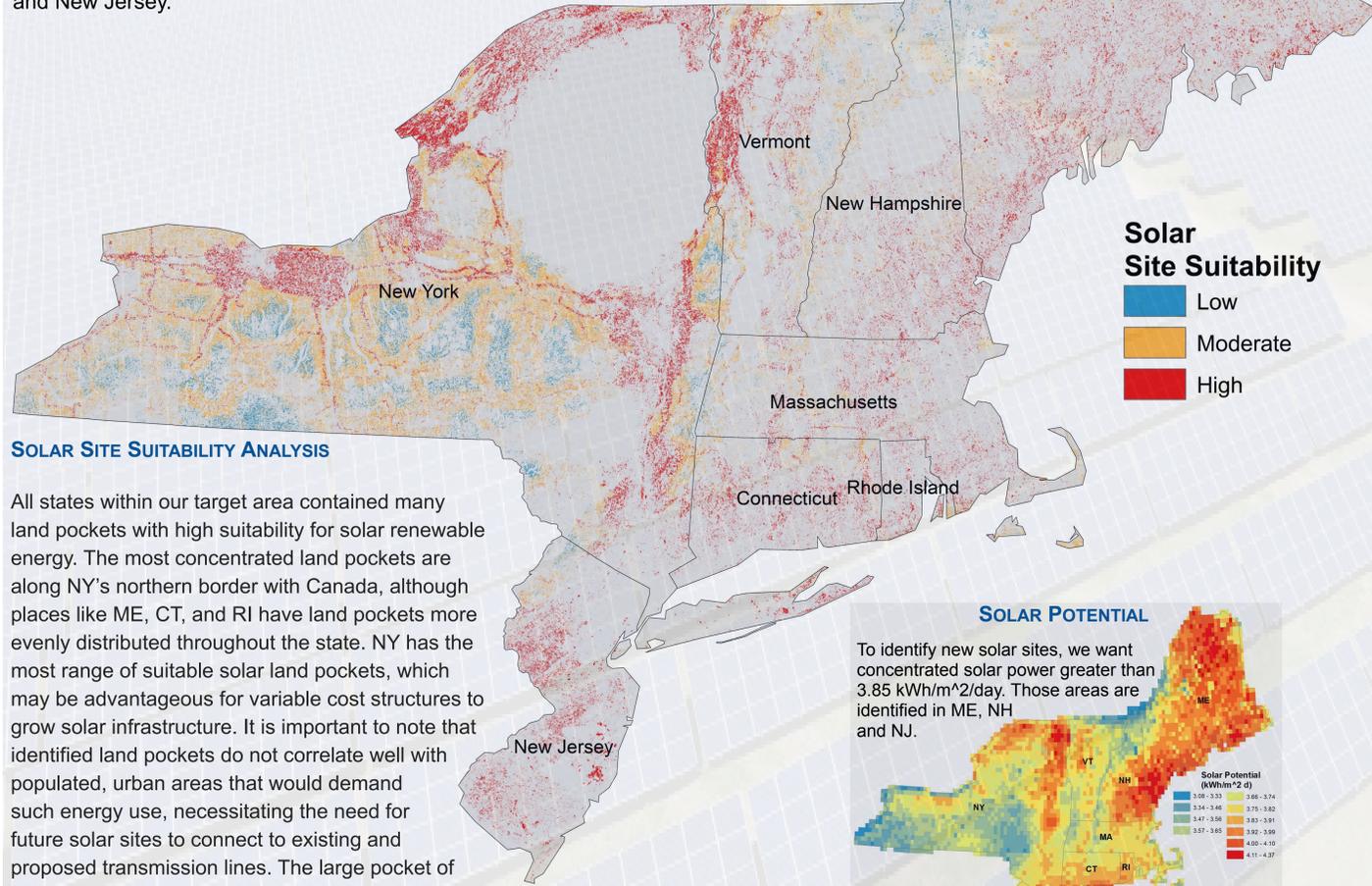


SITE SUITABILITY ANALYSIS FOR SOLAR AND WIND ENERGY POWER PLANTS

WHY GREEN ENERGY?

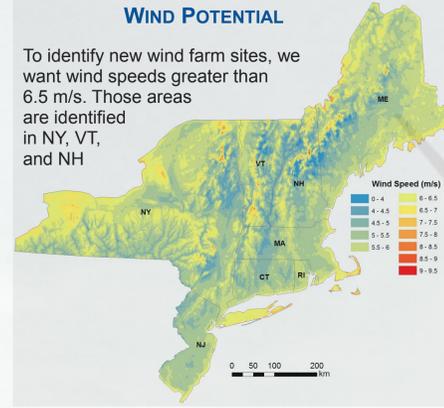
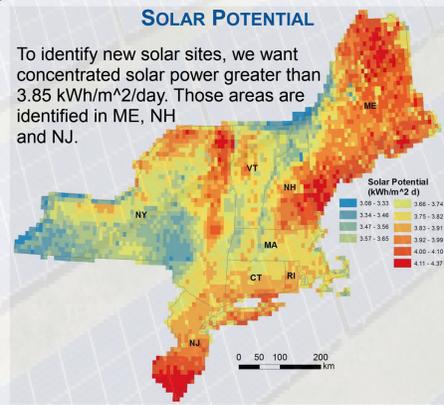
We currently rely heavily on non-renewable fossil fuels for our energy that will eventually dwindle. In contrast, renewable energy resources-such as wind and solar energy-are constantly replenished and will never run out. Green energy production is an increasingly important asset for any region as it is a source of clean, inexhaustible, secure energy. In this project we are looking for potential renewable energy outputs for solar and wind energy throughout New England, New York, and New Jersey.

We identified sites for potential power plants based on the technical potential of solar and wind energy. After taking into account land exclusions (wetlands, national and state parks, federal land and different landcover.) we used attracting factors to determine the most suitable locations for future renewable energy projects. The attracting factors include: slope of the terrain, distance to power lines, wind speed potential or solar potential.



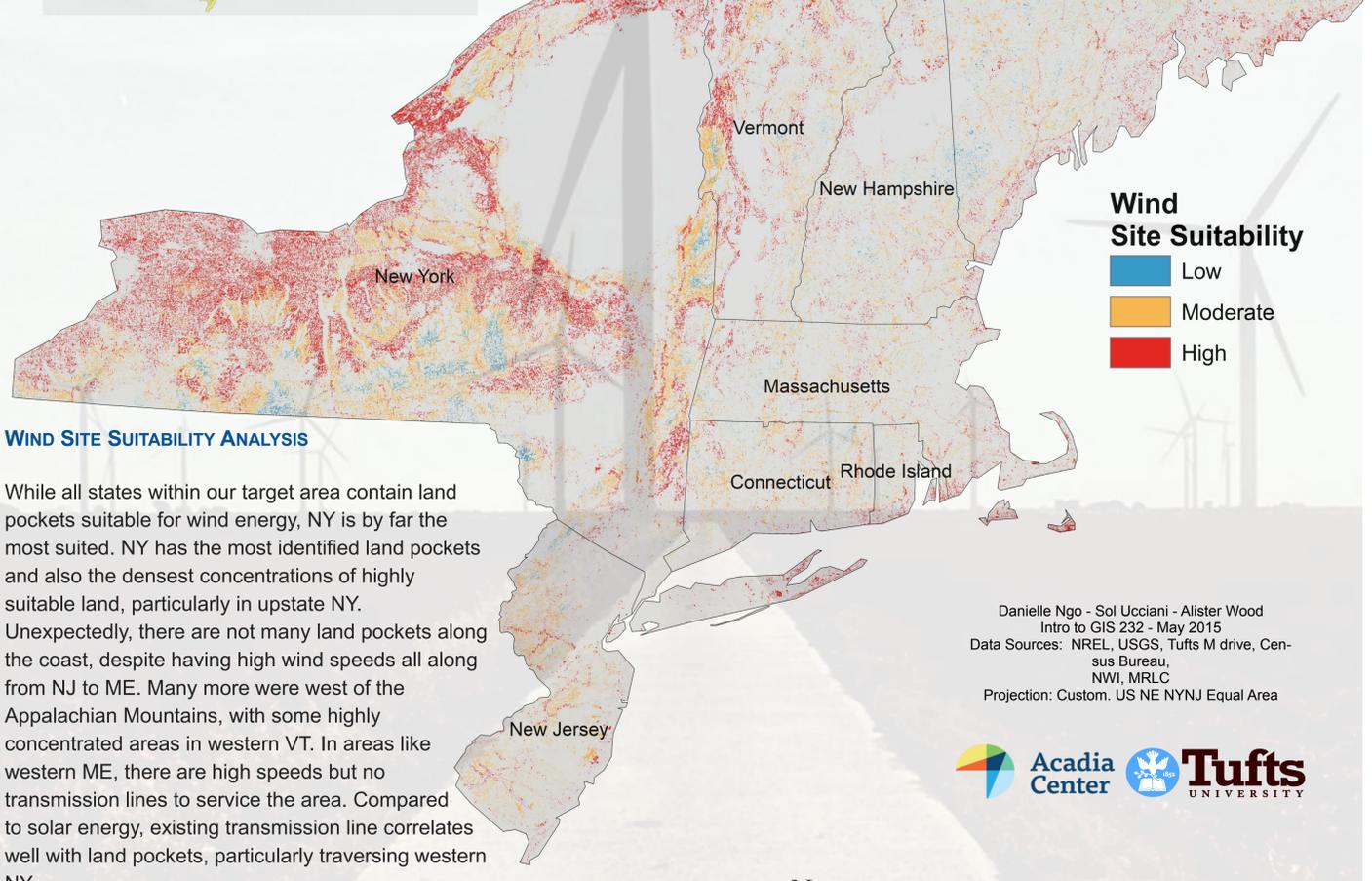
SOLAR SITE SUITABILITY ANALYSIS

All states within our target area contained many land pockets with high suitability for solar renewable energy. The most concentrated land pockets are along NY's northern border with Canada, although places like ME, CT, and RI have land pockets more evenly distributed throughout the state. NY has the most range of suitable solar land pockets, which may be advantageous for variable cost structures to grow solar infrastructure. It is important to note that identified land pockets do not correlate well with populated, urban areas that would demand such energy use, necessitating the need for future solar sites to connect to existing and proposed transmission lines. The large pocket of federal land in northeast NY would be a unique challenge for proposed transmission line projects to navigate in order to reach the more populated urban centers such as Albany and New York City.



QUANTIFYING RENEWABLE ENERGY SITE POTENTIAL

For our entire target area, 58.3% of land could be used for either solar and wind renewable energy, which amounts to 427,274 km². This area is slightly larger than the state of California, at 423,970 km². For solar energy, 4.8% is low suitability, 26.5% is moderate suitability, and 27% is high suitability. 27% of the land amounts to 198,152.4 km²s, which is similar to the state of South Dakota. For wind energy, 2.7% is low suitability, 28% is moderate suitability, and 27.6% is high suitability. There is overlap in the land pockets we identified for solar and wind energy.



WIND SITE SUITABILITY ANALYSIS

While all states within our target area contain land pockets suitable for wind energy, NY is by far the most suited. NY has the most identified land pockets and also the densest concentrations of highly suitable land, particularly in upstate NY. Unexpectedly, there are not many land pockets along the coast, despite having high wind speeds all along from NJ to ME. Many more were west of the Appalachian Mountains, with some highly concentrated areas in western VT. In areas like western ME, there are high speeds but no transmission lines to service the area. Compared to solar energy, existing transmission line correlates well with land pockets, particularly traversing western NY.

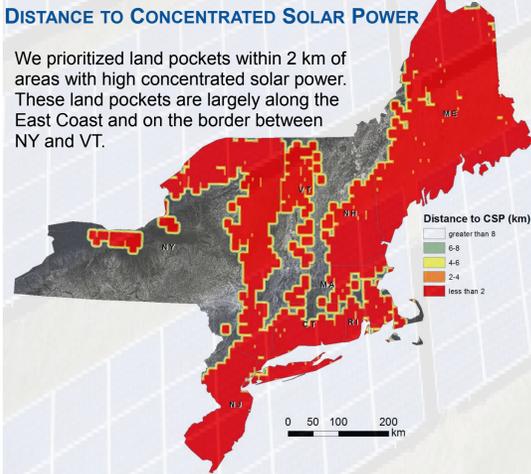
Danielle Ngo - Sol Ucciani - Alister Wood
Intro to GIS 232 - May 2015
Data Sources: NREL, USGS, Tufts M drive, Census Bureau, NWI, MRLC
Projection: Custom. US NE NYNJ Equal Area



THE PROCESS

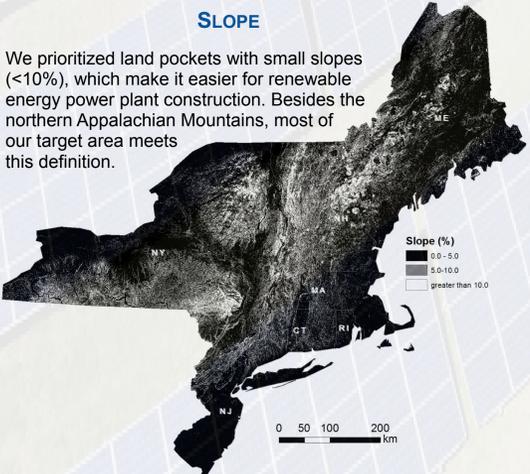
DISTANCE TO CONCENTRATED SOLAR POWER

We prioritized land pockets within 2 km of areas with high concentrated solar power. These land pockets are largely along the East Coast and on the border between NY and VT.



SLOPE

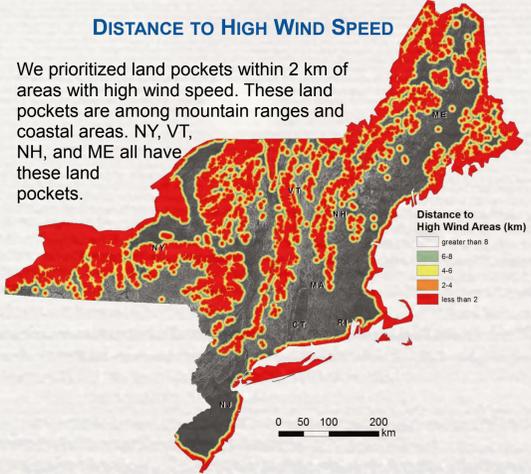
We prioritized land pockets with small slopes (<10%), which make it easier for renewable energy power plant construction. Besides the northern Appalachian Mountains, most of our target area meets this definition.



We used similar constraints for both the solar and wind site suitability. Federal land, park land, and wetlands are all off-limits to new construction for this project's scope. Certain land covers were also off limits: open water, developed land, forest, dwarf scrub, sedge/herbaceous, lichens, moss, and cultivated crops. Proximity to transmission lines was an attractant for both - we prioritized area within 8 km. We assumed that both solar and wind would prefer land with less than 10% slope, although in reality wind turbines are more tolerant of high sloping land. Our solar specific attractant was concentrated solar power (CSP) measured in kWh/m²/day, and our wind specific attractant was wind high wind speed measured in m/s.

DISTANCE TO HIGH WIND SPEED

We prioritized land pockets within 2 km of areas with high wind speed. These land pockets are among mountain ranges and coastal areas. NY, VT, NH, and ME all have these land pockets.



DISTANCE TO TRANSMISSION LINES

We prioritized land pockets within 2 km of existing transmission lines. Many of the lines conglomerate around cities such as Boston, MA; New York, NY; and Albany, NY.

