclear power generates electricity. Despite its benefits, not many countries use this type of renewable energy because of incidents like the Fukushima Nuclear Disaster in 2011. Wind energy, solar energy, and nuclear energy have pros and cons. Still, one best thing they have in common is that they can create more renewable energy sources. That's the goal. America has already started storing wind and solar energy in energy storage technology. The creation of energy storage technology preserves wind energy and solar energy for future use just in case the wind isn't moving enough and the sun isn't shining much. Wind turbines are machines used to convert kinetic energy into mechanical energy or usable electricity. In simpler terms, wind turbines create electricity using wind energy. A wind farm is a group of wind turbines within the exact location. A larger site is needed to cater to large-scale wind turbines. Wind farms must be in the windiest places to reach maximum wind power capacity. Wind turbines use the wind to make usable electricity, but the operation isn't as easy as it sounds. Here's a detailed process of how a wind turbine works. A wind turbine uses blades to catch the kinetic energy of the wind. Ideally, the location of wind turbines is in places with consistent and regular air movement. This air movement pushes the blades to allow the wind to move effortlessly. The blades used in wind turbines are designed and shaped to move downward and upward. These blades are similar to airplanes as they generate lift and move! Kinetic energy is the free energy from the wind. When the wind meets a turbine's blades, it transforms kinetic energy into mechanical energy. To store and be able to use kinetic energy, it first needs to be converted into usable electricity. Inside the wind turbine's nacelle, there is a spinning drive shaft connected to a gearbox that increases their wind speed of rotation. Enough wind speed spins a generator to power up. The electricity produced by a wind turbine's generator is a 60-cycle alternating current (AC). A transformer is needed to convert the energy produced, depending on the energy demand of the locals. This last part of the process only indicates that the electricity produced by wind turbines is now ready for distribution. It is delivered through transmission lines and a power grid for consumption or to be stored in a battery. The electric grid of wind turbines is located underground and connected to a nearby substation. To utilize the wind's kinetic energy, convert it into generating energy. It all starts with installing wind turbines. The principal components of a wind turbine are as follows: The primary support tower of a wind turbine is steel. It is finished with several layers of protective paint to protect it from different elements. The wind turbine tower must be tall enough to ensure that the rotor blade does not interfere with normal ground-level operations. Another thing to consider why wind turbines need to be tall is that the higher the wind turbines are, the higher the capacity they can provide. Wind turbine heights and rotor blade sizes have increased through time due to technological advancements and efforts made by different research institutions. The height of an average wind turbine is between 60 to 120 meters. As of 2019, GE's Haliade-X holds the world's largest turbine title, with a support height of 138 meters. The head of a wind turbine is called the nacelle. The nacelle is what you see on top of a support tower. The wind turbine nacelle is the housing of all the generating components for wind turbines to work, such as: Gearbox assemblyAerodynamic brakingMechanical brakingTurbine generatorElectrical power transmission systems The three long thin blades we see attached to the nacelle of a wind turbine are called rotor blades. The rotor blades are designed to capture the kinetic energy from the wind as it passes and then convert it into rotational energy. As of 2021, wind turbines with over 115cm rotor blades are the largest wind turbines manufactured in the world. The blade tips of this kind can sweep through 230 mph in the air. In 2020, the US, The Energy Information Administration stated that one home in the United States uses an average of 893-kilowatt hour (kWh) energy consumption per month. The mean wind power capacity in commercial and residential applications is 2.75 MW. According to the 2021st edition of the Land-Based Wind Market Report by the Department of Energy, 42% is the average capacity factor among recently built wind turbines in the US. With this average, it could generate 843,000 kWh per month, enough to generate electricity for more than 940 US homes. In many countries, wind energy has become an essential part of their energy systems, improving the air quality. Although considered the best renewable energy source, not all countries can build a name in the wind energy sector. It is crucial to plan and know the best location and height of wind turbines. Below are the top countries and regions that have built the most wind energy projects to this day: China is still the leader in wind energy production worldwide, contributing to over one-quarter of wind energy capacity globally. The Chinese wind power industry has built the largest onshore wind farm located in Gansu Province. So far, despite its dependency on the fossil fuel industry, Wind Power in the United States has already generated 139GW of onshore wind energy capacity. The majority of the largest onshore wind farms are in the US. The Alta Wind Energy Center in California is the second-largest wind farm globally. Germany has Nordsee One Offshore Wind Farm that provides energy supply for 400,000 homes. The German wind industry also has some of the largest offshore wind farms. Gode Wind Farms Phase 1 and Gode Wind Farms Phase 2, with a capacity of 582MW combined. Wind Energy in the UK has a very important role in the regions goals for Net Zero. The UK has some key wind farms, like Dogger Bank, London Array, and Inch Cape. Who Are The Main Manufacturers Of Wind Turbines? Here are the top wind turbine manufacturers this 2022: Vestas wind turbines are located in Denmark and are currently the top and largest wind turbine manufacturers. They dominated the wind turbine market in 1898 and represented over 16% of the wind energy industry. To this day, Vestas has installed over 600,000 turbines across countries. Its manufacturing facilities are in Asia, Europe, North America, and Latin America. The Siemens Gamesa wind turbines rank second on the list. Siemens Gamesa is known to have a firm position in the offshore wind market. They were the first to install an offshore wind farm in 1991. Since then, they have never stopped dominating the offshore wind market, with around 70% market share in Europe alone. As of 2022, the Chinese wind turbine manufacturer, Goldwind, remains in the world's top three list of largest wind turbine manufacturers. By late 2019, Goldwind has installed a 50GW capacity for wind turbines in more than 20 major countries worldwide. The amount of wind energy a wind turbine can produce depends on the wind speed. The quicker the wind blows, the more energy wind turbines can produce. Another factor to consider is the model and size of the wind turbines. Here are the three kinds of wind turbines according to size and model and how much wind energy they can produce. This kind of wind turbine is generally the largest among the three types. It can produce up to 600 MWh annually using 2.5-3 MW onshore wind turbines. If we use a 3MW offshore turbine, it may double the production of generated electricity. Residential wind turbines are the ones we can install on our house roofs. Given its name, this kind of wind turbine is smaller than commercial wind turbines. However, compared to commercial wind turbines, most residential wind turbines can only generate electricity from 1 kW to 10 KW. Portable wind turbines have the lowest electricity power among the three kinds of wind turbines. That said, it is suitable only for small appliances. Its principal function is to provide electricity for cameras, charging phones, and the like. Countries worldwide have taken the initiative to move closer to a cleaner and greener future by using energy independence. This is the term used in the US for preventing too much reliance on oil and fuel. Continuous consumption of renewable sources such as wind energy may also reduce carbon and greenhouse gas emissions. With the wind energy pros and cons, it's still one of the best clean, renewable energy alternatives to fossil fuels. As the production of energy storage technology continues and the more countries follow this concept, the more hope we have to save the planet in the future. Take note that the maximum capacity of wind energy a wind turbine can produce depends on the height or elevation of the support tower, the size of the rotor blades, the wind speed, and the location. Lastly, the location of wind farms brings revenue to rural areas by providing jobs. So, they are safe and not harmful to people living near the wind farm and are also great for local and rural economies. How can financial brands set themselves apart through visual storytelling? Our experts explain how.Learn MoreThe Motorsport Images Collections captures events from 1895 to today's most recent coverage.Discover The CollectionCurated, compelling, and worth your time. Explore our latest gallery of Editors' Picks.Browse Editors' FavoritesHow can financial brands set themselves apart through visual storytelling? 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An interesting look at the Three Gorges Dam project in China which sits on the Yangtze River and is the world's largest hydroelectric dam in terms of annual electricity generation. Take a look at the many different advantages and disadvantages of geothermal energy to determine how beneficial it is to the world. Latest Articles This article delves into the much-debated question of whether nuclear energy is renewable or nonrenewable. Learn about the different pros and cons of nuclear energy. Find out what makes nuclear power good and what makes it bad. Learn about what nuclear energy actually is and the difference between fission and fusion. Learn more about what concentrated solar power plants are and how they work. This article also touches on the different types of solar thermal power plants. A comparison of solar energy vs fossil fuels. Take a look at how they compare on different levels including emissions, cost, and availability. Can biomass energy improve water quality? Read this article to find out Tidal energy has huge potential in providing clean and renewable electricity, but how does tidal power actually work? Take a look at this article to find out. Some of the world's largest wind turbines are found in offshore wind farms. This article looks at how long the blades of these turbines can actually get. This article explores the topic of wind turbine capacity and how much power they can produce under different scenarios. What's the between active and passive solar energy systems? This article looks at both types, comparing the two to give you a better understanding of the subject. What is passive solar energy? This article explains all and offers an insight into how passive solar heating works and how passive buildings are designed. What is active solar energy and how does it work? Read this article to learn more about the topic. Explore the environmental impacts of geothermal energy. Some of these include water and air quality issues. Solar energy has lots of benefits but what about its drawbacks? This article looks at eight of the main disadvantages solar energy has. Learn about the three R's of waste management. Find out how you can cut down on your waste to help the environment and conserve natural resources. Do solar panels work at night? This article explores this topic in further detail and explains why some people believe this to be the case. This article looks at the benefits of solar car parking canopies to determine why they are becoming increasingly popular all over the world. Take a look at our list of tidal energy pros and cons. Discover whether this particular renewable energy source is good or bad. This article explains what tidal energy actually is and how we can use it to generate clean and renewable electricity. This article looks at the pros and cons of crude oil usage in energy production. Learn more about the advantages and disadvantages of oil here. In this paper a number of issues of sustainable development at the local level resulting from wind energy projects are explored, with the aim to analyze and identify the most important criteria that would lead, through projects, to a local socio-economic growth. In order to achieve this aim, two surveys were designed and applied, one to evaluate different sustainable development criteria, and another one focused specifically social acceptance criteria of wind energy projects. The criteria evaluated in the first survey were identified from the literature review and feedback received by residents and land owners in the study sites, in the state of Baja California, Mexico. The criteria assessed in the sustainable development survey were divided into six categories: social acceptance with six indicators; social benefit with six indicators; the cultural impact with three indicators, the environmental impact with three indicators; the economic benefit with seven indicators; and finally, techno-ecological criteria with four indicators. The data obtained were analyzed using a multicriteria analysis technique based on pairwise preference relationships (outranking). Equal weights were assigned to all indicators. In contrast, the preference function for each indicator was chosen using the help menu of the software Visual PROMETHEE used for the analysis. Preference functions allowed to classify the study sites according to the values obtained in the net flow Phi, which is essentially an average of pairwise preference relationships. In the second survey, only social acceptance criteria were evaluated and the results were analyzed qualitatively. In general, it was concluded that wind power projects have a large social acceptance, but do not have a local socio-economic development impact, so it is suggested that the criteria identified as drivers for such development are taken into account for future wind energy development projects. Share — copy and redistribute the material in any medium or format for any purpose, even commercially. Adapt — remix, transform, and build upon the material for any purpose, even commercially. The licensor cannot revoke these freedoms as long as you follow the license terms. Attribution — You must give appropriate credit , provide a link to the license, and indicate if changes were made . You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. ShareAlike — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original. 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