Class Project Information
Transportation Methods
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Objectives: The objectives of this project are twofold: 1) to introduce you to graph network analysis techniques, and 2) to give you experience in taking a project from conception through completion.

Study Area: The class project study area is the dry puna region of northern Chile. This region is very remote and has a limited road network. Very few paved roads can be found in the region, and those that are paved extend from the Chilean coast into Bolivia. These paved roads form a link that connects Bolivia to the Chilean ports of Arica, Iquique, and Antofagasta. Our study will be limited to the puna region. The puna is the high plains (altiplano) that separates Chile and Bolivia. There is very little rainfall and the terrain is extremely rugged. Population density is very low, confined to a large number of very small villages (10-100 people) and a few small towns (> 500 people). The population is primarily indigenous Aymara who have limited access to automobiles. Travel through the region is light, except for those few paved roads connecting to the Chilean ports, and even these roads are lightly traveled relative to more developed areas.

Figure 1: Graded dirt road in the Chilean puna.

Goals: The goals of the project are to 1) determine the overall network characteristics of the puna road system, 2) map accessibility within the study area using the techniques learned in class.

Project Deliverables: There are several project deliverables from the class as a whole, the most important being the matrices and maps…specifically, connection and distance matrices in Excel format, results matrices in Excel format, and a series of results maps for the study area. The results maps can be provided in a variety of forms; for example, accessibility of locations (point maps) or area accessibility (interpolated surface maps). Each student will also provide a short report (5 pages) on their specific work addressing what area they were responsible for and detailing the issues that arose. Each student will have to include individual accessibility maps and matrices for their area.

Project Specifics: This project will require all students to work individuals and together. Meeting as a group during class is strongly encouraged. Since all links and node will have to have unique identifiers, it is important to have a clear understanding of the ID system prior to doing any work. If there are any questions or issues please contact me before proceeding. The project will have several distinct phases:
1. Assignments of areas and area assessment.
   a. An initial assessment of the level of work required for each area should be done before work begins.
2. ID system.
   a. I will give class the ID system to use and it is important the everyone follows the system.
   b. We will develop a road category system for coding roads.
   c. We will determine what roads should NOT be digitized.

3. Digitizing the roads.
    a. Roads will be digitized in Google Earth and saved as individual KMZ files.
    b. These KMZ file will be imported into ArcMap.
4. Generating working maps.
    a. Working maps will be printed out based on the digitized roads.
5. Matrix development
    a. Each student will generate a connection and distance matrix.
    b. These matrices will ultimately be merged into region-wide matrices.
6. Analyses
    a. Graph techniques will be used to generate accessibility results.
    b. These results will be added to ArcMap files.
7. Results mapping.
    a. Accessibility maps will be produced for each area and the region as a whole.

The results from this class will be merged with results from previous classes, so it is important that the output be consistent. This project is part of a long-term project on Andean accessibility, so it is vital that the techniques used, the output generated, and results be done in a professional manner.