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Liechtenstein, Renewable Energy

Liechtenstein: A Place With the Ability to Implement New Renewable Energy Technologies

What do you think of when you hear of the country name Liechtenstein? Some people, including myself prior to researching this topic, have never heard of Liechtenstein. Those who have heard of Liechtenstein might recall that the country is extremely wealthy for its size, coming in with the highest gross domestic product per capita, and it is tremendously tiny. Liechtenstein can provide most of the necessities to the people of their country - with one huge exception - energy.

Liechtenstein is located in Europe, between Austria and Switzerland. According to Trading Economics, a website with information on countries' economies, Liechtenstein has a total population of around 38,000 people. Of that total population, only 14% live in the urban area while 86% live in the rural area (Liechtenstein - Urban). Liechtenstein's government is known as a hereditary constitutional monarchy, meaning that the Head of State, Prince Hans-Adam II, is the hereditary monarch. The prince is accompanied by Prime Minister Adrian Hasler as Head of Government (Liechtenstein Government).

As mentioned earlier, Liechtenstein is one of the world's smallest countries with a total of 160 square kilometers (≈ 62 square miles). Liechtenstein is shaped like a stretched oval, but if it were shaped like a circle it would take a little more than an hour to drive from one edge of the country to the opposite edge. Liechtenstein is currently cultivating roughly 32% of the country's total land, with major crops including wheat, barley, corn, and potatoes (Liechtenstein Natural). Trading Economics states that "Liechtenstein mainly exports machinery, metal by-products, vehicles, chemical products, beverages, and processed food. Liechtenstein's main export partners are Germany, United States, Austria, Finland, Italy, China, the United Kingdom, Spain and Sweden" (Liechtenstein - Agricultural). The average size of a farm in Liechtenstein is roughly 0.34 km², comparable to 84 acres or about 34 city blocks. World Travel Guide, a website guide of the world, explains to us that Liechtenstein has a "temperate, alpine climate, with warm, wet summers and mild winters . . . shares borders with Austria and Switzerland and lies between the upper reaches of the Rhine Valley and the Austrian Alps" (Liechtenstein. World). This alpine climate helps Liechtenstein grow wheat, barley, corn, and potatoes easier.

What is life like for a typical family in Liechtenstein like? A typical family will consist of four people, a set of parents and two children. Countries and their Cultures explains that "there is sufficient housing for all of Liechtenstein's inhabitants, and dwellings range from wooden houses scattered across picturesque mountain villages to modern multi-story apartment buildings in the capital city of Vaduz" (Liechtensteiners). Every family is different, but a typical family will eat three meals a day. A family will have coffee and bread with jam for breakfast. Lunch will be a heavier meal consisting of a main dish, soup, salad, and dessert. Finally, for supper, Liechtensteiners will have a lighter meal comprised of an open-faced sandwich made with various kinds of meat and cheese (Liechtensteiners). The people of Liechtenstein will go to local supermarkets or farms to get their food and ingredients. The residents of Liechtenstein will cook with whatever ingredients they have. There is a large, local source of dairy products they can buy. A famous Liechtenstein dish is known as k채skn枚pfle. K채skn枚pfle is a traditional cheese pasta made by squeezing a mixture of water, eggs, and flour through a perforated board to make noodles. The noodles are baked with a layer of fried onions and grated cheese.

According to Liechtenstein in Figures 2018 about half of the people employed in Liechtenstein come from contiguous countries (Liechtenstein in). A lot of employees come in from other countries to work. The services sector is where roughly 61% of employed adults work. Laborers typically work longer days,

starting from 8:00 a.m. and going till 6:30 p.m., with lunch lasting for around an hour. Metal finishing, ceramics, pharmaceuticals, and electronic equipment are all major industries of the country. Liechtenstein's yearly average wage is €63,768 Euros or about \$71,030 US Dollars.

All children are required to attend school in Liechtenstein. The central government administers both primary and secondary education. Primary education is ages 6-12 and secondary education is the ages of 13-19. Liechtenstein offers a system of general and vocational education that is unrestricted and free of charge for students, trainees, and apprentices. The health care system in Liechtenstein meets the healthcare standards of a modern state and all citizens aged 16 years or older must have health insurance. Every permanent resident of Liechtenstein must contribute to the national health care fund. For the more serious injuries/illnesses, patients will be transferred out of the country to specialized hospitals in Switzerland and Austria (Healthcare).

Residents of Liechtenstein have 100% safely managed drinking water services (People). Public toilets are clean and mostly free (Lonely). There are 43,914 mobile cellular telephone subscribers; furthermore, the subscriptions for telephone use are higher than the population number (Liechtenstein. Liechtenstein). The road network consists of around 130 km of state roads and over 500 km of local community roads. Public transport in Liechtenstein relies mostly on buses. Most Liechtenstein families get their food from local supermarkets or dairy farms. The working population in agriculture in Liechtenstein is at a low 0.7%.

If Liechtenstein seems to be the perfect country to live in, then what changes could be made? Liechtenstein relies heavily on imports of energy such as gas, fuels, and electricity. Its domestic energy production only covers slightly under one-fourth of the country's electric supply. Liechtenstein is currently having trouble producing their own renewable energy. Renewable energy is a form of energy that is created from a source that will never be depleted. Non-renewable energy is from limited sources such as coal and oil that will run out quickly. Liechtenstein produces only about 13% of the total energy supply they use, the rest is imported in. Less than ¼ of the 13% of Liechtenstein's energy is renewable (Liechtenstein Energy). Like many other countries, their energy consumption is increasing, making the need for more energy more apparent. Non-renewable energy sources will run out someday soon. The countries Liechtenstein imports their energy from could have future political differences with Liechtenstein and cut off the energy supply completely. Without more local renewable energy sources, there will be a shortage of energy to go around in Liechtenstein. The trend of renewable energy usage in Liechtenstein is very slowly improving, but the limited space and infrastructure of the country prevents Liechtenstein from fully covering its domestic needs with renewable sources. Liechtenstein prioritizes its urban population for energy since it is the center for the majority of the population. Also, when non-renewable energy runs out, most of the country will be without power, unless they have a larger source of renewable energy to keep them going. Access to electricity from renewable energy sources is regulated by the General Legislation on Energy and shall be granted according to the principle of non-discrimination. The marginalized population has the most limited access to renewable energy since there is not a large source of it in Liechtenstein. Once, Liechtenstein starts to completely use renewable energy everyone who uses energy will have the chance to use renewable energy. Liechtenstein's people are currently using non-renewable imported energy sources. With our world population growing more and more people will use energy, making the non-renewable source become soon extinct. The environment will go downhill quickly without a large renewable energy source. Climate change will become an even bigger item to be concerned about. However, if Liechtenstein begins to start using their renewable energy sources, then they will become a leader to other countries and will be able to improve their environment.

To help Liechtenstein transition over to renewable energy sources of their own, they first need to be educated on the benefits of renewable energy. This solution would not solve their problems with non-renewable energy sources, but it would help the people of Liechtenstein understand non-renewable energy sources are limited and will soon run out unless they change their energy source. The country should start

teaching students about non-renewable energy and how it is negatively affecting their environment. They would teach the students first since they are the future and should recognize the problems and solutions now. The schools would also teach students ways each of them could start helping their country now. Since every child in Liechtenstein is required to attend school, the school would be able to incorporate it into daily lesson plans. The older people of the country would also need to be educated on the importance of renewable energy. The school could provide night sessions to community members as well as news broadcasts about renewable energy, energy conservation, and energy-efficient appliances and vehicles. The central government, with the help of the Global Renewable Education and Training (aka GREET) Programme, would lead and fund this education project in Liechtenstein. GREET Programme is an organization that was created to increase the knowledge of renewable energy technologies and their uses and applications to people (Global). GREET could potentially fund the education of Liechtenstein as well as the implementation of renewable technologies in the country. The community members, government, and other organizations would have to accept educating the country on renewable energy sources. The government would have to set up a policy for every school to follow saying they are to teach about renewable energy to children.

In addition to educating the people of Liechtenstein about renewable energy and the benefits that come with it, Liechtenstein should immediately begin investing in researching all currently available and future renewable energy sources to determine which methods are best suited for their small country. They should consider sources such as solar, wind, and water since those technologies exist and are easily accessible. These technologies do not take up a lot of geographic area and installation can begin immediately so renewable energy benefits can be seen very shortly. Liechtenstein's government can aid in the installation of these methods by offering their citizen's tax breaks or rebates on solar panels or wind turbines. Solar panels could be a great technology for Liechtenstein because the country gets on average 5 hours of sunlight each day (Climate). Solar energy needs a constant of at least 4 hours of sunlight to be an effective energy source for a house. Solar power technology is a great and easy way of producing energy. Solar panels could be mounted on top of rooftops to save room. Wind power is also a great way of producing renewable energy. Liechtenstein would need to put up around 7 wind turbines to produce enough energy for the entire country. Each wind turbine takes about 1.5 acres of land. If Liechtenstein were to install 7 wind turbines, it would take about 2.6% of the total country's land. They could also consider expanding hydroelectric power production by installing more dams on their rivers. Hydroelectric power production would be difficult for Liechtenstein because of the low amount of usable rivers; however, if Liechtenstein could use this renewable energy technology, then they would have more farming land. More farming land would increase the production of available food to Liechtenstein. If Liechtenstein produced more food, then they could aid other developing countries with food insecurities. Solar, wind, and water are all great choices of renewable energy sources. Renewable energy sources are awesome because they do not contribute to global warming and the decline of good food, but contribute to a healthy environment for the growth of food, livestock, and humans.

Other future technologies, such as CO₂ converters, should also be considered. Everyone creates CO₂ by simply breathing. The CO₂ converter is still in the process of being created and perfected, but, scientists have found that single nickel atoms are both efficient and cost-effective catalyst for converting CO₂ into usable, renewable energy (Converting). CO₂ converters work by using single nickel atoms and the CO₂ out of the air to convert it into CO. CO can then react with water to produce a hydrogen gas full of energy (staff). Removing CO₂ from the air would benefit the environment of Liechtenstein and our world. CO₂ is the main source of global warming, which causes extreme weather, rising ocean levels, and increasing temperatures. These changes to the environment make growing food incredibly difficult, making more people food insecure. Having technology such as the CO₂ converter would remove the CO₂ gas from the environment and create a renewable energy source for Liechtenstein. The CO₂ converters would supply renewable energy to the tiny country and meet all the needs of renewable energy and cleaner air for the population of Liechtenstein. With excess renewable energy, Liechtenstein could aid other developing

countries with renewable energy. A Liechtenstein energy station, such as Samina Power Station, with the help of GREET and Liechtenstein's Prince and government, could manage the project of implementing the CO₂ converters. Liechtenstein could easily fund the project since they have a great deal of money and is known as the richest country in the world—per capita. In the tiny country, the little power stations located within Liechtenstein or local people wanting a change for the better could also help fund the new renewable energy expedition. A community member will need to know exactly what it is that is changing and understand that the change is for the better of their environment. The government would support the change and communicate to the community that they will no longer be using non-renewable energy, but renewable energy from CO₂ converters. Liechtenstein would need to declare the policy of only using renewable domestic energy sources. Some people might not be willing to change from non-renewable energy sources to renewable energy sources. Those people will need to be educated more intensely about the benefits of using a renewable energy source such as the CO₂ converter. The unemployed people of Liechtenstein could work with the renewable energy project. Implementing CO₂ converters in Liechtenstein will help improve air quality since the converters will be taking out excess CO₂ from the air and turning it into usable energy. With cleaner air quality, the agriculture community will have a better environment to grow food in and the climate for Liechtenstein will be improved. CO₂ is known as the culprit for climate change. Climate change produces erratic weather which makes previous favorable farming land unusable or hard to grow crops. Implementing the carbon dioxide converter would low the high amounts of CO₂ in the air and use it as a practical energy source. Carbon dioxide converters would be very beneficial to the earth: first, it would produce a renewable energy source; second, it would slow down the progression of climate change; and third, it would keep CO₂ at a safe livable level and benefit crop and livestock growth.

Even though Liechtenstein is a small country, they could easily produce renewable energy while cleaning the air they need to breathe and growing nutritious foods. Before Liechtenstein can start the project, they first need to educate the people of the country about the benefits of renewable energy. Liechtenstein has enough money to begin this project and to be sustainable with it. Implementing renewable energy technologies such as solar panels, wind turbines, and CO₂ converters will have numerous benefits to the country, such as more jobs and cleaner air to breathe, while taking little space and providing the country with energy when the non-renewable energy sources have vanished. Everyone in the world uses energy. Most of the energy being used is from non-renewable energy sources such as coal and oil. These energy sources are limited and as our world grows, more energy will be used. Non-renewable energy sources will run out. Liechtenstein has a chance to start changing for the better by implementing known technologies such as solar power, wind energy, and/or hydroelectric power. Or, Liechtenstein could take a step into a world of new technology and start using CO₂ converters as a renewable energy source for their country.

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