Improving Preparedness of Communities for Evacuations using ZEVs

Development of ZEV Evacuation Readiness Score - II

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December 5th, 2024

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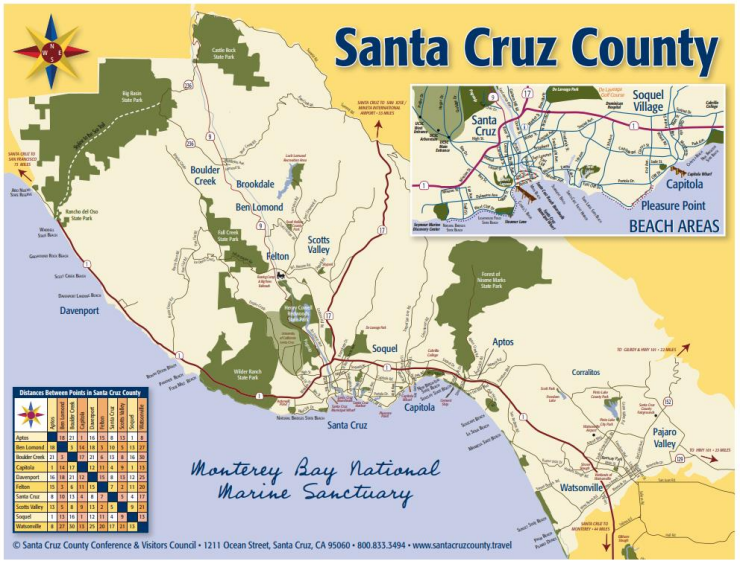
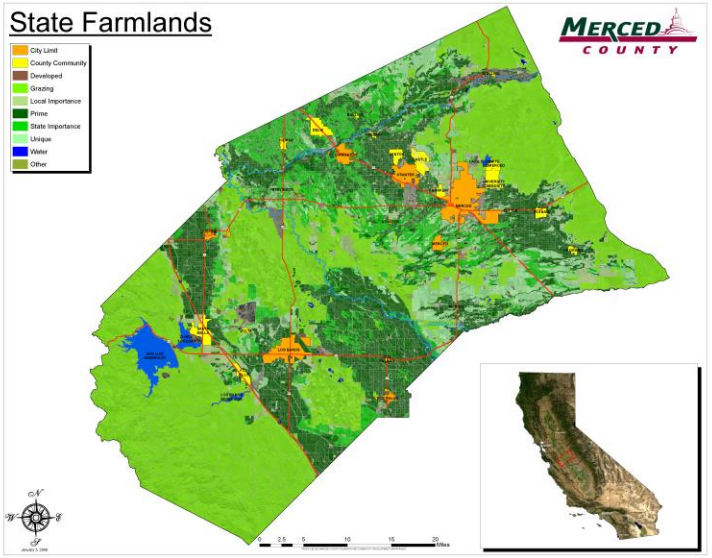
Intro to ZEV Evacuation Readiness Score

- ZEV evacuation readiness score provides a basis to categorize each county based on its preparedness to successfully carry out a zero-emission vehicle evacuation.

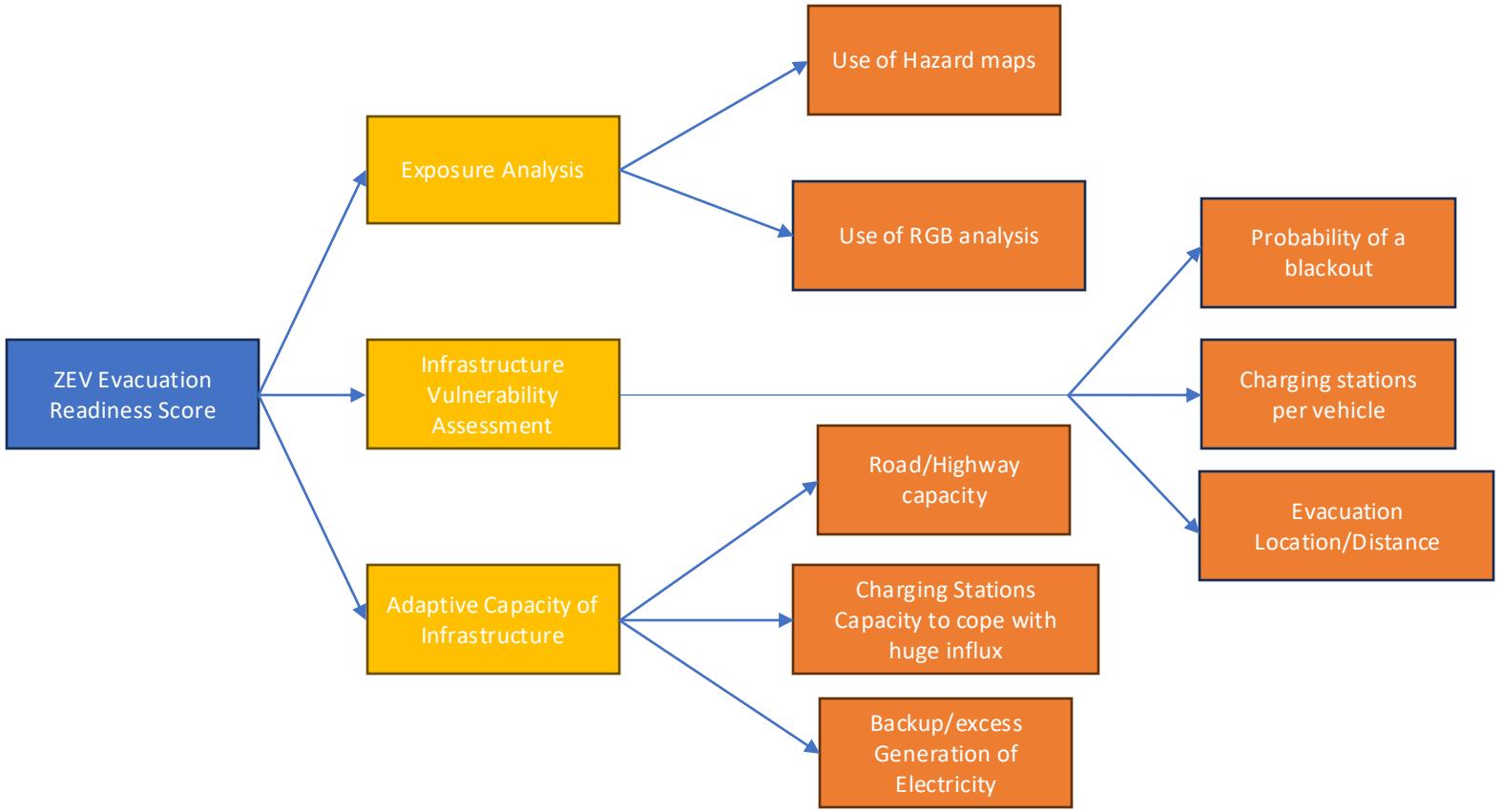


ZEV Score: ★★★★☆



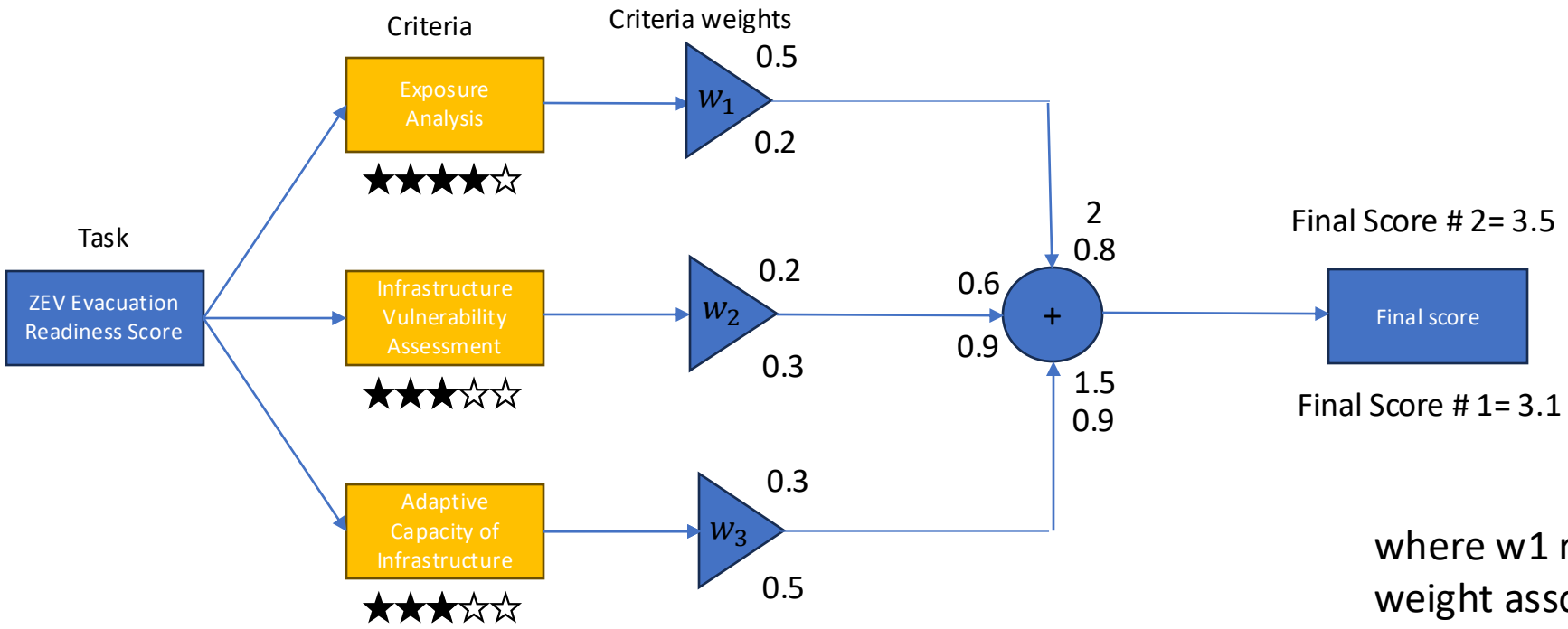
ZEV Score: ★★★☆☆

ZEV Evacuation Readiness Score Framework



Now, lets introduce the concept of weights!

ZEV Evacuation Readiness Score Weights Selection



$$R(EI, IVS, ACIS) = EI \,.\, w_1 + IVS \,.\, w_2 + ACIS \,.\, w_3$$

where w1 represents the weight associated with the EI analysis, w2 represents the weight associated with the IVS analysis, w3 represents the weight associated with the ACIS analysis.

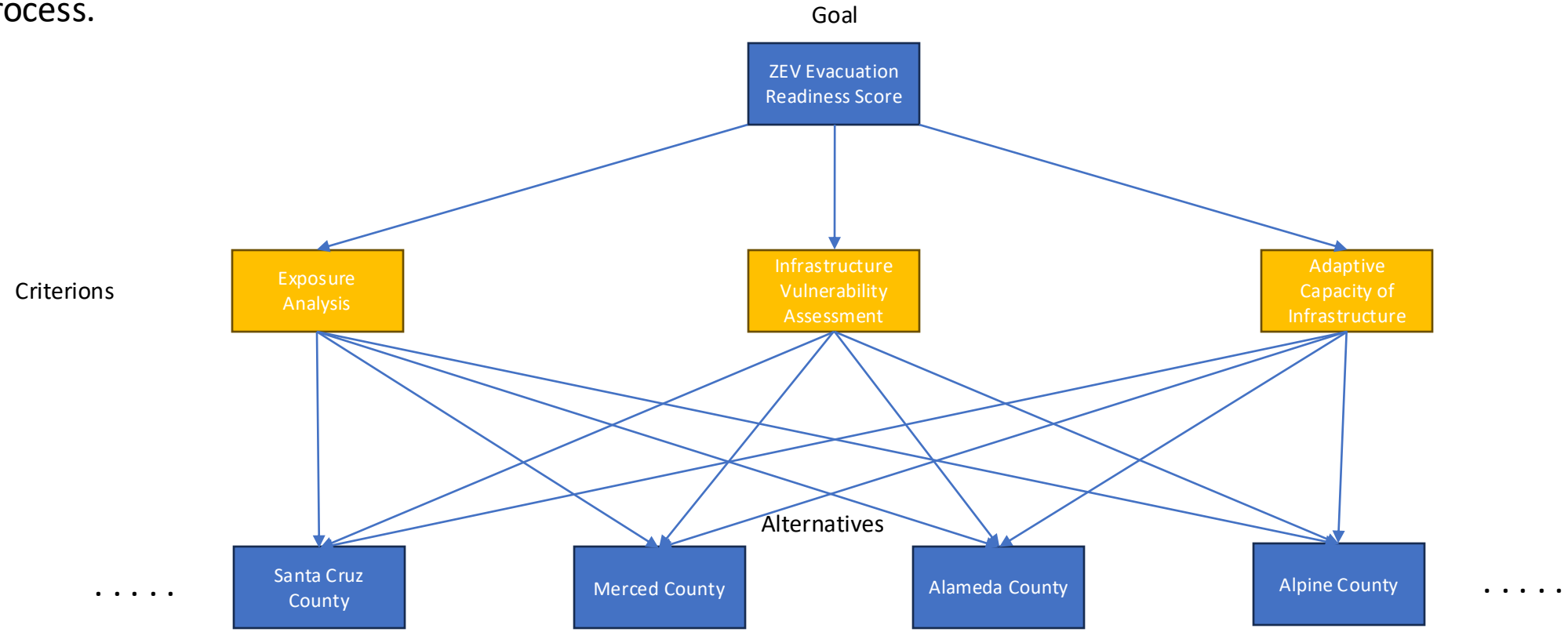
But to present ZEV score 2.0, with new weights, we introduce a concept of fuzzification!

Fuzzification of Scoring Methodology

Why Fuzzification:

- Dealing with uncertainty
- Handling vagueness and ambiguity
- Improves decision making
- Help analyze real-world scenario better

Previously, we were using simple “Analytical Hierarchy Process”. But for ZEV Score 2.0 we will be using Fuzzification process.



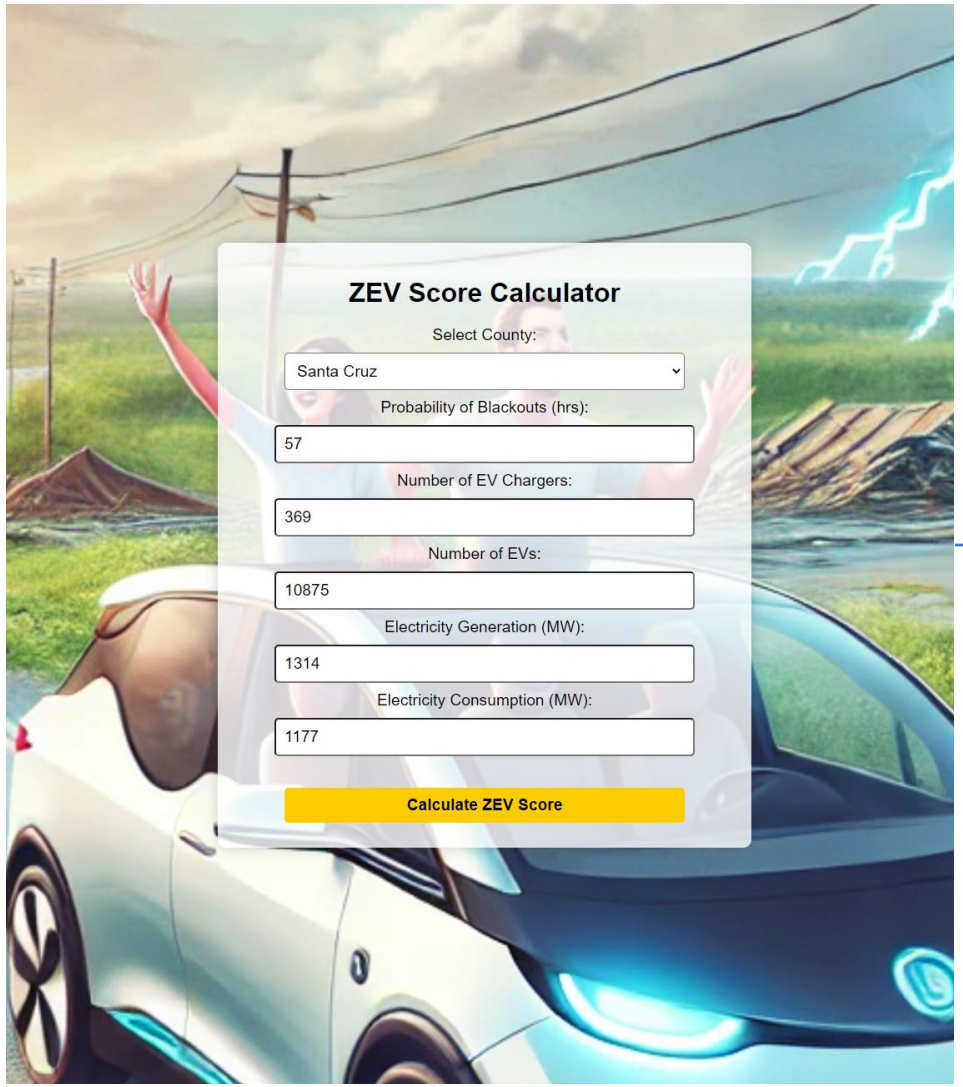
Weights Comparison

Weights calculated using Fuzzified AHP	***Weights calculated using simple AHP***
$w_1(for\ Exposure\ Analysis) = 0.24$	$w_1(for\ Exposure\ Analysis) = 0.15$
$w_2(for\ Infrastructure\ Vulnerability\ Analysis\ ) = 0.19$	$w_2(for\ Infrastructure\ Vulnerability\ Analysis\ ) = 0.2$
$w_3(for\ Adaptive\ Capacity\ Infrastructure\ ) = 0.668$	$w_3(for\ Adaptive\ Capacity\ Infrastructure\ ) = 0.65$

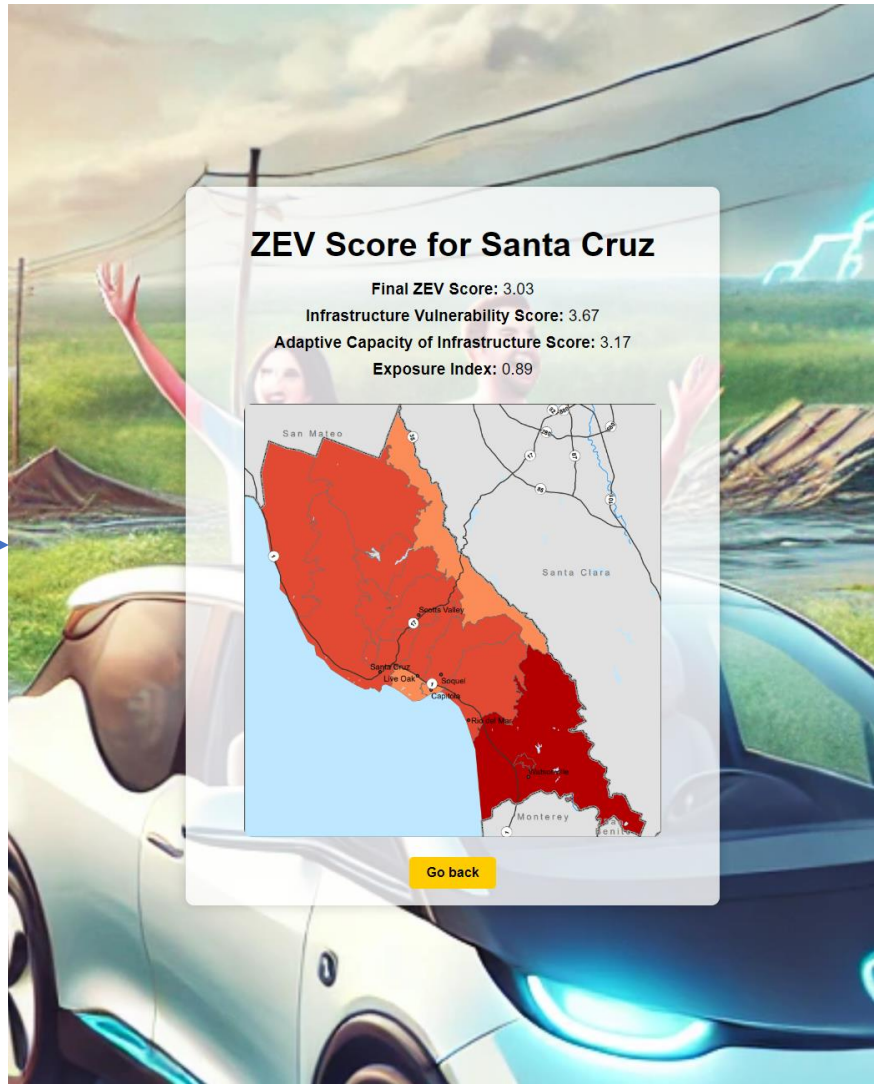
Fuzzified Analytical Hierarchy Process (FAHP) enhances the standard Analytical Hierarchy Process (AHP) by incorporating fuzziness, which provides a more nuanced and accurate decision-making framework.

Creation of ZEV Calculation Tool

Landing Page

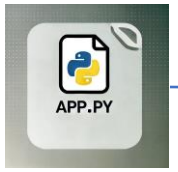


Result Page



ZEV Score Calculation Web Page Development

Backend



Contains the scoring methodology, takes input from the user and gives a ZEV score.

Requirements.txt & Procfile for the configuration purposes.

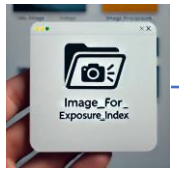


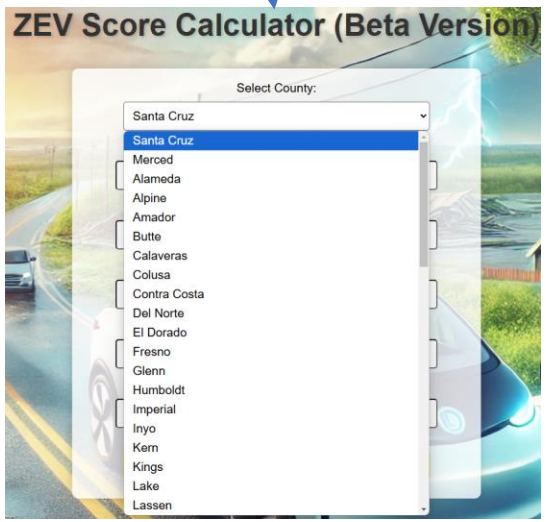
Image folder keeping the exposure index map for each county that can be selected for drop down menu.

Frontend

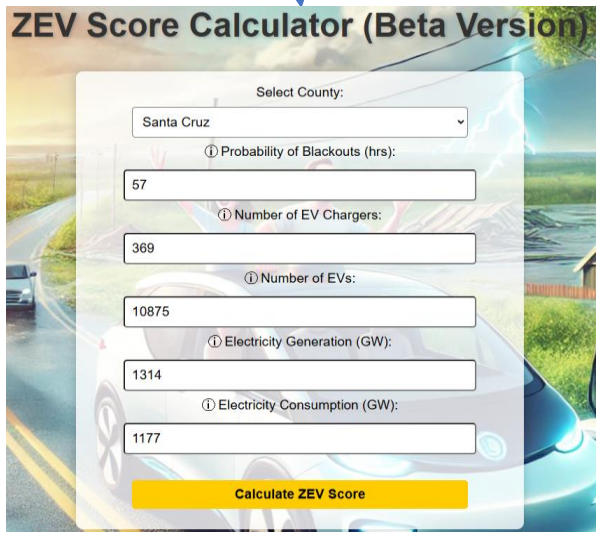
These files are used to design the landing and resulting page.

ZEV Score Calculation Web Page Key Features

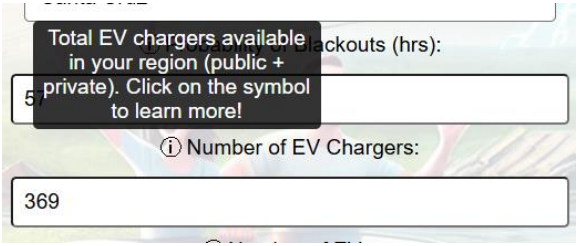
Contains every county in the drop-down menu.



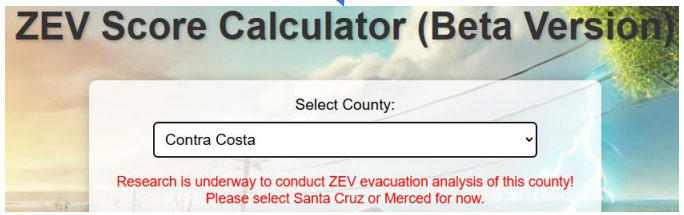
Whenever a County is selected, criteria values will automatically be adjusted for that county.



There is an information symbol right beside each criteria which can redirect you to further resources.

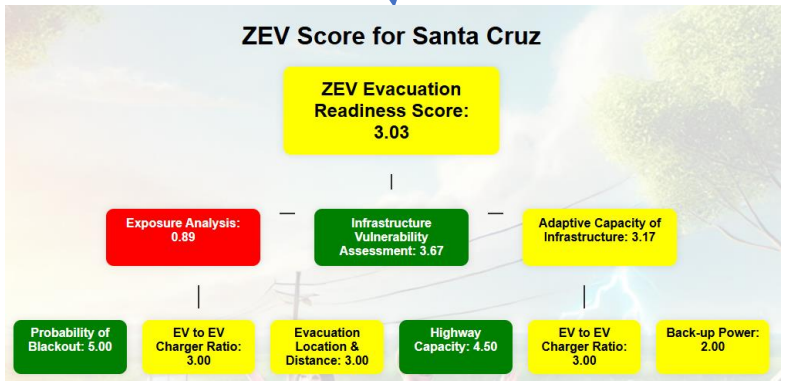


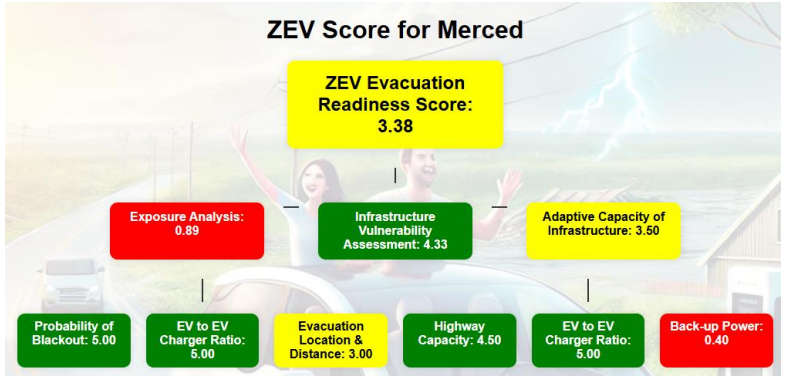
Right now, website is not optimized for counties except for Santa Cruz and Merced!



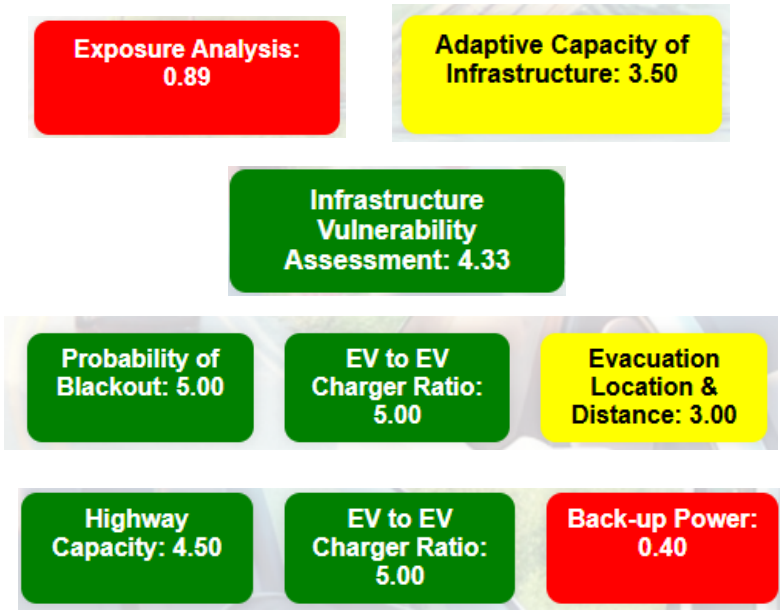
ZEV Score Calculation Web Page Key Features

Output is represented in a flowchart for easier understanding of key factors enhancing or reducing the ZEV score.

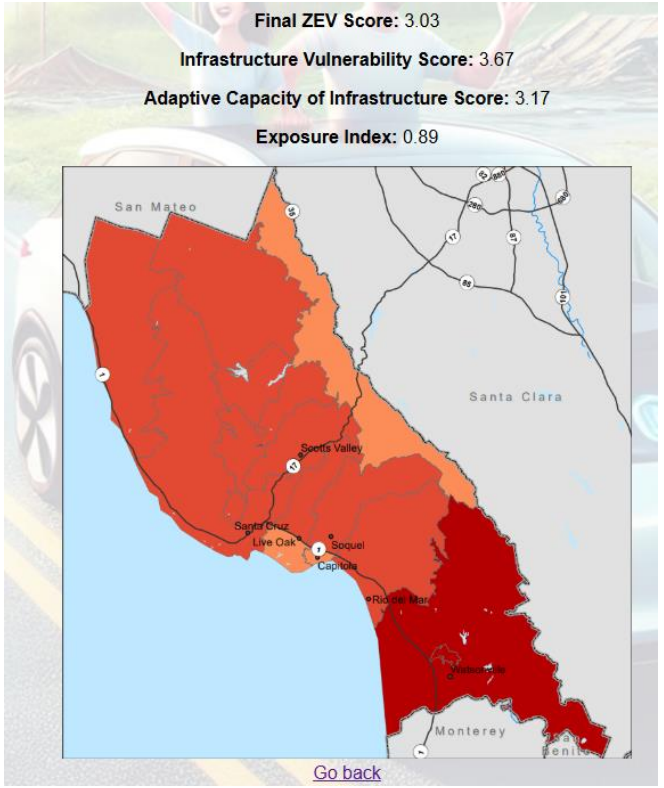




Color coordination is introduced to better highlight the criteria/sub-criteria that need attention/improvement.



When exposure analysis is being carried out in runtime, the map being used is also displayed at the result page.



Resources used for Merced hazard analysis: https://thinkhazard.org/en/report/28888-united-states-of-america-california-merced

Link to the Website!

https://zevscorecalculator-6a334960ec96.herokuapp.com/

Thank you!