NC STATE UNIVERSITY

Solar Panel Site Suitability in RTP, North Carolina: GIS as an International Development Strategy

Maureen Catlow, MIS Candidate
CHASS School of Public and International Affairs

Objective:
Create and test a scalable GIS analysis technique to demonstrate the promising role GIS can serve for sustainable development on a local and international level.

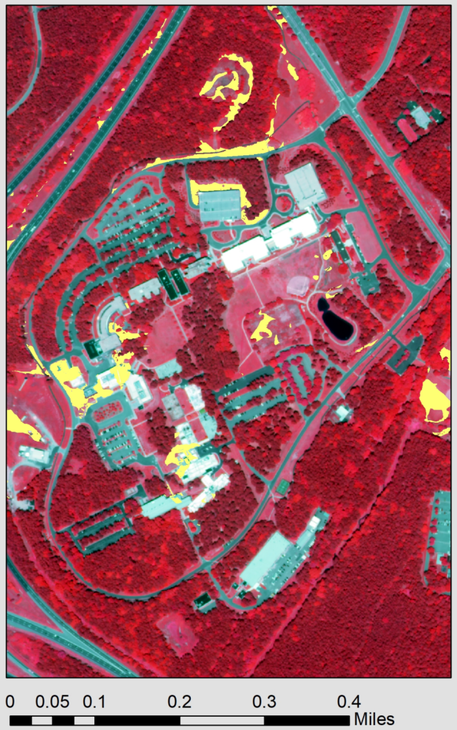
Methodology:
This study aims to develop a quick and appropriately imprecise technique for assessing the strategic value of solar panel installation using open-sourced remotely sensed imagery and LiDAR data (EarthExplorer, 2017 & Durham GIS Services, 2017). The sample site for this research is RTI International in Research Triangle Park, North Carolina.

Purpose:
The quick and initial assessment suggests solar panel installation would not be a strategic addition to the campus. This study illustrates the value of GIS analysis and dissects components of particular value for potential applications on the international scale.

Results:
The results of this study found that there are 11 locations that fit ideal conditions for installation with a potential output of 5.95 megawatts (mWh) during peak sunlight hours. RTI's total daily usage hovers at 25 mWh.

Analysis:
This initial analysis of open-sourced geospatial data and shows that solar panel installation would not be a strategic move until solar panel efficiency is increased. This coupled with site-specific information, like that of campus expansion and sustainability efforts, suggest that an additional analysis should be run after energy capacity innovation or changes in campus criteria.

Suitable Sites for Solar Panel Installation on RTI International's Headquater Campus



International Development and GIS:
GIS analysis as a social science methodology has the opportunity to provide concrete answers and visual narratives to complex cultural and sustainability concerns facing the field of international development.

Opportunities
- Scalability: GIS can analyze large swaths of regions while considering the unique geospatial attributes
- Open-source data: Satellite imagery is updated often (weekly) and available for most international regions

Challenges:
- LiDAR data: Valuable topographic data is expensive to obtain for some regions and states
- Updated data for specific locations

Conclusions:
- In the case of this study, GIS techniques were a valuable initial analysis to a large-scale and high-investment decision and have the ability to inform public policy on renewable energy in the region. This study could be adapted and scaled to specific regions of interest for international development.
- GIS methodologies in social science research can help to inform public policy and potential impacts international development programs in a region.
- GIS is not an entirely new addition to social science research methodologies but this application has a chance to have increased integration into applied social science research.

Important site-specific notes:
- Study specific calculations assess the potential power output using available installation space and ideal industry standards of 200 watts per a m^2, at 20% efficiency (Fares, R., & Fares, n.d.).
- Tracks of land under 1000 m^2 are filtered out of final calculations due to negligible energy output.

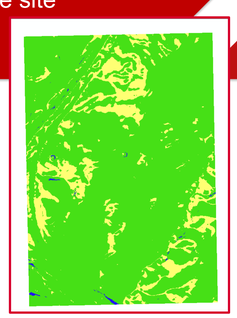
Workflow:

1. Create criteria matrix from project considerations and industry research

Criteria	Most Favorable (1)	Favorable (2)	Least Favorable (3)
Slope	0 -15 degrees	15-20 degrees	20 - <20 degrees
Aspect	S, W	SW, NW	N, E, NE, SE, NW
Area	<1000 - 1000 sq meters		
Land Use Classification	"Buildings" and "Maintained Grasses"		

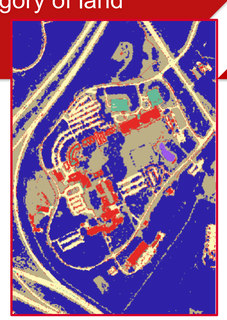
Developed solar panel site suitability criteria matrix for RTI International campus.

2. Use LiDAR data to determine slope and aspect suitability of sample site



Aspect and slope overlay at equal weights, ideal locations in yellow.

3. Run a supervised classification on satellite imagery to determine suitability category of land use



A supervised classification of RTI International in ArcMap with land use classifications.

4. Overlay the suitability categories (with or without weight) for ideal locations

Suitable slope and aspect locations in green and suitable land classifications in purple.

5. Measure area of ideal locations and run calculations for project

6. Determine potential value of project for site locations

Suitable_1000

FID *	Shape *	Id	gridcode	Class_name	Area	Shape_Length	Shape_Area	Potential_Output
1	Polygon	227	2	Maintained Grasses	7571.692416	2453.072347	7571.694069	1514339
2	Polygon	301	2	Maintained Grasses	2605.730041	702.391008	2605.732351	521146.5
3	Polygon	485	2	Maintained Grasses	1478.396737	1140.964294	1478.395014	295679
4	Polygon	608	2	Maintained Grasses	1897.856618	1010.378562	1897.855409	379571.1
5	Polygon	628	1	Buildings	1063.117191	369.652109	1063.117781	212623.6
6	Polygon	660	2	Maintained Grasses	2104.133652	522.892881	2104.135087	420827
7	Polygon	664	1	Buildings	1405.601261	676.707654	1405.600534	281120.1
8	Polygon	691	2	Maintained Grasses	3428.716097	702.70044	3428.715501	685743.1
9	Polygon	734	2	Maintained Grasses	2096.681531	820.464684	2096.682233	419336.4
10	Polygon	754	2	Maintained Grasses	4529.442759	1266.593407	4529.441023	905888.2
11	Polygon	794	1	Buildings	1533.503253	851.382078	1533.502682	306700.5

Table of the 11 suitable locations over 1000 m^2 with area in m^2 calculated in "Shape_Area" and output estimations (20% efficiency of solar panels) in "Potenital_Output".

Results show that a total of 5.95 mWH is estimated to be produced for peak sunlight hours, roughly a fifth of RTI's energy use (RTI Sustainability Report, 2017).

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