IDENTIFYING MARKETS TO ACCELERATE SOLAR ADOPTION ON MULTIFAMILY HOUSING

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ENVIRONMENTAL PROBLEM

Residential housing accounts for 21% of the energy consumption in the U.S. Despite this, landlords in the multifamily housing sector have little motivation to adopt solar photovoltaics (solar PV). Our client, ZNE Capital, addresses this issue by purchasing multifamily properties and installing solar panels. This strategy not only increases property value but also reduces tenants' monthly electricity expenses. However, ZNE Capital and similar firms lack the necessary knowledge to identify the most promising real estate markets for optimal success.

OBJECTIVES

- Create a data-driven model for identifying cities most attractive for solar PV on multifamily housing based on economic, social, and environmental preferences of investors

- Apply our model in two different scenarios, A) ZNE Capital & B) Equity-centered, to shed light on how different investment perspectives may lead to different priorities and metropolitan area results

- Provide a ranked list and map of the top areas for rooftop solar PV on multifamily housing for both sets of user preferences
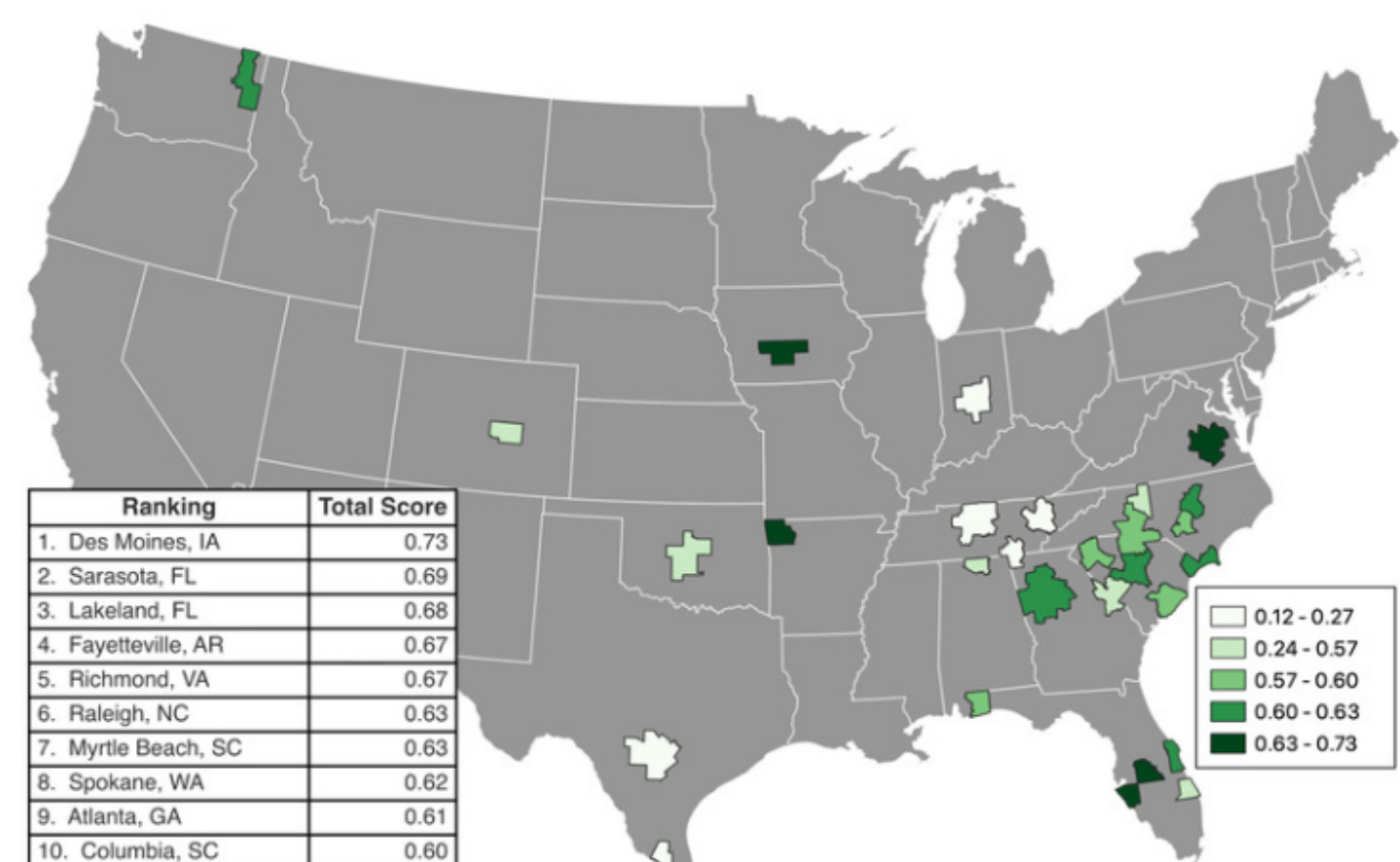
FINDINGS

CLIENT SCENARIO

The weighted bar chart (right) shows the ranked list of the metropolitan areas based on the client's model weights. The contribution of each criteria to the total score can be seen by the various colors. Climate risk (pink) had the greatest weight, meaning it was the greatest priority for investments due to the long-term impacts on property investments. This is seen in the bar chart, in which the climate risk bar contributes most to the investment score. Richmond, Virginia exhibited the highest investment favorability score for ZNE Capital's preferences due to avoided climate risk.
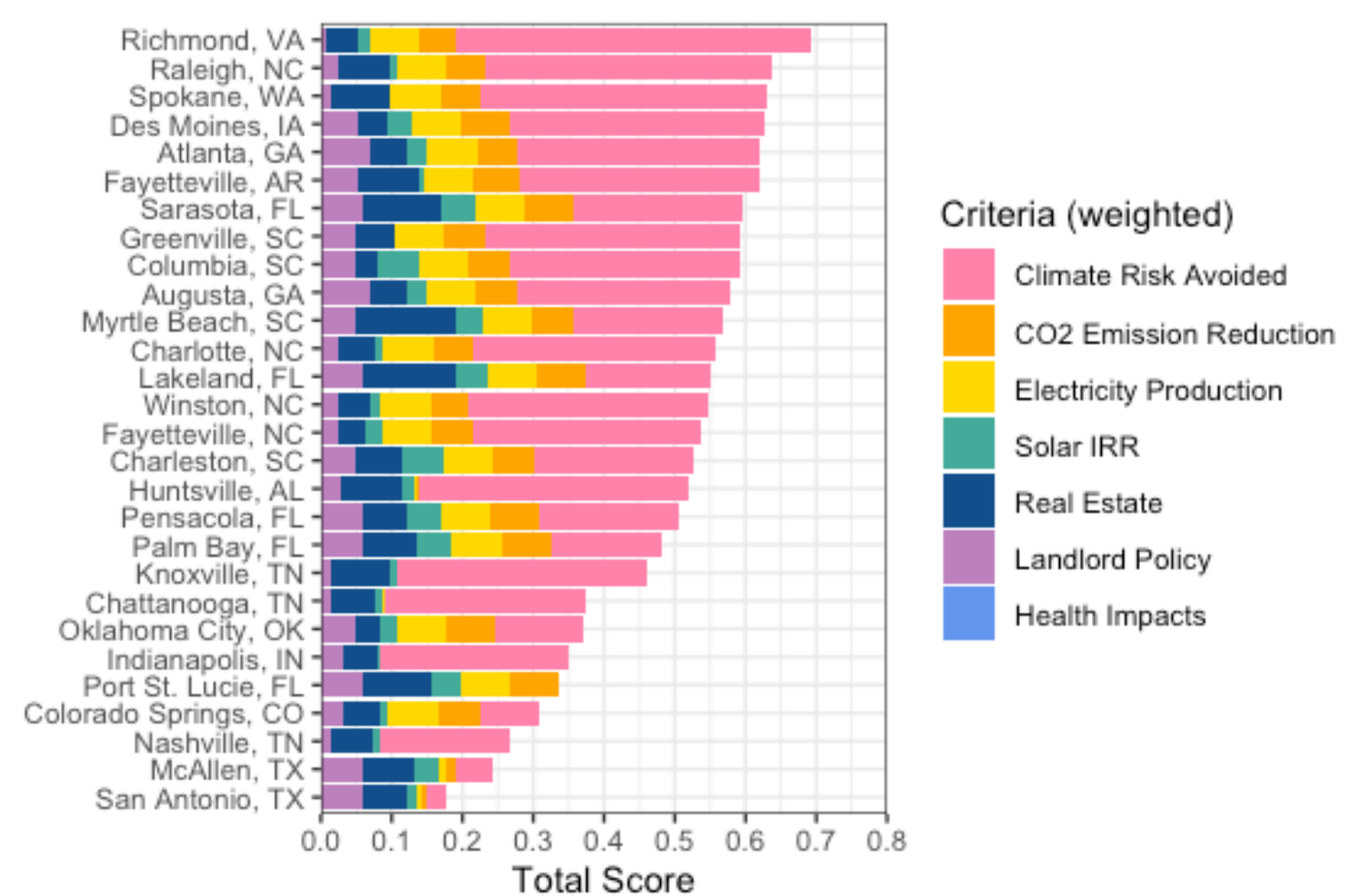

EQUITY-CENTERED SCENARIO

The map (right) shows the top 10 metropolitan areas with the highest investment favorability score based on equity-centered criteria weights. This scenario focused on expanding into areas that would have the greatest reduction in CO2 emissions and health costs associated with air pollutants. This scenario also did not have restrictions to states' landlord policy. Under this scenario, Des Moines, Iowa ranked at the top.

Ranking	Total Score
1. Des Moines, IA	0.73
2. Sarasota, FL	0.69
3. Lakeland, FL	0.68
4. Fayetteville, AR	0.67
5. Richmond, VA	0.67
6. Raleigh, NC	0.63
7. Myrtle Beach, SC	0.63
8. Spokane, WA	0.62
9. Atlanta, GA	0.61
10. Columbia, SC	0.60

OUR APPROACH

We developed a multi-criteria model based on best-available data to identify and rank metropolitan areas across the U.S. for solar PV on multifamily housing based on 7 criteria:

1. Avoided carbon emissions
2. Real estate market potential
3. Improved health from avoided air pollutants
4. Electricity generation
5. Solar PV financials
6. Landlord policies
7. Climate risk avoidance
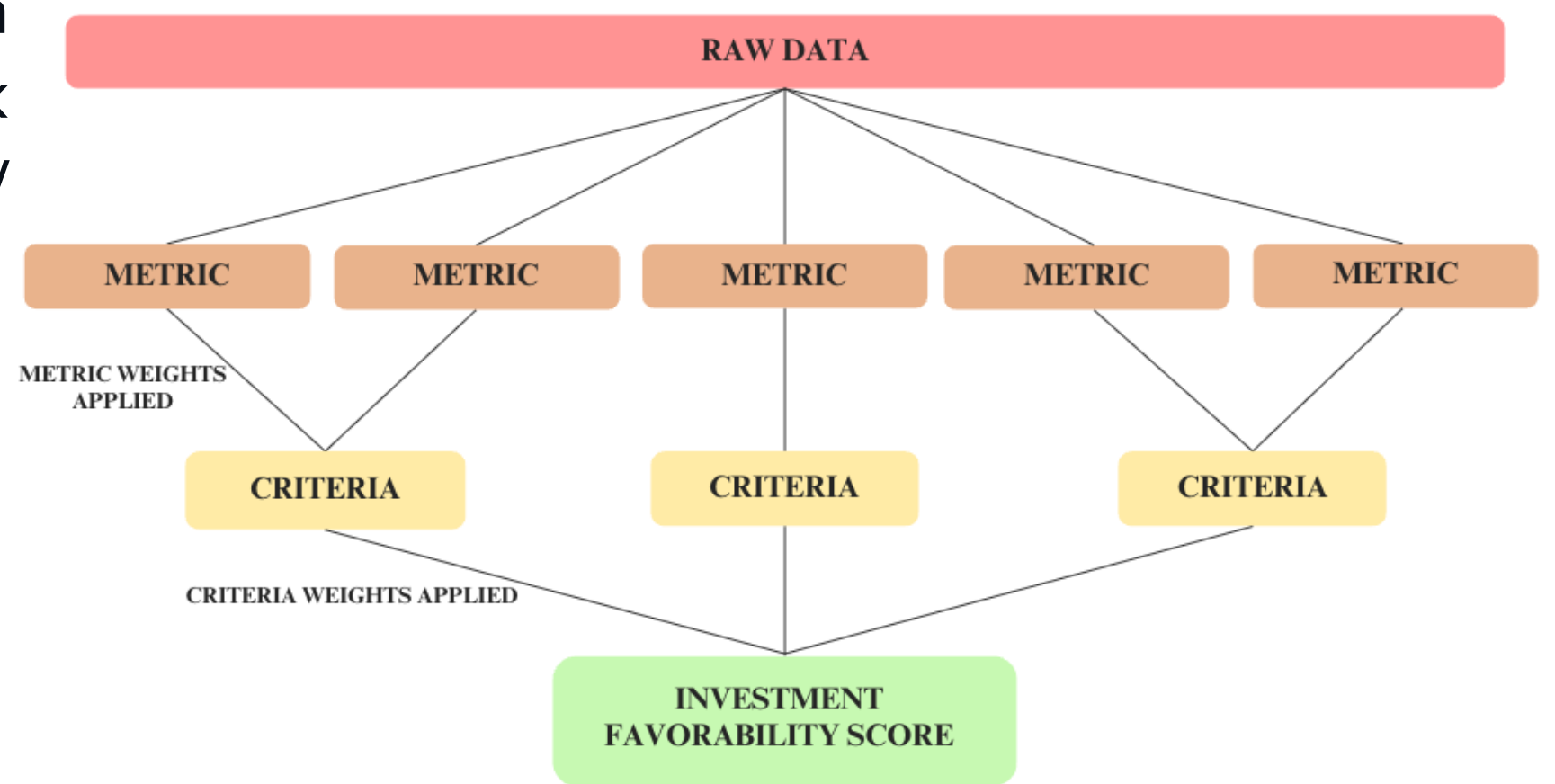
Note: figure not representative of total number of metrics and criteria

The framework for the project can be seen above. First, raw data was used to calculate indicator metrics, which were then weighted to comprise a criteria. Second, user assigned criteria weights were used to calculate the investment favorability score for a given metropolitan area. Data was analyzed in RStudio presenting reproducible code for future solar PV projects and results were visualized in GIS.

We calculated an investment favorability score for two scenarios: A) with the client's preferences, and B) with equity-based preferences. This allowed us to demonstrate the model's robustness and generalizability. Out of the top 10 metropolitan areas, there were 8 areas that overlapped between both scenarios, indicating the model's robustness.

PROJECT IMPACT

When solar PV systems are added to multifamily housing, it provides an opportunity to reduce electricity costs for tenants.

This project demonstrates that installing solar PV on multifamily housing is profitable. Results can inform landlords and real estate investors on favorable areas for investments.

Nonprofits and government agencies can utilize this framework and provide funding for solar PV projects based on their preferences.

FUTURE WORK

The model could be more accessible to the public if presented as an app, which would also enhance framework customization. This would allow future studies to adjust the model inputs and weights, and incorporate more recent data as it becomes available. In addition, future studies can explore alternative ways to use rental policy and National Risk Index Climate Risk data options.

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