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GREENING DHAKA CITY THROUGH AFFORESTATION & CONSERVATION: CHALLENGES & WAY FORWARD

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ABSTRACT

This policy paper outlines a comprehensive strategy aimed at transforming Dhaka into a sustainable and livable city by addressing critical issues related to the environment, economy, and public health. Key components of this policy paper include role of stakeholder and their involvement to ensure collective commitment and engagement, a thorough PESTEL analysis to assess external factors, MCA to evaluate policy options, and comprehensive risk analysis to identify and mitigate potential challenges. These Policies align with broader goals of combating climate change, mitigating the Urban Heat Island Effect, restoring ecological balance, promoting biodiversity, and enhancing human health over the long term. A selected policy option is presented for accompanied by a detailed implementation and monitoring plan, complete with a proposed budget. This budget allocation is designed to facilitate the successful execution of the policy and the attainment of desired outcomes. Furthermore, this policy emphasizes the importance of considering health, environmental sustainability, social well-being, and economic growth in tandem to create a livable and ideal city. Recommendations and action points are proposed to guide the transformation of Dhaka into a city that harmonizes the interests of its inhabitants, environment, and the broader community. By adhering to the principles outlined in this policy paper, Dhaka can move towards a future characterized by sustainability, resilience, and improved quality of life for its residents while contributing to global efforts to address climate change and promote urban livability.

Keywords: Greening, Dhaka city, Afforestation, Conservation, Policy Analysis, Policy Proposal, Sustainability, Urban Design, Urban Planning, Environmental Planning, Landscape Design, Tree Plantation

I.INTRODUCTION

The greening system of a city is made up of Economic, Social, and Environmental system where green spaces are the crucial position. They play a vital role in clean up the air; adjust the microclimate, eliminating noise, beautifying the surroundings, etc. Apart from these benefits, they also support the construction of high-quality human settlements, since green spaces act as the *''lungs''* of the city [1]. Urban green space encompasses neighborhood parks, playgrounds, recreational green areas, and urban forest cover. Urban forests, on the other hand, consist of all urban vegetation, including street trees and tree patches in parks and peri-urban trees extending to the outer city. Urban forests provide ecosystem services essential for aesthetics, urban heat, poor air-quality, hydrologic governance, pollution prevention and social strength, public health, and well-being. Urban vegetation can store substantial amounts of carbon, which ensures long-term stabilization of carbon fluctuations in the environment and thus helps reduce atmospheric CO_2 concentrations. Many megacities worldwide have become impervious surfaces with less vegetation. Consequently, urban vegetation cover faces many challenges in a stressful artificial, rapidly changing urban environment. It is worth noting that different forms, sizes, and tree cover affect urban climate and temperature [2].

II.BRIEF HISTORY OF GREENING DHAKA CITY

Dhaka has an extensive history dating back about 400 years. The city went through phases of growth and decline from its beginning as a city with a small population to its current state as a extremely extended megacity. Traditionally, the development of Dhaka city took place in the pre-Mughal period from the banks of the South River which is now a part of Old Dhaka. Then the city extended to the west and the north during the Mughal and British periods. During the Pakistan period, development was initially from south to north, which later expanded, rapidly in an unplanned approach in each direction.

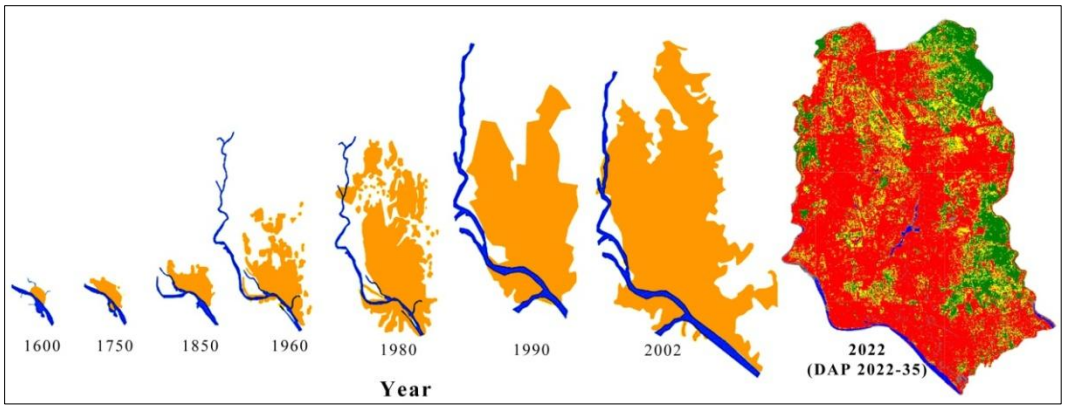

Fig.01: The historical growth of Dhaka City [3,4]

Historically, the city featured gardens, water bodies, and greeneries within its urban fabric. Mughal-era gardens and structures like Lalbagh Fort bear witness to this early emphasis on greenery. During British colonial rule, Dhaka saw significant changes in —urban planning and infrastructure development. Green spaces like Ramna Park were established during this period. However, the colonial focus was often on enhancing the city's administrative and economic functions rather than sustainable urban planning. After gaining independence in 1971, Bangladesh experienced rapid urbanization, with a significant influx of people into Dhaka City [5]. Dhaka experienced a surge in population growth due to rural-to-urban migration. This influx of people resulted in overcrowding, inadequate infrastructure, and further environmental degradation. Open spaces, parks, and trees were sacrificed for the construction of buildings and roads. The population density of Dhaka city has also increased day by day and due to that, the land surrounded by plants has decreased for the needs of the city to build houses, offices, factories, roads, bridges, bus-terminals, railway stations, etc. For the expansion of this high density of population, more areas were required in Dhaka. At that time, the corporation was ruling with the beginning of the Dhaka Municipal Corporation Ordinance, 1983, repealing the function of the Pourashava Ordinance, 1977. Later, the quantity of wards was greater than before to 75 and Administrators / Mayors were selected by the Government until 1994 [6]. At present condition, Dhaka covers an area of 1528sq km. The city is experiencing massive population growth, estimated by the UN at 6.9% between 1974 and 2000, resulting in 21.1 million people living in Dhaka by 2015. This rapid growth worried the city's resources and infrastructure, leading to a haphazard urban sprawl that often neglected green spaces and environmental concerns. As the negative consequences of environmental degradation became more apparent in the 1980s and 1990s, environmentalists in Dhaka began to raise awareness about the importance of afforestation, Green Conservation, playgrounds, etc. for a sustainable city environment.

Why this problem need to be addressed: Dhaka is the eleventh largest megacity in the world with 18.2 million people living in an area of only 1528 sq km. It's crucial to greening Dhaka city for many reasons, especially considering its unique challenges and characteristics. With over 400 years of human settlement, Dhaka City has a critical challenge in increasing green spaces and improving environmental sustainability. The problem is worsened by rapid urbanization, inadequate planning, and limited green space, which has resulted in environmental and social issues. The lack of green infrastructure negatively affects residents' well-being and threatens the city's resilience to climate change. The shortage of accessible and well-maintained green areas in the urban landscape impedes the city's efforts to provide adequate recreational spaces, manage storm-water, and enhance overall quality of life. The main issue is identifying and addressing specific barriers that hinder the creation and maintenance of green spaces in Dhaka, which provide recreational opportunities, improved air-quality, and decreases the urban heat island effect. This would limit the city's potential for positive environmental, social, and economic outcomes.

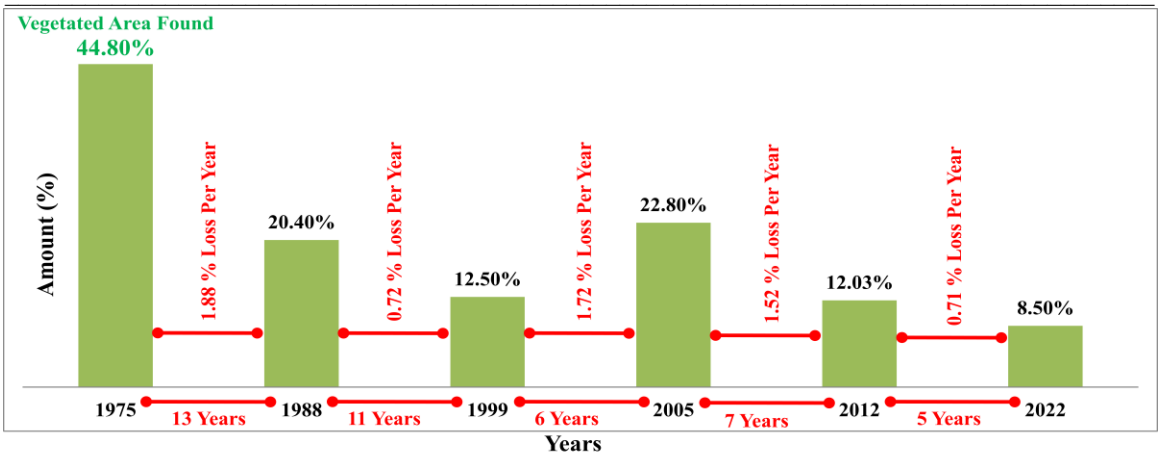

Fig.02: Losses of Green area in Dhaka ***[1,7,8]***

Carbon sequestration of Dhaka city is not as expected due to insufficient amount of vegetation and lack of diverse trees. The average cooling and humidification effect of mid-scale green areas were most visible during the summer. Moreover, the loss of urban green areas can promote an urban heat island effect, a microclimatic event with important temperature increase and amplifying heat effect **[2].** A published study found that only 8.5 percent of Dhaka's land has tree cover, compared to the minimum 20 percent green landscape required for a healthy city **[8].** The plan for Dhaka city has been altered multiple times due to geopolitical factors. Because of excessive development planning, the size of Dhaka has not only changed in central areas but also in the surrounding green spaces. It is now crucial for Dhaka to adopt and implement green initiatives.

III. PROBLEM STATEMENT

Green spaces offer residents areas for relaxation, social interaction, and leisure activities. They contribute to an improved quality of life by providing a break from the hustle and bustle of city life. By narrowing down the problem statement, the focus is to identify the challenges to greening Dhaka, address them, and propose effective policies for a livable city environment.

IV. OBJECTIVES AND LIMITATIONS

Objectives of the Study:

The Broad Objective of this policy paper is to determine the challenges and way to solve the greening problem of Dhaka City through Afforestation and Conservation of Existing Greeneries.

The Specific Objectives are as follows:

- To determine challenges of mitigating the Climate Change & Urban Heat Island Effect.
- To find a way to fulfill Sustainable Development Goals (11, 13, 15).
- To determine the challenges of enhancing biodiversity in Dhaka city through Afforestation and Conservation.

Limitation of the Study:

Here are some potential limitations of the study:

- Studies may lack a long-term assessment to identify challenges and counter measures to greening Dhaka, which may delay a successful policy formulation.
- In a rapidly developing country context, the study may not fully account for future changes in technology, policy, or societal attitudes toward greening.
- The study might not deeply delve into the social and economic factors influencing greening efforts, such as income disparities, access to resources, and differential benefits among various demographic groups.

V.LITERATURE REVIEW

A Literature Review has been conducted to prepare this policy paper and some of the existing local & neighborhood countries policies have been summarized in this paper. Through this, in formulating a new policy, if there is any conflict with the existing policy, it can be found and if any part of the existing policy needs to be used as a reference, it will be known. Different existing policies that are likely to be somewhat similar to the proposed policy are listed in the following section.

Draft Forest Policy 2016 ***[9]***

- Defense of current forest resources
- Raise participating forestry
- Via appropriate mechanisms, enhance tree cover outside of state forests on both public and private property even in urban areas.
- Valuation of ecosystem services and payment for ecosystem service

National Environmental policy 2018 - Section 3.9: Forest and wildlife [10]

- Research and development of forest and wildlife conservation for the ecosystem and socioeconomic development
- Protection of wetlands
- Development of alternative forest products to reduce extraction of forest products
- Import-prohibition of harmful and exotic species
- Awareness-raising among people regarding forest and wildlife conservation

*Bangladesh forestry master plan (FMP) 2017–2036****[11]***

- Ecosystem products and services for the national economy
- The reforestation of vacant lands and increased forest cover outside forests to improve ecosystem resources and forest-based employment.
- Anthropogenic issues and climate change issues are considered.

Urban and Regional planning act 2022 [12]

- Prevent unplanned urbanization, and prevent misuse of land.
- Clearance from the authority to develop arable land
- Strategic plans for Agricultural land, Wetland, Forest, Hill areas and Coastal belts.
- Develop coordination among the authorities

8th 5-year plan ***[7]***

- Prioritize reducing air and water pollution, managing forests, and implementing Bangladesh Delta Plan 2100.
- Commitment to increase social-forestry

Forest Investment Plan (FIP - 2017) ***[13]***

- Identify scope of future invest to increased forest cover growth, deforestation and forest degradation.
- The investment plan is to improve the livelihoods of the forest-product-dependent people by implementing participatory/social forestry.

"URBAN GREENING POLICY, A PROPOSAL" [12]

- Urban forestry, open space, and park systems
- Green building efforts
- Green and living streets initiatives
- Urban Agriculture
- Urban greenways and trail systems;
- Wildlife habitat and management

Conceptualization and Operationalization of the Problem:

Conceptualization of Problem:

- According to the National Constitute of Bangladesh, Part II, Section 18A: - Protection and improvement of environment and biodiversity: The State shall endeavor to protect and improve the environment and to preserve and safeguard the natural resources, bio-diversity, wetlands, forests, and wildlife for the present and future citizens.
- *Achieve SDG Goals***:** Urban Greening is one of the principles of UNDP Sustainable Goal 11 - ***"Sustainable Cities and Communities",*** Goal 13 - ***"Climate Action",*** and Goal 15 - ***"Life on Earth"*** which are transforming the way building and mitigating Climate Change.

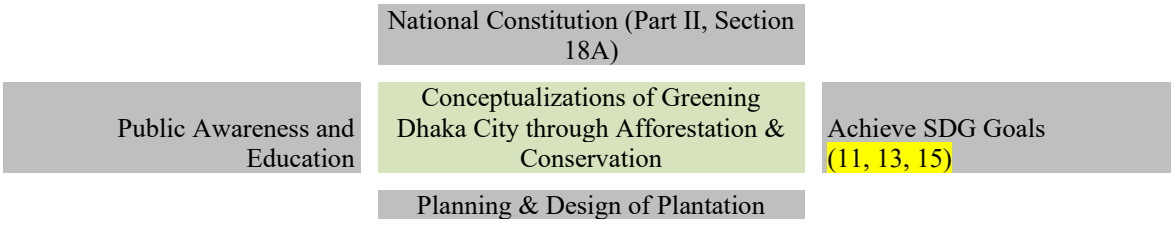

Fig.03: Conceptualization of Root Cause

- Plantation Planning and Design**:** Urban greening turns public spaces into lush green areas using shrubs, ground covers, and tree designs, seen in parks and along roads.
- Public Awareness and Education**:** Creating public awareness and educating the residents of Dhaka City about the importance of afforestation and green initiatives is crucial for this policy successful implementation.

Operationalization / Measuring Index of Problem:

Tree Cover and Green Space (%):

- Measure the increase in tree cover and green space within the city over time.
- Calculate the percentage of the city's total area covered by trees and greenery.

Biodiversity Metrics:

- Monitor changes in biodiversity through regular species surveys and assessments.
- Track the presence and health of native plant and animal species in urban green spaces.
- Measure improvements in the conservation status of endangered or threatened species.

Air and Water Quality:

- Monitor air quality through measurements of pollutant such as Nitrogen Dioxide (NO_2), Particulate Matter (PM2.5, PM10), etc.

Community Engagement:

- Measure community participation and involvement in tree planting and conservation programs.
- Track the number of community-led green initiatives and the extent of public support.

Green Infrastructure Development:

- Track the adoption of green building practices and green infrastructure, such as green roofs, green walls, and permeable pavements.

Public Health Outcomes:

- Measure improvements in public health, including reduced rates of respiratory illnesses and stress-related disorders.
- Assess the overall well-being of city residents in greener areas compared to less green areas.

Environmental Education and Awareness:

- Track the success of environmental education programs in raising awareness and changing behavior.
- Measure changes in public perception and understanding of environmental issues.

Policy and Regulatory Changes:

- Monitor the implementation of new policies and regulations supporting greening efforts.
- Measure compliance with zoning and land-use policies that encourage green spaces.

VI.METHODOLOGY

Methodology of the study:

The methodology for the study titled ***"Greening Dhaka City through Afforestation and Conservation: Challenges and the Way Forward"*** involves a systematic approach that analyze the challenges related to enhancing Greening in Dhaka city are giving below:

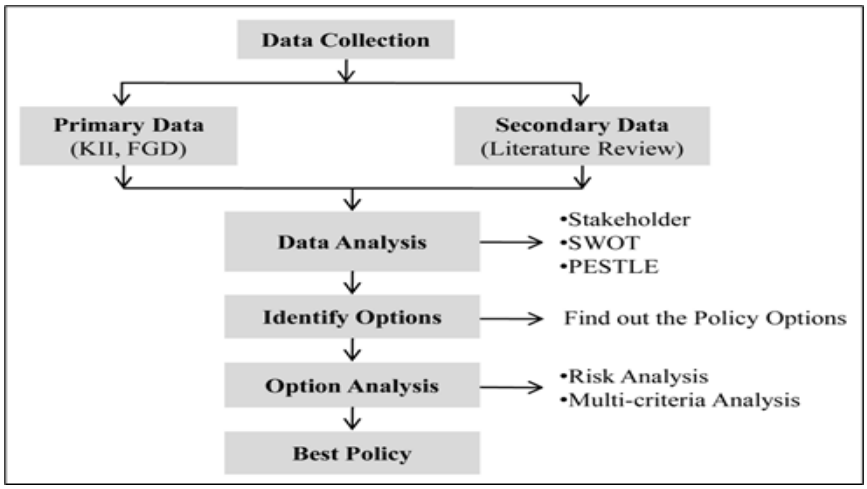

Fig.4: Methodological Framework for data collection and analysis.

Study Types
In this study, I will collect data from Primary and Secondary sources and analyze that data through various tools to fulfill the objectives of my study.

Primary & Secondary Data Collection
I will gather information on greening in Dhaka through **Key Informant Interviews (KII)**, **Focus Groups Discussion (FGD)**, and various **Secondary** sources like books, articles, and websites.

Data Analysis
In this study, data will be analyzed by applying different data analysis tools after getting data from primary and secondary data sources to fulfill the study's objectives. As analysis tools in this study, I have used Stakeholder Analysis, SWOT Analysis, and PESTLE Analysis to explore the policy options.

Policy Options Identification
According to the information obtained from the data analysis, some options for our desired results are found at this stage, which will serve as an initial solution to our objectives and problems.

Options Analysis
In this stage, policy options will be analyzed by applying different analysis tools to find out the best policy option. As analysis tools in this study, I have used Risk Analysis where using **"High"**, **"Medium"**, and **"Low"** stages scales. Also using Multi-criteria Analysis where applying the following formula:

$$\mathbf{I = P \times W}$$

Where, **I** = Impact of Specific Criteria
P = Points of Criteria (+5 to -5)
W = Weight of Criteria, which is not more than 1.0 or less than 0.1

After adding the impacts of all the criteria, I found out the total score of the requirements. Based on this score, I made the criteria that got the highest score first and arranged the rest of the policies from high score to low according to this series. The results of both risk analysis and multi-criteria analysis are consolidated in a summary sheet to identify the optimal policy option. In multi-criteria analysis, priority is given to the policy with the highest score, while in risk analysis; priority is given to the policy with the lowest level of risk to determine the best policy option.

Context Analysis

Stakeholders Analysis:
Dhaka City Corporation **(DCC)** is a self-governing corporation called Local Government, which manages many important affairs of the city, which in 2011 was divided into two administrative divisions namely Dhaka North City Corporation **(DNCC)** and Dhaka South City Corporation **(DSCC)**. Apart from city corporations, there are 42 different organizations of Dhaka city, which includes **PWD, RAJUK, LGED, NHA, DWASA, DTCA, RHD**, etc. The city corporations provide urban services (Management of solid waste, control of food adulteration, establishment of markets, slaughterhouses, construction of roads, buildings, parks, open spaces, creation of opportunities for various cultural events, plantation etc.) and collect revenues. **RAJUK** works in planning, development, development control, construction approval, plot allotment, etc. Government construction projects are implemented and maintained by **PWD. NHA** is responsible for disbursing loans for housing and home preparation to low and middle income people. Dhaka **WASA** looks after the water supply where **DTCA** is accountable for public transport in the city**[6].**

Table 01: Role of Different Stakeholders. [8][6]

Type of Organization	Name of Organizations	Activities
State, Local & Autonomous Bodies	DCC, RAJUK, DoE, R&H Department, PWD, DUTP, DTCA, BFD, IMED, DoA	• Afforestation & Beautification • Greening Policy Formulation • Awareness Rising • Forest Related Researches • Monitoring & Management • Establishment of Parks • Funding & CSR Initiatives • Conservation & Promoting Social Forestry
Media & Communication Channels	TV & Newspaper, Online Media, Social Media, etc.	• Awareness Rising • Researches
Educational & Research Organizations	Academician, Primary Schools, Secondary Schools, Universities, Research Institutes	• Afforestation & Beautification • Awareness Rising • Forest Related Researches • Conservation & Promoting Social Forestry
NGOs, NPOs, Environmental Activists and Advocacy Groups	ASHA, NNC, NISORGO, Society of Arboriculture, BAPA, BIE	• Afforestation & Beautification • Awareness Rising • Forest Related Researches • Nursery & Traders • Conservation & Promoting Social Forestry
Community & Residents	Local Community, Individual Residents, Local Youth Clubs,	• Afforestation & Beautification • Awareness Rising • Nursery & Traders • Conservation & Promoting Social Forestry
Business & Corporations	Beximco Group, HSBC Bangladesh, The ACI Group, FBCCI	• Afforestation & Beautification • Awareness Rising • Funding & CSR Initiatives
International Organizations and Donors	BRAC, ADB, World Bank, UNDP	• Afforestation & Beautification • Awareness Rising • Forest Related Researches • Funding & CSR Initiatives

Stakeholders Mapping:

Here is a mapping of stakeholders based on interest and power which is given below. This will help in the formulation and implementation of this policy.

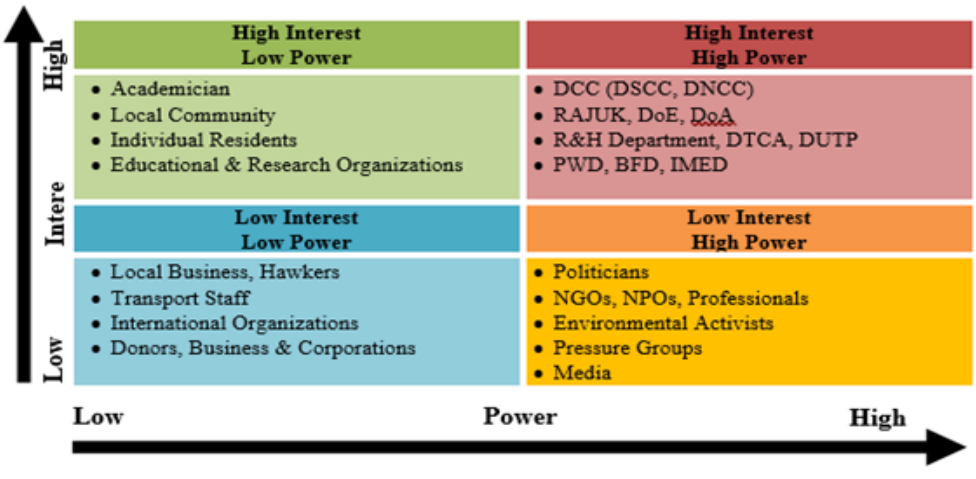

Fig.05: Stakeholder mapping based on Interest & Power.

SWOT Analysis:

Through this SWOT analysis we will know the significant benefits of greening Dhaka city through afforestation, it will be easy to find its weaknesses, we will know what are the opportunities to work in Dhaka city in the future and what the threats to Dhaka city are if these steps are not taken.

Strength	Weakness
• Air Quality Improvement • Regulate Heat Island Effect • Biodiversity conservation • Enhance local food production • Improve natural aesthetic • Mitigated carbon emission.	• Possible air pollution • Increased Urban Heat Island Effect • Challenge of land available for plantation. • Aesthetic & Psychological Impact. • Possible to increased maintaining cost.
Opportunity	**Threats**
• Roadside planting • Public Park & open spaces • Educational Programs • Corporate & NGOs partnership • Green Building Initiatives. • Urban Agriculture.	• Loss of Biodiversity • Climate Change Impact • Loss of Ecosystem services • Social & Mental health hazard • Political & Policy making challenges. • Resource Constraints.

Fig.06: SWOT Analysis

PESTLE Analysis:

For the formulation of this policy paper and to gain a comprehensive understanding of the external factors of the root cause, I have analyzed here PESTLE. These PESTLE factors can provide valuable insights into the broader context in which a policy will be implemented.

Political Factors:

- Political decisions determine the allocation of budgets.
- Political factors influence land ownership and access to suitable areas for greening.
- Political leaders can engage in diplomatic efforts to secure International cooperation and financial assistance.
- Political leaders can develop strategic plans that outline specific afforestation goals.

Economic Factors:

- Afforestation and conservation projects create job opportunities.
- Green spaces and forests can attract tourists and locals looking for recreational activities.
- Greening efforts can support local agriculture by providing pollinators and beneficial insects.

Social Factors:

- Green spaces and forests can have a positive impact on public health.
- Afforestation and conservation can foster a sense of community ownership and engagement, strengthening social bonds among residents.
- Some green spaces may have social, cultural, or historical significance thus can help preserve cultural heritage and provide opportunities for cultural events and festivals.

Technological Factors:

- Utilize GIS technology to map out suitable areas for afforestation, low green cover, optimal conditions for tree growth, etc.
- Implement tree inventory software to keep track of the type, age, health, and location of planted trees.
- A smart irrigation system adjusts water usage based on weather and soil moisture.

Legal Factors:

- Ensure that existing environmental laws and regulations for support afforestation and conservation efforts.
- Establish or revise land use and zoning laws to allocate space for green areas, parks, and afforestation projects within the city.
- Enact and enforce tree protection ordinances that safeguard existing trees and require permits for tree removal or pruning.
- Implement and enforce laws that protect local biodiversity, including native plant and animal species.

Environmental Factors:

- Trees and greenery can help improve air quality by absorbing pollutants and emitting oxygen.
- Afforestation and conservation contribute to climate resilience by reducing the urban heat island effect and providing natural buffers against extreme weather events.

Causes & Effect Analysis (Problem Tree):

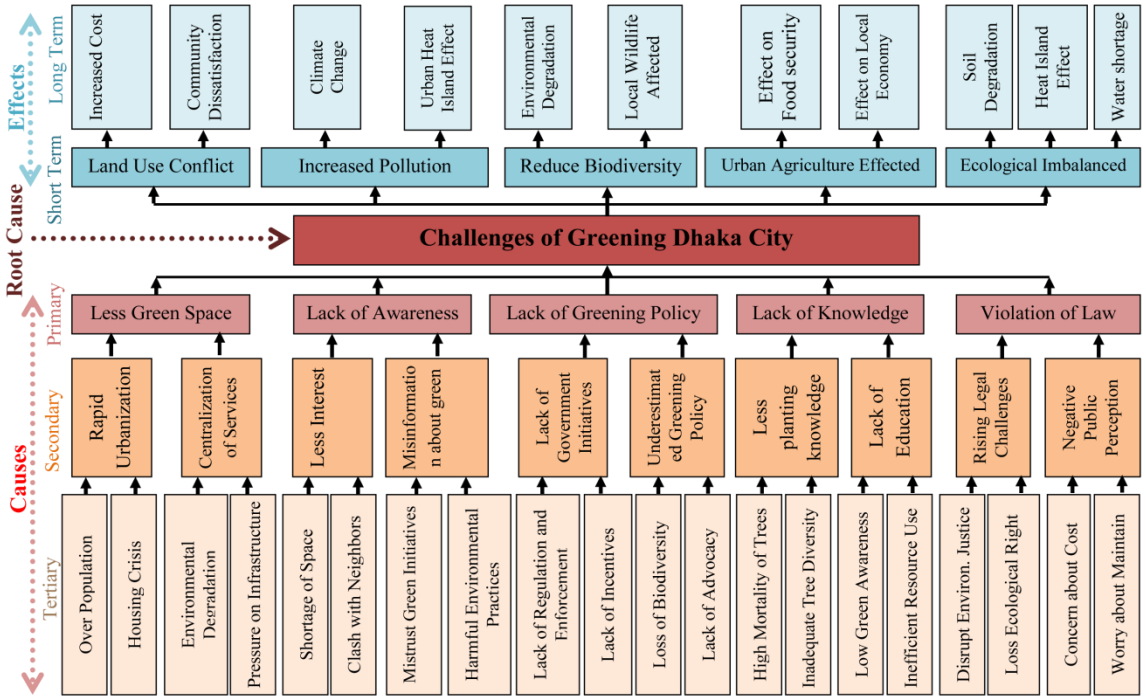

Fig.07: Causes and Effect Analysis

Below is a discussion of the primary problems to understand the challenges of formulating this policy paper:

- Less Green Space: Dhaka City's lack of green space is a complex issue affecting residents' quality of life and the environment due to factors like over population, air pollution, and biodiversity loss, etc.
- Lack of Awareness: In Dhaka City, the lack of knowledge about greening initiatives and practices can result in many challenges related to urban environmental sustainability. Some common issues that arise from this lack of awareness include inefficient land use, conflicts with neighbors, mistrust of green initiatives, and harmful environmental practices.
- Lack of Greening Policy: Dhaka City's failure to implement a comprehensive greening policy can lead to numerous issues regarding urban sustainability, environmental quality, and overall well-being. The absence of such a policy results in problems such as inadequate regulation and enforcement, lack of incentives, insufficient government initiatives, and disproportionate government policies.
- Lake of Planting Knowledge: Without a comprehensive greening policy in Dhaka City, there are various challenges and problems related to urban sustainability, environmental quality, and overall well-being. Some of these issues include a lack of knowledge about planting, high mortality rates of trees, and inadequate tree diversity.
- Violation of Law: Non-compliance with laws and regulations concerning planting and urban greening in Dhaka City can create challenges. Enforcing laws and regulations for planting and urban greening in Dhaka is crucial for a sustainable environment. Effective enforcement methods and community engagement can ensure compliance.

Options Analysis

Probable Options Identification

Table 02: Probable Policy Options

Sl No.	Primary Problem	Probable Policy Options
1	**Less Green Space**	**Op. 1:** Formulating Policies for Greening Dhaka through Afforestation and Sustainable Landscape Design.
2	**Lack of Awareness**	**Op. 2:** Public awareness programs and formulating policies to encourage people to invest in green projects.
3	**Lack of Green Policy**	**Op. 3:** Formulation of Policy for Conservation and Monitoring of existing green spaces in Dhaka City.
4	**Lack of Knowledge**	**Op. 4:** Formulation of General Guidelines for Planting and Managing Trees.

Brief Discuss about Policy Options:

Op. 1: Formulating Policies for Greening Dhaka through Afforestation and Sustainable Landscape Design: Sustainable landscaping, also known as eco-friendly or green landscaping, is an approach to designing and maintaining outdoor spaces that prioritizes environmental conservation, resource efficiency, and ecological health. It aims to create attractive and functional landscapes while minimizing negative impacts on the environment. Key principles and practices associated with sustainable landscaping are - Native Plants, Water Conservation, Soil Health, Reducing Lawn Size, Organic Planting, Wildlife Habitat, Permeable Surfaces, Energy Efficiency, Sustainable Materials, Maintenance Practices, Education and Outreach, etc.

Op. 2: Public awareness programs and formulating policies to encourage people to invest in green projects: Promoting public awareness about green and encouraging investment in eco-friendly projects can address climate change concerns and boost economic growth. Governments should take initiatives such as incentives to encourage business participation in sustainable practices and job creation while combining public awareness with enthusiasm for a sustainable future. Bank loans should be arranged at low rates if necessary.

Op. 3: Formulation of Policy for Conservation and Monitoring of existing green spaces in Dhaka City: It is important to conserve and monitor existing green spaces for a range of reasons. Green spaces are vital for maintaining the health and well-being of both ecosystems and human communities. They help preserve biodiversity, mitigate the impacts of climate change, provide cultural and aesthetic value, and mitigate the urban heat island effect. By conserving and monitoring green spaces, we can ensure that these areas continue to provide ecological, social, and economic benefits for generations to come.

Op. 4: Formulation of General Guidelines for Planting and Managing Trees: Planting and managing trees according to general guidelines can benefit communities in many ways socially and environmentally. These guidelines promote a uniform approach to tree planting and management, ensuring adherence to best practices and consistency in practice. This consistency helps create a more orderly and predictable urban environment. Guidelines also encourage long-term planning and decision-making in urban forestry, allowing communities to make informed choices about tree planting locations, species selection, and maintenance practices to ensure the sustainability of tree populations over time.

Risk Analysis of Options

Table 03: Risk analysis of probable options

Scale of Risk Analysis – Low Medium High

Op. 01: Formulating Policies for Greening Dhaka through Afforestation and Sustainable Landscape Design.						
Sl no	**Risk Factors**	**Probability**	**Impact**	**Risk Level**	**Rank**	**Mitigation Strategy**
1	Urban Density vs. Green Spaces				**Low (1st)**	• Stakeholder consultations • Funding and Budget • Bureaucratic and Administrative Risks mitigation • Monitoring and Evaluation • Public Awareness and Education
2	Centralized Developments					
3	Housing Crisis					
4	Regulatory Compliance					
5	Environmental Degradation					
Op. 02 - Public awareness programs and formulating policies to encourage people to invest in green projects						
Sl no	**Risk Factors**	**Probability**	**Impact**	**Risk Level**	**Rank**	**Mitigation Strategy**
1	Less Public Interest				**Medium (4th)**	• Public Awareness and Education • Develop incentives, loans or grants, etc. • Bureaucratic and Administrative Risks mitigation • Monitoring and Evaluation
2	Harmful Environmental Practice					
3	Misinformation about Green					
4	Political and Regulatory Risk					
5	Economic Viability					
Op. 03 - Formulation of Policy for Conservation and Monitoring of existing green spaces in Dhaka City						
Sl no	**Risk Factors**	**Probability**	**Impact**	**Risk Level**	**Rank**	**Mitigation Strategy**
1	Less Government Initiatives				**Low (2nd)**	• Stakeholder consultations • Funding and Budget • Monitoring and Evaluation • Legal and Regulatory Review
2	Lack of Incentives					
3	Less Advocacy					
4	Shortage of Professionals					
5	Lack of regulation & Enforcement					
Op. 04 – Formulation of General Guidelines for Planting and Managing Trees.						
Sl no	**Risk Factors**	**Probability**	**Impact**	**Risk Level**	**Rank**	**Mitigation Strategy**
1	Disease and Pests				**Medium (3rd)**	• Conduct ecological assessments before planting.
2	Planting Techniques					
3	Destruction & Damage					
4	Water Scarcity					
5	Society Engagement					

Multi-Criteria Analysis of Options

Selection of Policy Alternatives: In this policy paper, multiple criteria and factors are being considered simultaneously through MCA. This holistic approach will thereby ensure that all aspects of greening are taken into account. Assigning weights to criteria and scoring alternatives based on data and analysis will reduce the influence of subjective bias and personal opinion in decision-making.

Table 04: Risk analysis of probable options

Assessment Criteria	Points (-5 to +5)	Weight (1)	Impact	Total Score
Option 01: Formulating Policies for Greening Dhaka through Afforestation and Sustainable Landscape Design.				
Administrative	**3.5**	**0.1**	**0.35**	**3.55 (Rank -1)**
Economic	**2.5**	**0.2**	**0.5**	
Fiscal	**-1**	**0.1**	**-0.1**	
Social	**4**	**0.2**	**0.8**	
Environment	**5**	**0.4**	**2**	
Option 02: Public awareness programs and formulating policies to encourage people to invest in green projects.				
Administrative	**2.5**	**0.2**	**0.5**	**3.05 (Rank -3)**
Economic	**2**	**0.2**	**0.4**	
Fiscal	**-0.5**	**0.1**	**-0.05**	
Social	**3.5**	**0.2**	**0.7**	
Environment	**5**	**0.3**	**1.5**	
Option 03: Formulation of Policy for Conservation and Monitoring of existing green spaces in Dhaka City				
Administrative	**3**	**0.2**	**0.6**	**3.20 (Rank -2)**
Economic	**2**	**0.2**	**0.4**	
Fiscal	**-1**	**0.1**	**-0.1**	
Social	**4**	**0.2**	**0.8**	
Environment	**5**	**0.3**	**1.5**	
Option 04: Formulation of General Guidelines for Planting and Managing Trees.				
Administrative	**1.5**	**0.1**	**0.15**	**2.80 (Rank -4)**
Economic	**1.5**	**0.1**	**0.15**	
Fiscal	**-1**	**0.1**	**-0.1**	
Social	**2**	**0.3**	**0.6**	
Environment	**5**	**0.4**	**2**	

Summary of Analysis for Identifying Best Option:

Table 05: Summary of Analysis for Identifying the Best Options

	Risk Analysis		MCA		Overall Rank
	Score	**Rank**	**Score**	**Rank**	
Option 1	**Low**	**1st**	**3.55**	**1st**	**1st**
Option 2	Medium	4th	3.05	3rd	4th
Option 3	Low	2nd	3.20	2nd	2nd
Option 4	Medium	3rd	2.80	4th	3rd

Best Option: According to the Risk level and multi-criteria analysis of probable policy options, the best policy option is - **"Option 01: Formulating Policy for Greening Dhaka through Afforestation and Sustainable Landscape Design."**

VII.OUTPUT & OUTCOME

Probable Outputs (Short Term)

Pollution Prevention: Due to preventing pollution through green policies, bring immediate benefits like better air quality, higher property values, saved resources, etc.

Increased Local Food Production: Local food production benefits individuals, communities, and the environment. It improves local and

seasonal food security and stimulates economic activity.

Increased Tourism Activities: The creation of green spaces and parks in urban areas can boost tourism, improve the environment, and enhance the overall quality of life.

Increased Local Economy: Greening Dhaka City can have a substantial positive impact on the local economy by promoting sustainability, creating jobs, attracting investment, and improving the overall quality of life.

Probable Outcome (Long Term Vision)

Prevent Climate Change: Greening efforts help prevent climate change by enhancing carbon sequestration, reducing greenhouse gas emissions, and improving air quality.

Mitigation of Urban Heat Island Effect: Trees and plants absorb CO_2, mitigating global warming. Additionally, green spaces cool urban areas, reducing the need for energy-intensive air conditioning. By reducing urban heat islands, greening ensures a harmonious coexistence, enhancing resilience against environmental challenges.

Enhancing Ecological Balance with Human and Other Spaces: Greening enhances ecological balance by integrating natural ecosystems with human spaces, fostering long-term sustainability. It improves air and water quality and stabilizes soil, creating healthier environments for humans and wildlife.

Enhancing Biodiversity: Greening efforts help actions promote biodiversity and foster sustainable ecosystems, contributing to a healthier, climate-resilient planet. It supports their populations, and maintains a good balance in nature by improving ecosystems and strengthening food chains.

Enhance Human Health: Exposure to green spaces has been shown to have numerous benefits for human health. These include improving air quality, reducing stress, and promoting physical activity. Access to green spaces has been associated with lower risks of respiratory diseases, improved mental well-being, and increased participation in outdoor activities, all of which contribute to healthier lifestyles and overall physical and mental well-being.

VIII.RECOMMENDATIONS

1. *Urban Forests to enhance Biodiversity*: Develop urban forests and green belts within the city by converting vacant lots and utilizing native plant species to enhance biodiversity.
2. *Tree Planting Campaigns*: Launch citywide tree planting campaigns involving residents, schools, and businesses. Provide incentives for citizens to participate actively.
3. *Vertical Gardens*: Encourage the establishment of vertical gardens on building facades and rooftops to maximize green spaces in densely populated areas.
4. *Green Building Standards*: Implement and enforce green building standards that require the incorporation of green features like rooftop gardens and energy-efficient designs.
5. *Zoning Regulations*: Review and update zoning regulations to protect existing green spaces and mandate to save existing agricultural lands, and green buffers around the roads, water bodies, parks, and residential areas.
6. Public-Private Partnerships: Collaborate with private businesses, non-profit organizations to secure funding, and resources for afforestation and conservation projects.
7. *Long-Term Planning:* Develop a comprehensive, long-term urban greening master plan that sets clear goals, targets, and timelines for afforestation and conservation efforts.
8. *Research and Innovation*: Invest in research and innovation to identify the most suitable tree species, green technologies, and sustainable urban planning practices for Dhaka's unique environment.
9. *International Collaboration to achieve SDGs (Goal - 11, 13, 15):* Collaboration on an international level is vital in achieving the SDGs related to Goal 11, Goal 13, and Goal 15. These goals aim to tackle issues related to climate change and biodiversity conservation, which are also mentioned in Section 18A of our National Constitution.
10. *Celebration of Green Spaces:* Organize events and activities in green spaces to promote a sense of community and appreciation for nature.

IX.CONCLUSION

In conclusion, the journey towards making Dhaka City greening is full of challenges. However, it is a path worth taking for the sake of the environment, health, and future generations. Dhaka's rapid urbanization and centralized over-planning have put massive pressure on its green spaces and natural resources. This has led to issues such as air pollution, rising temperatures, and loss of biodiversity. A multi-faceted strategy is required, which includes active community engagement, government support, sustainable environmental planning, and innovative green technologies. Communities must be encouraged to participate in afforestation and conservation efforts, making them stakeholders in the process. The government needs to enact and enforce policies that protect green spaces, promote sustainable development, and incentivize businesses and individuals to adopt eco-friendly practices. Greening Dhaka City is not just an environmental aspiration but also an urgent necessity. By addressing the challenges head-on and implementing a well-thought-out plan, we can transform Dhaka into a model green city that benefits its current residents and leaves a legacy of environmental stewardship for generations to come. Together, we can turn the challenges into opportunities and ensure a greener, healthier, and more sustainable future for Dhaka City.

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