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December 19, 2010

Radford University Commuter Study – Carbon Footprint – Spring Semester 2010

A. Purpose

To develop the basis for calculating the Carbon Footprint of Commuting Students to Radford University.

B. Methodology

Registered commuting students, e.g. those who had purchased a ‘commuter tag’ (hangtag for mirror in car - that would allow them to park their vehicle on a commuter student parking lot) was supposed to be the foundation for estimating the total mileage driven by these students during one semester (Spring Semester 2010) to derive at the Carbon Footprint of this group of students. Students purchasing such parking permits supply some data at the time of purchase.

The data for this study was supplied by Dr. Debra Templeton and her team in Institutional Research. The data was supplied as a spreadsheet with names removed, leaving primary and local addresses. I was informed that the data had not been “cleaned” and that, except for removal of addresses, it was “raw” data. The dataset contained some students with on-campus addresses who had purchased commuter stickers. The data also contained fields with information on the day of the week when the individual attends classes.

The data was cleaned to some degree (with assistance of the Registrar in one case, in using deductive reasoning in others), while acknowledging that the data is less than perfect to begin with.

The dataset was separated into “local addresses” (according to the information provided) and “primary addresses”, with those removed from “primary addresses” if it matched the “local addresses” (to avoid counting the mileage twice).

The cleaned datasets were subsequently moved into the GIS (ArcGIS vs. 10) for “geocoding” of all addresses (= map each address location using U.S. Streets format). Since spelling mistakes are made, some re-matching of initially unmatched addresses had to be done one a one-by-one basis. Some addresses were P.O. boxes – in those cases the post office where the P.O. Box is located was mapped as the address.

Of all addresses that were subjected to geocoding, only two had no matches and had to be dropped from the study. In those cases where the primary address was

outside of North America (Turkey, France, South Africa, Serbia), I substituted Roanoke Airport and assigned one round-trip from RU to the Roanoke Airport to each respective address. The same was done for addresses in the U.S.A. and Canada, if the location of the address was beyond 800 miles (road mileage). The appended maps show (Map 1: Distribution of all commuter student addresses, and Map 2: Distribution of local addresses of commuter students).

A location matrix was then constructed and calculated on the basis of a recent (July 2010) dataset of North American Streets to enable measurements along shortest distances on primary roads. This provided the GIS software with the appropriate basis for distance calculations.

The geocoded addresses were then subjected to a distance calculation, with the center of RU being the point of origin and the respective address being the point of destination.

The mileage for each address' distance from RU was added to the tables for geocoded addresses and the data was then exported from the GIS software to a spreadsheet format.

Each address was examined individually with its calculated distance from RU, so that number of trips per semester could be calculated (on the basis of the number of days per week the student has classes on campus). This was done for each dataset (local addresses only and primary address if different from local addresses).

Whenever a record showed that there were zero times/week to attend classes, one round-trip to campus was indicated per semester.

Whenever primary addresses had a distance of less than 75 miles (and no local address), it was taken as commuting from that distance to RU. If the distance was greater than 75 miles, it was assumed that there would be 2 round-trips per semester, and that there is a local address which is not indicated in the database. There are 14 weeks per semester, so 14 round-trips per semester for each day that classes were attended per week.

The result of the distance calculations are as following: (for Spring Semester 2010)

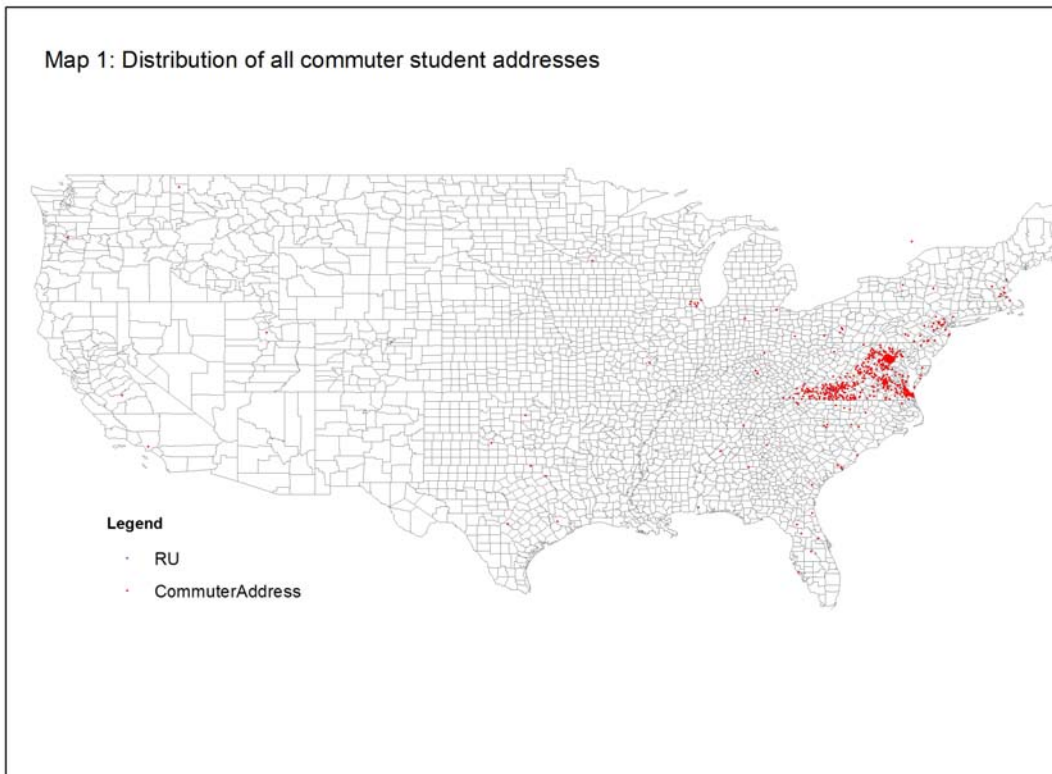
Total distance commuted from local addresses:	209,484.2 miles.
Total distance commuted from primary addresses:	2,690,171.7 miles.

The combined total distance for the records in this database: 2,899,655.9 miles.

EPA published the most recent update of "Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2010" in November 2010 (EPA-420-R-10-023). According to this the "fleetwide average

adjusted (or real world) MY2009 light-duty vehicle CO² emissions value is 397 g/mi, which is a 27 g/mi reduction relative to MY2008 and an all-time low since the database began in 1975.” (Source: EPA-420-R-10-023, Executive Summary, p. ii). The same federal agency in December 2010 (<http://www.epa.gov/otaq/cert/mpg/fetrends-archive.htm>) states in a release updated on December 17, 2010 that the CO² emissions for MY2009 has a projected value on 422 g/mi (p.1).

Under the assumption that the majority of the vehicles driven by commuting students are light-duty vehicles, this implies (using the figure of 397 g/mi that RU commuter students produced 1,151,163.3 kg of CO² (= 1,151.1633 metric tons) in Spring Semester 2010.



Map 2: Local addresses of commuter students

