México Conectado

Evaluating public internet access in Oaxaca, Mexico

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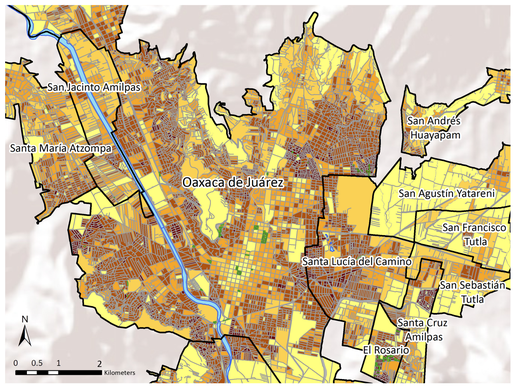
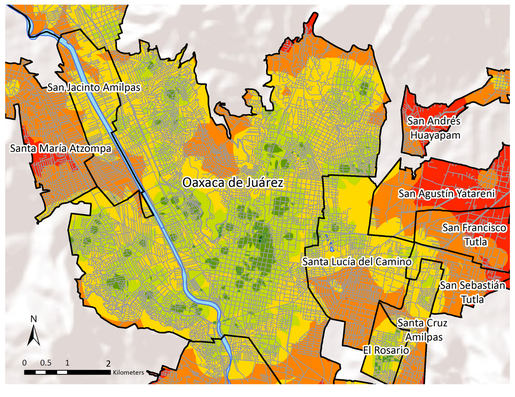
Background

México Conectado is a public works program run by the Mexican federal government with the ultimate goal of reducing the "digital divide" across the country and simultaneously fulfilling the constitutional guarantee to broadband internet for all Mexican citizens. The program seeks to provide internet connectivity in public locations including schools, medical centers, libraries, community centers, and parks. The program involves not only connecting computers within chosen buildings but also installing WiFi routers in a variety of public spaces to allow for free internet access in these areas.

This project explores the current status of *México Conectado* and other publicly available internet connection points in the capital city of Oaxaca de Juárez (referred to simply as Oaxaca) in the state of Oaxaca, Mexico. The goal is to not only demonstrate which areas of the city and its surrounding towns have the greatest access to public internet, but also to evaluate potential new locations for connection points in locations that are far from existing connection points and that would serve the greatest number of people. Assuming that the target population of greatest interest, most likely lower income populations who may not be able to afford a computer or internet service, would walk to a connection point from their home, this project desclares distances over 1km to be inaccessable and those under 1km accessible with shorter distances being more preferable.



Population density of Oaxaca by block



Internet access by distance

Methods

Data and shape files were downloaded from the National Institute of Statistics and Geography (INEGI), National School Information System (SNIE), and from the Ministry of Communication and Transport (SCT). Geographic and population data were current as of the 2010 national census. Elementary and secondary school locations and information were taken from national records for the 2014 - 2015 school year. Precise coordinates and type (WiFi/fixed internet terminals) of internet connection points installed through *México Conectado* were available from the SCT and were current as of April 2016.

To illustrate the accessiblity of public internet points, the Euclidean distance from current *México Conectado* points and schools with internet was calculated. These distances were reclassified to give areas closer to these connection points a higher score, with areas outside of walking distance a score of zero (1-1.5km) or -1 (1.5km or further). A final weighted score was calculated from these scores with WiFi scores given twice the weight because of the greater immediate accessibility to WiFi networks for both mobile devices as well as laptops and other portable electronics. The map of internet accessibility (lower left) represents areas with the shortest linear distance to any connection point (greatest access, highest score) in dark green, while areas with the longest linear distance to connection points (lowest access, lowest score) are shown in dark red.

The same method was applied to the map of potential new *México Conectado* locations, except that scores were reversed so that higher scores were given to areas further away from internet points but closer to schools without internet, as these areas would benefit most from additional public internet connection points. The overall score was then multiplied by population density for the block so that blocks with a higher population density would be weighted more heavily.

Results

The final map highlights in green areas that would benefit most from additional public internet connection points. The insets below highlight an sample area that would be a good area for planners at *México Conectado* to investigate further, as this area has many concentrated blocks of high population density but low internet accessibility. The third inset highlights a potential location for a new WiFi router within this study area - a small park that is surrounded by green blocks and is not close to other internet connection points. A different, more precise model would be needed to assess the ideal street location for an additional conneciton point and its impact on accessibility for this area.

This map is meant to illustrate potential locations based on estimated linear distances to internet connection points and does not take into account other elements of accessibility such as road conditions, walkability, or use of other modes of transport. It also does not consider the capacity for connection at each point (for example, there are a finite number of computers at non-WiFi points), the range of WiFi networks, or internet cafés and other locales where internet is available for a fee. While data on schools and *México Conectado* points are current as of 2016, geographic and demographic information is from the 2010 census and may not reflect current or future block distribution or population numbers. Despite these limitations, this model is still well suited to identify locations that are worth

Sources

Geographic boundaries, streets, natural resources, and public buildings
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Manzanas, June 2013, INEGI; published by Diego Valle Jones, accessed March 22, 2016.
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Servicios A, June 2013, INEGI; published by Diego Valle Jones, accessed March 22, 2016.
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***México Conectado* locations**
Tabla con sitios con conectividad a internet, April 2016, Secretaría de Comunicaciones y Transporte; published by the Secretaría de Comunicaciones y Transporte, accessed April 27, 2016.
Photo
Google, December 2015; published by Google Maps Street View, accessed May 3, 2016.
Basemap
World Shaded Relief, March 2015, Esri; published by Esri, accessed May 4, 2016.

Projection: WGS 1984 World Mercator
Cartographer: Leslie Wentworth
Course: Fundamentals of GIS, NUTR 231
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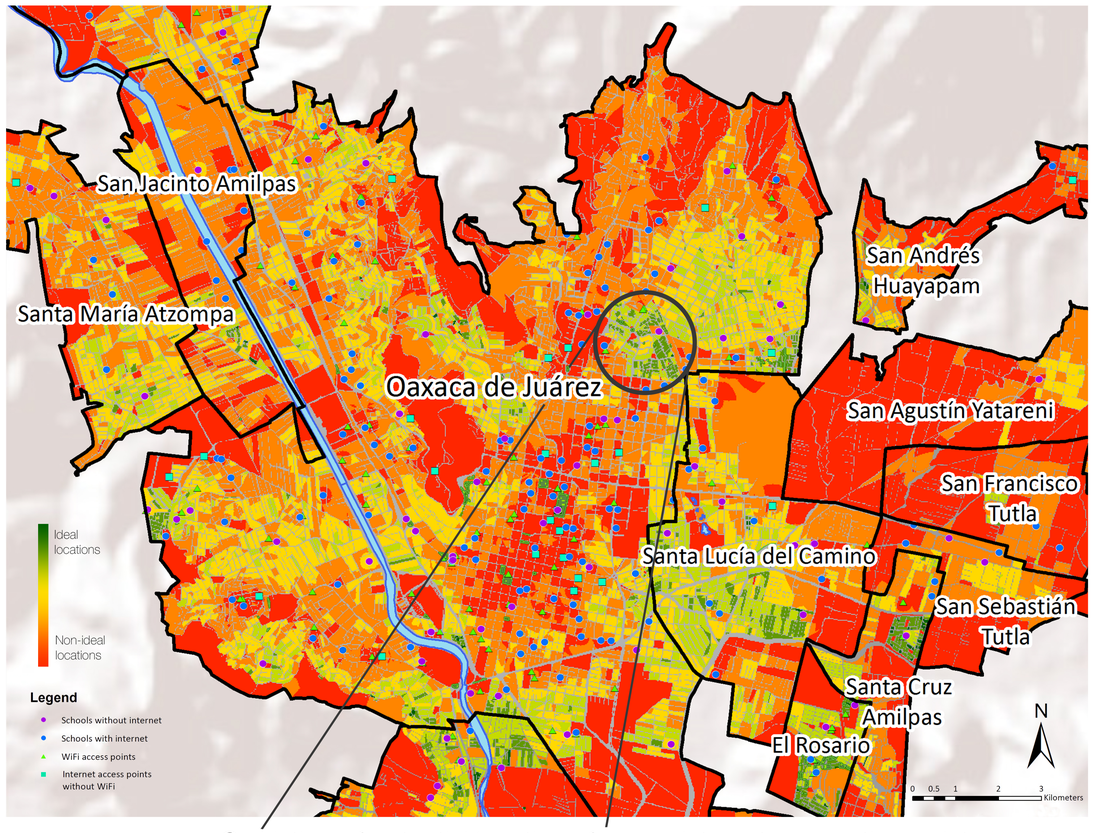
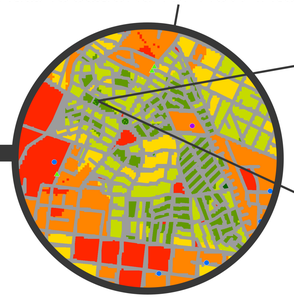


Gradation of potential locations for new internet connection points by block

Population density

The sample area has a very high population density by block, as indicated by the darker colors.



Potential new locations by block

Even though there are several publicly accessible internet points within the sample area, the model indicates that more public internet connection points would be highly beneficial, likely due to the very high population density of these blocks (shown at left).

Potential WiFi location

This photo, taken from Google Street View, is of a small park within the study area highlighted and is within walking distance (500m or less) of all dark green blocks in the sample area. It may be a good area for México Conectado to investigate installing a WiFi router.