THE INTEGRATION OF GREEN SPACES INTO URBAN ENVIRONMENTS: STRATEGIES FOR THE DESIGN OF SUSTAINABLE URBAN LANDSCAPES.

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ABSTRACT

This article aims to examine the pros and cons of urban green zones by critically reviewing research data from various locations. Green areas are fundamental to sustainable development for several reasons. Environmental, social, cultural, and economic factors are all part of the mix. Urban parks and other green areas may end up being a powerful instrument for environmental preservation in the distant future. Reason being, they have several positive effects on air quality, property value (because to their aesthetic value and the amenities they provide), and energy usage (as they cut down on cooling needs for buildings). Furthermore, urban green zones may provide ecosystem services, such as leisure and recreational facilities, which are highly desirable by city dwellers and visitors alike. Incorporating some level of qualitative development and the correct distribution of green spaces within the urban region into the agenda for environmental sustainability is crucial for justifying the several roles that green spaces perform. Only by establishing a unified strategy for the creation, maintenance, and improvement of urban green spaces can cities throughout the world hope to achieve this goal of environmental sustainability. The worrying loss of green spaces in contemporary, densely populated cities is a major concern to the sustainability of these places, and sustainable development has become a key idea for tackling a multitude of environmental, economic, and social problems. Given the multi-disciplinary nature of urban green space, this study draws from and evaluates sources based on multidisciplinary and transdisciplinary approaches. Urban green ideas for revitalisation and expansion should prioritise the incorporation of more green spaces into built settings.

Keywords: Green Area, Environmental Sustainability, Air Quality, Sustainable Development, Qualitative Development, Green Space.

INTRODUCTION

The availability of parks and other green areas is highly valued in metropolitan areas. Concerns about climate change, global warming, and pollution in metropolitan areas have increased the value of parks and other naturally occurring places. These areas may help reduce urban heat islands and air pollution. Important conversations on sustainable development and human civilisations' capacity to live in livable cities have taken place in the last few decades. Thus, municipal parks and other green areas should be included in urban sustainable development plans. When parks and

other green spaces in cities get the attention and upkeep, they need to be pleasant places to live, it improves both the quality of life and the health of the urban region. Urban green resources are essential for developing eco-friendly cityscapes (Jennings & Bamkole, 2019). Parks and other green spaces are becoming more important for city people due to urbanisation and the rising number of city inhabitants. Parks, gardens, boulevards, and gardens provide city dwellers with an opportunity to reap the mental and physical benefits of spending time in nature. The correlation between green space and human health has been the subject of a great deal of research, and the results show that green space improves people's mental and physical health (Semeraro et al. 2020). Parks and other verdant spaces are suitable venues for recreational and athletic activities. People may enjoy these spaces for a variety of activities, including walking, biking, exercising, and playing sports. Participating in these activities leads to a stronger heart and blood vessels, less stress, and improved general health. There is some evidence that spending time in natural settings might help reduce stress and anxiety. In general, green space resources improve city air quality, reduce pollution, alleviate respiratory ailments, and make people's lives simpler. Plants in cities can have a beneficial effect on wildlife. By reserving more space for parks and other forms of natural habitat, cities may increase their biodiversity. These spaces are home to many different kinds of plants and animals (Li, 2024).

BACKGROUND OF THE STUDY

Some examples of urban green spaces include parks, forests, and private gardens. These types of green spaces provide a variety of advantages to city dwellers, while also serving as essential habitats for a wide variety of animals. If more green space leads to improved physical fitness and less depression, then it may be beneficial for people who live and work in metropolitan areas to have access to more green space (Alterio, 2020). In the latter part of the 1980s, the concept of landscape urbanism emerged as a theoretical framework. As a result of the increasing number of large-scale city projects that started to push the traditional bounds of landscape architecture and urban planning, as well as the work of well-known people like Charles Waldheim, Richard Weller, and Peter Connolly, this was a reaction to the situation (Gatto et al. 2020). An ancient English phrase, "landscape" originally meant "region, tract of land" in Dutch. It is often used in English. At the beginning of the 1500s, when the phrase was first used, the artistic connotation of "a picture depicting scenery on land" had already established itself completely. Given the early acceptance of landscape painting in the Netherlands, the birth of the term in the country during this time period is not unexpected under any circumstances. At the time, landscapes were an excellent method to appeal to the preferences of the growing Protestant middle class, who were looking for secular art for their homes. This was something that was happening at the same time (Pinto et al.2025).

PURPOSE OF THE RESEARCH

Minimising negative implications on occupant health, the environment, and general well-being is the primary goal of sustainable design, an approach to building performance. The core principles of sustainability include reducing dependency on non-renewable resources, boosting productivity, and minimising waste. Get rid of background noise and polluted air. Gathers precipitation that, if uncontrolled, might lead to flooding. Creates a sanctuary where native creatures may live in peace. Maintains a steady state for regional carbon emissions. Society should aim for sustainability in the long term if it wishes to meet the needs of its growing economy with little environmental harm. Nevertheless, safeguarding our planet and its fragile ecosystems is only the start. Green towns are characterised by their abundance of public green spaces and lush flora, which promote public health, reduce pollution, and increase biodiversity. By using eco-friendly construction methods, pollution may be reduced in eco-cities.

LITERATURE REVIEW

The robustness, sustainability, and health of cities are all impossible to achieve without their green spaces. Incorporating green spaces into urban environments is one of the most significant methods that can be used to improve the quality of life in metropolitan areas and also to assist environmental sustainability as cities continue to expand. There are several studies that have shown the numerous benefits of green spaces, which include a reduction in the urban heat island effect, an improvement in the quality of our water and air, an increase in biodiversity, and an increase in the number of opportunities for residents to relax and have fun (Semeraro et al. 2020).The detrimental consequences of urbanisation on green spaces, climate change, and environmental harm have been the subject of investigation by a variety of experts working in the sector, including architects, planners, and lawmakers, amongst others. It will be possible to enhance both human health and the environment by putting into practice biophilic design, multifunctional landscapes, and green infrastructure (Ramyar et al. 2020). The idea of landscape management has found new applications in landscape study. Historic site management, landscape ecology, and rural forest and landscape management are a few examples. Employs the phrase "urban landscape management" when discussing cities, but focusses on the practical and technical parts of the field. We consider these details to be part of the more restricted realm of maintenance, as opposed to management. One of the first attempts at defining landscape management that we came across is that the field should be considered integral to both landscape design and upkeep (Leboeuf et al. 2023).

Urban forestry, park management, and landscape planning are three related disciplines that we combed through for information on how to organise urban landscapes. Sometimes, it's hard to tell which of these fields is which. But these are the cornerstones of our urban landscape management concept and logic.

RESEARCH QUESTIONS

How does air pollution affect sustainable urban landscape?

RESEARCH METHODOLOGY

RESEARCH DESIGN

The quantitative data analysis was conducted using SPSS version 25. The odds ratio and 95% confidence interval were used to ascertain the strength and direction of the statistical link. The researchers developed a statistically significant criterion at $p < 0.05$. A descriptive analysis was performed to determine the key characteristics of the data. Quantitative approaches are often used to evaluate data obtained from surveys, polls, and questionnaires, as well as data modified by computational tools for statistical analysis.

SAMPLING

A convenient sampling technique was applied for the study. The research relied on questionnaires to gather its data. The Rao-soft program determined a sample size of 1463. A total of 1600 questionnaires were distributed; 1557 were returned, and 57 were excluded due to incompleteness. In the end, 1500 questionnaires were used for the research.

DATA AND MEASUREMENT

A questionnaire survey served as the principal tool for data gathering in the study. The survey had two sections: (A) General demographic information and (B) Responses on online and offline channel variables assessed using a 5-point Likert scale. Secondary data was obtained from many sources, mostly on internet databases.
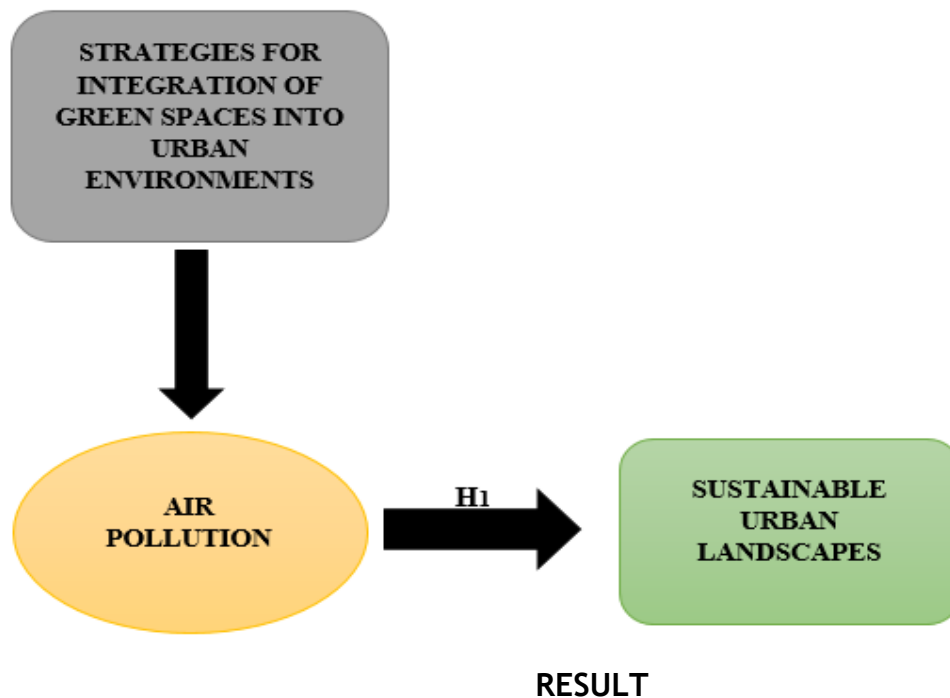
STATISTICAL SOFTWARE

The statistical analysis was conducted using SPSS 25 and MS-Excel.

STATISTICAL TOOLS

To grasp the fundamental character of the data, descriptive analysis was used. The researcher is required to analyse the data using ANOVA.

CONCEPTUAL FRAMEWORK

RESULT

Factor Analysis: One typical use of Factor Analysis (FA) is to verify the existence of latent components in observable data. When there are not easily observable visual or diagnostic markers, it is common practice to utilise regression coefficients to produce ratings. In FA, models are essential for success. Finding mistakes, intrusions, and obvious connections are the aims of modelling. One way to assess datasets produced by multiple regression studies is with the use of the Kaiser-Meyer-Olkin (KMO) Test. They] verify that the model and sample variables are representative. According to the numbers, there is data duplication. When the proportions are less, the data is easier to understand. For KMO, the output is a number between zero and one. If the KMO value is between 0.8 and 1, then the sample size should be enough. These are the permissible boundaries, according to Kaiser: The following are the acceptance criteria set by Kaiser:

A pitiful 0.050 to 0.059, below average 0.60 to 0.69

Middle grades often fall within the range of 0.70-0.79.

With a quality point score ranging from 0.80 to 0.89.

They marvel at the range of 0.90 to 1.00.

Table1: KMO and Bartlett's Test

Testing for KMO and Bartlett's

Sampling Adequacy Measured by Kaiser-Meyer-Olkin .950

The results of Bartlett's test of sphericity are as follows: approx. chi-square

df=190

sig.=.000

Table 1: KMO and Bartlett's Test.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.950
Bartlett's Test of Sphericity	Approx. Chi-Square	3252.968
	df	190
	Sig.	.000

This establishes the validity of assertions made only for the purpose of sampling. To ensure the relevance of the correlation matrices, researchers used Bartlett's Test of Sphericity. Kaiser-Meyer-Olkin states that a result of 0.950 indicates that the sample is adequate. The p-value is 0.00, as per Bartlett's sphericity test. A favorable result from Bartlett's sphericity test indicates that the correlation matrix is not an identity matrix.

INDEPENDENT VARIABLE

Strategies for Integration of Green Spaces into Urban Environments: Rapid and permanent population expansion poses challenges for urban areas' ability to manage urbanisation due to limited resources and infrastructure. Strategic planning is one of the management strategies that help organisations choose their future course of action and the methods they will employ to reach their goals. By considering the current profile of the city and doing a SWOT analysis, urban strategic planners may foretell how a city or urban area will develop in the future. With this plan in place, the city can handle change more effectively, respond faster to unexpected occurrences, and improve residents' quality of life. In order to adapt to the changing conditions in the city, the process must develop rather than stay static. There will always be many repetitions of forward and backward movement throughout the process before arriving at the final set of decisions. Urban strategic planning and plans are indispensible, and neither is the spatial planning process nor the spatial plans proposed for development at various levels. Using a consensus-building method, the strategic planning process guides progress towards the accepted long-term goals of all parties involved (Kavouras et al. 2024).

FACTOR

Air Pollution: Nitrogen makes up around 78% of air, oxygen about 21%, and argon about 0.9%. Carbon dioxide, hydrogen, water vapour, and other trace components make up the remaining elements. Gases such as carbon dioxide and methane, which are present in very low quantities, are the primary cause of the rapid acceleration of climate change due to their enormous capacity to trap heat. When the volume or chemical, physical, or biological characteristics of air are changed, it results in air pollution. The atmosphere is a finely tuned equilibrium of many particles and elements. Animals and crops alike are vulnerable to the effects of even a little imbalance (Oijstaeijen et al. 2019).

Point sources, including industries and fuel-burning automobiles, release gaseous and particle pollutants into the air, including nitrogen dioxide, carbon dioxide, and methane. Although certain gaseous emissions are easily detectable, others may spread into the air and go unnoticed. However, particulate pollution, including black carbon and soot, is always visible (Lin & Egerer, 2020).

DEPENDENT VARIABLE

Sustainable Urban Landscapes: By reducing consumption and waste, among other practices, sustainable urbanism aims to improve the health of communities over the long term while simultaneously protecting people and the environment from harm. By following certain rules, sustainable landscape designers want to create an outdoor space that is good for the environment and looks good doing it. Fundamental to ecologically responsible landscaping is a reduction in water use, soil erosion, and waste. Sustainable landscape design includes features such as a rainwater collecting station and a garden that features native species. Sustainable landscapes offer numerous benefits, but you can't enjoy them unless you have the resources to create them. Then, let's take a closer look at a few architectural elements that might be influenced by sustainable landscape design principles. To construct cities in a sustainable manner is to ensure that they can support human development, make efficient use of resources, endure throughout time, and reduce our impact on the environment (Maggiore et al. 2019).

Relationship between Air Pollution and Sustainable Urban Landscapes: Air pollution is a threat to healthy and functional green spaces; but well-designed landscapes might help to solve this issue. This is why sustainable urban environments are really crucial. Urban air pollution mostly comes from industrial emissions, automobile exhaust, and construction activity; they contribute harmful pollutants like sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), and particle matter (PM2.5 and PM10). These poisons injure plants, reduce photosynthesis, and impair the quality of the soil. Plants suffer decreased ability to detoxify contaminants and manage their own temperatures when ozone (O_t) destroys them. Particle matter absorbs sunlight, so pollution increases the UHI effect; cities are hotter and the cooling effect of urban vegetation is reduced. Further lowering

plant resilience are depleted soil nutrients and declining biodiversity brought on by air pollution, acid rain. Public health suffers also from the degradation of green infrastructure. Bad air quality directly causes lower outdoor activity participation and increased healthcare costs since it aggravates respiratory and cardiovascular diseases (Semeraro et al. 2019).

The reality that city crops in pollution-related forces raise maintenance costs adds to sustainable landscaping management further. Communities should give the implementation of plants that tolerate pollution a top priority with the goal to mitigate these impacts, establish urban forests, and support the creation of green infrastructure like vegetated barriers and green walls. Using green transportation and planning techniques will help to lower emissions and improve air quality. This will make it feasible for cities to keep effectively offering ecological services. Cities should give sustainable development and pollution control first priority if they are to create stronger, more resilient communities better able to endure climate change and maintain biodiversity (Miller & Montalto, 2019).

On the basis of the above discussion, the researcher formulated the following hypothesis, which was analyse the relationship between Air Pollution and Sustainable Urban Landscapes.

H_{01}: **There is no significant relationship between Air Pollution and Sustainable Urban Landscapes.**

H_1: **There is a significant relationship between Air Pollution and Sustainable Urban Landscapes.**

Table 2: H_1 ANOVA Test.

ANOVA					
Sum					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	39588.620	564	5565.517	988.0201	.000
Within Groups	492.770	935	5.633		
Total	40081.390	1499			

This investigation yields remarkable results. The F value is 988.0201, attaining significance with a p-value of .000, which is below the .05 alpha threshold. This signifies the "H_1: **There is a significant relationship between air pollution and sustainable urban landscapes.**" is accepted and the null hypothesis is rejected.

DISCUSSION

The numerous ways in which urban green spaces improve air quality, property value (due to the aesthetic features and amenities they offer), and energy consumption

(due to the reduced need for building cooling) imply that they have the potential to be an effective instrument for the long-term preservation of environmental sustainability. Neighbourhood gardens and green roofs have the potential to contribute to the production of ecosystem services such as the regulation of water flow, the mitigation of extreme events, and the improvement of air quality and climate. This is due to the fact that they lessen the adverse effects of impermeable surfaces, which are the primary contributors to urban heat islands and floods. Following an examination of the relevant literature, this result has been arrived at. A number of additional benefits may be derived from the installation of community gardens or green roofs. These benefits include the enhancement of people's mental and physical well-being, the attraction of a greater variety of plant and animal species, and the filling in of gaps in the habitats of insects and other forms of wildlife. Community gardens seem to have a significant role in facilitating the reduction of bias and other social issues in cities that are expanding and have a diverse population. When creating GI, it is important to take into consideration the plants that are appropriate for the work at hand, the issue that is currently being addressed, and any potential energy or material fluxes that may occur between the plants and their surroundings. Despite the fact that these energy and material fluxes are the cornerstone of ecosystem services, they are also the defining characteristics of disservices, which may have both positive and negative consequences on human health. Therefore, plants are not only decorative things; rather, they are essential, living components of the natural environment on which we live.

CONCLUSION

Parks and other green spaces in cities enhance the quality of life for residents in many ways. Parks and other green areas in cities are thus widely acknowledged as essential to the growth of eco-cities in the modern era. Rising traffic and urban temperatures have social, economic, and environmental consequences, especially in developing countries. The many ecological benefits offered by green spaces, such as reducing the impact of climate change and maintaining biodiversity, must be included in contemporary sustainable development. Green spaces inside cities are especially important for improving air quality because they soak up toxins and other airborne particles that may aggravate respiratory illnesses. Less energy is required to cool buildings that have more green space around them. The aesthetic and functional advantages that green spaces provide might increase property prices. Urban parks are popular for many reasons, but the most sought-after are the social and psychological benefits. In instance, urban gardens and parks provide a spot to relax and appreciate nature. In a perfect world, this helps with both physical relaxation and emotional healing. The city's parks and other open spaces should be easily accessible, big enough, and of good enough quality to meet the needs of the people living there. The city's parks and other open spaces should be spaced out equitably over the terrain and large enough to accommodate all of the residents. Cities are not only home to most people on Earth, but they also use up most of the

resources that the planet has to offer. In addition to facilitating essential services, urban green areas inspire and promote a more positive relationship with nature.

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