Validating Geospatial Analysis with Community Risk Perception Survey in Big Island, Hawai'i

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Introduction

Background

Military vehicle-generated particulate matter released into the air has proved to be a possible environmental and health concern for communities surrounding Pohakuloa Training Area (PTA) on Big Island, Hawai'i. The author's prior geospatial research[1] has been to identify, using GIS analysis, the local populations surrounding the military installation that are most at-risk from the vehicle-generated particulate matter.

Model Development

In order to identify the populations at risk of this dust hazard, a model was developed as a means to assess social impacts through GIS. This process-based model (shown below), which includes wind, elevation, and distance (weighted more), was used to develop a **Dust-Impact Index.**

$$100 * \frac{\left(\frac{W}{W_{max}}\right) + \left(\frac{E_{PTA} - E}{E_{PTA}}\right) + 5\left(\frac{D_{max} - D}{D_{max}}\right)^{\frac{1}{2}}}{7}$$

Methods

This project aimed to assess the perceived impact of dust exposure among local residents using a qualitative survey and quantitative analysis. Respondents were surveyed at farmers' markets and other public spaces around the Island over a 4-day period. The survey asked residents to relate whatever concerns they may have (environmental or not) regarding PTA. Responses varied from full support to major opposition, which speaks to Hawaiians' environmental awareness as well as some of the underlying controversies surrounding U.S. military presence in Hawai'i.
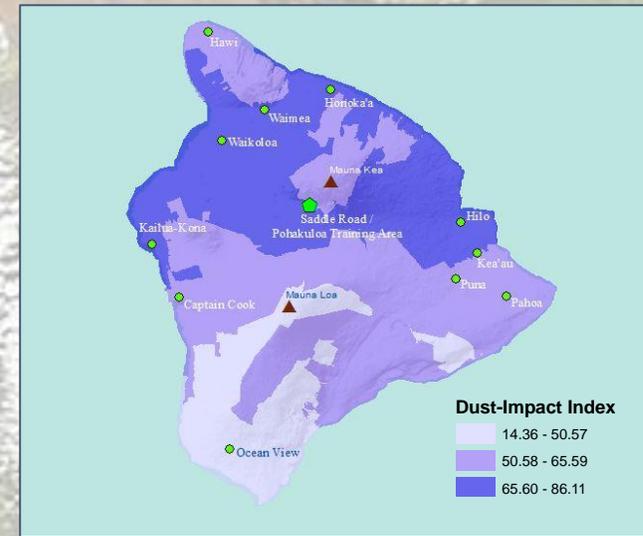
Dust-Impact Index
- 14.36 - 50.57
- 50.58 - 65.59
- 65.60 - 86.11

Literature Cited [1]Ayers, Darcy (2016) "Using GIS to Assist in Social Impact Assessments at Military Installations," *Pursuit - The Journal of Undergraduate Research.* 7(1):1-9.

Results

The results of the survey – particularly answers to the question of whether the respondent perceived military-generated dust in areas with which they were familiar – were compared to the previously produced Dust-Impact Index map (*left*). A linear regression was calculated (*below*) relating the 62 responses regarding 12 areas around the Island with the corresponding Index level. Every response regarding an area with an Index level of below 68 (normalized out of 100) indicated no perceived dust, while the locations of Saddle Road (directly adjacent to PTA) and Waikoloa Village (to the northwest of PTA) each had high Dust-Impact Index levels (75.1 and 85.5, respectively) as well as a high percentage of responses indicating dust perception (85 and 100 percent, respectively). The R^2 level of the regression line was 0.49. The results of this survey indicate that the Dust-Impact Index model is relatively accurate in predicting levels of risk perception.
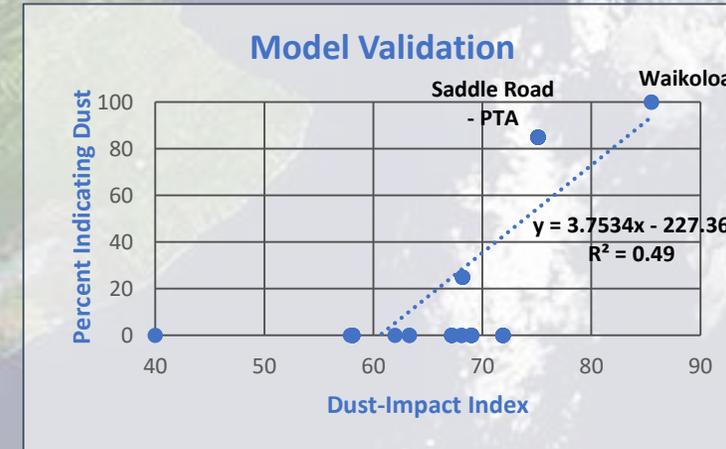
Model Validation

y = 3.7534x - 227.36
R^2 = 0.49

Next Steps

Throughout the survey process, data was collected regarding the influence of the responders' culture on the way in which they perceive risk. A paper is in preparation that will further the discussion of Hawaiians' perceptions of potential environmental and health issues as they relate to U.S. military presence.