Assessment of the Sustainability of Tree Plantation in Urban Areas

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Abstract- The issues and options for sustainable tree planting in an urban location are discussed in detail, with references to numerous research articles being used. The focus of this study is on the selection of suitable tree species to decrease air pollution, which is accomplished via the use of artificial intelligence methods, geographic information systems (GIS) tools, and computational analysis. Air pollution is the most essential component of environmental studies nowadays since every advancement made by civilization has resulted in a deterioration of air quality. The use of artificial technologies has been shown to be insufficient in effectively resolving this difficulty. Consequently, planting is a strategy for reducing air pollution that is both more effective and less harmful to the ecosystem of the environment. There are significant similarities across plants, despite the fact that each plant reacts differently to the many kinds of contaminants encountered. As a result, no one facility can effectively treat all types of air pollution. A number of factors influence the selection of plant species for plantation, including their APTI and API, dust accumulating capacity, carbon sequestering capability, and other characteristics. Each of these factors should be thoroughly investigated before choosing a plant species for a plantation project. Furthermore, the decision needs to be made in line with the requirements of the location. The current review is an attempt to diagnose Indian tree species based on their Air Pollution Tolerance Index (APTI), Anticipated Performance Index (API), Carbon Sequestration, and Dust Collection Potential, and to certify them based on the purpose of plantation for which they are being planted. This review is being conducted in both India and the United States.

Keywords-Air Pollution Tolerance Index (APTI), Land Use / Land Cover (LU/LC), Sustainable tree Plantation.

I. INTRODUCTION

Since there are several hazards linked with air pollution that impact all forms and classes of life, it has become the most serious issue of discussion in

the modern day. Because of this, it is necessary to have a comprehensive conversation about the solutions that are linked to these risks. Global warming is one of the dangers that may be posed by air pollution. One of the impacts of global warming is a rise in the temperature of the whole planet, which is the root cause of a great deal of other problems that are associated with it. Many scientific solutions have been developed to address the problem of global warming, but none are as effective as planting and green vegetation, particularly given the multifunctional nature of green plants and trees. Because plants are able to absorb carbon dioxide and store it in their tissues as a reserve source of food, they are a natural method for reducing the amount of pollution that is released into the atmosphere. Plants, which are the first acceptors of air pollutants, also serve as scavengers for the contaminants that are subsequently accepted. As a consequence of this, leaves provide a substantial amount of surface area that may be applied to dust particles and air pollutants, allowing them to be absorbed and absorbed by the leaves. There are only a few plants that are fragile enough to be affected by certain air pollutants, whereas others are able to tolerate these toxins. On the other hand, pollution sinks are responsible for the latter, whereas pollution indicators concentrate on the former. 2 [2] [3]: When plants are subjected to air pollution, they go through a series of physiological changes that lead to their eventual destruction. When it comes to planting, the species that are more tolerant are selected rather than the ones that are more sensitive. In order to conduct an analysis of the species, a number of different elements are used. These include the Air Pollution Tolerance Index (APTI), which is based on biochemical features, and the Anticipated Performance Index (API), which is based on the biological and socio-economic components of a plant, amongst other things. In addition, the capacity of a species to gather dust and sequester carbon varies from one species to the next. Another component of plant life that is relevant to resolving global concerns about the amount of carbon dioxide in the atmosphere and global warming, both of which are produced by human activity, is carbon fixation. This is because carbon fixation is also tied to the process of carbon fixation. Many forest managers in the tropics believe afforestation, reforestation, forest conservation, and beautification to be effective methods of achieving this goal, which encourages more study into carbon absorption by natural and manmade forests in the region. It is fairly common for plants to be chosen for planting solely on the basis of their APTI score. However, this decision may not be representative of the proper concept, and it is highly likely that the planter will fail to solve the real issue and achieve its intended result. In the case of roadside planting, the main goal is to capture dust and fugitive emissions created by cars as they pass through the area. As a result, picking a species only on the basis of its APTI value without considering its dust-trapping capacity will not be effective. Similarly to this, the plants that will be

employed for green belt development in the vicinity of a thermal power station should be chosen based on their carbon sequestration capability and projected performance index (API). Rather than focusing on a single parameter, an integration of many characteristics might be beneficial for the objective of global air pollution prevention.

II. Literature Review

S.R. Kumar and colleagues (2013). When it comes to controlling environmental pollution, the use of plant species is critical [4]. This paper examined the relevance of tree species inside metropolitan areas in order to keep the degree of contamination under control. It was decided to focus on a few plant species that were eco-friendly and had high contamination resistance in the current essay. The selection of valid appropriate particular tree plant species based on their geographical nature in an urban environment is the fundamental main assignment that necessitates the use of a legitimate proper planning procedure in order to be completed. Following that, it was proposed in this inquiry that, before selecting the most appropriate tree or plant species, it is necessary to understand the most natural link between the tree or plant and the human being's environmental state. They strongly recommended the development of a choice assistance tool such as the DSS, which ensures the success of the tree species identification procedure.

J. Vogt and colleagues (2017). A database for tree selection in metropolitan areas with a temperate climate [5] has been developed by the Citree project. In this article, the link between tree species in urban residential areas and their beneficial effects is explored. The selection of the most suitable tree species is a time-consuming and complicated procedure that must be consolidated with a few parameters depending on the local environment. Taking into consideration the writing audits, they offered woody plants for the manor that were ecologically friendly and had a long life cycle. When it comes to monitoring counteractive activity in setting up a high-pitched ecological and financial overhead profit, the created database has shown to be more valuable. Following that, the findings of this inquiry reveal that there is a pressing need for a contemporary, new procedural approach that can be completed as successfully in practice as it is now being done.

S. Roy and colleagues (2012). Six cities in diverse climatic zones were subjected to a comprehensive quantitative analysis of the advantages, costs, and assessment methodologies associated with urban trees. According to this research, in rapidly increasing urbanization, environmental conditions, the relevance of tree species, and the many services provided by trees are all important considerations. The researchers also looked at a few original editorial papers that evaluated the value of in-urban trees in a variety of different zones, atmospheres, and geographical

balance. A couple of techniques were successfully examined using diverse evaluation processes in order to spotlight the fiscally advantageous conditions of all adjacent biological system organizations of trees in urban area zones, and the results were published in the journal Trees. Additionally, the findings of this current research piece indicate that additional mechanical technical structures should be specifically deliberated for specific decision-making Morani, A.et al., 2003. (2011). Choosing the best tree planting locations to improve air pollution removal in the MillionTrees NYC initiative [7], which was previously recognized with the assistance of a priority index map zonal area for tree plantation definitely depends on the concentration of pollution, the density of population, and the lack of sanctuary cover. This was done in order to improve the removal of air pollution. The primary goal of this research is to identify areas with poor tree shelter cover in the investigation zone. Additionally, a novel approach for distinguishing the best tree-planting regions has been introduced. In order to attain this goal, a tree planting priority index map was created with the use of geographic information system software. The air quality index was calculated in order to evaluate the air quality at the investigation location. The priority index map was also employed in this research to identify the contamination level in order to distinguish between highly inhabited and less populated areas. Improved management plans for tree estates, as well as a choice emotionally supporting network, are necessary in order to bring early benefits to society.

H. Nagendra and colleagues (2010). Street trees in Bangalore: Density, variety, composition, and distribution [8] was research that identified Bangalore as the city with the greatest dispersion of road trees. Alternatively, the major aim examined here was the circulation and variety of road trees in Bangalore city, which provided vital information. In addition, it seems to be checking the distribution of trees in various sections of the city in order to make adequate plans for the particular time period necessary for tree planting in a given region. This information may be useful to the city's urban planner throughout the decision-making process. This research makes use of a Spatially Stratified Methodology, which examines the tree species, size, and thickness arrangement in terms of spatial stratification. New design policies with certain new characteristics must be explored in order to make improvements. According to the findings of this research, as compared to other cities in the Asian urban region, there are fewer street trees on the streets of this city.

E. Ng and colleagues (2012). A research on the cooling impacts of greening in a high-density city: An experience from Hong Kong [9], the study acknowledged Bangalore City for road tree dispersion, and the study recognized Hong Kong City for road tree dispersion. Alternatively, the major aim examined here was the circulation and variety of road trees in Bangalore city, which

provided vital information. In addition, it seems to be checking the distribution of trees in various sections of the city in order to make adequate plans for the particular time period necessary for tree planting in a given region. This information may be useful to the city's urban planner throughout the decision-making process. This research makes use of a Spatially Stratified Methodology, which examines the tree species, size, and thickness arrangement in terms of spatial stratification. New design policies with certain new characteristics must be explored in order to make improvements. Comparing the results of this research to other cities in Asia's metropolitan region, the analysis revealed that the prevalence of street trees is at a low level in this city.

III. Conclusion

Factors such as land use land cover (LULC) classification, noise pollution, air contamination, and soil characteristics order should all be monitored in order to preserve the degree of greenery at the level necessary for the natural environment at its optimal level. In this part, we make an effort to analyse the characterisation and significance of newly studied research for our study in relation to our study. As we have seen in prior research efforts, natural concerns and the strategies used to assess these issues were summarised and discussed. The selection of the most appropriate plant species is an extremely essential undertaking in the fight against air pollution. As a result, the choosing process should always be guided by the purpose and geographic location of the plantation. In fact, a thorough examination of a plant species for planting according to the requirements of a certain region may really resolve a large number of air quality concerns associated with that place.

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