

FEASIBILITY STUDY OF WIND POWER IN MASSACHUSETTS: A GIS ANALYSIS

Introduction

Of the energy produced for use by the United States, Massachusetts produces only 0.50% of the total renewable energy produced. Non-renewable energy sources such as coal, oil, and natural gas are responsible for producing toxic nitrogen oxides, sulfur dioxide, carbon monoxide and particulate matter that are released into the ambient air during the combustion process and can have detrimental effects on meteorological patterns and health.

Table 1. Massachusetts energy production shown by source in comparison to United States

Energy Source	Electricity (million kWh)	% of US generation
Hydroelectric	709	0.23%
Biomass	2000	3.14%
Solar	5	0.26%
Wind	61	0.05%
All Renewable	2775	0.50%

This study aims to find the best locations in Massachusetts to build wind turbines based on a weighting system of the following factors:

1. Wind Power Class (WPC)
2. Airport Interference Zones
3. Land Use

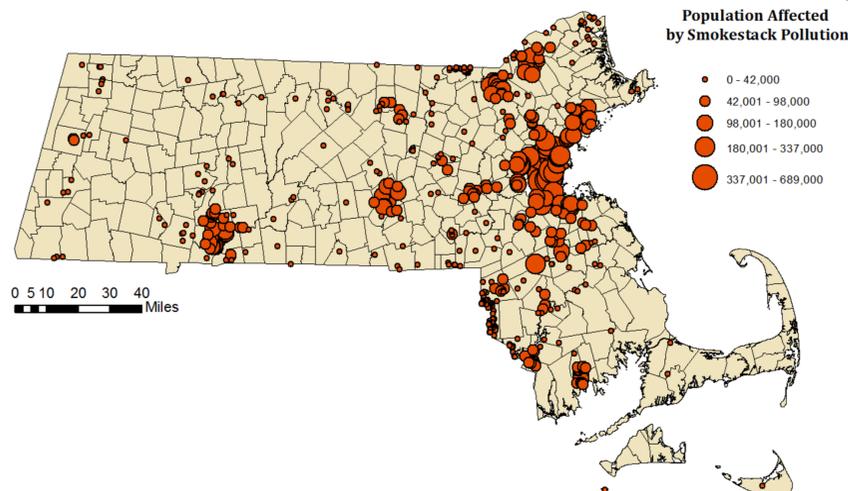


Figure above shows the number of people whose air quality is strongly determined by local smoke stacks.

Method

The method by which the divisions were made amongst categories and then combined to output the range of locations with feasibility values is shown below. Land uses were valued depending on whether the location would be feasible for a single turbine or a wind farm. Wind power classes (WPC) above one were given increasing values. The airport buffers were given values of zero within the 5 km radius and a one outside this buffered zone. The following equation was used to associate scores with geographic regions with a maximum value of 11 points:

$$SCORE = ([Land\ Use] + [WPC]) * [Airport]$$

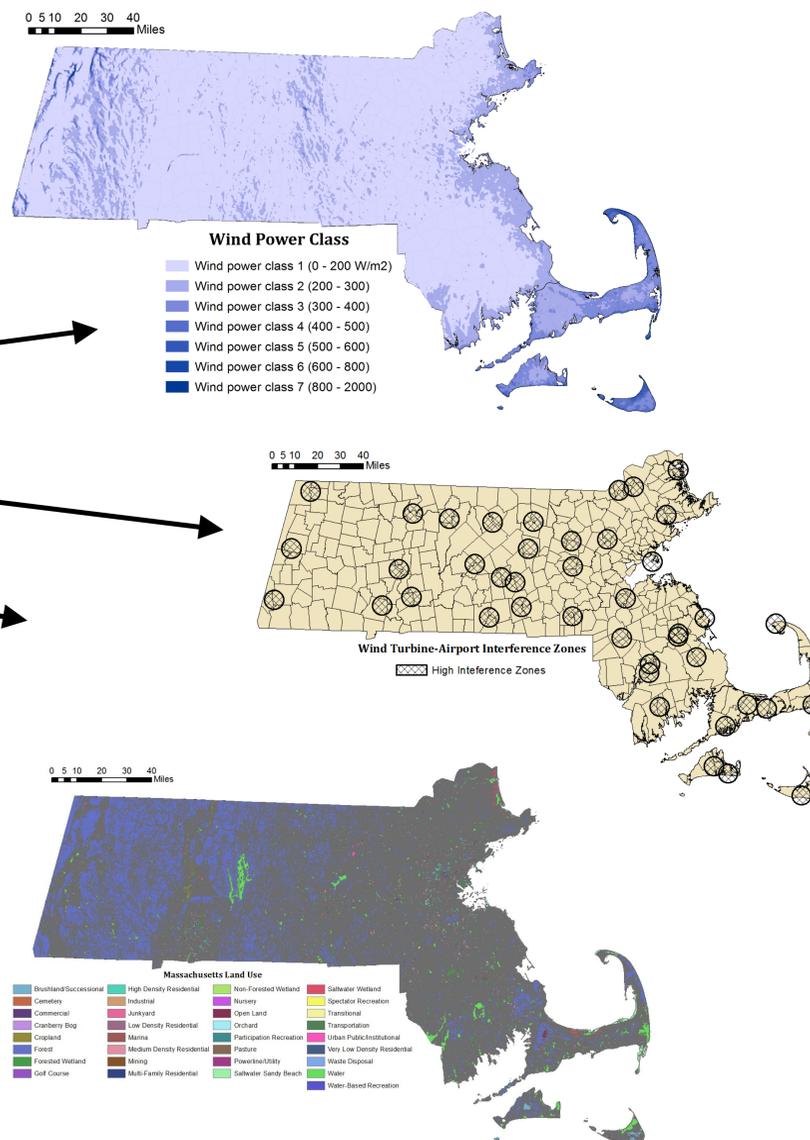
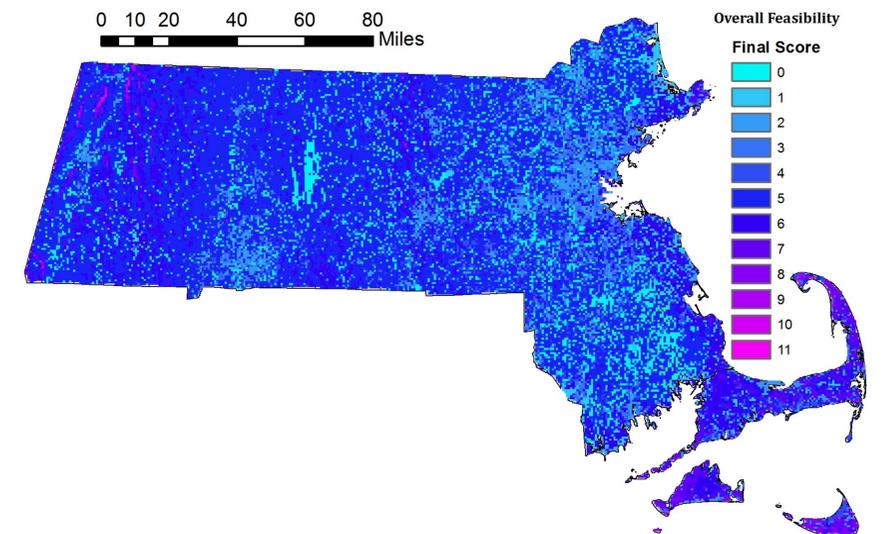


Table 2. Example scoring for Land Use based on feasibility, see report for full table

Land Use	Score
Cropland/Pasture/ Open Land	5
Residential/ Commercial	3
Forest	5
Water-related/ Cranberry Bog	0
Industrial	4
Brushland	5
Urban Public/ Institutional	4

Table 3. Wind Power Class scoring

Wind Power Class	Score
WPC 1	0
WPC 2	1
WPC 3	2
WPC 4	3
WPC 5	4
WPC 6	5
WPC 7	6



Conclusion

Following the raster analysis, it is evident that the more feasible locations lay along the coast on the south east portion and within the north west quadrant of the state. Both areas are generally have a high wind power class associated with them because of this, these regions ended with high scores. These regions should implement wind power and attempt to reduce the current smokestack impact.

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