International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Scenario of Urban Green Space Development of Selected Sites in Ahmedabad

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ABSTRACT

With a very high population and fast economic growth and increasing per capita incomes, the mega city of Ahmedabad in the state of Gujarat, India faces challenges of maintaining green spaces. The city has semi-arid climate with shorter period of monsoon. The city's landscape is changing faster than ever before and with the residences changing from independent bungalows with small gardens to high rise apartments in a very short span of 20 years, the responsibility of maintaining green spaces falls on the public authorities. The Ahmedabad Municipal Corporation (AMC) and the Ahmedabad Urban Development Authority (AUDA) have made efforts in this area and this paper focuses on one such effort of AUDA.

Keywords: Urbanisation, Urban green space, Carbon sequencing.

INTRODUCTION

Urban green spaces have become a challenging subject for researchers, planners, governments and citizens alike. The urban sprawl is increasing ever since the contest of development among regions and nations and this contest results in another urban contest and that is the race about public health, quality of air and water, aesthetics, flora-fauna and bio-diversity.

Green space is a land covered with some form of vegetation. They must act as bio-propellants. It is not merely a vegetated land, it is rather an eco-friendly land. Developing countries with improper planning strategies and increasing rate of urbanization face a more difficult test. Indian cities are a typical example of immense population density pressures on limited green spaces.

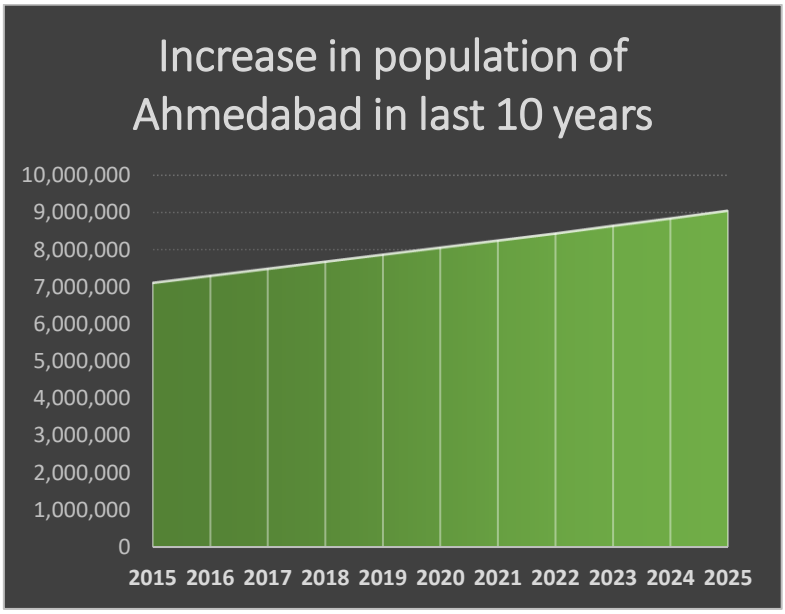
Economic progress is identified by industrialization and urbanization. Economic development is rather identified by the organization of agriculture, per-capita food availability and per-capita housing space, drinking water, living space and the overall quality of life.

In 2021, 56.48% of the world population was urban population living in only 3% of the world's land as urban regions. According to the UN[1], the urban population is likely to rise to 68% by 2050. Such trends are crucial in the attainment of sustainable development goals and in drawing urbanization plans.

[1] United Nations. The *2018 Revision of World Urbanization Prospects* produced by the Population Division of the UN Department of Economic and Social Affairs (UN DESA) notes that future increases in the size of the world's urban population are expected to be highly concentrated in just a few countries. Together, India, China and Nigeria will account for 35% of the projected growth of the world's urban population between 2018 and 2050. By 2050, it is projected that India will have added 416 million urban dwellers, China 255 million and Nigeria 189 million.

Developing countries and specially India will have to plan the growth of her cities very meticulously. UN projects that by 2050, India will have added 416 million urban dwellers. Indian cities accommodate 31% of the population of the entire country but occupy only 6% of the total area which shows immense pressure on urban land and resources. If cities grow haphazardly and in an unplanned manner, they tend to lose their green spaces. This makes cities unhealthy and unsustainable to live. (Swati Rajput, et al., 2021).
Again, in India some states are highly urbanized and within the states, some cities are already exploding or likely to explode with increasing urban trends. Over 75% of India's urban population resides in 10 states namely Maharashtra, Uttar Pradesh, Tamil Nadu, West Bengal, Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Rajasthan, and Kerala. 40% of Gujarat state is already urbanized. Majority of the urban population of Gujarat is concentrated in the districts of Ahmedabad, Surat, Vadodara, Rajkot, Bhavnagar and Jamnagar.

Graph 1: Population trends in Ahmedabad



On the other hand, Ahmedabad also, the largest city in Gujarat, boasts of an estimated GSDP of $322 billion for 2024-25, contributing more than 8% to India's total GDP. The city's annual per capita income is estimated at $4.498 for 2024 - 25. The density of population in Ahmedabad district is 890 per sq. km. area (2011 census).[2] This calls for managing urban structures, green spaces, health, pollution and climate. One area of concern in fast growing urban areas is that of green spaces. While a lot is said and written about creating and maintaining gardens, the city of Ahmedabad looks barren and is highly polluted. The city has hot and semi-arid climate and faces poor air quality from time to time.
According to the 2023 India State of Forest Report, Ahmedabad was listed as the worst city in maintaining its forest cover between 2011 and 2021. The city's green cover was 17.96 sq. km. in 2011 which reduced by 47.6% and went down to 9.41 sq. km. in 2021.
WHO[3] standards suggest that an ideal of 50 square meters and a minimum of 9 square meters of urban gr-

[2] Ahmedabad city and district are sometimes alternated as climate for the entire district is mostly the same and so is the growth story.
[3] World Health Organization.

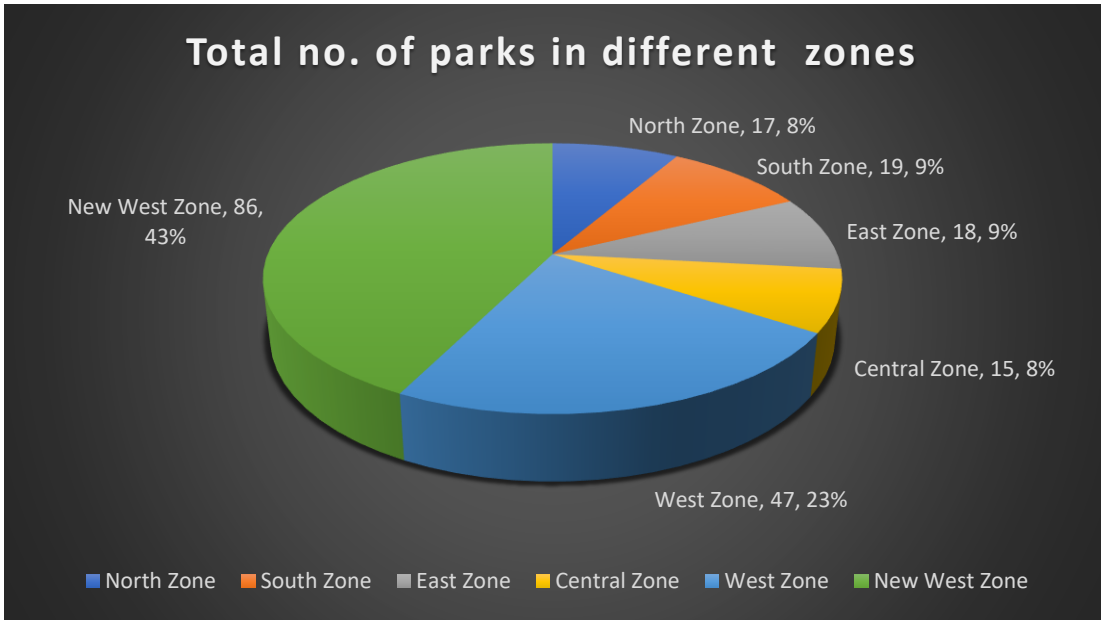
een space is needed per capita. Urban green spaces are in a way infrastructural investments which public authorities must make for the well-being of their citizens. Trees outside forests are commonly grown along the streets, roads and rivers. These trees help to maintain the micro-climate and soil fertility in cities and prevent soil erosion. Gardens are also maintained in societies, schools, hospitals and offices. Hedonic price studies have shown that property prices rise around urban green spaces resulting in higher property taxes for the governments. People are also willing to pay higher property taxes for the green amenities which the governments might provide. However, when talking about urban green spaces, public parks and gardens play an important role. The Ahmedabad Municipal Corporation (AMC) and the Ahmedabad Urban Development Authority (AUDA) have several gardens and parks in the various zones of the city.

Accessibility of green spaces is another important aspect in considering recreation space and aesthetics. Distribution of green space must match the demand and distance criteria and must be accessible more or less free of cost. With this idea, AMC and AUDA have made a provision of 214 plots for developing urban gardens in the different zones of the Ahmedabad urban region. When a public authority designates large areas for gardens or public parks it is trading-off huge sums of revenues from other types of economic activities for which the space could have been alternatively used. Therefore, public gardens and parks must be viable in two respects: firstly, In terms of being able to maintain the parks financially and secondly, the environmental, health, recreational and aesthetic values must be large enough to justify the trade-off. The comparison of revenue to the public authorities if a portion of land is used for urban green space rather than for built-up use is very important for assessing financial performance. (Wang & Chan, 2019).

AMC and AUDA were responsible for maintaining 214 public gardens and parks (with a total area of approx.17,27,296 sq. mt.) across seven zones in Ahmedabad. However, it was an expensive affair of maintaining those at a per sq. m. cost. In 2001 a Public Private Partnership (PPP) model was worked out with the Anand Milk Federation Union Limited (AMUL) whereby AMUL commenced maintenance of 25 gardens in 2001 which increased to 126 in 2015 (with 78 retail stores of AMUL) and by 2021 there were 214 garden retail stores maintained by AMUL.

Ideally a social sector delivery model for a public utility must fulfil the clauses of efficiency, financial sustainability, environmental sustainability, public health and recreation.

The purpose of this project is to analyse if the clauses of efficiency, financial sustainability, environmental sustainability and recreation are fulfilled by the gardens and parks of Ahmedabad. Urban sustainability, health promotion and the benefits of urban green space intersect to create mutual areas of interest. (Veniece Jennings, et al., 2019).



Graph 2: Representing the total number of parks in different zones of Ahmedabad.

This paper combines perception of citizens along with a botanical survey of carbon sequencing of trees in selected gardens and parks in the city of Ahmedabad. Most urban green spaces are represented as grassy lawns while neglecting the need for multifunctional value which green spaces must provide to the ecosystem. (Paudel, et al., 2023). Thus urban green spaces must be viewed as multifunctional areas of land.

RESEARCH DESIGN

A survey of 500 citizens was conducted to understand the reasons of visit to green spaces in Ahmedabad and their expectations from urban green spaces.

The survey pertained to the awareness about the existence of a park within a radius of 3-5 km. of their residence, the frequency of visits to these parks/gardens, the purpose of visit like exercise/yoga, enjoying serenity, for recreation with children, if the citizens would appreciate labelling of trees/plants with their uses for education purpose, if they would appreciate varieties which attract more birds, if they have contributed in planting trees outside their personal gardens and if they have made efforts in reducing the use of petrol, ride bicycles to commute to shorter distances etc.

Alongside interviews were conducted with authorities at AMC, AUDA and AMUL regarding their PPP venture in maintaining 214 public parks in Ahmedabad. Subsequently carbon sequencing was done for trees in total 20 gardens and parks of Ahmedabad. However, the carbon sequencing was done on limited number of trees because it is difficult to find trees with higher average leaf density in Ahmedabad. Owing to the semi- arid climate of Ahmedabad, the parks developed by AMUL after 2015 have trees with relatively lesser leaf density

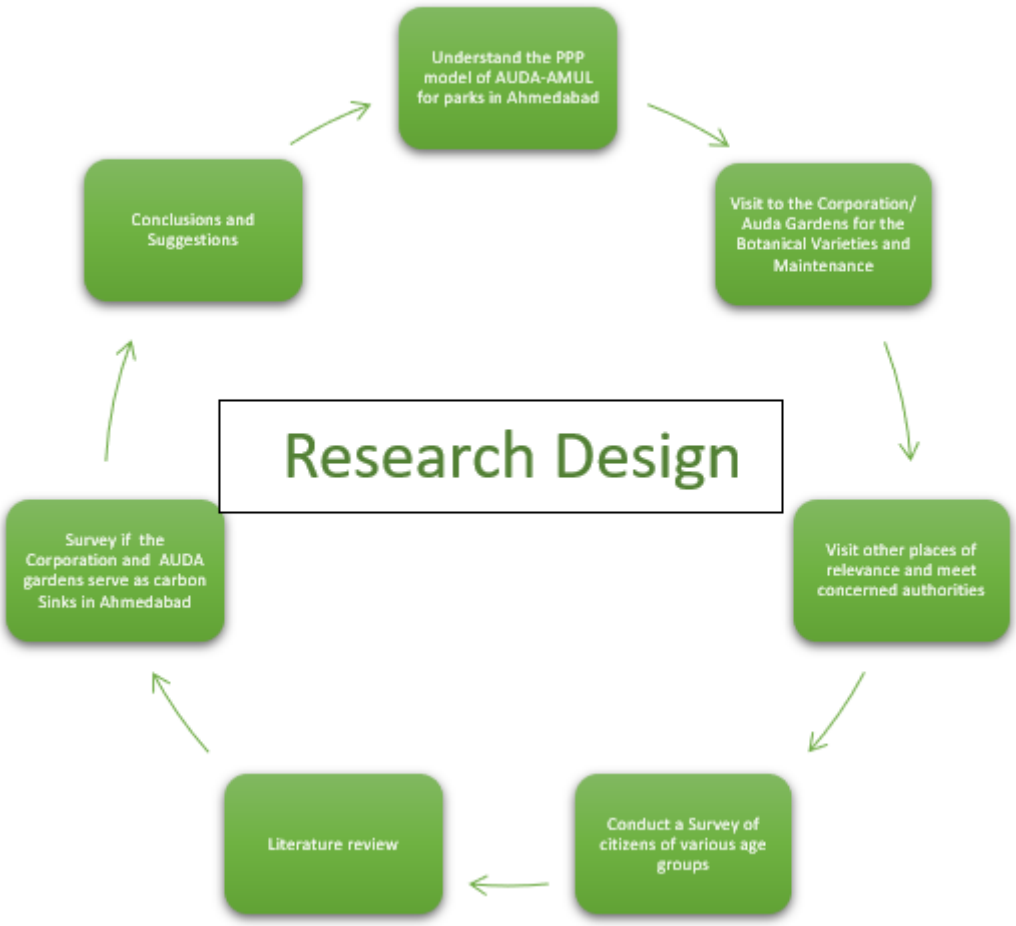


Fig. 1: Flow chart of research design

Carbon sequencing method:

To calculate the carbon sequestration of a tree, we first measured the tree's diameter at breast height (DBH). This was done using a measuring tape around 1.3 meters above the ground. Next, using allometric equation the biomass of trees were estimated. This takes into account species-specific factors like wood density. Once the biomass was obtained, it was converted into carbon content by assuming that approximately 50% of the biomass is carbon. To determine the annual carbon sequestration, the growth rate of trees were factored in. The annual biomass increment was then multiplied by the carbon content percentage to estimate how much carbon the tree sequesters each year. This method helps in understanding the role of trees in capturing and storing carbon, contributing to efforts to combat climate change.

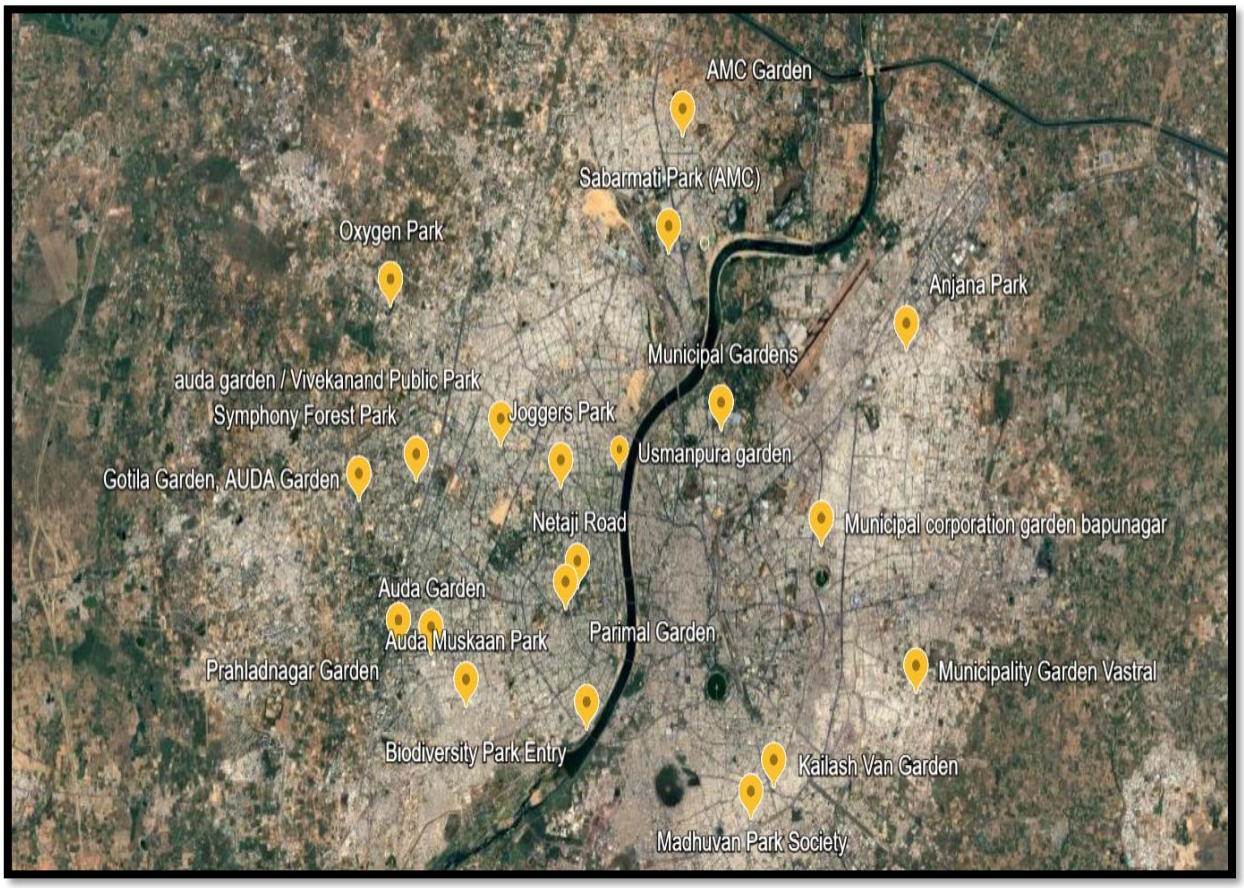
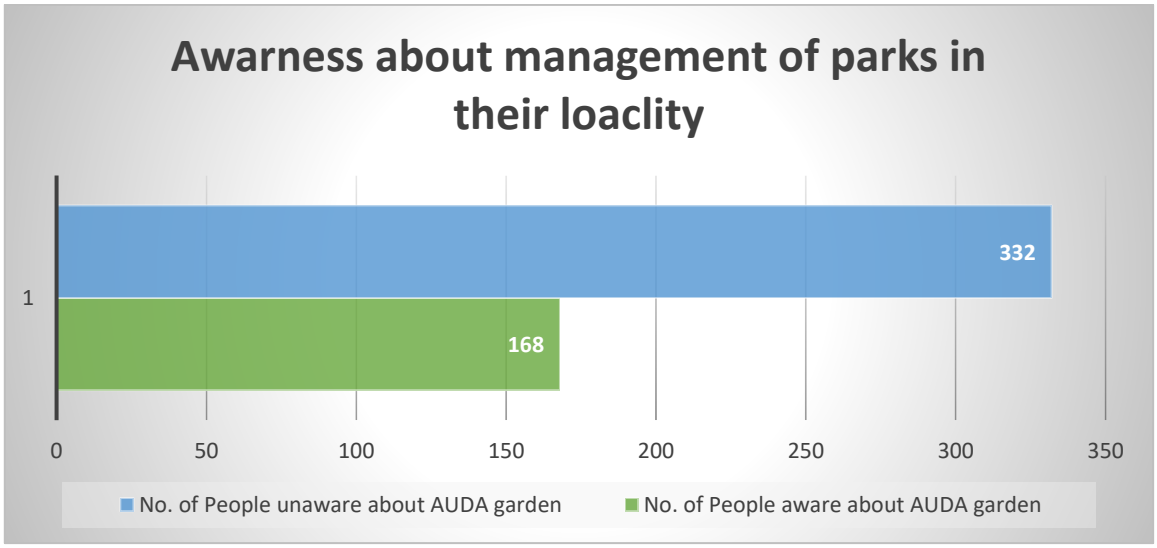


Fig. 2: Map of location of the gardens and parks under study

OBSERVATIONS OF USER PERCEPTION SURVEY:

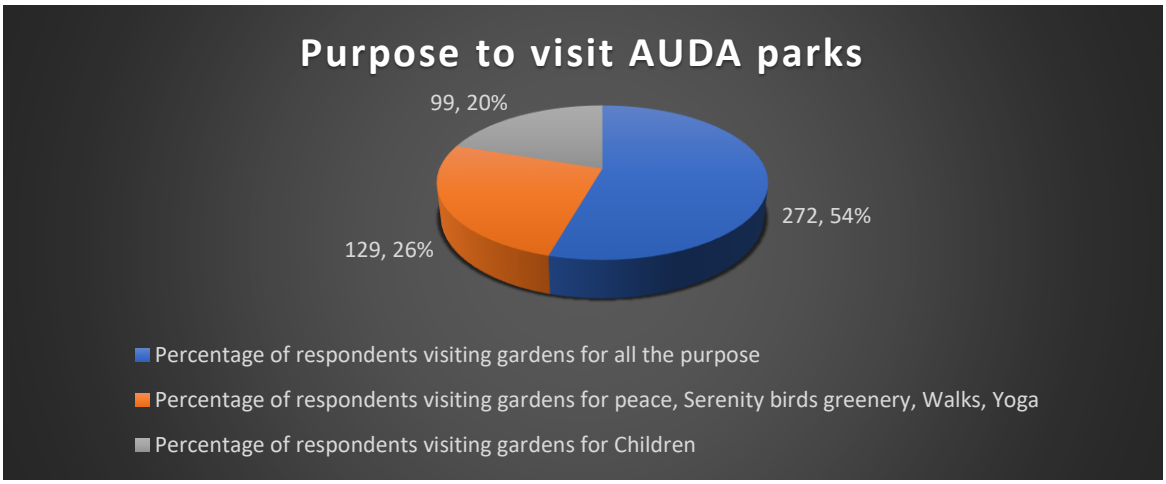
The perception survey of 500 citizens revealed that a majority of the residents had visited AUDA parks at least occasionally. Despite this, there was a noticeable lack of awareness regarding the management and maintenance of these parks among the residents.

Graph 3: Citizens awareness regarding AUDA parks



The survey highlighted that individuals aged 40 and above were more regular visitors to the parks. Regular visitors to AUDA parks were found to use these green spaces for a range of activities. These included relaxation, recreation, walking, yoga, and spending quality time with

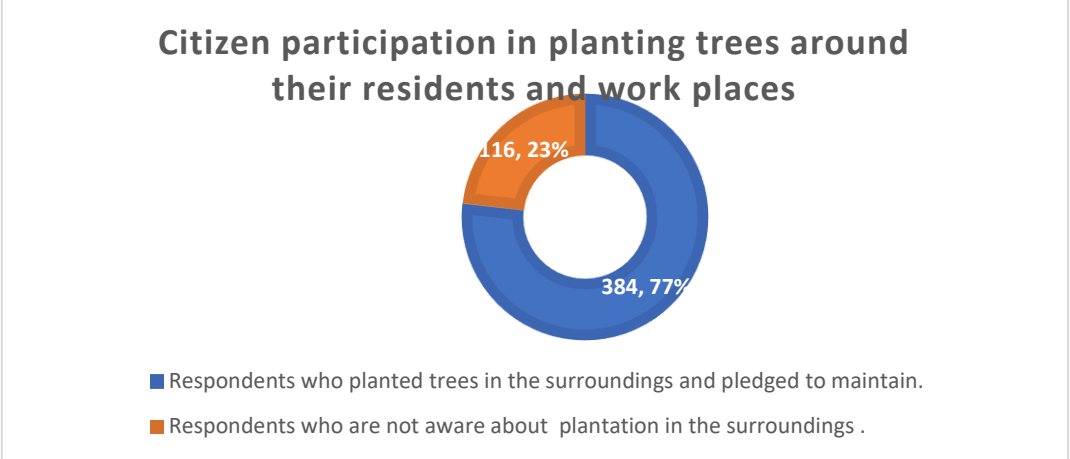
Graph 4: Purpose of citizens' visits to AUDA parks



their children. The presence of natural surroundings and open spaces provided an ideal environment for these activities, contributing to the overall well-being of the visitors.

A significant finding of the survey was the interest shown by visitors with children in the educational potential of the parks. These visitors expressed a notable appreciation for the idea of labelling plant varieties within the parks. Such labels could serve an educational purpose, enhancing the knowledge and curiosity of both children and adults about the various plant species present in their local parks. This indicates a potential area for improvement in the park services, which could lead to increased engagement and satisfaction among the park visitors.

According to our survey, 77% of respondents have already participated in growing trees around their homes or in public places. However, many did not choose plant varieties with complete information and knowledge. Although attempts have been made by authorities to grow medicinal plants, these were only found in 40% of the parks. Due to a lack of labelling, citizens are unaware of these efforts. Therefore, more systematic efforts should be made to plant them with proper labels to increase awareness among citizens.

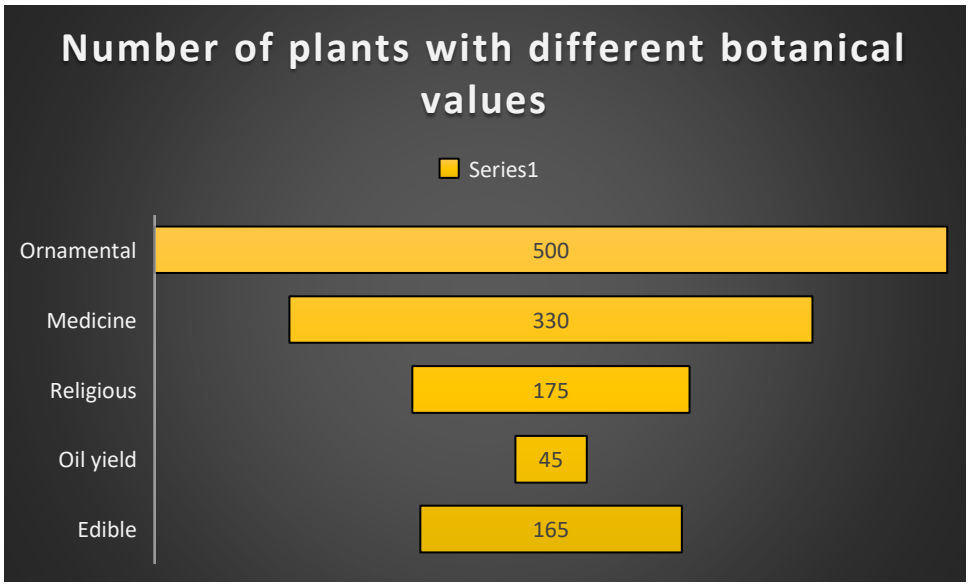


Graph 5: Citizens' participation in tree plantations

Overall, the survey provided valuable insights into the current usage and potential areas for improvement in AUDA parks emphasizing the importance of educational initiatives and better park management and awareness among the residents.

OBSERVATIONS ABOUT CARBON SEQUENCING:

Our survey was conducted across 20 parks located in different zones. Most plants surveyed belong to varieties that help reduce pollution through carbon sequencing, meaning they absorb CO_2 from the atmosphere and release it as O_2, thereby converting CO_2 into O_2 and helping to reduce pollution. This indicates that the PPP venture between AUDA, AMUL, and AMC has successfully implemented carbon sequencing. However, trees planted in last 10 years have lesser leaf density and the number of trees and plant varieties in each garden does not seem to be enough. There is a scope to increase the variety and number of trees and plants. Given the growing population of Ahmedabad and the expanding urban landscape, more efforts are required to keep pollution levels under control. Citizens of Ahmedabad expect more flora, fauna, and information about plants in these parks, which would also help them choose suitable varieties to plant around their homes.



Graph 6: Number of plants with different botanical values

RECOMMENDATIONS:

1. **Internships and Community Involvement:**

- AMC and AUDA should offer direct internships to college students in conducting carbon sequencing and surveys about citizens' perceptions and needs.
- Homemakers and retired individuals can be made to play a crucial role in community gardening initiatives.

2. **Evaluation and Renewal of Contracts:**

- The contract with companies (such as AMUL) should be evaluated and renewed at stipulated intervals. (The PPP between AUDA and AMUL seems to be a financially viable model based on the interviews conducted with authorities on both the sides).

- It is of most importance to evaluate the financial and environmental sustainability of such parks because in an urban area, a single sq. ft. of space has a monetary value and can become a significant revenue deal for the governments. Sparing a total area of 17,27,296 sq. mt. for parks must ensure that an environmental capital of equivalence is created.

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