A comparison of the urban expansions and their driving factors of two border cities: Laredo in the US and Nuevo Laredo in Mexico

Chunhong Zhao1, Jennifer Jensen1, Benjamin Zhan1
1Geography Department, Texas State University

The twin cities of Laredo in the US and Nuevo Laredo in Mexico have been growing at an unprecedented pace over the last few decades. The trans-boundary flows of commodities, capital, and significant population growth have created an interdependent system, making this area a unique region for analysis and thus providing an opportunity to thoroughly examine drivers of landscape change. This is the first attempt to examine urban growth and the influencing factors of twin-cities along the US-Mexico border. This study aims to answer the following questions: What is the rate of urban growth and what is the resulting growth pattern? What are the factors affecting urban growth in the area and how would the factors differ in the two cities?

Land cover maps for 1985, 2000, and 2014 were produced by supervised classification from Landsat imagery with high classification accuracy. Change analysis indicated that considerable urban expansion occurred in both cities over the past three decades. Results indicate that entirety of the built-up areas increased by 227.5 % from 1985 to 2014, with an annual increasing rate of 9.31 % from 1985 to 2000 and 2.61 % from 2000 to 2014, respectively. Spatially, pronounced urban sprawl in Nuevo Laredo was observed periphery of the urban core, while in Laredo, growth was more dispersed. Results also indicate that Laredo had a faster growth rate compared its counterpart city of Nuevo Laredo.

To evaluate driving factors of urban expansion, three classes of independent variables were employed in a logistic regression: (1) site specific variables related to topography, slope, and population, (2) proximity variables related to transportation and international river, industrial sites, and existing urban clusters, and, (3) neighborhood condition variables related to transportation and urban clusters. Using data at the pixel level on both sides of the border, the following factors were found to affect urban growth: (1) DEM elevation (with odds ratio < 0.9 for both cities), (2) distances to the nearest urban clusters, distances to the nearest minor road (with odds ratios > 1.1 for both cities), number of urban cells within a 5*5 cell window (with odds ratios > 1.1 for both cities), and, (3) population density (with odds ratio < 1.0 for Nuevo Laredo and odds ratio >1.0 for Laredo) and (4) number of highway cells within a 5*5 cell window (with odds ratios > 1.0 for both cities). Results demonstrate that in terms of driving factors for urban expansion, highway density was more important than the urban cluster density for urban expansion in Laredo, while access to existing local transportation infrastructure and urban clusters were the primary driving factors of urban expansion in Nuevo Laredo.