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A perspective of the residents on the annoyances and problems of street trees in Visakhapatnam city, Andhra Pradesh, India.

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ABSTRACT

Street trees are an integral component of urban resident's life. The environmental, economic, and social benefits they provide to residential and commercial areas are crucial for the maintenance of healthy communities. Urban areas cannot function properly without street trees. Despite trees' many benefits, it is important to remember that if they are not properly planned, planted, and maintained, they can become a source of trouble, additional expense, and even danger. Since most of this study is conducted in the Visakhapatnam metropolitan city, it is unclear if these results may be generalized to other city communities or nations. A one-way ANOVA test is performed to see any significant difference in the overall opinion of each annoying factor given by the local neighborhood residents from different study areas in Visakhapatnam city. Generally, people like street trees and their surroundings, and six community respondents rated annoyances as more serious. According to questionnaire surveys, hidden traffic signs and preventing sunlight from entering homes are two of the greatest annoyances of street trees. Before proceeding to the next and final phase of the investigation, they will undoubtedly generate some preliminary ideas for potential responses. All of these must be completed so that suitable street trees can be incorporated into the final design in the future.

Key Words: *Street Trees, Annoyance, Perceptions, Annoyance, and Neighborhoods*

I. INTRODUCTION

Municipal street trees, also known as street trees, are a vital component of the green infrastructure of many cities. There is a correlation between the presence of street trees and an increase in sustainability and a decrease in environmental problems. Researchers have used visual simulations, questionnaires, and other methods to collect data on residents' attitudes and perceptions of street trees and urban green spaces (Hitchmough & Bonguli, 1997; Lohr et al., 2004; Flannigan, 2005; Schroeder et al., 2006). The majority of urban residents in the United States value street trees for their ability to provide shelter, which helps reduce summertime temperatures. The urban heat island effect causes cities to be typically warmer than the rural areas that surround them; the shade provided by street trees may reduce the amount of energy that buildings require, thereby resolving this issue. In addition to their aesthetic appeal and ability to improve air quality, street trees also reduce pollution and store carbon. Residents' value the aesthetic and functional benefits of street trees, such as their ability to increase property values, provide shelter, promote privacy, and reduce noise pollution. Residents appreciate the aesthetic value and shade provided by street trees (Summit & McPherson, 1998; Flannigan, 2005; Zhang et al., 2007). The majority of residents agree that the benefits of having street trees much outweigh any negative aspects (Schroeder et al., 2006; Sommer et al.,1989; Schroeder et al., 2006). Residents continue to see street trees positively owing to their multiple perceived benefits despite identification of possible potential risks such as failing branches, leaf debris, tree

particles, and infrastructure damage. According to Williams (2002), it is challenging to extrapolate results from the temperate northern hemisphere due to differences in temperature, vegetation, landscape, and cultural values.

II. REVIEW OF LITERATURE

Despite the many positive benefits of street trees, there are still many issues with planting, maintaining, and managing street vegetation. There are many negative aspects of the trees themselves, including physical limitations to the tree growth and governmental decisions, harsh seasonal conditions, improper maintenance and pruning practices, vandalism. Here, we will take a closer look at the conditions that are causing problems for the trees. The paved surfaces of the built environment pose many challenges to street trees such as lack of water, dust, pollution, infrastructure, and above/below-ground telecommunication or electrical lines. If a tree is planted to develop in conditions drastically distinct from its native environment, it develops is stress. In fact, this should take precedence over aesthetic and functional considerations when selecting a tree for planting (Sjoman & Busse Nielsen, 2010). Without proper planning, street tree installations can become a nuisance instead of a source of dynamism and interest in our urban environment. To accomplish a permanent infrastructure and sustainably growing street vegetation with all its aesthetically pleasing, municipal departments responsible for different aspects of a street must engage in extensive consultation and collaboration. The individuals planning the landscaping must be aware of the current and prospective routes of all cables and pipelines.

The primary reason for tree declines and mortality in urban environments is the incorrect choice of species. However, through many years of trial and error, many of these species have become tolerant of urban environments and have been identified as excellent urban trees. A limited supply of moisture is another issue associated with urban tree populations. The majority of storm water discharge in a city runs off the impervious surfaces because many parts of a city are covered with concrete and asphalt. Urban soil absorbs little water, which causes a deficiency of moisture. In addition to a lack of precipitation, urban soils are frequently devoid of essential nutrients. As the soil is covered with permeable materials, they are unable to acquire revitalizing elements such as nitrogen and oxygen. This is yet another significant problem for urban trees. This is the main reason most tree species cannot survive in urban environments (Sieghardt et al., 2005).

Furthermore, urban trees suffer from lack of appropriate maintenance. Care and pruning practices are crucial for preventing tree disease and fostering tree health. Pruning, sprinkling, and other general care activities are included in the maintenance of street trees. These practices are expensive, and when they are restricted, trees become sickly and eventually die. Interactions among like-minded groups regarding the best way to manage street trees eventually come down to an awareness of the various pruning techniques. However, if the tree is pruned when it is young, it can be shaped, and annual pruning is beneficial for the tree. Though a community may continue to be as well-organized and peaceful as it has consistently been, there will always be groups that feel the need to destroy and destruct. Young, vulnerable street trees planted sometime appear to be appropriate targets for street hooligans who enjoy breaking off limbs or destroying entire trees.

III. MATERIALS AND METHODOLOGY

The methodology of this study focused on collecting both qualitative and quantitative data from the site's physical surroundings, the local people, and the appropriate authorities. Primary sources, including as interviews and questionnaires, are used extensively. Greater Visakhapatnam Municipal Corporation (GVMC) selects six representative neighbourhoods from among its twelve zones. Only street trees are included in this research. A self-administered questionnaire is used to collect the data. In order to collect data from more people, we decided to use a survey questionnaire rather than conduct individual interviews. The survey is a google forms-based online questionnaire. The first section of the survey was quantitative in nature. Respondents are required to provide basic demographic information like age, sex, level of education, domicile status, and whether how long have they been resident in that neighborhood area or city. The second part of the survey dealt with the satisfaction and resident's attitude.

In this part of the questionnaire included a series of questions regarding the knowledge of street trees, their benefits, and visual aspects. Using simple checkmarks, benefits were to be rated: Very important, somewhat important, not very important, not at all important, no opinion. Following data quantification, many statistical measures were computed with the use of Statistical Package for the Social Sciences (SPSS), including means, standard deviations, t-values, and analysis of variance (ANOVA) tests. A one-way ANOVA is conducted to analyses the factors affecting importance and satisfaction. T-test and one-way ANOVA are employed to analyze the differences among group means. This is done to see if there are differences in the perception and attitude of respondents coming from an urban neighborhood area of Visakhapatnam city. Analysis of Variance (ANOVA) - Results on the perceptions of respondents according to their area, gender, Stay at place, Age, Qualification, Occupation, Owner of the House with respect to Environmental factors with street trees in Visakhapatnam City.

Study Area

Visakhapatnam is one of the most rapidly growing cities in India. Visakhapatnam lies in the state of Andhra Pradesh in eastern India. Visakhapatnam is a city on growing, both in terms of population and urban development. it is situated on 17° 41' 18" North latitude, 83° 13' 07" East longitude, and 900 metres above sea level on the eastern coast of Andhra Pradesh, India (Figure 1). This area is covered with hills of range between 30 m to 594 m above mean sea level. Visakhapatnam has its own local government. Greater Visakhapatnam Municipal Corporation regulates 72 wards within six zones, as shown in Figure 1. One of the most important cities on the East Coast of India, Visakhapatnam may be reached by National Highway 5, a major highway that is a part of the Golden Quadrilateral System of Indian Highways. According to the 2011 census, Visakhapatnam City (GVMC) has a population of approximately 17, 28,128 people, with a density of 3,191 persons / sq. km. The total Geographical area of the reconstituted Greater Visakhapatnam Municipal Corporation is 539.95 Sq.Km. The study areas are located in the Visakhapatnam district, a backward region in terms of both economic growth and social development, and it is a component of North Coastal Andhra Pradesh and is a developing region in terms of both economic development and social development.

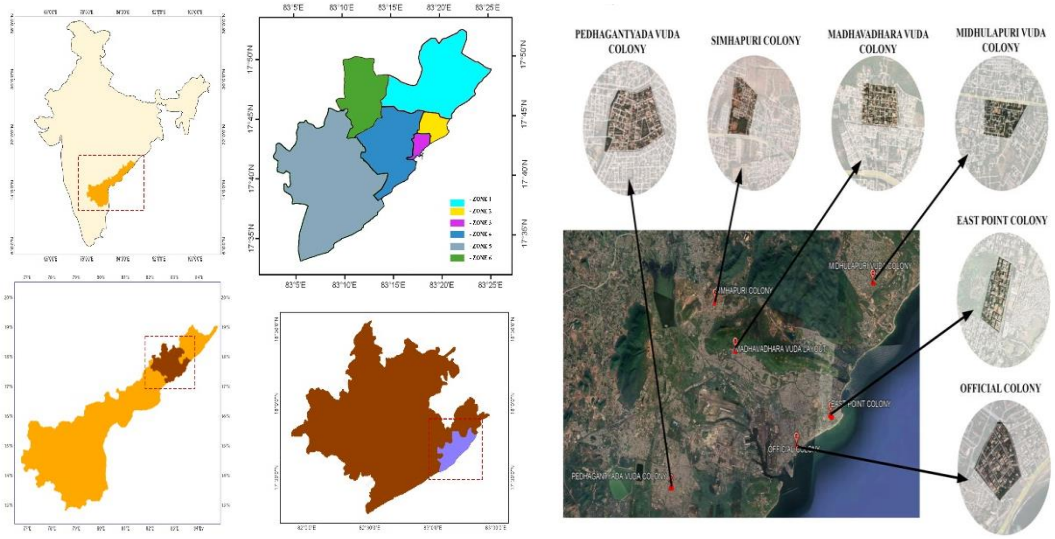

Fig. 1: Location of Study Area within the GVMC Limits and Location of selected Neighborhoods, Source: Author, 2023.

As shown in Figure 1, six typical neighbourhoods are chosen for each zone. Midhilapuri Colony (zone 1), East Point Colony (zone 2), Official Colony (zone 3), Madhavadhara (zone 4), Pedhagentyada (zone 5), and Simhapuri Colony (zone 6) are some of the areas where we collected tree inventories. These communities typically occupied 15–20 acres of land.

IV. RESULTS

There were 600 responses to the questionnaires distributed in six different neighbourhoods. In all, there are 308 males (51% of the population) and 292 females (49%). About half of the people taking part are young adults (defined as those less than 35). the remaining respondents are split evenly between those over the age of 60 (8%) and those under the age of 18 (17%). The remaining 31% belong to those between the ages of 35 and 60. 220 (or 36% of respondents) held bachelor's degrees. About 150 respondents (25%) had completed high school, while another 130 (8%) had completed elementary school and 52 (22%) had completed middle school; however, only 48 respondents (8%) had completed higher education at the master's level or above. There are approximately 139 (23% of the total population) students, 131 (22%) business professionals, 88 (15%) self-employed individuals, 75 (13%) unemployed individuals, and 25 (4%) individuals with other occupations. Although 39% of respondents own their residences, 10% live in accommodation provided by their companies, and 9% live in the homes of others while individually paying rent.

According to Figure 2, it is observed that, out of total 600 respondents, 269 (44.83%) of the respondents expressed that, they face some problems with having trees in their street, whereas 62(10.33%) never thought about it and 269(44.83%) are not facing any problems with having trees in their street. Out of 308male respondents, 144(24.00%) of the respondents expressed that, they are

facing some problems with having trees in their street, whereas 34(6%) never thought about it and 130(22%) do not face any problems with having trees in their street. Out of 292female respondents, 125(21%) of the respondents expressed that, they face some problems with having trees in their street, whereas 28(4.00%) never thought about it and 139(23 %) do not face any problems with having trees in their street.

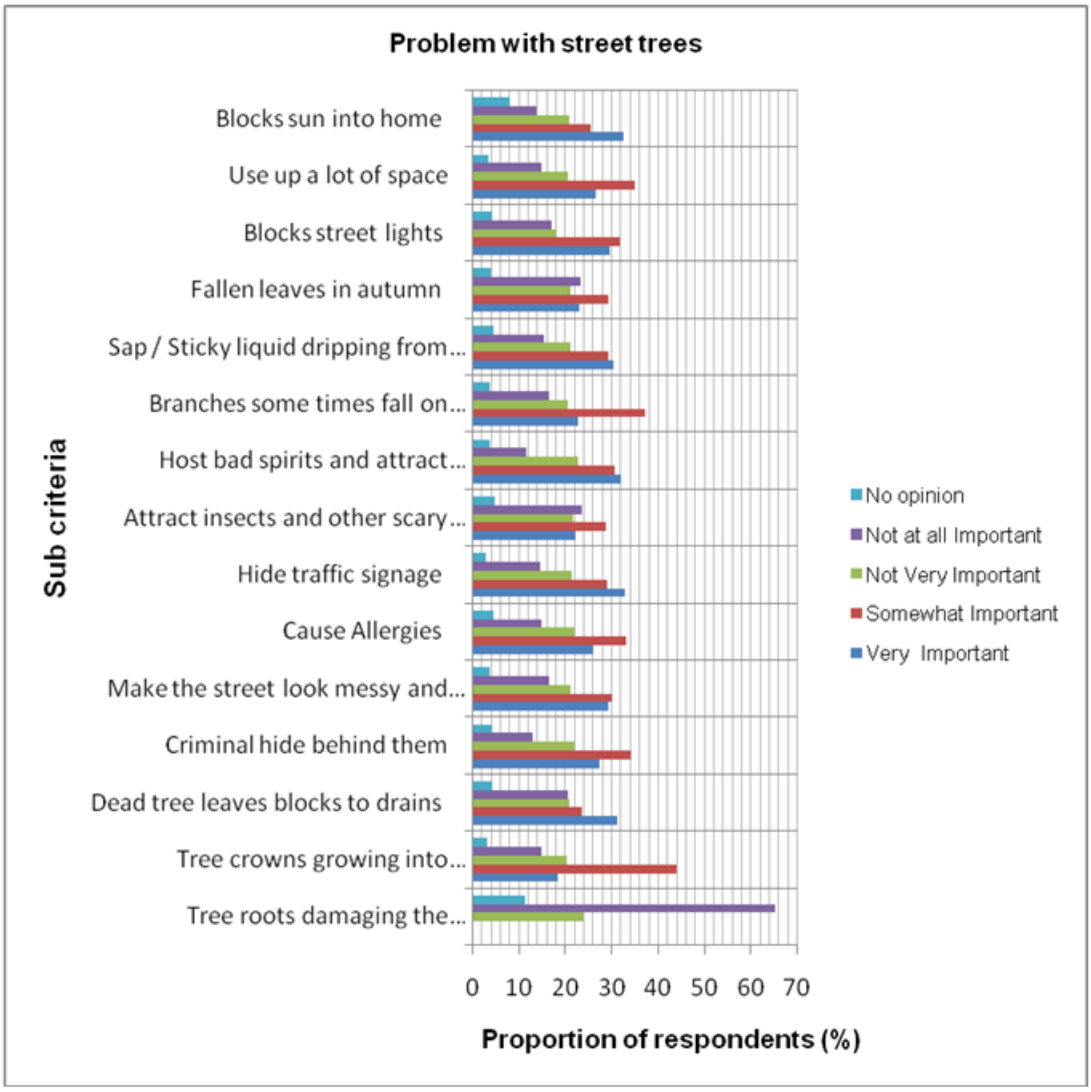

Fig. 2: The response of residents regarding annoyances faced due to trees. Source: Researcher, 2023.

In addition to rating the benefits of trees in the neighbourhood, respondents from all six neighbourhoods have also given a rating for the annoying characteristics of trees near their street. With regard to problems with street trees, the mean perceptual scores of respondents based on their living area, (8%) of the respondents strongly agreed that, agreed that they hide traffic signage, whereas (8%) felt they block sun into home, (8%) that they host bad spirits and attract lightning,(8%) that dead leaves block the drains , (8%) that sap / sticky liquid drip from tree,(8%) that they make the street look messy and dirty and (8%) think trees block street lights. Overall, residents of all six of the study neighbourhoods found it most annoying that the hide traffic signage and blocks sun into home. 'Host bad spirits and attract lightning' and 'dead leaves block the drains' are also highly rated. The least preferred tree annoying features are the tree roots damaging the pavement (1%), the tree crowns growing into power lines/street lights(5%), attracting insects and other scary creatures (6%), the branches sometimes falling on people (6%), the fallen leaves in autumn (6 %), criminals hiding behind them(7 %) , using up a lot of space (7 %) and causing allergies (7 %).

ANNOVA Test-Results: Mean comparison among the perceptions of respondents towards Problems of Street Trees.
The result is shown in table 5.5.5.and also analysis the means, standard deviations(SD) and ANOVA results comparing among the perceptions, importance, and satisfaction of respondents with respect to problems of street trees.

Table 1: Mean comparison among the perceptions of respondents towards issues of street trees. Source: Researcher, 2023.

Variable	Category	Number	Mean	SD	F or t-value	p-value
Area	Midhilapuri Colony	100	36.96	13.22	2.44*	0.03
	East Point Colony	100	34.01	12.25		
	Official Colony	100	36.33	13.27		
	Madhavadhara	100	33.89	12.62		
	Pedagantyada	100	37.97	10.71		
	Simhapuri colony	100	38.37	11.74		
Gender	Male	308	36.78	12.33	1.07 NS	0.29
	Female	292	35.70	12.49		
Stay at place	Upto 10	222	37.08	12.23	0.87 NS	0.45
	11 - 20	254	35.43	12.63		
	21 - 30	100	36.09	12.39		
	Above 30	24	38.04	11.84		
Age	Below 18 Years	102	36.18	11.96	0.56 NS	0.64
	18 - 35 Years	265	36.08	12.71		
	35 - 60 Years	188	35.99	12.05		
	Above 60 Years	45	38.56	13.26		
Educational Qualification	Primary	52	44.40	13.68	9.77**	0.00
	Secondary	150	36.95	13.34		
	Intermediate	130	32.23	10.29		
	Degree	220	36.45	12.16		
	Above Degree	48	35.25	9.74		
Occupation	Self Employed	88	36.69	12.34	1.22 NS	0.29
	Business	131	35.13	12.19		
	Student	139	36.40	11.58		
	Employed	51	37.78	11.18		
	Homemaker	75	33.80	11.30		
	Unemployed	91	38.24	14.86		
	Other Occupation	25	36.84	13.67		
Owner of the House	Owner	234	37.24	12.83	2.90*	0.03
	Renter	250	36.69	12.34		
	Provided by employer	61	34.00	10.25		
	Use not paying Rent	55	32.58	12.44		

**Significant at 0.01, *Significant at 0.05 level and NS: Not Significant

With regards to problems with street trees, the mean perceptual score of respondents based on their living area, for Midhilapuri colony is 36.96, whereas it is 34.01 for East Point Colony, 36.33 for Official colony, 33.89 for Madhavadhara, 37.97 for Pedhagentyada, and 38.37 for Simhapuri colony, and the SD values are 13.22, 12.25, 13.27, 12.62, 10.71 and 11.74 respectively (Table 1). The 'F'-value and the p-value are 2.44 and 0.03, respectively, which are statistically significant at 0.05 level. This shows that there is a significant difference among the perceptions of respondents based on their area and respondents who are living in the Simhapuri colony perceived high problems with street trees more than that of the rest.

Based on the Table 1, the mean perceptual score of respondents based on their gender with respect to environmental factors the mean perceptual score of male respondents is 36.78, whereas it is 35.70 for female respondents, and the SD values are 12.33 and 12.49, respectively. The derived F– value and the p-value are 1.07 and 0.29, respectively, which are statistically not significant. This shows that there is no significant difference between the perceptions of male and female category respondents, and they perceived similar opinions towards problems with street trees. With regard to problems with street trees, the mean perceptual scores of respondents based on their period of stay at the locality, the mean perceptual score of respondents for up to 10 years is 37.08, whereas it is for 11 – 20 years is 35.43, it is for 21 - 30 years is 36.09, and it is for above 30 years is 38.04 and the SD values are 12.23, 12.63, 12.39 and 11.84 respectively. The 'F'-value is 0.87 and the p-value is 0.45, which is not statistically significant at

any level. This shows that there is no significant difference among the perceptions of respondents based on their period of stay in the locality and they perceived similar opinions towards problems with street trees.

It is observed from the results, the mean perceptual scores of respondents based on their age group, the mean perceptual score of respondents below 18 years is 36.18, whereas it is 36.08 for 18 – 35 years, 35.99 for 35–60 years, and 38.56 for above 60 years, and the SD values are 11.96, 12.71, 12.05, and 13.26, respectively. The 'F'-value and the p-value are 0.56 and 0.64, which are not statistically significant at any level. This shows that there is no significant difference among the perceptions of respondents based on their age group, and they perceived similar opinions towards problems with street trees.

it is observed from the results, the mean perceptual scores of respondents based on their educational qualification, the mean perceptual score of respondents for primary education is 44.40, whereas it is 36.95 for secondary education, 32.23 for intermediate, 36.45 for the degree qualification, and 35.25 for above degree and the SD values are 13.68, 13.34, 10.29, 12.16, and 9.74, respectively. The 'F'-value and the p-value are 9.77 and 0.00, which are statistically significant at 0.01 level. This shows that there is a significant difference between the perceptions of respondents based on their educational qualification and respondents who are having primary education perceived high towards problems with street trees more than that the rest. Based on the results, the mean perceptual scores of respondents based on their occupation, the mean perceptual score of respondents for self-employed is 36.69, whereas it is 35.13 for business, 36.40 for student, 37.78 for employed, 33.80 for homemaker, 38.24 for the unemployed, and 36.84 for other occupations, and the SD values are 12.34, 12.19, 11.58, 11.18, 11.30, 14.86, and 13.67, respectively (Table 1). The 'F'-value and the p-value are 1.22 and 0.29, respectively, which are statistically not significant at any level. This shows that there is no significant difference among the perceptions of respondents based on their occupation, and they perceived similar opinions towards problems with street trees.

With respect to problems with street trees, the mean perceptual scores of respondents based on their owner of the house, the mean perceptual score of respondents for the owner is 37.24, whereas it is 36.69 for the renter of the house, 34.00 for the employer, and 32.58 for use not paying rent, and the SD values are 12.83, 12.34, 10.25, and 12.44, respectively (Table 1). The 'F'-value and the p-value are 2.90 and 0.03, respectively, which is statistically significant at 0.05 level. This shows that there is a significant difference between the perceptions of respondents based on their owner of the house and respondents who are the owner of the house perceived high towards problems with street trees more than the rest.

V. DISCUSSION

The city of Visakhapatnam, a southern state of India often known as Vizag, is an important north coastal city in Andhra Pradesh. It is the industrial capital of Andhra Pradesh on the east coast. In,2014 the Hud Hud Cyclone devastated the city obliterating its entire green cover and the people there are still struggling to recover from the damage it caused. Many street trees are either uprooted or are severely damaged or burnt. The Andhra Pradesh government took timely steps to restore the cities' natural vegetation. Alstonia Scholaris (Indian devil trees) are planted in the city along the streets, and they grew rapidly giving a considerable green look to the entire city. But now the problem is that the pollen grains of the flowers of the tree have an effect on the health of the neighbourhood residents. For some residents, inhaling it might pose serious health hazards. The Visakhapatnam residents are thus requesting the authorities to remove the plants as soon as possible. In general, problems occur when trees reach their mature height. Different types of trees have unique physical characteristics. There are some trees that grow rapidly while others do not. Because of this, selecting the appropriate planting location is essential for providing enough space for a tree's growth process.

In Visakhapatnam, several trees were planted alongside the street without enough space for them to grow properly. This issue will undoubtedly worsen if the trees grow to their full height and are no longer suited for specific locations. It is important to consider the location of both overhead and underground utility lines when deciding on a tree species to be planted in a public space, such as a street. There are several trees in Visakhapatnam that are contributing to this issue. To ensure safety, it becomes necessary for the utilities to cut off a few parts of the trees, leaving them appear unnatural. As noted by both Sivakumar et al. (2010) and Dana &, Carpenter (2001), pruning will promote the development of a healthy tree by removing weak and overgrown branches. In addition, they argued that this would improve the visual harmony and prevent the trees from obstructing any signage. This is also essential for trees located near utility poles to ensure the security and reliability of electric supply. Pruning trees away from electrical lines place trees under more stress and makes them more vulnerable to pests and diseases thus decreasing the trees life span. In order to provide the most possible protection against pests in an urban forest, Santamour (1990) proposes the 10-20-30 formula, which states that the urban forest should not include more than 10% of any single tree species, no more than 20% of species in any tree genus, and no more than 30% of species in any tree family. It has been hypothesised that ecosystems with a greater variety of species are more resilient than those with fewer dominant species (Nagendra and Gopal, 2010).

In several places in Visakhapatnam, trees have been planted improperly along the street giving the public minimal opportunity for shade. Increasing canopy cover has been demonstrated to have positive effects on climate regulation, wildlife habitat availability, and community vitality (McPherson E.G. and J. Muchnick, 2005). Good trees with large canopies may help provide shade for pedestrians and the neighbouring area, making it more pleasurable to walk along pedestrian paths. Some areas also have enormous trees planted, making it difficult for routine movement of people and vehicles. The major problem is the lack of adequate plans for

tree planting and maintenance by the Visakhapatnam Municipal Corporation and other administrative entities. For a number of reasons, many mature trees are regularly cut down with no plan for replacement. The findings reveal that while respondents are aware of tree problems most are satisfied with current tree management efforts, with satisfaction varying by neighbourhood. Lack of accurate data on individual trees is the primary obstacle in preserving the city's tree cover. Without this knowledge, no one pays attention to the loss of even a single tree, whether it is a tree that falls during heavy rain, a tree that is illegally cut down, or a tree that is cut down for a development project. Lack of public interest in spending time in nature is one of the key challenges the research is reveals. Thousands of avenue trees have already been hacked down as a result of the road widening activities. The current state of its urban street vegetation in Visakhapatnam is representative of many Indian cities and challenging to determine since there is a lack of available information and research on this topic.

This research, the first of its kind, fills a critical gap in this area, of street trees in Visakhapatnam city. The city administration does not have a complete database of the urban trees. This study recommends, it is essential that we gather detailed data on the quantity, diversity, and condition of all trees inside the greater Visakhapatnam municipal corporation limits. Census in this regard, we have created a field proforma for an urban tree census. It is a requirement and creates a foundational database for the city's green cover. It is simple to achieve by involving the assistance of local residents, NGO's, plant lovers, and college/university students. Studying and defining which tree species have a better response to local conditions will serve as a guide to improve current management, with the potential for enhancing future planning even in other tropical cities. The study is also expected to contribute to the expanding body of literature in the field of urban green spaces in the many cities in India. For the purpose of maintaining the significance of street trees and the safety of users, the local authorities in Visakhapatnam may be able to implement all of these different options.

VI. CONCLUSION

Based on results it is concluded that, Simhapuri residents gave higher importance to problems with street trees compared to other neighbourhood residents. According to the residents' opinion gathered through the questionaries surveys, they hide traffic signs and pprevent sunlight from entering homes is considered as the most annoying aspect in the Visakhapatnam study neighbourhood areas. ANNOVA Results shows that, there is no significant difference between the perceptions of gender, their period of stay at locality and their age group respondents they perceived similar opinion towards problems with street trees and also there is a significant difference among the perceptions of respondents based on their area, their educational qualification, and home ownership. Respondents perceived high towards problems with street trees than that of the benefits.. In order to improve residents' satisfaction with the level of vegetation around them, we should consider their perceptions while designing street trees. This will help to strengthen and develop both the aesthetic and sustainable benefits that trees provide to communities.

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