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MULTICRITERIA ANALYSIS FOR EVALUATION OF BIKE LANE ROUTES INTEGRATED TO PUBLIC TRANSPORTATION

Silva Ana*, Ilce Pinto, Denise Ribeiro, Juan Delgado

Transport Department, Polytechnic School, Federal University of Bahia

Abstract

The integration of the bicycle with the passenger public transportation is efficient to increase the sustainable urban mobility strategy and improves quality of life. The objective of this paper is the development of a method to assist in evaluating the "best" cycling route integrated to public transportation and to consider among other criteria, the factors of individual choice of cyclists. To validate the proposed method was used as case study Mussurunga Station, Salvador, Bahia, Brasil. The results showed that in the perception of the cyclist the main criteria that influence the choices of their paths are related to safety aspects.

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Keywords: Bicycle, modal integration, cyclist Perception, focus group, multi-criteria analysis.

1. Introduction

From the accelerated industrialization in Brazil, which had its starting point in 1950, there was the phenomenon of rural exodus and according to IBGE (2010), 84.36% of the population live in urban areas nowadays. This reality has caused, especially in large Brazilian cities, unplanned population growth, resulting in irregular housing in peripheral areas far away from the business centers. Among the problems with this unplanned urbanization, there has been increasing demand for transport with increasing need for commuting.

Within this context, unlike what is happening in developed countries like the Netherlands and France, which developed to encourage the use of public transportation and increasing ease to integrate bike policy, Brazil still maintains a policy of

* Salvador, Bahia, Brasil. Tel.: +55-071-3283-9880; fax: +55-071-3283-9880.
E-mail address: abezerragualuz@hotmail.com

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encouraging the automobile over the collective and non-motorized modes, resulting in an unsustainable mobility, with daily traffic, major traffic jams and consequent degradation of environmental conditions and public spaces.
Salvador, city chosen for the study of this work, is embedded in this reality. With a population of 3,642,682 inhabitants (IBGE 2010) corresponding to the third most populous city in Brazil, it has a transit almost always congested, public transportation service with low quality, which supply cannot meet the needs of population displacement. Facing this situation the Municipality of Salvador has developed an Integrated Transport Plan which proposed an Integrated Transport Network (RIT), with the deployment of two subway lines under construction, integrated with the bus mode. However, the integration of this network with non-motorized modes provides only the implementation of bicycle and bicycle racks without dealingwith the paths that allow access for cyclists to the stations.
In Brazil, in the National Policy on Urban Mobility, there are some steps to get a sustainable city, they are: encouraging the use of public transportation, the priority of non-motorized transportation modes on motor, promoting sustainable development with mitigation of environmental and socioeconomic costs of displacement of people and cargo in cities, discouraging excessive use of the automobile, the integration between different modes of transportation, the integrated planning of land use and transportation and design of public spaces to encourage the use of non-motorized transportation (BRAZIL, 2012).
The article presented here is part of a research project developed by CNPq-Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq MCT/CNPQ Project 18/2009), entitled *Methodology for deploying Integrated Collective transport Cycling Network in Brazilian Cities*, whose aim was to establish a methodology for deploying integrated cycle network to public transportation in Brazilian cities. This project has the participation of three Brazilian metropolises and it has been developed by the Federal University of Pará (UFPA), Federal University of Bahia (UFBA) and Federal University of Pernambuco (UFPE).
The purpose of this article is the development of a method to assist in the evaluation of "best" cycling route integrated to public transportation that considers, among other criteria, the factors of individual choice of cyclists. Is divided into four sections: section 2 presents an overview of published works on the bike theme, while Section 3 deals with the methodological approach discussed in this work, also Section 4 presents a case study conducted in the city of Salvador, and section 5 presents the main conclusions.

2. Literature Review

There are several studies on the use of bicycles, especially those developed in foreign countries and few studies in Brazil on the bike theme.
Of the studies done in foreign countries, the main ones are:
In Texas - USA, Sener et. al. (2009) sought to identify and assess the importance of attributes that influence the choice of bicycle use and of cycle routes. Among these attributes stand out features of the cyclist, pathways and parking. The results of the study highlighted the importance of a comprehensive evaluation of attributes and data on cyclists to decide on the choice of cycle routes. The practical results indicate that the travel time and volume of motorized traffic are the most important attributes in choosing of cycle routes, as well as the amount of traffic signs, speed limits and characteristics of parking.
In a survey conducted in New Zealand, Tin Tin et. al. (2009) investigated the attitudes of 2,469 cyclists in relation to environmental policies and measures to encourage the use of bicycles for travel to work. This study concluded that the majority of respondents cyclists (88%) indicated the bike lane as an important infrastructure to increase bicycle use and 38% cited the encouragement of public bicycle rental systems. Those traveling by bike at least once a week to work cited a few points that encourage this use: increased fuel prices (41%), lower amount of parking for cars (27%), increasing the price of these car parks (25%).
In a survey developed by Su et.al.(2010) whose goal was the route planning to promote bicycle travel to the metro in Vancouver, Canada, a program of cycle routes was made using the Google Maps interface. This tool allowed the user to retrieve optimal routes for bicycle based on their own references. The use of this tool besides helping to promote cycling trips integrated to public transportation, it also contributed in reducing the number of car trips (2010).
In U.S.A, McLaughlin and Glang (2010) evaluated the effect of cycling on 206 elementary students through a computer program called Bike Smart. This software aims to teach safety behaviors for cyclist children. This research demonstrated that in addition to being low cost, the program was effective in training these children to safety.
In Holland, Heinen et. al, (2010) analyzed the influence of the attitudes of cyclists on the benefits of cycling as lower vehicle cost and benefits it brings to health. This work concluded that the habit of cycling increases the likelihood and frequency of