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Exploring transportation equity: Development and application of a transportation justice framework



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ABSTRACT

Recent efforts to emphasize social equity in transportation are emerging as local, regional and national governments have set initiatives to identify, existing and potential, disproportionate impacts to low-income and minority populations, also referred to as transportation justice (TJ). Currently, there are suggested methods for identifying transportation justice areas; however, there is no streamlined method instituted across transportation agencies. Each jurisdiction identifies transportation justice (or environmental justice) areas based on their own methodology, typically based on either average regional thresholds, graduated thresholds, or a more unique in-house index methodology. This research explores and evaluates existing methods and develops a rigorous and comprehensive method called the Transportation Justice Threshold Index Framework (TJTIF) using Geographic Information Systems (GIS), as well as factors based on demographics, socio-economics, and transportation/land use. The framework is applied to a case study region in Pennsylvania reflective of the Marcellus Shale impact area, highlighting Sullivan County, PA. The methodology and the case study application serve as an example for how transportation agencies throughout the country can promote social sustainability and enhance transportation equity.

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1. Introduction

Interest in sustainable practices throughout the transportation engineering sector continues to rise, and as a result, pressure to adopt more equitable, environmentally-friendly and affordable mobility, is necessary. In order to support the issue of social equity, transportation agencies are looking to environmental planning strategies to identify and avoid impacts (disproportionately) to low-income and minority populations, also referred to as environmental justice (EJ) areas (Rock et al., 2014). In 1993, the National Environmental Justice Advisory Council was established to provide recommendations to the Environmental Protection Agency on emerging issues, and since then, efforts to bridge EPA recommendations with the transportation sector have grown (EPA, 2014). More recently, the Federal Highway Administration has begun to promote environmental justice guidance for local transportation planning agencies as well as state Department of Transportation agencies through training, workshops and case studies (FHWA, 2014a). As a result, Department of Transportation (DOTs) agencies and Metropolitan Planning Organizations (MPOs) throughout the country have begun to focus on transportation justice (EJ applied to transportation planning) as a key component of their planning process.

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1.1. Motivation

Currently, there are guidebooks and suggested methods for identifying transportation justice (TJ) areas; however, there is no formal method for evaluating TJ areas across the country. Each jurisdiction identifies TJ (or EJ) areas based on their own methodology, typically based on average regional thresholds, graduated thresholds, or a more unique in-house index methodology (Parsons Brinckerhoff, 2004). The factors used for the existing methods tend to be focused on easily accessible demographic data (such as income level, and number of people per household); however, the opportunity to incorporate more specific travel data into the analysis is needed.

With agencies using a variety of methods and factors, consistency as well as the opportunity for comparison, is lacking between jurisdictions. Also, since a variety of methods are being used, the validity as well as rigor of the TJ plans can vary amongst the jurisdictions. As a result, there is a need to evaluate existing methods as well as an opportunity to develop a new, formalized method that expands the traditional EJ definition to transportation, using Geographic Information Systems (GIS).

1.2. Objectives

The primary objective of this research is to develop a formalized method for identifying transportation justice (TJ) areas using socio-economic factors correlated specifically to transportation mobility. The development of the Transportation Justice Threshold Index Framework (TJTIF) draws on existing methods, and tools developed by federal, state, and local transportation agencies in order to develop a more rigorous approach to identifying EJ populations (beyond the traditional demographic data currently used). A case study application based on Pennsylvania counties within the Marcellus Shale impact area (Bradford, Clinton, Lycoming, Sullivan, Susquehanna, Tioga, and Wyoming), with a spotlight on municipalities in Sullivan County, PA, is used in order to explore application to a real world network. The results of the case study provide the opportunity to enhance transportation equity within the region, as well as serve as an example for how agencies can apply TJTIF as part of their long range transportation planning process.

1.3. Research methodology

The following methodology is used to complete the research objectives:

1. Inventory existing EJ methods (transportation as well as other applications) through literature review.
2. Identify existing factors used for EJ areas and correlate to GIS databases/sources (publicly available) for spatial analysis.
3. Identify additional socio-economic and transportation factors not currently included in existing methods and correlate to GIS data layers.
4. Develop a rigorous GIS-based TJ method specific to transportation, Transportation Justice Threshold Index Framework (TJTIF), based on average regional thresholds (ARTs) and index values.
5. Apply the proposed TJTIF method to a case study region (Marcellus Shale impact area including seven counties and highlighting Sullivan County, PA) to determine applicability, as well as identify framework improvements.
6. Analyze the case study results based on location (regional differences) and identify future correlations to transportation-related issues such as Marcellus Shale impacts.
7. Identify future work including expansion of TJTIF and recommendations for agency application.

The results of this research will be beneficial not only to the local jurisdictions included in the case study, but also regionally, as the process is applicable throughout the country. Streamlining the process will allow for comparison between jurisdictions, opportunity for spatial analysis, as well as a rigorous identification of EJ populations as they apply to transportation and mobility.

2. Background

The following section includes a literature review on environmental justice, transportation equity, as well as current efforts by transportation agencies to address social sustainability. In addition, existing methods and factors used in identifying environmental (or transportation) justice regions are explored.

2.1. Transportation equity and environmental justice

Interest in sustainable practices throughout the engineering sector continues to rise, and as a result, pressure to adopt more equitable, environmentally-friendly, and affordable mobility is necessary. A balance between these three principles is required in order to achieve sustainability; however, there is a stronger focus on environmental criteria and system performance rather than on economic criteria and social objectives (Oswald, 2012). In order to equally balance the goals of the triple bottom line of sustainability (environment, economics, and society), environmental justice efforts that build on social equity principles are emerging (Rock et al., 2014).

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