



## Question

To determine optimal locations for wind farms in Southern Ontario through utilization of GIS.



“If we are to continue to inhabit the **earth** we must **change** the current energy systems used across the **world**.”

## Introduction

Fossil fuels and current systems in place for generating power are entrenched in the way we run our lives. Without them, the world would not be able to function or continue to grow and advance. The problem is that they result in heavy pollutants that are contaminating and degrading water systems, climate systems, air, species survival, natural habitats, and every aspect of the environment. If we are to continue to inhabit the earth we must change the current energy systems used across the world. Alternate clean energy systems must replace fossil fuels and become the dominant source of energy. Wind energy has emerged as a potentially successful renewable energy source. The goal of this project is to determine suitable locations for future wind farms, as this source of energy could be a prominent solution.

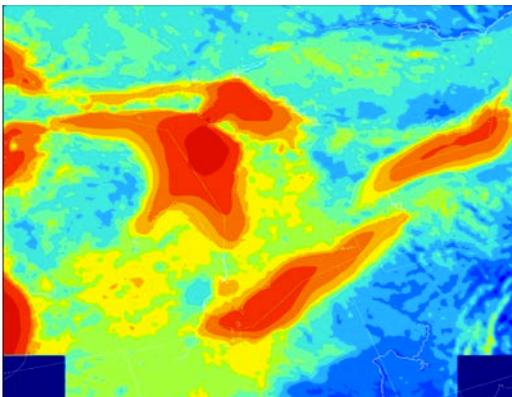


Figure 1. Wind Energy Speed Obtained from the Canadian Wind Energy Atlas.

## Methods

- Research conditions appropriate for wind farm construction and classify them based on a constant number of classes, with the highest number being the most appropriate
- Obtain appropriate data from online sources
- Upload data layers onto ArcGIS and ensure all data layers are compatible
- Perform Spatial Analyst Tools and Conversion Tools to generate layers needed to assess the land suitability
- Reclass each of the layers and apply appropriate weights
- Use Raster Calculator to combine all layers for a land suitability layer
- Determine which areas from the output layer are appropriate for optimal wind farm locations



Figure 2. Pre-Existing Wind Farms in Southern Ontario.

## Results

There are not many other locations in Southern Ontario that would be suitable for a large scale operation wind farm, as the optimal locations are presently occupied. But, there are suitable locations at smaller scales dispersed equally throughout the study area. As we can see in Figure 1, the highest and fastest wind values are displayed in red, and the lower values in blue. The most optimal sites in terms of how efficient the turbines will be would be over water.

## Conclusion

As we can see from this analysis, this study area may have been too large for the allotted time and depth of analysis for this project. In order to acquire all of the data for this large of a region, the time that went only into downloading and joining the data together was tedious. A solution to this would have been to choose a smaller scale project or to focus on building these wind turbines and farms solely in the water (although there may not be enough data on the water systems off the coast in areas such as the Great Lakes).



Figure 3. Wind Turbines Constructed in Southern Ontario.

## References

- How to Design a GIS Project. [http://www-sul.stanford.edu/depts/gis/project\\_design.html](http://www-sul.stanford.edu/depts/gis/project_design.html)
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