

## The use of Non – Motorized Mode for Sustainable Mobility and Cycling Project: A Special Reference of Jaffna City in Sri Lanka

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### Abstract

Cycling is increasingly recognized as a sustainable mode for society, economy and environment which is reducing harmful impacts of using motorized vehicles. Importance of these advantages of the cycling, it is a worldwide recognition that should be advocated for environmental sustainability and individual health. A variety of aspects may cause for

Cycling usage in every cities. In this research, urban structures and infrastructure aspect was chosen in the context of Jaffna City to discuss how this aspect influence on cycling usage and identify the project in spatially using space syntax software and Geographical Information System (GIS). Recommendations are given for better project to implement the sustainable cycling mode in Jaffna City of Sri Lanka.

**Index Terms:** Cycling, Road Network, Urban Structure, Space Syntax

### 1. Introduction

The urban structure and road network under the infrastructure plays an effective role in providing integrated activities. Riding a bicycle is an idyllic way to get together people and a developmental milestone in a human living. It symbolizes fun, freedom, fitness or strength of body and fresh air. Cycling can be without difficulty integrated into everyday life, through riding to school, to work, to shops and to other social actions. It is the one activity that has the

possible to make the single biggest impact on the health and wellbeing of the city and has a major part to take part in addressing the city's growing problems in related to transportation. Cycling is a necessary life skill and ability, which provides opportunities for people to contribute in physical activities and functions for their life.

The development of the bicycle culture in the Jaffna since the past decades shows that there is

lot of potential and high usage which is interconnected with their daily lives which is very popular in Jaffna City, the capital city of the Northern Province of Sri Lanka and a very important part of daily traffic.

High percentage of trips done by bicycle and significant increase in bicycle use compared to the mobility and traffic flow survey in Jaffna Urban Area is significant. Almost all the households in the study area own at least one bicycle, which is an important means of transport. Bicycles are used as a main mode and entertainment source for a majority of the households.

Urban structure is contained of three components such as space, movement and form. Space is the underlying landscape, the natural features and topography of an area. Space influences on the look and character of the area or region and neighborhoods. The road pattern and its infrastructure facilities which are exist upon the land base. Movement is the system of roads, sidewalks, cycling paths and walking ways as well as the road infrastructure and its services they accommodate. Form is the range of the road types or grade as defined by their physical scale, frame, orientation and length within an area. The interplay between forms is what creates spaces, defines streets and lanes influence on city's skyline.

Components of urban structure provides a framework to guide and influence the development of the individual or collective projects. Those developmental projects provide a framework to ensure that the urban structure is well planned and is able to provide the foundation for a livable urban community which delivers best services for the citizen that meet people's daily needs and better transportation system that connect neighborhoods, other urban spaces and areas of the city and the border region. These will create the high quality and well maintained public realm and private realm.

Jaffna city was identified as a rapid growing single agglomeration city (Francoise Clottes, 2015) but City core is completely taken over by uncontrolled high volume vehicular traffic, informal car parking and unsafe cycling and walking. Traffic jams and uncontrolled on – street parking badly affect the urban space, contribute to the physical decay of the urban environment and constrain retail businesses. Cycling supportive system and provision of a network of cycling routes are absent in the city core which create unsafe and accidents with increasing the bad manners in people' mind about the cycling. However, people are interested to use the bicycle and practice in their day to day life. Therefore, urban structures and infrastructure aspect was chosen in the context of Jaffna City to discuss how this aspect influence on cycling usage and identify the

project in spatially using space syntax software which was carried out from August 2016 and

## 2. Related Work

Urban Structure and infrastructure facilities are most important to the cycling usage. Due to this importance, the author is doing a research, titled

## 3. Scope of the Research

Cycling is a physical and active form of transportation which is practiced more in Jaffna City Region. Therefore, the following objectives are selected to make detail study through this research.

- To explore how urban structure influence on cycling and its impact amongst the local

## 4. Methodologies and Discussion

The Constructivist Approach was used to conduct this research. Primary data were collected by observation, interview, Questionnaire and discussion which were included inexperienced cyclists. Secondary data were collected through the documents review. There were able to collect data from Consumer Finances Socio – Economic Survey of Central Bank of Sri Lanka and evaluation reports from different Institutions.

May 2017.

“An Investigation of Cycling Practices from Socio – Cultural Perspective: A Case Study of Jaffna”. She has a proposal idea to do a research in future regarding Gender perspective and tourism industry in cycling culture.

community in Jaffna based on space, movement and form.

- To study the barriers for strengthening and promoting of cycling practices in Jaffna.
- To suggest future project with strategies in Spatial Planning to promote cycling practices while addressing the existing challenges.

In total, 93 questionnaires were distributed for the study in Jaffna urban area. A reasonable gender balance and age spread was achieved. 33 Semi structured questionnaires were distributed to the bicyclists to know the mode share of travel time and urban structure. 14 total user interviews were conducted for getting details of the cycling and its infrastructure. Basic descriptive statistical analysis was applied to analyze the collected questionnaires' data. The space Syntax analysis was used for the future implication of the

cycling routes and identifying the integration of the local roads using Geographical Information

## 5. Result and Findings

An enhanced urban environment like landscape, the natural features and topography is a positive habitat for the increasing enterprises that one day will become the engines of growth.” its geographical coordinates are 9° 40' 0" North, 80° 0' 0" East. Well planned cities can be centers of innovation, modernization and job creation as experienced in many parts of the world and this is an opportunity for Jaffna to connect people to prosperity. Improving the road network with cycling and walking way system while preserving the city's natural pattern, which have played an important role in traffic management and which could be key to climate change adaptation. These are very important to improve urban services, preserve cultural and environmental assets and improve livability in Jaffna”.

Topography was often cited as a factor influencing cycling practice in a positive way in flatter city of Jaffna. Weather was identified as a positive influence on cycling trips because Jaffna is dry zone area. The provision of easy access to greenery was mentioned by participants as encouraging them to cycle, as they enjoyed the views and fresh air as well as the actual cycling. Some said that a move to an area with more greenery had influenced their

System. This was helped to select the strategies for the future cycling usage in spatial Planning.

decision to start cycling. If it is the nice green surroundings, that make it enjoyable.

Road conditions were mentioned as having a negative influence, with the perception that they had got worse, so making participants' trips more dangerous and uncomfortable. It is terrible because there are no cycle lanes and facilities. It's just not safe. This is also one of the main barriers to use the bicycle. The perceived safety of roads was highlighted as a key barrier to cycling. When asked about specific concerns participants tended to mention the level of traffic, narrow roads and busy junctions. “There really is a lot of traffic around here. Lack of sufficient cycling infrastructure to be the strongest other barrier, Lack of infrastructure and safety are the majority important barriers with score values above 6.0, Lack of safety. Bicycling facilities and on-road facilities like on road signals, dedicated route allocation or share path and cycling rules and policy implementation were not considered in the transportation. Comfort refers as convenience and safety aspects, which includes for example pavement quality, a scenic environment and little traffic. Study found that the most important determinant of cycling for women was their 'level of comfort bicycling'. Although men experienced the high discomfort on average as women, they were more likely to state that they

would ride anyway, whereas women said they would not. Nearly 95.8 percent of the cyclists are feeling discomfort during the bicycling.

Within these feelings of discomfort cyclists, 90 percent of women feel discomfort on cycling.

Table: 01, Pavement Quality of the Jaffna City

No	Cycling Facilities	Yes	No	%
1	Segregated Cycling Lanes		√	100
2	Speed Control		√	90
3	Street Lighting	√		10
4	Parking Provision	√		10
5	Inter sections/ Road crossing on the Roads	√		10
6	Shared Spaces for cycling		√	100
7	20mph Zones		√	100
8	Other Vehicle's Drivers' behavior about cycling	√		50

Within the Jaffna the oldest group also is more experienced due to the influences of the cycling culture, but the youngest group is the most inexperienced group because of the age and inefficient facilities on cycling route. This clearly says that the experience of safety has higher influences in cycle use in Jaffna due to

the high unsafely standards of the infrastructure. Road environments found within Jaffna, varying in road width, traffic volume, traffic function and the absence of bicycle lanes. Cycling infrastructure shows the uncomfortable stage in Jaffna without dedicated cycling paths and infrastructure facilities.

Table: 02, Mean Scores of “How comfortable regarding urban infrastructure would you feel riding bicycle on the following roads”

	Males (n=40)	Females (n=53)	Cyclists (n=60)	Non Cyclists (n=60)	Total Samples (n=93)	Std. Deviation
A – High traffic volume in city core, no bicycle lane	3.65	3.45	3.61	3.54	3.57	0.617
B - Low traffic volume in city core, no bicycle lane	3.25	3.02	3.27	3.03	3.12	0.571

C - High traffic volume in local roads, no bicycle lane	2.93	2.79	2.97	2.78	2.85	0.645
D - Low traffic volume in local roads, no bicycle lane	3.40	3.37	3.61	3.25	3.38	0.531
E – City Core with traffic calming	3.12	3.04	3.15	3.03	3.08	0.615
F – City Core, no traffic calming	2.88	2.65	3.00	2.61	2.75	0.807
G - Local Roads with traffic calming	2.30	1.98	2.33	2.00	2.12	0.693
H - Local Roads no traffic calming	1.40	1.10	1.36	1.15	1.23	0.447

Result indicate that absent of bicycle infrastructure and urban structure on a road is more significant consideration for cycling than the traffic volume on a road and traffic calming, with all high traffic road examples scoring the highest despite examples A and C absent of bicycle lanes or by pass roads. Particularly those offering physical segregation from traffic are still an important factor as roads of similar Opportunities for increasing cycling participation in the survey asked respondents to rate the effectiveness to the road environment, to determine how effective these potential changes would be in encouraging them to cycle more. Only clearly marked, physically segregated bicycle lanes were considered to be effective with a mean score of 4.58 ('effective'). Question 32 asked non-cyclists to consider whether or not they would consider cycling in the future given a significant change in

traffic volume and function. Other supporting finding shows from this analysis that a fear of riding on roads is the single largest barrier to cycling. A comparison between genders once again revealed that females are more risk-averse and sensitive to traffic on roads, scoring all roads for comfort lower than males except for example G.

individual circumstances or the physical environment. Of those who responded (n=58), (77.6%) answered 'yes' to the statement. Majority of respondents (64.4%) identified segregated cycling paths, which was the only significantly recurring theme. Therefore, author has identified cycling path project by using space syntax and Geographical Information System for future implication for the cycling ways. (Map:1)

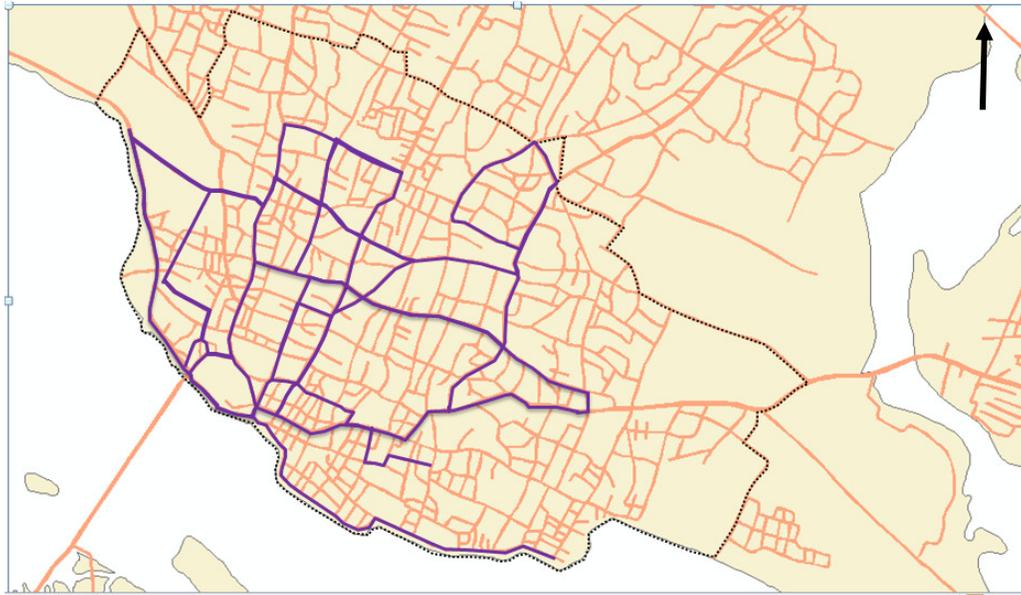
Map:1, Space Syntax Analysis Map for Jaffna Urban Area



Author identified some roads to be created the cycling ways which are based on the medium integration of the roads and other important people gathering places such as public recreational parks, Market cluster, main institutions like hospital and Rail way station,

bus stands, Banks and Temples, historical fort, beaches, university and schools and heritage sites. Nearly 26.25 km distance roads proposed for the cycling lanes projects based on the space syntax map and other collected data analysis. (Map: 02)

Map: 2, Proposed Cycling Paths for future project Implementation



## 6. Conclusions

Jaffna has a most excellent cycling attributes and high cycling stage with polycentric urban structure. Cycling was regarded positively in the sample, recognized as being good for the environment, individual fitness and enjoyed by a majority of respondents. All significant deterrents to cycling in the sample were related

## 7. Recommendation

Cycling friendly policy, improved and comprehensive cycling infrastructure plans good combination between cycling and public transport should be formulated for future activities for the sustainable cycling. Using Motivation approaches and establishing an organizational network, Making Awareness

to negative externalities of sharing the road structure, with feeling unsafe. Results from the survey indicate the perceptions of comfort and safety while cycling on roads is a function of both traffic volume and the degree of separation and absence of bicycle infrastructure on the road between cyclists and motorists, though traffic volume was found to be a more significant consideration for riders.

Programs, doing researches and publishing with proper technical ways, Validate of the Jaffna Mobility Action and Parking and traffic Management Plan, collect comprehensive cycling data, Provide the separate cycling lane and other facilities, Provide the separate cycling lane and other facilities should be considered and developed.

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## Biography with Photo



Mrs.S.Mathivathany who is a Lecturer (Prob) in Project Management and experienced in the units Community and Regional Planning, Geographical Information System, Planning tools and

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