HERE COMES THE SUN

A SUITA(BEATLE*)TY ANALYSIS OF SOLAR PARK INSTALLATION IN METROPOLITAN FRANCE

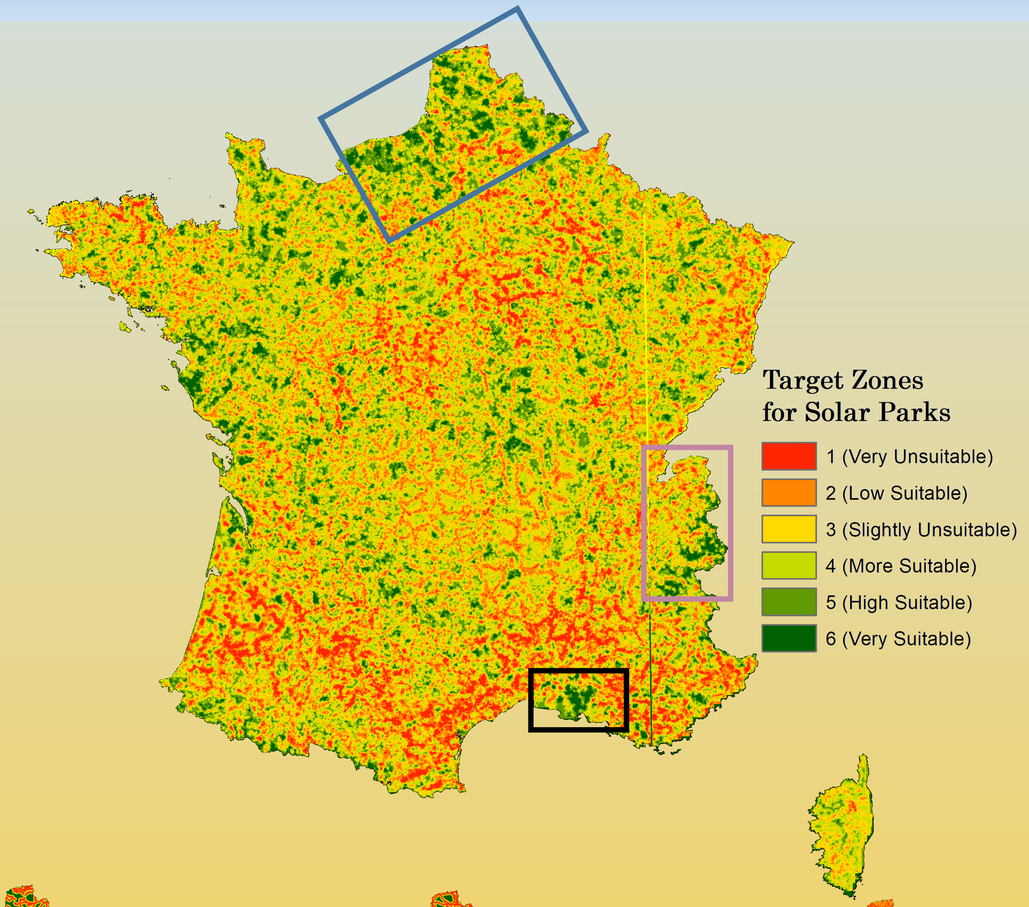
INTRODUCTION

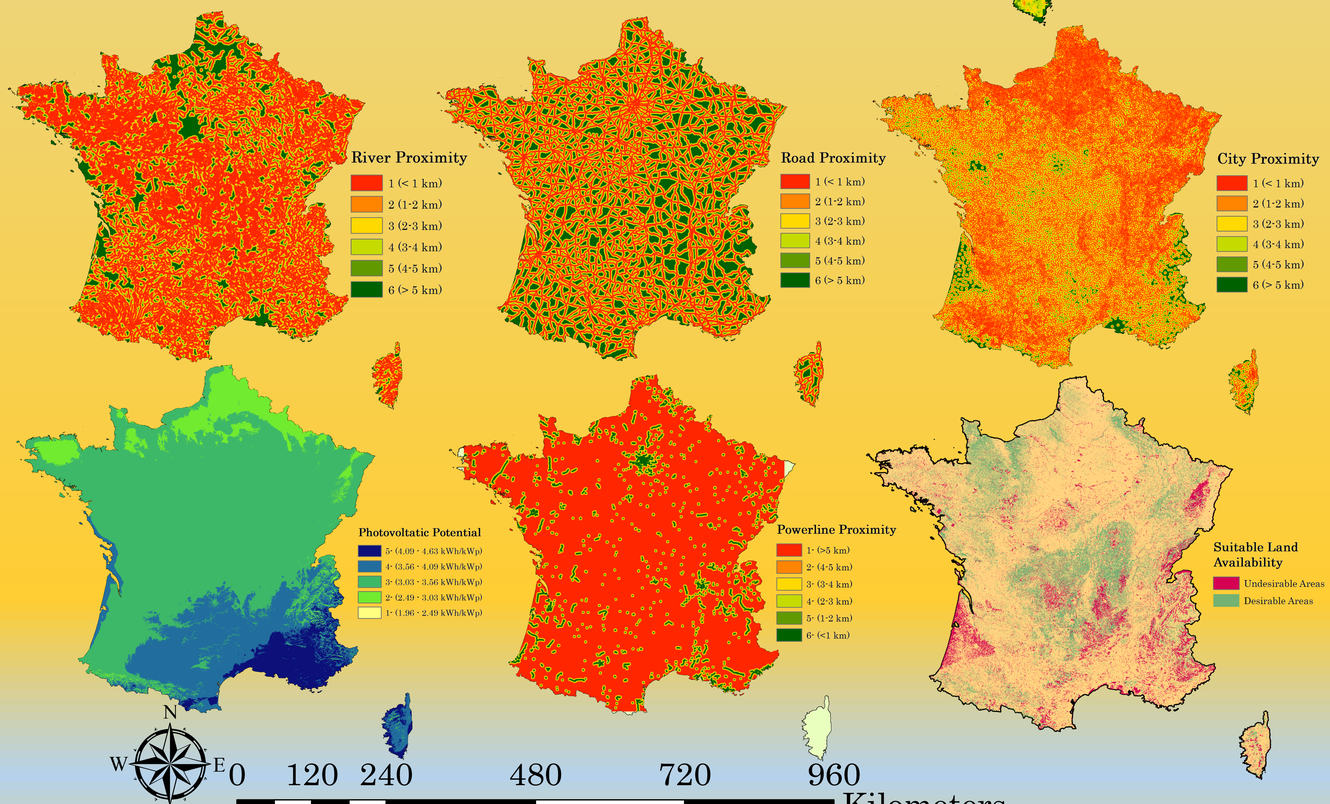
France is almost entirely reliant on nuclear energy; **over 70% of household electricity used is sourced from nuclear energy.** While nuclear energy is cleaner than other non-renewable sources, such as coal, it produces a solid waste that cannot yet be stored safely; a number of energy specialists have proposed storing nuclear waste everywhere from the bottom of the ocean, to the greater bounds of outer space. These alternatives come with significant risks, and mandate a new way of sourcing our electricity. **Solar energy has recently made significant technological progress**, and might be a better alternative to nuclear energy use as well as an employment stimulator to under-employed regions. This analysis investigates the suitability of the metropolitan French terrain and identifies specific areas that will allow the country to avoid becoming a nuclear wasteland, without altering or destroying the natural environment of the territory.

METHODOLOGY

The following criteria, which uses similar metrics as Georgiou & Skarlatos (2016), were applied to determine terrain suitability. These criteria were chosen to avoid proximity to the natural environment, infrastructure and human settlements:

- **Suitable Land (ideally within 50 meters)**
  1. Pastures
  2. Sparsely Vegetated Areas
  3. Burnt Areas
- **Unsuitable Land (ideally away by 3 km)**
  1. Airports
  2. Beaches, Sand Dunes, Coastal Lagoons
  3. Coniferous Forest
  4. Continuous and Green Urban areas
  5. Salt Marshes / Inland Marshes
  6. Water Bodies/Water Courses
  7. Land Principally Used for Agriculture
- **Photovoltaic Potential**
  (1.96-4.63 kWh/kWp)
- **Slope**
  (between 0° and 45°)
- **Proximity to roads, towns, rivers**
  (ideally away by 3 km)
- **Proximity to Underground Powerlines**
  (ideally within 1 km)





RESULTS

The analysis reveals that the available , most suitable land for the installation of solar parks is limited to three regions (see *Target Zones for Solar Parks* map). The model applied a rigorous criteria that would (1) least disrupt the natural and human environment and (2) allow for the most efficient absorption of solar energy. The largest viable areas are found the in the **Nord-Pas-de-Calais** (blue box), **Haute-Normandie** (blue box), **Provence-Alpes-Cote-d'Azur** (black box), **and Rhône-Alpes** (purple box) regions. Most surprisingly, the analysis revealed that a significant portion of the north of the country, which has the lowest photovoltaic potential in the country, has many suitable zones for solar park installation; these regions are populated by fewer waterways and have a widely flat slope, which optimises the installation and function of solar panels. The aforementioned regions are also in the **closest proximity to underground powerlines**, which is vital to transferring electricity to from the solar parks to energy storage facilities. Though photovoltaic potential is higher in the South-Western regions of the country, the higher and more irregular slopes likely limited the possibility of installing solar parks. The results also demonstrate that there tend to be **more unsuitable zones in high photovoltaic potential zones**, which is also evidenced in the suitability analysis, revealing reveals that there are several suitable areas in the north of France.

CONCLUSION

This analysis produced some unexpected results, most surprising of which was the indication of several optimal solar park installation zones in the North of France, which has the lowest photovoltaic potential in the country. While this result may not encourage the installation of solar parks, today, it is important to remember that photovoltaic potential is partially anchored to the ability of current solar technology to absorb light waves. Recent advancements in solar panel technology indicate that **future solar panels will be able to absorb 99.7% of light** that reaches the panel (InStyleSolar 2019). This could mean that areas that currently receive less light may become great candidates for solar park installation, which will not only reduce **the need to use nuclear energy**, but will also contribute **to new employment opportunities** in regions that have the highest unemployment in the country (Statista 2019).

Cartographer: Laurent X. Frapaise (UEP232-01)

Projection: UTM Zone 32N

Term: Fall 2019

*In reference to the popular music group, the Beatles, and their hit single: *Here Comes the Sun*

Sources:

Georgiou, Andreas, and Dimitrios Skarlatos. "Optimal Site Selection for Sitting a Solar Park Using Multi-Criteria Decision Analysis and Geographical Information Systems." *Geoscientific Instrumentation, Methods and Data Systems* 5, no. 2 (July 26, 2016)

Statista. "Taux de chômage régional France T2 2019." www.statista.fr

InStyleSolar. "All You Need To Know About Super Black Solar Panels." *Instyle Solar* (blog), July 4, 2018.

Data Sources: EU-Digital Elevation Model, EU Copernicus Land Use Data, EtaLab Data.Gouv

Font Source: font name: *Bootle;* Source: www.fontmeme.com