Direct Normal Irradiance and Solar Cost Analysis

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Abstract

The aim of this project is to compare the cost of solar to the amount of energy each state receives in America.

Introduction

The amount of solar radiation received per unit area by a surface that is always held perpendicular (or normal) to the rays that come in a straight line from the direction of the sun at its current location in the sky is known as direct normal irradiation (DNI). The amount DNI received by an area is directly proportional to the amount of solar energy that the area can capture.

I think that this analysis is important as it will help the user figure out depending on their own spatial interest the value of an investment in solar.

Methodology

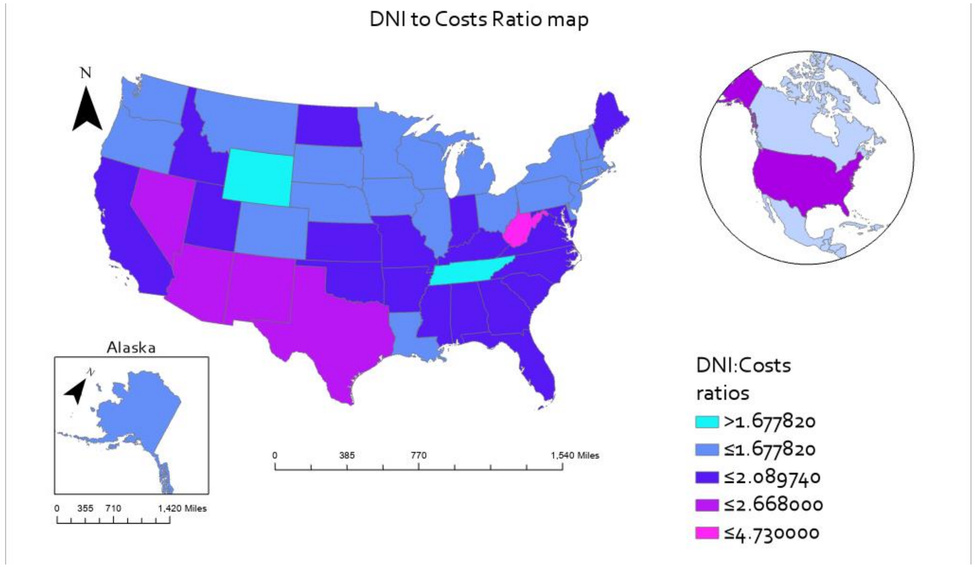
Data collection

The DNI data was collected from National Solar Radiation Database. The boundary data for the states was collected from the United States Census Bureau.

GIS part

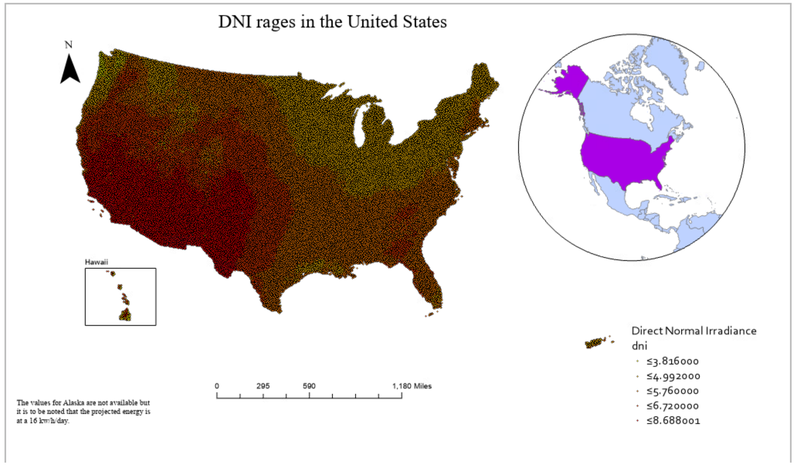
The DNI data was then manipulated using a script to figure out the centroid of the data. By sorting the data out into locations and then using statistics the averages are calculated. The DNI data was then analyzed using GIS and the average DNI for each state was plotted onto the spatial area A new calculated field is then introduced into the attribute table which figures out the ratio of DNI to the Solar Costs of the defined state. Through this information specific symbology was used in order to better highlight the solar cost to energy production ratio in each state.

Output, map, conclusion etc.

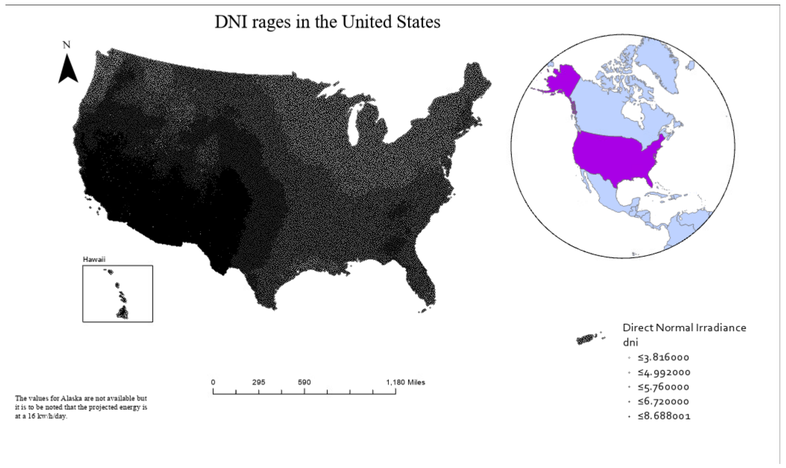


This map represents the ratio obtained by dividing the average DNI of each state (mainly around their cities specifically) by the costs of solar per wat/hour. The Final result can help the user make a better decision regarding the value that solar has in their state compared to others in America.

DNI Map.



The data for this map is collected through National Solar Radiation Database. The data provided comes in the form of polygons. In order to do analysis and for better readability for the user we must convert the polygon features into data points. We accomplish this by running a script that figures out the centroid of a polygon and then projecting the data using centroids. Look to the right for a greyscale with the same data just for projection variety.



For questions, please contact your Utkarsh Sharma, sharmau@jacks.sfasu.edu, 4/25/20