Assessing Environmental Inequality in the Autonomous Community of Madrid, Spain

Background

Several US researchers have looked at the relationship between communities' socioeconomic characteristics and exposure to environmental hazards, documenting that low socioeconomic populations tend to reside in areas that have higher levels of environmental pollutants. This type of research has transcended the US geopolitical borders into other parts of the world including Canada, New Zealand and the European Union.

Due to differences in social and political structures, countries like Germany and France have incorporated different yet similar socioeconomic and environmental indicators when looking at environmental inequality. These factors include availability of green space, air quality, household of migration backgrounds, low-income households, unemployment, exposure to noise, and particulate matter[1, 2].

While some European countries have studied the topic of environmental inequality, countries such as Spain, have not fully assessed the burden of environmental pollutants on certain socioeconomic groups. The aim of this environmental inequality analysis is to look at environmental health hazards and socioeconomic factors to identify which municipalities in the autonomous community of Madrid are advantaged and which are highly disadvantaged.

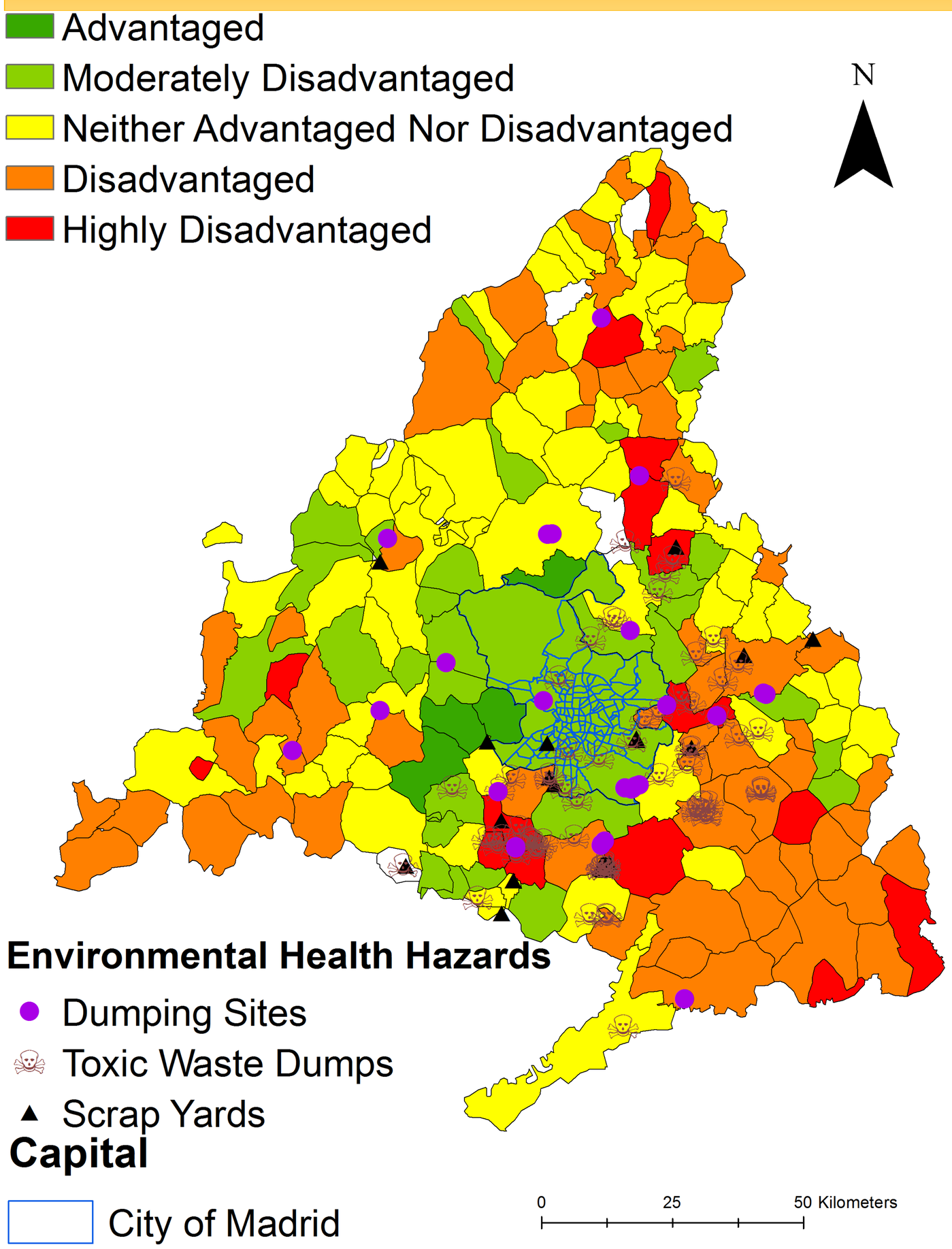
Methodology

Selecting from factors based on previous environmental vulnerability studies, six factors were used to identify areas with high environmental vulnerability: environmental health hazards (dumping sites, toxic waste dumps and scrap yards), income, immigrant population and public service green space.

Tabular data and shape files from the *Instituto de Estadística de la Comunidad de Madrid* were used to create six layers (Map 1-3). These layers were then transformed into raster data sets, reclassified, overlaid, and then summed together with the raster calculator to create the environmental vulnerability analysis map (Map 4).

The analysis was based on a point system; Municipalities that contained dumping sites, were given one point if they had one or more dumping sites. The same amounts of points were awarded if the municipalities had toxic waste dumps and scrap yards. Municipalities that had the largest amount of green space, highest level of income and lowest percentage of immigrant population were awarded one point for each factor. While those that the least amount of green space, lowest level of income, and highest percentage of immigrant population were awarded 5 points for each factor.

Map 4. Environmental Inequality Analysis



Results

The combined data on socioeconomic and environmental factors on the final map (Map 4) illustrates a range of inequality throughout the community of Madrid. The map shows that the majority of advantaged and moderately disadvantaged municipalities are closer to the center of the community of Madrid, to the northwest of the city of Madrid. The municipalities that had no disadvantage included: Tres Cantos, Pozuelo de Alarcón, Villaviciosa de Odón and Boadilla del Monte.

The majority of the disadvantaged and highly disadvantaged areas are located on the southeast region, as well as near the periphery of the community. The municipalities that are highly disadvantaged include: Fresnedillas de la Oliva, San Fernando de Henares, El Molar, Lozoyuela- Navas-Sieteglesias, El Vellón, Valdilecha, Pelayos de la Presa, Humanes de Madrid, Villamanrique de Tajo, Estremera, Valdilecha, Fuente el Saz de Jarama, Horjacuelo de la Sierra, and San Martín de la Vega.

Limitations

This analysis was not did not encompass all the possible indicators such as air quality, unemployment and exposure to noise. Further research should include these factors as well as additional indicators that can produce a comprehensive analysis to inform local or country wide environmental policies. In addition, the topography of the community of Madrid was not accounted for as certain parts are mountainous, which could affect the number of hectares of public service green space.

References

1. Padilla, C. M., Kihal-Talantikite, W., Vieira, V. M., Rossello, P., Le Nir, G., Zmirou-Navier, D., & Deguen, S. (2014). Air quality and social deprivation in four French metropolitan areas—A localized spatio-temporal environmental inequality analysis. *Environmental research*, *134*, 315 -324.

2. Geißler, G., Kleinschmit, B., Ahrberg, R., Erdenetsogt, B., Heimann, Y., Heinsch, L., ... & Wisniewski,B. *Environmental Justice in Berlin: GIS-based method determining an aggregated index for urban planning*. na.

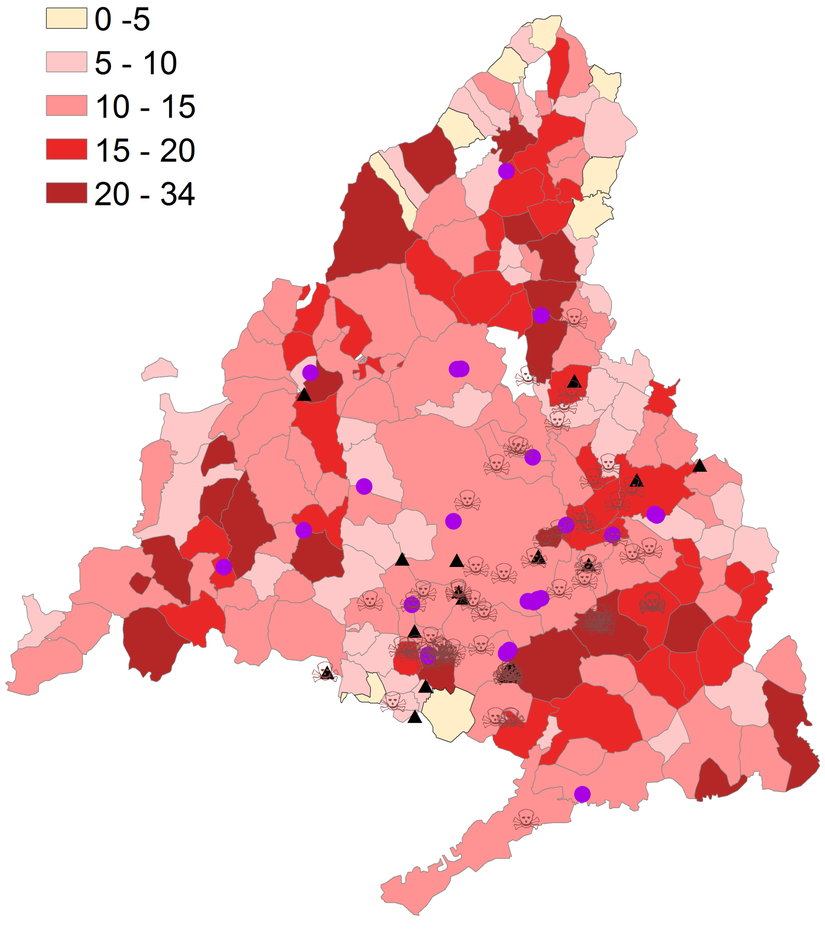
Jacqueline Ochoa| PH 262 | 5-6-15

Data Source: Instituto de Estadística de la Comunidad de Madrid

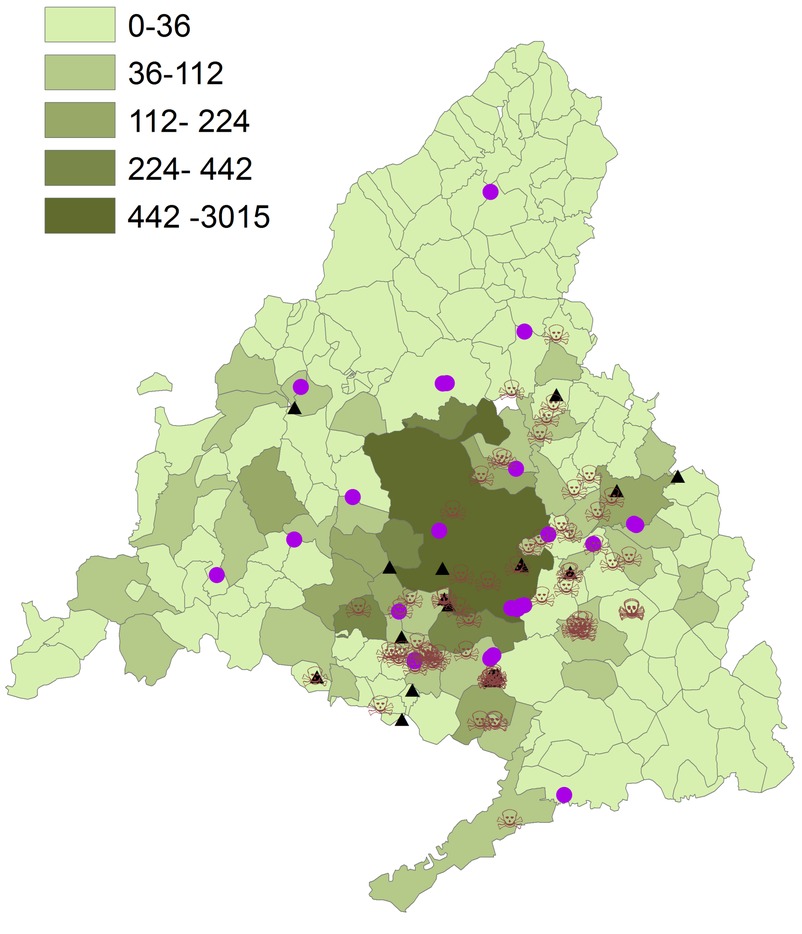
Projection: ED_1950_UTM_Zone30N

Tufts UNIVERSITY

Map 1. Immigrant Population



Map 2. Public Service Green Space



Map 3. Annual Income