

User Perception Assessment in Erode City towards the Implementation of Public Bicycle Sharing as a Sustainable Transportation System

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ABSTRACT: All over the world, administrators are looking to implement transportation systems that are sustainable in the long run as the present transportation systems are non-sustainable. One of the sustainable transportation systems is the bicycle transportation. Public bicycle sharing system, one of the sustainable bicycle transportation systems has been implemented successfully in many cities around the world. The current paper aims to present the willingness and perceptions of people in Erode city, study area considered for the present research towards implementing a public bicycle sharing system using a questionnaire survey technique. The survey results indicated that 82% of the respondents were willing to use the public bicycle sharing system if it implemented in the study area and 63.2% of the respondents wanted to access the bicycle stations within 250m to 500m. 78 bicycle stations selected within the study area were able to cover 28.52sq.km of the study area considering a buffer analysis distance of 500m from the bicycle stations. The results of the study can be used as a primary planning tool for implementing a successful public bicycle sharing system in the study area.

KEYWORDS: Sustainable, Public bicycle sharing, Questionnaire survey, Bicycle stations, Buffer analysis, Planning

I. INTRODUCTION

Transportation is a basic need of people. People use various transportation modes to satisfy their mobility needs. Bicycle is one of the transportation modes available for people. But the share of bicycle in the overall mobility of people is very less compared to the motor vehicle. The bicycle is not preferred by people in cities and urban areas. This can be mainly attributed to the lack of transportation facilities required for bicycle riding in the form of exclusive bicycle lanes, proper sheds for bicycle parking. Bicycle sharing systems as a part of sustainable transportation systems have been tried in many metropolitan cities all over the world. Bicycle sharing system is a public transportation system wherein public has access to bicycle available in bicycle stations at various parts of a city. A person willing to avail the services can pay the user charges normally fixed at per hour rate. The person availing the service can take bicycle from one station and can leave the bicycle in any other station within the city [1, 2]. For implementing a successful public bicycle sharing system in any city, it is necessary to study the perception of people in that city towards the use of bicycle as a transportation mode, the user charge preference, the nearest location of bicycle stations, frequency of use of the facility, etc.. The present study aims to assess the perceptions and the willingness of people in Erode city towards implementing a successful public bicycle sharing program as a form of sustainable transportation system.

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II. Materials and Methods

2.1. Study Area

The study area considered for the present research work is Erode city. It is one the Tier II cities located in the western part of Tamil Nadu state of India extending over an area of 110sq.km. The city had a population of 4,98,121 as per the Census 2011 and the population density was 4,548 persons per sq.km. The city is an important textile, commercial and agro based industrial center. Owing to the location on the banks of two major rivers, Cauvery and Bhavani and also the proximity to Coimbatore and Salem, two major industrial cities in Tamil Nadu, the growth potential of the city is very high. The city is administered by the Erode City Municipal Corporation. Erode city, being the district center of Erode District houses many important administrative offices, educational institutions, major hospitals and trade centers [3, 4]. The study area is depicted in Figure 1.

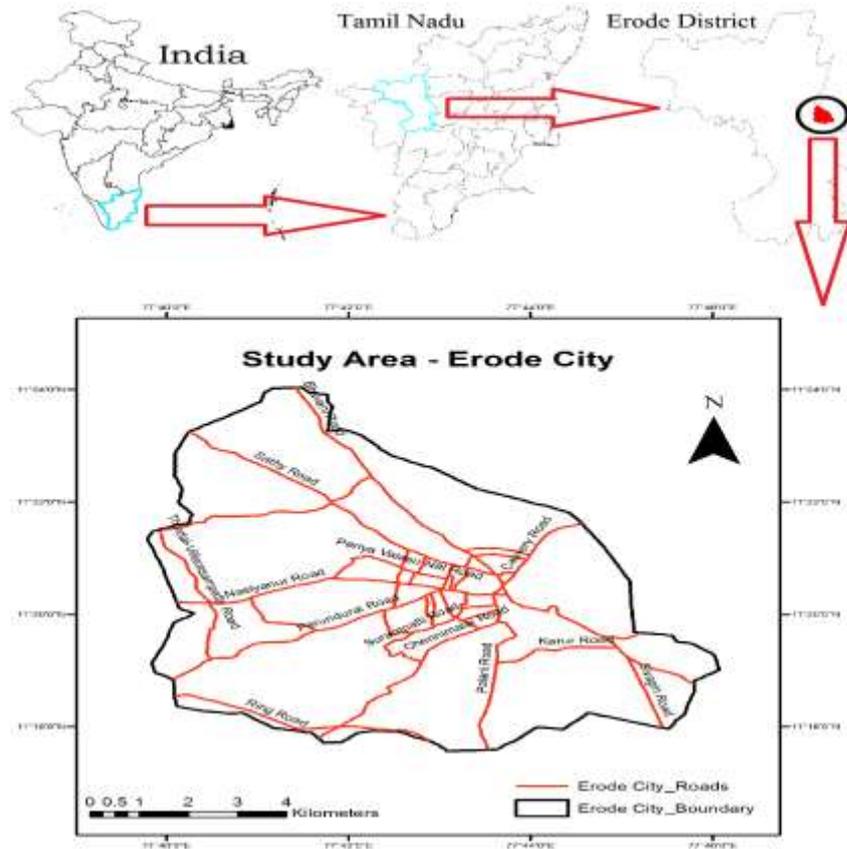


Figure 1. Study Area Map

2.2. Methodology

The methodology adopted for the current research work included conducting a public questionnaire survey to determine the preference of people in the study area in using a public bicycle sharing system if it is implemented. The questionnaire survey was conducted to cover various types of end users including the essential and non-essential commuters. The research work also focused on identifying the suitable bicycle stations within the study area using the GIS technique. The locations of the bicycle stations were mapped in GIS and a buffer analysis was conducted to determine the total study area covered by the selected bicycle station locations. The study also suggested the implementation strategies required to be implemented by the nodal agency, Erode City Municipal Corporation for the successful implementation of the proposed public bicycle sharing system.

2.3. Public Questionnaire Survey

A public questionnaire survey was conducted within the study area to understand the perceptions and willingness of people in implementing a public bicycle sharing system in the study area. The questionnaire was based on the similar questionnaire type survey conducted by Lincoln/Lancaster County Planning Department for implementing a Bike Share programme at Lincoln in USA during 2014 [5]. A total of 228 people representing 0.05% of the population of the study area were surveyed. The sample represented different types of commuters like daily and occasional commuters. The daily commuters included regular office going people, students, shopkeepers, low wage daily workers. The occasional commuters included the people visiting markets for buying products, people visiting government offices, banks, religious institutions and hospitals. The sample also represented people of different age groups ranging from 14 to 65.

III. Results and Discussions

3.1. Questionnaire Survey Results

The questionnaire survey conducted to determine the perception of people in the study area towards implementing public bicycle sharing system in the study area included questions related to personal commuting activities, commuter’s perception and preference about a public bicycle sharing system. The results are indicated in the Figure 2 & 3.

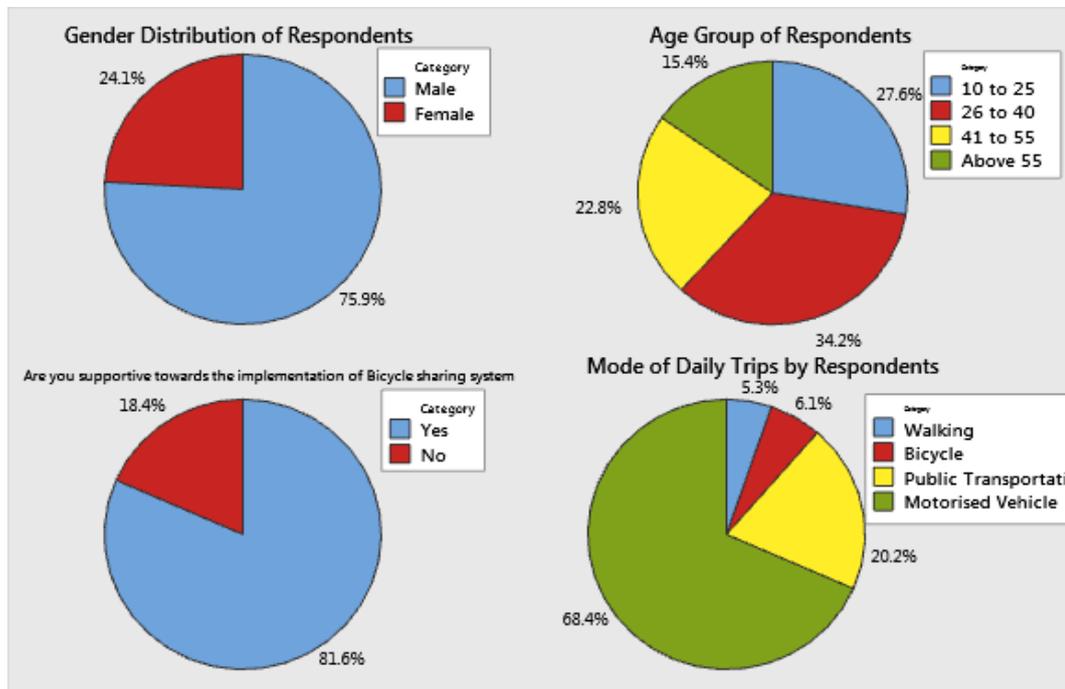


Figure 2. Piechart 1 of Respondent Results

Among the 228 respondents, 176 were male (77.2%) and 56 were female (22.8). This represented a good sample considering the fact that most of the office going and low wage workers are male. The age group of the respondents indicated that 63 (27.6%) were aged between 10 and 25, 78 (34.2%) were aged between 26 and 40, 52 (22.8%) were aged between 41 and 55 and 35 (15.4%) were aged above 55. 186 respondents (81.6%) indicated that they are supportive towards implementing a public bicycle sharing system in the study area, whereas 42 respondents (18.4%) were not supportive towards it. Among the respondents, only 6.1% (14 respondents) were using the bicycles for their daily trips. They were mainly schools going students and low wage daily workers. 12 respondents (5.3%) were using walking as their mode of travel, while 46 respondents (20.2%) were using the public transportation system and 156 respondents (68.4%) were using personalized motor vehicle in the form of car, motorcycle or motor scooter.

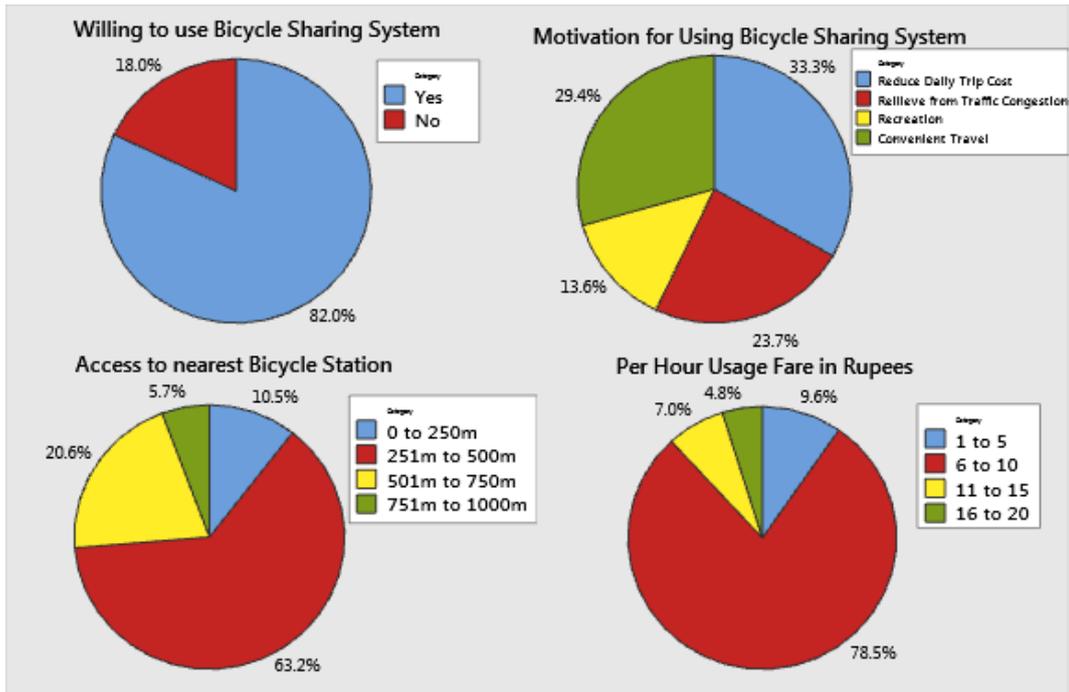


Figure 3. Piechart 2 of Respondent Results

187 (82%) of the respondents were willing to change from their present mode of travel and start using the bicycle sharing system if it was implemented. The remaining 41 (18%) of the 228 respondents replied that they wanted to continue their present mode of travel even if the bicycle sharing system is implemented. 144 (63.2%) respondents wanted a bicycle station within 251m to 500m from their houses or workstations. 47 respondents (20.6%) wanted a bicycle station within 501m to 750m, while 24 respondents (10.5%) wanted a bicycle station within 0 to 250m and 13 respondents (5.7%) were willing to use a bicycle station within 751m to 1000m. 179 respondents (78.5%) wanted the per hour usage fare of the bicycle system to be fixed between Rs.6 to Rs.10. 22 respondents (9.6%) wanted the fare to be fixed between Rs.1 to Rs.5, while 16 (7%) respondents were willing to pay between Rs.11 to Rs.15 as per hour usage fare and 11 (4.8%) respondents were willing to pay a per hour usage fare between Rs.16 to Rs.20. 76 respondents (33.3%) indicated that they were willing to use the public bicycle sharing system to reduce their daily trip cost, whereas 67 respondents (29.4%) were willing to use for the convenient travel offered by the system. 54 respondents (23.7%) wanted to use the public bicycle sharing system to get relieved from traffic congestion problems, while 31 respondents (13.6%) were willing to use the system as recreation purpose. The survey results indicated that people in the study area were supportive about implementing a public bicycle sharing system.

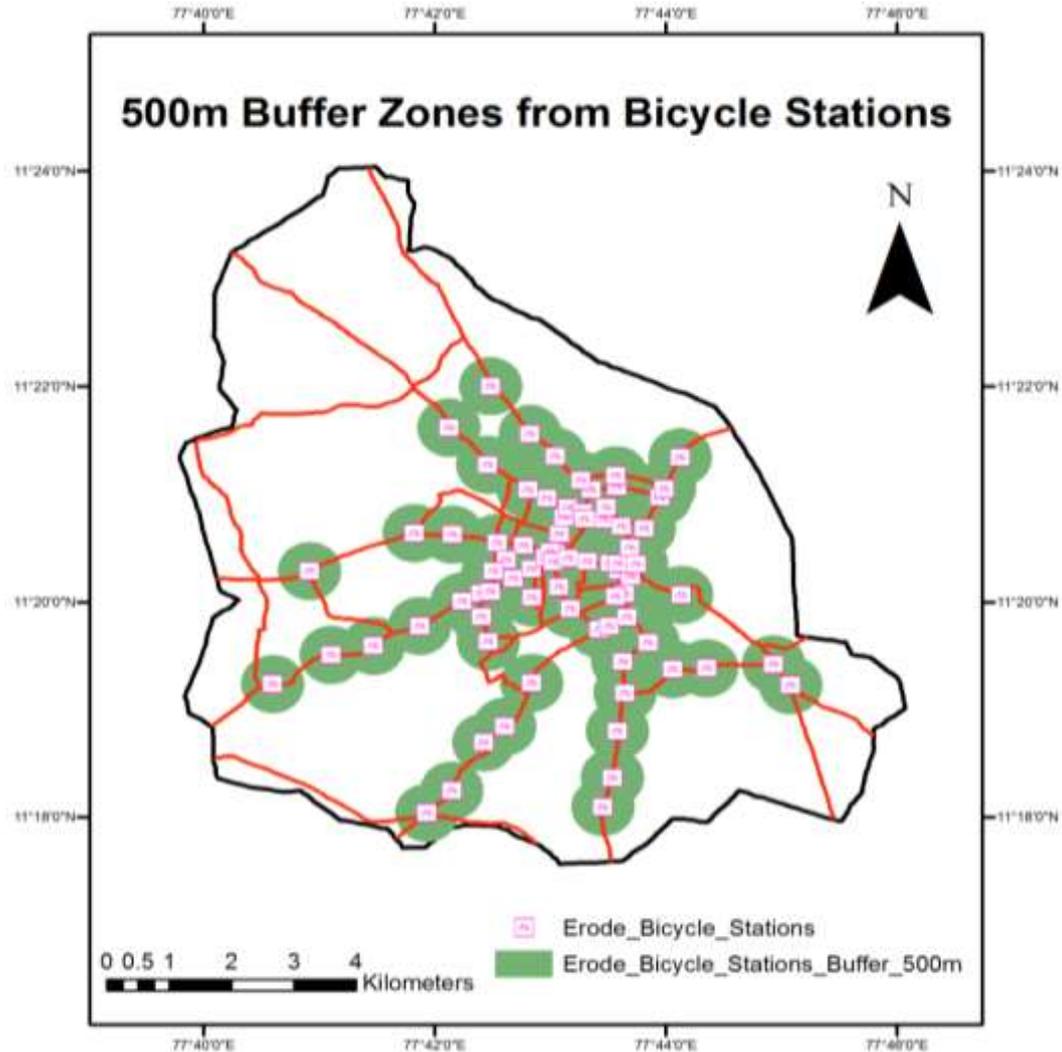


Figure 4. GIS 500m Buffer Analysis Result

3.2. GIS Analysis Results

For the purpose of locating bicycle stations in the study area, a reconnaissance survey was conducted to identify the suitable locations to establish the bicycle stations. 78 locations were identified in the study area for establishing the bicycle stations. The locations were selected based on the available area to set up bicycle stations, the importance of the location with respect to the presence of government offices, bus stops, market centers, schools, major hospitals, etc.,. Easy accessibility to the selected locations was also one of the major factors in selecting the locations for the bicycle stations. The GPS locations of the selected bicycle stations were recorded using the Mobile GPS and the spatial data of the locations were analyzed using ArcGIS. Buffer analysis was conducted for the selected bicycle stations for 500m, 750m and 1000m. The results of the 500m buffer analysis indicated that 28.52sq.km of the study area would be covered by the 78 selected bicycle stations when the accessibility to the bicycle stations was fixed at 500m. The result of the 500m buffer analysis is indicated in Figure 4. Similarly, the buffer analysis results indicated that 42.21sq.km and 53.62sq.km of the study area would be covered by the 78 selected bicycle stations when the accessibility to the bicycle stations were fixed at 750m and 1000m respectively. The results of the 750m and 1000m buffer analysis are indicated in Figure 5 and 6.

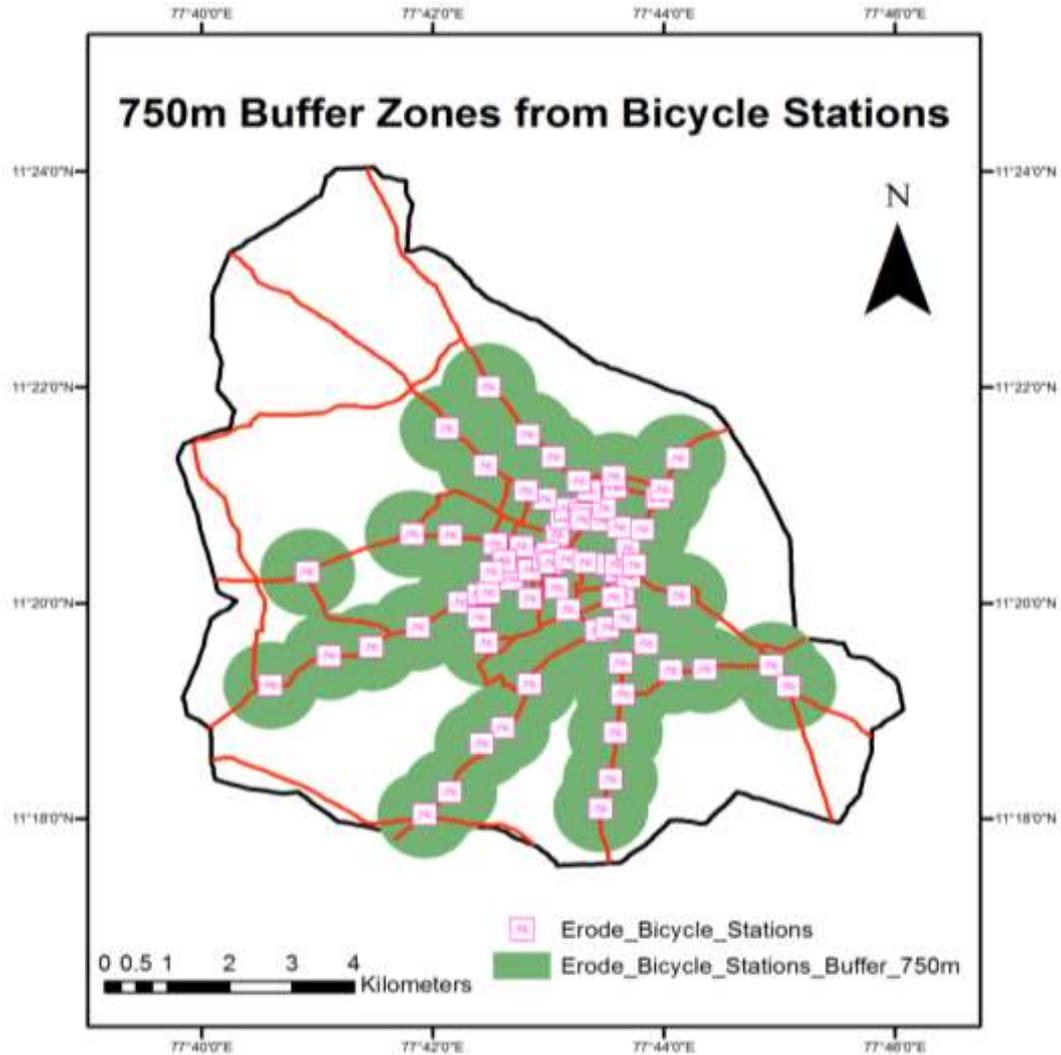


Figure 5. GIS 750m Buffer Analysis Result

IV. Conclusions

The current research work aimed at identifying the perception and willingness of people in the study area using the questionnaire survey technique for implementing a successful public bicycle sharing system. The questionnaire survey method was very useful in identifying the viewpoints of people and it was evident from the results that people were willing to use a public bicycle sharing system. The accessibility to the nearest bicycle station and the per hour usage fare are the two main factors to be considered during the planning of a public bicycle sharing system in order to ensure a higher usage of the system by the people in the study area. More people would be using the public bicycle sharing system if the bicycle stations are easily accessible at 500m from their houses or workplaces and the per hour usage fare of the bicycles is fixed between Rs.5 and Rs.10. If the bicycle stations are accessible within 500m, around 28.52sq.km of the study area can be covered by the public bicycle sharing system. Erode, being one of the cities selected for the smart city mission of Government of India will surely be benefitted through the implementation of a public bicycle sharing system. Authorities of the Erode City Municipal Corporation must ensure that a public bicycle sharing system which is the most sustainable transportation system is implemented in the study area to progress in the path of sustainable development.

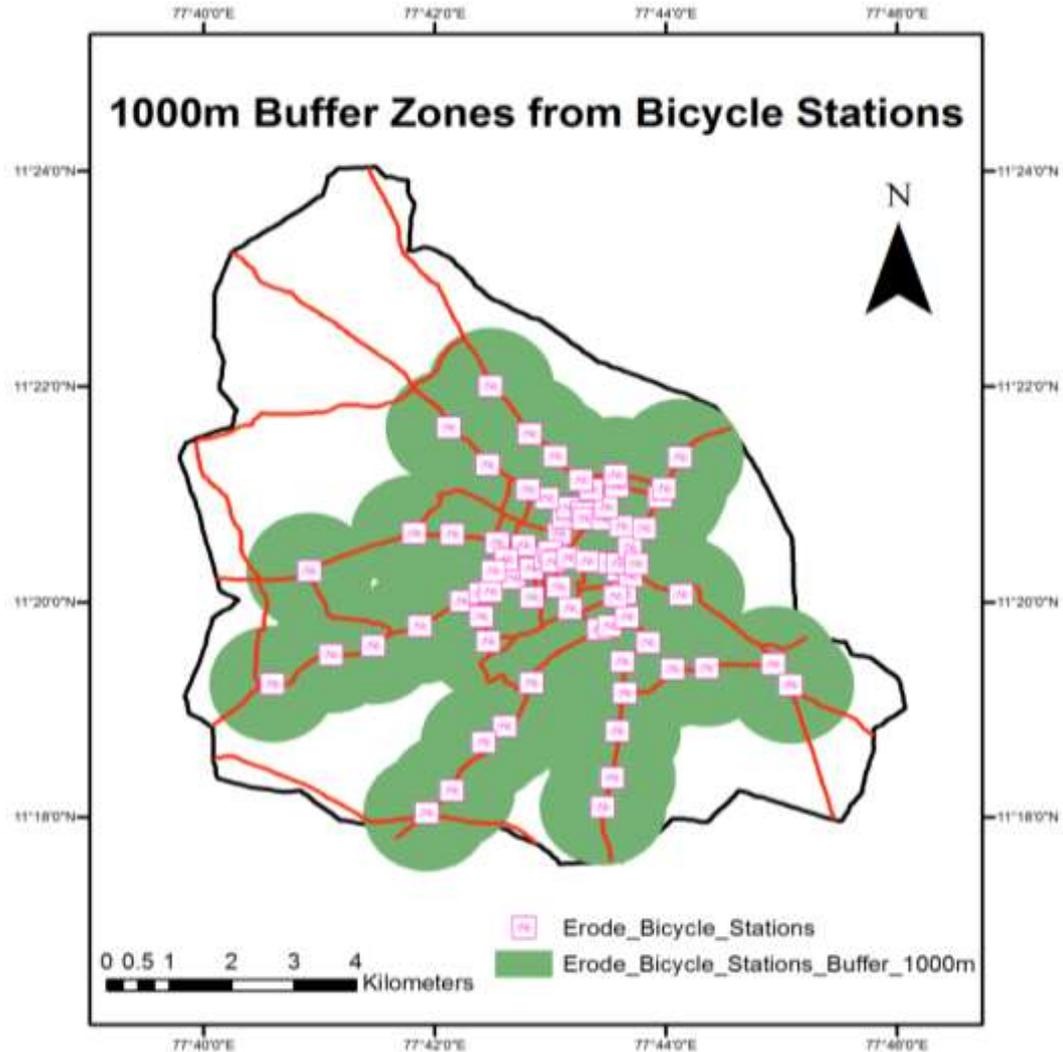


Figure 6. GIS 1000m Buffer Analysis Result

V. REFERENCES:

1. Ministry of Urban Development, “Public Cycle Sharing Systems: A Planning Toolkit for Indian Cities”, Government of India, New Delhi, (2012).
2. A. Vassi and T.Vlastos, “Bike Sharing Systems, Effectiveness, Impact and Assessment”, Proceedings of the European Transport Conference, Association for European Transport, Frankfurt, (2014).
3. CDM Smith India Pvt. Ltd., “Erode Comprehensive Mobility Plan”, Erode City Municipal Corporation, (2014).
4. Urban Management Consultants, “Final Report – CDP for Expanded Erode City Municipal Corporation”, Erode City Municipal Corporation, (2013).
5. Lincoln/Lancaster County Planning Department, “Bike Share Public Participation Report”, (2014).