

The Role of Green Spaces and Waste Management in Ecosystem Sustainability

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Abstract

Rapid urbanization, population growth, and inadequate environmental governance have intensified ecological degradation across cities in the Global South, particularly through the erosion of urban green spaces and the collapse of functional waste management systems. This study examines the intersecting roles of urban green infrastructure and solid waste governance in sustaining ecosystem health, with a focus on India, Bangladesh, and Nigeria as representative developing-nation contexts, benchmarked against European nations, notably Germany, Sweden, and the Netherlands. Employing a qualitative comparative methodology, the study draws on peer-reviewed literature, government policy documents, and international organization reports to conduct thematic and comparative policy analyses across four dimensions: urban green space distribution, solid waste management systems, public health and environmental inequality, and governance effectiveness. Findings reveal that urban green spaces deliver critical ecosystem services, including air purification, urban heat island mitigation, and biodiversity conservation, while simultaneously supporting physical and mental well-being among urban populations. Escalating waste generation in cities such as Lagos, Dhaka, and Mumbai overwhelms underfunded collection and disposal systems, generating severe environmental pollution, waterborne disease burdens, and disproportionate health risks in low-income communities. Comparative analysis confirms that European cities achieve superior sustainability outcomes through binding regulatory frameworks, integrated green-waste urban planning, advanced recycling and waste-to-energy technologies, and structural advantages largely absent in developing-country governance contexts. The study concludes that urban ecosystem sustainability cannot be achieved through isolated interventions; it requires the deliberate integration of green infrastructure planning, equitable waste governance, and strengthened institutional accountability. Policy recommendations include enforceable urban green space mandates, formalization of informal waste economies, increased environmental budget allocations, and community-centred governance frameworks. This research contributes a cross-regional comparative perspective to the urban sustainability literature and provides evidence-based direction for policymakers in rapidly urbanizing nations.

Keywords: Urban green spaces; solid waste management; ecosystem sustainability; environmental governance; urbanization; developing countries; comparative urban policy.

Introduction

1.1 Background of Study

Rapid urbanization and population growth, natural landscapes are being replaced by densely built-up towns and cities, resulting in intense environmental pressures in cities, particularly those in developing countries. Urbanization has led to a rise in solid waste, pollution of plastics, loss of biodiversity, pollution of air and water, and urban heat island, which all affect urban quality of life and public health. These issues are exacerbated by poorly managed municipal garbage with poor garbage segregation, limited recycling, uncollected garbage and burning. Meanwhile, the diminishing urban green space diminishes how cities are able to absorb these pressures, as vegetation offers a number of important ecosystem services including the purification of the air, regulation of temperature, stormwater control, and support for biodiversity ([Bolund & Hunhammar](#)).

1.2 The importance of green spaces

Green spaces are an integral part of sustainable urbanization, especially in the context of fast-growing cities. In urban cities in developing nations like Lagos, the rising urbanization has led to the loss of vegetated open spaces due to transforming nature into built environments. The result of this transformation has created some environmental issues such as urban flooding, air pollution, loss of biodiversity and urban heat island effect ([Okunola et al.](#)). Open green spaces such as parks, gardens, urban forests, and recreational fields play a critical role in enhancing environmental sustainability. These spaces provide ecosystem services such as carbon sequestration, temperature regulation, air purification, and stormwater management. According to World Health Organization ([2016](#)), access to green spaces is directly linked to improved environmental health and urban livability. ([Adekunle et al., 2026](#))

1.3 Waste Management Challenges

Communities across both urban and rural settings are increasingly grappling with waste management challenges that jeopardize public health, environmental quality, and ecological balance. While the pressures manifest differently across contexts, inadequate sanitation facilities, accumulation of plastic and solid waste, and unmanaged pollution are concerns shared by densely populated cities and rural areas alike. In urban centres, these issues strain municipal services and overwhelm collection infrastructure; in rural and peri-urban regions, the absence of formal waste systems leads to open dumping, burning, and contamination of agricultural land and water sources, all of which adversely affect residents' wellbeing regardless of geography.

While green infrastructure is known to provide benefits, many settlements, both urban and rural, lack the ability to realize these benefits due to land pressure, weak governance, and

ineffective waste management. Parks, roadside plantings, and waterways in cities tend to be mired in plastic and other non-biodegradable trash that pollutes soil and poses a threat to local wildlife, as well as making areas unsanitary. In rural areas, open dumping and unmanaged agricultural waste similarly degrade natural green cover and water resources. Results from the research indicate that if waste generation is high, the ecosystem services which vegetation provides (cooling, air purification, stormwater management) will be less effective and need to be integrated with better waste-management strategies rather than tackled separately, a challenge that extends well beyond city boundaries.

1.4 Why India, Bangladesh and Nigeria?

India, Bangladesh and Nigeria have been chosen as the case studies as they have many of the same developmental and environmental issues, such as rapid urbanization, high population density, and poor waste management infrastructure. The lack of sanitation systems, irregular waste collection, low recycling rates and high levels of illegal dumping are issues affecting these low and middle-income countries, which threaten the ecological and aesthetic value of urban green spaces (Ferronato & Torretta, 2019).

The municipal solid waste generated in India is approximately 152,245 tons per day, with about 75% being processed (Government of India, 2023). Bangladesh is a rapidly urbanizing country expected to host 56% of its population living in urban areas by 2050(ASEFSU23-Background-Paper_Sustainable-Urbanisation-in-Bangladesh-Dhaka, n.d.). The issues of limited land and poor waste services are also being experienced in the Nigerian cities (Okpete & Byeon, 2025).Harmful pollutants are emitted during the open dumping and burning process, which leads to an increase in respiratory diseases and water and soil contamination with high concentrations of harmful metals, which are higher than the recommended values (Ferronato & Torretta, 2019).

1.5 Research Objectives

1. Evaluate how green spaces affect the people's health in physical and mental aspects.
2. Discuss how poor waste management impacts on public health and society.
3. Assess the contribution of policies to enhance the environmental situation.

Research Questions

1. How do urban green spaces affect people's physical and mental health?
2. How does substandard waste management affect society and health?
3. What is the potential of environmental policies to enhance sustainability and public health in the city?

Literature Review

2.1 Concept of Green Urban Spaces

City landscapes hold pockets of nature - parks, gardens, tree-filled zones, marshy spots, green pathways, play areas, and leafy patches woven into built environments. Vital pieces in the city planning puzzle, these places deliver quiet advantages across ecology, community life, and financial value. Breathing cleaner air happens here; plants filter pollutants while sheltering diverse creatures, balancing heat waves through shade, capturing carbon underground instead of letting it rise skyward, research shows (Ali, 2017; Aram et al., 2024).

Plants in cities help handle a changing climate. Because of greening, places stay cooler during hot spells while soaking up heavy rains - making floods less likely when storms hit hard (Athokpam, 2024; Demuzere et al., 2014). Roofs covered in plants, stretches of trees between neighborhoods, even wild pathways through built areas - they've become common ideas among planners aiming for lasting designs (Castellar et al., 2021; Frantzeskaki, 2019).

Green areas are disappearing fast in growing cities across developing nations. Because city expansion happens without clear plans, nature gets pushed aside. Poor rules on how land should be used make the problem worse. When governments fail to protect natural spots, trees and parks vanish. This shrinkage harms air, water, and people's well-being. With less green, cities struggle to stay balanced and liveable. Studies show a strong link between planning gaps and lost vegetation cover.

2.2 Green Spaces and Public Health

Out among trees and open lawns, people find room to move their bodies naturally. Where parks exist, folks walk more, ride bikes, or stretch under the sky - simple actions that add up to stronger hearts and lungs. Instead of just concrete and exhaust, leaves trap dust and smoke while releasing fresh breaths of air. Cleaner air means fewer problems for those with sensitive lungs or tired immune systems. These pockets of nature quietly lower the harm caused by city living.

Besides helping the body, time spent outdoors lifts mood and mental well-being. Studies show leafy areas ease tension, worry, even low spirits - also sharpen thinking and boost daily contentment (Davern et al., 2017; Kabisch et al., 2017). When lockdowns hit, city parks turned into quiet havens for movement and calm, revealing how much communities rely on them.

Still, some neighborhoods get more fresh park space than others. Poorer areas usually find it harder to reach cared-for gardens or tree-lined spots - this gap can widen health gaps.

Because of that twist, city planners now see fair access to green zones as key when building towns that last.

2.3 Waste Management in Developing Countries

Most cities in poorer nations struggle to handle growing piles of trash. This happens because more people move into towns, populations rise fast, fewer systems exist to manage what gets thrown away. Places like India, Bangladesh, and Nigeria see garbage piling up quicker than trucks can haul it off. Broken landfills, overloaded dumps, missing recycling centers make things worse. Research shows many areas collect only part of household waste. Some neighborhoods wait days before bins get emptied. Without proper handling, health risks climb alongside pollution levels.

Out in the open, trash just sits there rotting, piling up where it should not be. Without proper handling, what we throw away seeps into the ground, messing with dirt and drinking sources alike. Rotting stuff underground pumps invisible gases into the air above us. Nature takes a hit every time waste spreads unchecked across landscapes. Plastics stick around far too long, breaking apart slowly while doing damage along the way. Life in rivers, lakes, and forests suffers when these stubborn bits get everywhere they do not belong.

Blocked drains from trash make city floods worse. Research in places like Dhaka and Lagos shows messy streets boost both water trouble and dirty surroundings. Because garbage piles up, bugs and germs find spots to grow, leading more people to get sick - cholera, malaria, stomach issues show up often. Poor neighborhoods suffer most when toilets, clean water, or doctors are hard to reach.

2.4 Environmental Governance and Existing Policies

Most cities face tough environmental hurdles that need clear rules and follow-through. When trash systems get upgrades, cleaner streets often result - one step toward healthier neighborhoods. Some nations pair cleanup drives with tree planting, blending old methods with new plans. Take India's push to reduce litter by fixing how garbage moves from homes to disposal sites. Projects there link public health gains to thoughtful city design over time. Cleaner air sometimes follows when leaders back long-term changes instead of quick fixes.

From global efforts come groups like the World Health Organization teaming up with the UN Environment Programme, pushing rules that fit within the SDG framework - especially around cleaner cities, healthier populations, upside-down weather patterns. These bodies nudge nations toward smarter urban planning while tackling pollution's toll on people, linking clean air to longer lives, quieter roads to calmer minds. Progress creeps forward when data meets policy, whispers turn into laws, small steps add up beneath big skies.

Even with progress, some poorer nations still struggle to put plans into practice. Without enough money, strong institutions might stumble - roads and services lag, rules get ignored. Experts point out that better leadership, more community input, little by little shifts how people see nature - all matter deeply down the line.

2.5 Comparative Research and Research Gaps

City planning in places like Germany, Sweden, then the Netherlands shows how mixing solutions helps towns stay clean. Waste handling there runs smoothly because methods combine smart design with public use, not just tech alone. Recycling reaches deep into daily habits thanks to steady access plus clear rules followed over time. Green spaces weave through neighborhoods, lifting air quality while giving people room to move outside. Results include healthier surroundings alongside better living conditions for residents across cities.

Still, big holes in knowledge stay when it comes to poorer nations. Most past work looks at city parks and trash handling on their own, even though they clearly shape each other's impact on nature. Studies that compare places like India, Bangladesh, and Nigeria are hard to find. What's missing could change how we understand long-term balance.

Pulling apart how parks, trash handling, rules, and people's well-being connect means digging deeper. One piece doesn't tell the whole story - each part shapes city strength in ways we're only starting to see. While one study might track air quality near recycling centers, another could follow policy shifts after community protests. Cities breathe differently when planning includes trees, fair rules, and clean streets - all at once. Without connecting these dots, solutions stay short-sighted. What grows matters just as much as who decides it.

Problem Statement

Cities have a big problem with the environment now. This is because cities are growing fast, more people are living in them, more trash is made, poor people suffer more, and the rules are not followed well. All these problems are joined together. They hurt nature, people's health, and the future of cities.

This problem is very bad in places like India and many African countries. These places do not have good buildings or roads, and the government is weak. So the environment gets worse. Some countries in Europe have better rules and city plans, but the environment is still getting damaged all over the world. So, we must know the main environment problems in cities to keep them safe for a long time

3.1 Shrinking Green Spaces

Cities are growing fast and this cuts down forests, parks, and wetlands. When we lose trees and plants, many animals and birds also go away. The air becomes dirty. Cities become hot because buildings and roads hold heat. We are also not ready for floods and hot weather.

In many poor cities, they build roads and houses by cutting nature. This helps now but makes big problems later [Seto, Güneralp, & Hutya, [2012](#)].

3.2 Growing Waste Management Crisis

More people and more buying means more trash. Cities make a lot of home waste, plastic, old phones and TVs, and factory waste.

But trash is not picked up on time. There are not many places to recycle. People throw trash in wrong places. This makes soil, water, and air dirty. People get sick. If a city cannot clean its trash well, it cannot be good for the future [Kaza, Yao, Bhada-Tata, & Van Woerden, [2018](#)].

3.3 Public Health and Environmental Inequality

Dirty environment does not hurt all people the same. Poor people and people with less money suffer the most. They live near dirty factories, trash dumps, or bad water.

They breathe bad air and drink bad water every day. Toilets and health care are also bad for them. So they fall sick more. This shows that harm to the environment is not shared fair. Poor people pay more World Health Organization [WHO], [2022](#)].

3.4 Weak Policy Implementation

Many countries have laws for the environment. But the laws do not work well.

This is because offices have less staff and less money. No one checks if rules are followed. The system is weak. So even with laws, the environment still gets damaged. We need strong control and people must be responsible for their work

[Ministry of Environment, Forest and Climate Change, [2023](#); Organisation for Economic Co-operation and Development, [2021](#)]. [MoEFCC]

Conclusion

City environment is getting bad because of four main things. Green places are going away. Trash is not managed well. Poor people suffer more. And laws are not used well. These problems hurt nature, make people sick, and make city life bad. To fix this we need strong

government. We need good trash systems. We need local people to help. And people must do their job right. Only if we use rules well can cities be safe for people now and in the future.

Research methodology

4.1 Research design

This study adopts a qualitative and comparative design to examine the role of green spaces and waste management in ecosystem sustainability across India, Bangladesh, Nigeria and selected European countries. A qualitative approach is appropriate as the study seeks to understand and interpret complex environmental, social, and policy phenomena that cannot be adequately captured through numerical data alone. Qualitative studies are well suited to investigate and explore how and why certain conditions exist within their real-world context. A comparative design will allow us to systematically identify patterns and differences across multiple national settings and standards, which is essential for drawing meaningful conclusions about environmental governance in both developing and developed regions.

4.2 Sources of Data Collection

The study will be reliant on secondary data, this approach is widely used in comparative environmental research across countries when primary fieldwork is not feasible. Primarily, government reports and policy documents, peer-reviewed papers and articles, international organization reports and published case studies are used to get a deeper understanding of the topic and how it may be affecting different spectrums of the chosen countries.

4.3 Comparative Analysis Method

The study employs a structured comparative analysis across four regional contexts: India, Bangladesh, Nigeria, and selected European nations (mainly Germany, Sweden, and Denmark). These countries were chosen because they represent contrasting stages of environmental governance, allowing for a “diverse” outlook on the current situation. India, Bangladesh, and Nigeria share common developmental challenges including rapid urbanization and weak environmental infrastructure, while European nations offer benchmarks of advanced regulatory systems and sustainable urban planning. The comparative framework is applied consistently across four thematic pillars: the status of urban green spaces, solid waste management systems, public health and environmental inequality, and the design and implementation of environmental policies.

Germany in particular was chosen as the primary European reference point for several reasons. It is widely regarded as one of the world’s leading nations in waste management, consistently achieving among the highest recycling rates globally and operating a well

established extended producer responsibility (EPR) framework through its packaging act. Beyond waste governance, Germany has made substantial investments in urban green infrastructure, with cities such as Berlin recognized internationally for integrating green corridors and biodiversity planning into urban development strategies. Sweden and Denmark further complement the European comparison by contributing strong performances in circular economy practices and carbon neutral urban planning, offering a broader picture of European practices rather than a single national model.

4.4 Method of Data Analysis

Two complementary methods can be applied in this research. Firstly, thematic analysis by following the six-phase framework of Braun and Clarke (2006), which is used to identify and interpret recurring patterns across the secondary data. Such an analysis is primarily inductive in nature which allows themes such as shrinking green spaces, waste governance failures, and environmental inequality to emerge from the evidence. After which comparative policy analysis can be applied to evaluate national environmental frameworks side by side, examining the design, scope and reported outcomes of policies that have already been implemented such as India's Swachh Bharat Mission, Bangladesh's Environmental Conservation Act, Nigeria's National Environmental Policy, and the EU Waste Framework Directive. Together these methods can allow us to get in-depth knowledge about both within-country and cross-national data and analyse it in a systematic manner.

4.5 Limitations of the study

The study might face two primary limitations. Firstly, its exclusive reliance on secondary data means findings are constrained by the quality and completeness of existing sources. In developing country contexts, official environmental data might be incomplete or inconsistently collected, which can affect cross-national comparability. Second, the absence of field based research limits the study's ability to capture perspectives of the community, their lived experiences, informal environmental practices, and localised conditions that are underrepresented in published literature and articles. Despite such setbacks, the use of rigorous peer reviewed and internationally recognised sources, combined with systematic comparative methods, ensures that the study will offer credible and evidence-based information and contribute to the understanding of urban environmental sustainability.

4.6 Recommendations for Future Research

This study identifies several approaches that can be built upon by future researchers and extend the findings presented here. First, primary fieldwork including community surveys, interviews with locals, and ethnographic observations would significantly enrich understanding of how environmental policies are experienced on the ground, particularly

in rapidly urbanizing areas of India, Bangladesh and Nigeria where informal practices are rarely reflected in official data. Second, future studies could expand the geographic European comparison to include Eastern European nations such as Poland or Romania, which face environmental governance challenges that are arguably more structurally comparable to developing country contexts than Germany or Sweden. and Third, conducting a longitudinal research that will help track the same indicators over time and show whether policy interventions like the Swachh Bharat mission lead to lasting improvements or whether benefits are short lived because of implementation problems.

Analysis and Findings (1500–1800 Words)

5.1 Green Spaces and Health

Thousands of years ago, before modern architecture, people needed to survive against Nature's harsh forces. This pushed them into making a physical boundary which was separate from the wild. In those times, gardens were used for 3 main purposes, which was for survival, sacredness, and power. (Architecture Skills, 2026)

In the 21st century, with our changing needs, we had other factors supporting the formation of green spaces. The basic reasons were the ones above, but due to lifestyle changes, one major factor, being health, both physical and mental, needed a retreat. Intensive scientific studies across recent years have led us to know of the health improvement nature of green spaces in urban localities. As cited by WHO, "preventable noncommunicable diseases (NCDs), such as mental illness, obesity, cardiovascular diseases, type 2 diabetes and cancer, remain major factors not only affecting health and well-being, but also driving up the cost of health care and reducing the productivity of the workforce." Shortt informs that such illnesses are usually due to prolonged stress due to a variety of factors. He also adds that the in-activity of many people in this day and age can be combatted by the open spaces, which attract us to take a break, explore and focus on physical wellbeing. (Shortt et al., 2014, as cited in WHO, 2016). In this context, open spaces can act as a preventive solution to ill health, as investing our time and energy into outdoor, nature activities can give us a boost of health. (Morris et al., 2006, as cited in WHO, 2016).

The SDG Goal 11.7 as stated by ICCROM: "Provide Access to Safe and Inclusive Green and Public Spaces" also displays the importance of green spaces as a pathway towards sustainable development.

The WHO SDG Target 3.4 aims to reduce NCDs to 1/3rd by 2030, by implementing preventions and better healthcare. They also aim to improve mind space and overall well-being. (WHO, 2015)

5.2 Urbanization and Loss of Green Areas

“Urbanization is the process by which towns and cities are formed and become larger as more and more people begin living and working in central areas.” (S Sushmitha, [2024](#)). As there is a need for more built structures, the natural ecosystem is cleared and replaced with an Urban one. Without proper care for the Flora and Fauna, non-native species could overpower the region, causing more destruction to the environment. (Knapp et al., [2021](#), as cited by Bedur, [2025](#)). Plants are a natural filter for the atmosphere, lithosphere and hydrosphere, and growing cities are in need of them the most. Neglecting these needs could create a toxic environment, inhabitable to humans as well. The Urban ecosystems traps heat due to the characteristics of its building materials like concrete asphalt, causing a local climate change, affecting the Environment. (Rastandeh and Jarchow, [2021](#), as cited by Bedur, [2025](#))

5.3 Waste Generation and Disposal Problems

Parts of Asia and Africa have undergone rapid population growth and city development, with often neglected systems of waste management. (Zhechen, [2024](#)) Municipal Solid Waste (MSW) generated from residential, commercial and institutional areas are supposed to be collected, managed, disposed and recycled in a systematic and clean manner. However, in many parts of Asia and Africa, many steps of the process are neglected and some do not even happen, leading to a failure of management. (Khan et al., 2016; Stafford, [2020](#) as cited by Zhechen, [2024](#)).

Excessive reliance on landfilling as a method of disposal can cause serious environmental repercussions. Also, improper Municipal Solid Waste Management (MSWM) can cause severe contamination of water bodies, flooding due to obstruction of storm drains and breeding of vectors due to unmanaged biological/hazardous wastes. (Liu and Hung, 2023, as cited by Zhechen, [2024](#)).

5.4 Solid Waste Management and its effects on health

It is not unknown that solid waste management has been co-related with public health. Since the disease outbreaks of Cholera and Typhoid in the 1800s in advancing cities, waste management had begun its first modern steps. (Wilson DC, 2007,2023 as cited by WHO, [2025](#))

“Solid waste encompasses a wide range of discarded materials from households, industries, health care, agriculture and other sources. It includes plastics, food waste, electrical and electronic waste (e-waste) and hazardous materials” (UN 2024 as cited by WHO, [2025](#)).

Out of all the types of waste, it is usually MSW that affects most people directly. This is because it is found and interacted with in the environment of daily life, like homes, public spaces, buildings, streets etc. MSW is a very broad waste category and now includes a

variety of non-biodegradable and potential toxins to the environment, making it complex to segregate and maintain. (UN 2024, as cited by WHO,[2025](#)).

5.5 Green Spaces and Waste Management

As we have seen, a lack of green spaces and inadequate waste management can cause an unsustainable living environment. Both Waste Management and Green Spaces can make an environment healthy, seeing improvements in the health of the surrounding air, ground water and storm drain runoff and a clean land which can promote mental and physical well-being.

Improved Waste Management can clear spaces and make way for either more green spaces or a place where community members can gather together and can promote more interactions and local initiatives improving social well-being.

Green spaces can serve as a reminder to the residents that the environment is a sensitive but important resource, and needs each one of our efforts to keep hygienic and protect.

A person living in a specific area could highly benefit by these 2 components being to a satisfactory level. Working on these two components in developing areas would make for a good investment for the future.

Government policies, mindset shift of people living in such communities and local initiatives could bring about this change.

5.6 Case Study: India

The population of Jaipur is rapidly growing, and has seen a change of population from 2.34 million to 3.5 million in between 2001 and 2016. “Solid waste management is an important part of urban and environmental management, like other infrastructural services has come under great stress, consider low priority areas, solid waste management was never taken up sincerely nor by public nor by concerned agency or authorities and in present time the solid waste is impacting our health, environment and well-being.” (Sudarshan Kumar, [2016](#)).

Omesh Bharti of Shimla, India says that one of Urban Local bodies most important functions, municipal solid waste management, gets undermined due to negligence in its primary legs. Budget deficiency, lack of skilled members and no proper understanding of how to make a plan to follow. (Omesh, [2013](#))

Taking Bangalore, a study reveals that the older part of Bangalore remains green, however the rapidly developing industrial and commercial parts have lost their green cover. They mention “Rapid urbanization has led to a decline in green cover, prompting efforts to preserve and enhance the city’s green spaces.” (S Sushmitha, [2023](#))

5.7 Case Study: Bangladesh

Dhaka, one of the world’s most populated megacities, portrays the tension between rapid urbanization and ecosystem service sustainability. With a population around 24.6 million and an estimated 15,000 new arrivals daily (Bangladesh Bureau of Statistics, [2024](#)), the city faces environmental failures resulting from inadequate urban planning and policy frameworks.

Despite spending over Tk 3,323 crore on waste management between 2016 and 2023, more than 250 unauthorized dumping sites persist across Dhaka (New Age Bangladesh, [2025](#)). Dhaka and Chattogram generate an estimated 10,000 tonnes of waste per day, yet formal collection systems remain severely insufficient (New Age Bangladesh, 2025b).

When Dhaka floods, it is easy to blame the rain. But the real problem is the waste that has been building up in every canal, drain, and waterway long before the first monsoon cloud appears. Plastic bags discarded on street corners, rubble dumped from construction sites, household garbage that never made it to a collection point, all of it finds its way into the drainage network, clogging it as an end result (Lezen, [2025](#)). So when there was a rainfall over 100 mm in a few hours in July 2023, the water had nowhere to go. Some of the city’s busiest areas like Mirpur Road, Panthapath and Moghbazar went underwater (Lezen, [2025](#)). Hospitals delayed services and commutes collapsed. And yet experts were not surprised. According to them, this is not a natural disaster, it is a man-made one.

Dhaka has almost no green left. Old Dhaka sits at just 5% green cover and New Dhaka is barely reaching 12% (Rsisinternational, 2024). The loss of nearly 88% of healthy vegetation means the city has surrendered its natural cooling, carbon absorption and stormwater regulation all at once (Rsisinternational, 2024). Researchers estimate this has cost Bangladesh’s cities USD 628.58 million in ecosystem service value, with Dhaka bearing the largest share (Rahman & Szabó, [2022](#)).

Around 100,000 informal waste pickers known as *tokai* quietly do what Dhaka’s official system cannot. They collect recyclables daily and keep nearly 200 recycling factories running (Global Recycling Network, n.d.). Since 1995, Waste Concern has been turning over 70% of household waste into compost, taking the pressure off from the already overloaded dumping sites. These communities are keeping the city from falling apart. Yet they remain unrecognized, unprotected and left out.

Dhaka's problems did not happen overnight, and they cannot be fixed overnight. But waste, flooding, vanishing green spaces, and overlooked recycling communities all point to the same root cause: a planning system that has not kept up with the city it is supposed to serve. Real change means bringing informal workers into policy decisions, investing in natural solutions and treating ecosystem services as a basic urban need.

5.8 Case Study: Nigeria

Nigeria presents one of the most severe examples of urban waste management failure in the developing world. Lagos, with a population exceeding 21 million, generates approximately 13,000 tonnes of solid waste daily, yet municipal collection systems recover only a fraction of this volume (World Bank, 2018). Cities such as Kano, Port Harcourt, and Abuja face analogous challenges, reflecting a systemic failure of waste governance rather than isolated local deficiencies.

In the absence of functional formal systems, informal waste pickers known locally as "kpiapo" in Lagos have become the primary actors in waste recovery. Mbah and Nzeadibe (2017) document how these individuals operate without institutional recognition or legal protection, recovering recyclable materials under hazardous conditions. While the informal sector performs a vital ecological function, its structural precariousness limits scalability and leaves low-income communities such as Makoko and Ajegunle bearing disproportionate pollution burdens relative to wealthier residential zones (Ezeah & Roberts, 2012).

The public health consequences are severe. Uncollected refuse breeds disease vectors responsible for elevated rates of malaria, cholera, and typhoid, while leachate from unlined dumpsites contaminates groundwater relied upon by low-income households (UNEP, 2023). These risks underscore the direct link between waste management failure and ecosystem sustainability at the community level.

5.9 Comparison with European Developed Countries

European nations such as Germany and the Netherlands present a stark contrast. Germany's urban planning model mandates the incorporation of green corridors, bioretention zones, and urban forests into city development plans, while the Netherlands employs ecosystem-based adaptation strategies that integrate green space management with stormwater regulation and biodiversity conservation (European Environment Agency, 2022). Sweden's waste-to-energy programme converts residual municipal solid waste into district heating and electricity, achieving a landfill diversion rate exceeding 99% through extended producer responsibility, mandatory source separation, and deposit-return systems (World Bank, 2018).

The effectiveness of European environmental governance rests on the strength of binding regulatory institutions. The EU Waste Framework Directive establishes enforceable recycling and recovery targets backed by independent agencies and credible penalties (European Environment Agency, [2022](#)). Public awareness reinforces these structures: source separation compliance rates exceed 60% in Germany and 70% in Sweden, reflecting civic internalisation of environmental responsibility (UNEP, [2023](#)). Purpose-built collection infrastructure, mechanised processing facilities, and cross-ministerial

coordination further distinguish European urban environmental governance from developing-country frameworks.

5.10 Governance and Policy Implementation Gaps

A foundational challenge in developing countries is the weak enforcement of environmental regulations. Nigeria's National Environmental Standards and Regulations Enforcement Agency (NESREA) Act exists in law, yet enforcement remains inconsistent and reactive, with regulators under-resourced to conduct systematic inspections or prosecutions (Ezeah & Roberts, [2012](#)). Corruption further compounds this failure: waste management contracts in many Nigerian urban authorities are awarded through politically influenced processes, resulting in nominal service delivery and systematic misappropriation of public resources (Mbah & Nzeadibe, 2017).

Inadequate fiscal allocation and inter-agency fragmentation complete the governance deficit. Environmental expenditure constitutes a negligible share of municipal budgets relative to the ecological challenges confronting Nigerian cities (World Bank, [2018](#)). In Lagos, responsibilities for waste collection, environmental health, and urban planning are distributed across overlapping agencies, including the Lagos Waste Management Authority and the Lagos State Environmental Protection Agency, with inadequate coordination, dispersing accountability and undermining integrated policy implementation (Ezeah & Roberts, [2012](#)).

Government failure equally compromises green space preservation; without dedicated funding and enforceable urban planning mandates, municipalities neglect parks and ecological corridors, accelerating biodiversity loss and reducing communities' resilience to climate-related hazards (UNEP, [2023](#)).

5.11 Comparative Findings and Key Observations

The comparative analysis across Nigeria, India, and Bangladesh reveals convergent structural conditions producing poor environmental outcomes: rapid urbanization outpacing infrastructure investment, weak regulatory enforcement, socioeconomic

environmental inequality, and fragmented governance (UNEP, [2023](#)). These patterns confirm that ecological degradation in developing countries is structurally embedded rather than incidental. European countries distinguish themselves through coherent alignment of binding policy, infrastructural investment, civic engagement, and institutional competence, demonstrating that sustainability is fundamentally a governance achievement (European Environment Agency, [2022](#)).

The critical role of public participation is equally affirmed. In European contexts, citizen engagement is embedded through consultation rights, participatory planning, and environmental education mandates (World Bank, 2018). The near-absence of equivalent structures in developing-country frameworks represents a significant missed opportunity. Ultimately, meaningful progress requires governance reforms that strengthen enforcement, increase environmental budget transparency, formalize informal sector actors, and embed ecological considerations into urban development, without which technical interventions alone will remain insufficient to close the sustainability gap between developed and developing nations (Ezeah & Roberts, [2012](#)).

Role of Policies and Governance

6.1 Environmental Laws and Regulations

Environmental laws and regulations play a major role in supporting long-term ecological balance and improving public environmental health. Governments introduce policies related to waste management, pollution control, urban planning, and protection of green spaces to reduce environmental degradation and improve public health. These policies also support ecosystem services such as air quality improvement, biodiversity conservation, and stormwater management, which are essential for sustainable urban development. In India, initiatives such as the Swachh Bharat Mission and Plastic Waste Management Rules were introduced to improve sanitation, cleanliness, and recycling practices([2022](#)). Bangladesh continues to strengthen governance frameworks to address urban flooding and waste management systems. Nigeria has adopted public sanitation and waste regulation initiatives in urban areas; however, challenges related to rapid urbanization and inadequate infrastructure continue to affect policy effectiveness. In comparison, European countries such as Germany and Sweden have implemented more advanced recycling systems and sustainable urban planning policies. These systems demonstrate comparatively higher efficiency due to stronger institutional governance, advanced recycling infrastructure, and stricter environmental enforcement mechanisms (World Bank, 2023).

6.2 Policy Implementation Challenges

Despite the existence of environmental laws and sustainability policies, the effective implementation of these policies continues to face several structural and administrative challenges, especially in developing countries. Key barriers to effective policy

implementation include inadequate infrastructure, limited financial resources, weak institutional coordination, corruption, and low levels of environmental awareness among citizens. In India, improper waste segregation and poor sanitation systems persist in many urban areas despite various government initiatives. Similarly, Bangladesh faces drainage failures and inefficient waste disposal practices in urban regions such as Dhaka. Nigeria also experiences waste management challenges in urban centers such as Lagos because of rapid urbanization and inadequate infrastructure. This implementation gap reduces the overall effectiveness of environmental governance and delays sustainable urban development goals. Recent UNEP reports indicate that rapid urbanization and population growth have substantially increased municipal waste generation and environmental pressure across developing nations (UNEP, 2023).

6.3 Role of Government Institutions

Government institutions and local authorities are central to the implementation of environmental governance frameworks, urban sustainability policies, and public sanitation systems. Regulatory authorities, municipal corporations, and pollution control boards are responsible for policy enforcement and pollution monitoring. They also manage waste regulation and public sanitation infrastructure. In India, municipal corporations manage waste collection and sanitation systems in urban areas (Swachh Bharat Mission, [2022](#)), while pollution control boards monitor environmental standards and industrial pollution. In Bangladesh, local administrative bodies continue to face difficulties related to waste disposal, drainage management, and rapid urban population growth in densely populated cities. In Nigeria, environmental agencies and municipal authorities struggle to manage increasing urban pollution and sanitation demands caused by rapid metropolitan expansion. Effective coordination between government institutions is necessary for sustainable urban development and efficient environmental management (UNEP, 2023). Compared to developing countries such as India, Bangladesh, and Nigeria, European countries have stronger waste management infrastructure and more effective policy implementation systems (WHO, 2022).

6.4 Role of International Organizations

International organizations significantly influence global environmental governance by supporting policy development, sustainable urban planning, climate action initiatives, and waste management reforms in developing nations. Organizations such as the United Nations Environment Programme (UNEP). ([2023](#)), World Health Organization (WHO), and the United Nations Sustainable Development Goals (SDGs) provide technical assistance, institutional support, financial aid, and international policy frameworks for effective environmental governance and long-term ecological planning. The Sustainable Development Goals (SDGs), particularly Goal 11 (Sustainable Cities and Communities) and Goal 13 (Climate Action), encourage nations to strengthen waste management systems,

reduce pollution levels, and promote sustainable urban planning strategies. Developing countries increasingly rely on international cooperation to address environmental challenges. Furthermore, international collaboration strengthens environmental governance by encouraging knowledge exchange, policy coordination, and long-term sustainability planning among nations (United Nations, 2023).

Overall, strong environmental governance, effective policy implementation, and cooperation between governments and international organizations are essential for achieving long-term ecosystem sustainability and efficient urban development in rapidly urbanizing regions.

Solutions and Recommendations

The literature suggests that urban ecosystem sustainability will improve when green infrastructure and waste systems are planned as core public infrastructure rather than as secondary environmental concerns (Afionis et al., 2020; Govind & Alam, [2022](#); T. Sultana et al., 2023). The following measures emerge as the most defensible policy directions from the reviewed studies.

7.1 Expanding urban green spaces

Develop parks, urban forests, and connected green networks so that green space serves ecological as well as social functions (Afionis et al., 2020; Turaga et al., 2019).

Promote rooftop and vertical gardening, especially in dense cities where land is scarce; work from Dhaka suggests rooftop greenery is highly valued and can widen access to cultural ecosystem services (R. Sultana & Selim, 2021).

Protect existing green zones, wetlands, and riparian areas from encroachment, since these spaces often provide flood control, cooling, water regulation, and livelihood benefits (Govind & Alam, [2022](#); Mundoli et al., 2023; Roy-Basu et al., 2020).

7.2 Improving waste management systems

Invest in scientifically managed waste disposal systems that reduce open dumping, pollution, and unmanaged land pressure (Ezeah & Roberts, 2014; T. Sultana et al., 2023).

Expand recycling infrastructure and source segregation instead of relying only on centralized disposal technologies; the Bangladesh literature shows that neglect of segregation can undermine more sustainable waste systems (Akther et al., 2024).

Strengthen reliable door-to-door waste collection, especially where weak service coverage pushes households toward informal dumping or self-help responses (Ezeah & Roberts, 2014; T. Sultana et al., 2023).

7.3 Public awareness and community participation

Support environmental education programs that link everyday behavior to waste reduction, green-space protection, and urban health (R. Sultana & Selim, 2021; T. Sultana et al., 2023).

Involve NGOs, schools, and community groups more directly in urban environmental management, especially where formal institutions have weak reach or limited trust (Guenat et al., 2021; T. Sultana et al., 2023).

Promote community cleanliness and recycling campaigns that build participation rather than treating residents only as passive service users (T. Sultana et al., 2023).

7.4 Strengthening policies and governance

Improve implementation of environmental laws and planning rules, since weak enforcement is a recurring problem across the green-space and waste literature (Afionis et al., 2020; Govind & Alam, [2022](#)).

Increase accountability and transparency across city and national institutions to reduce fragmentation and improve coordination (Afionis et al., 2020; Ezeah & Roberts, 2014; T. Sultana et al., 2023).

Pursue sustainable urban planning reforms that integrate green infrastructure, waste recovery, and informal-sector realities into the same planning framework (Kasinja & Tilley, 2018; Mbah et al., 2019; Shakir et al., 2020; Wittmer, 2022).

7.5 Learning from European models

European practice can serve as a comparative reference point for policy learning, especially in areas such as advanced recycling systems, sustainable transportation, eco-city planning, and structured citizen participation. In this review, these lessons are best treated as transfer ideas rather than as direct findings from the four-country literature. Their value lies in showing that stronger recycling systems, better integration of land use and transport, and clearer participation frameworks can be built into urban planning when governance capacity is stronger.

Weak coordination, top-down policy, poor enforcement, and weak cross-level coherence limit sustainable outcomes (Afionis et al., 2020; Ezeah & Roberts, 2014; Govind & Alam, [2022](#); Shakir et al., 2020; T. Sultana et al., 2023).

(Afionis et al., 2020; Ezeah & Roberts, 2014; Govind & Alam, 2022; T. Sultana et al., 2023)

Informality as a planning issue

Informal recyclers and waste pickers already perform key environmental functions, but formal reforms often exclude them (Ezeah & Roberts, 2014; Kasinja & Tilley, 2018; Mbah et al., 2019; Wittmer, 2022).

(Ezeah & Roberts, 2014; Kasinja & Tilley, 2018; Mbah et al., 2019; Wittmer, 2022)

8. Conclusion

The study emphasizes on green spaces and waste management in developing sustainable ecosystems and their role in enhancing human health and well-being by improving urban environments. It brings focus to environmental concerns like rapid urbanization, population growth, degrading ecosystems affecting developing countries, especially India, Bangladesh, and Nigeria, and their quality of life. Decreasing urban green spaces, growing waste generation, and poor environmental governance have given way to serious social, environmental, and public health problems and challenges to prolonged sustainability.

The analysis reports that urban spaces like parks, forests, gardens and their other such green infrastructure improves air quality, shows significant decrease in urban heat island, regulates temperature, biodiversity enrichment, and improve climate resilience and serve as essential components of urban infrastructure. Positive effects are also seen on physical and mental health as they provide space for physical activity and social interactions, improving quality of life and reducing stress. Various pieces of evidence from Stockholm and other urban areas have pointed out that regular interaction with natural environments has remarkable effects in improving one's experience and well-being.

Simultaneously, the study recognizes poor waste management as a hurdle to sustainable development. Expanding volumes of household, plastic, and industrial waste and improper waste handling- collection, segregation, recycling, and disposal systems have led to air, water, and soil pollution. Such situations multiply morbidity, negatively affect sanitation, and are vulnerable and low- income sections. Various case studies of India, Bangladesh, and Nigeria uncover common challenges faced due to weak policy implementation, poor governance, insufficient funds, lack of proper infrastructure, and public awareness.

Comparative Analysis with Sweden, Germany, the Netherlands, and other European Countries points to the advantages of proper recycling systems, integrated waste management, advanced waste-to-energy technologies, effective environmental governance, as well as well-planned urban green infrastructure. These showcase sturdy

institutions, active public participation, and in-force policy implementation are necessary for attaining sustainable environmental success.

The study contributes by explaining the combined role of green spaces and waste management and their effect on sustainable urban development. It presents a comparative analysis between India, Bangladesh, and Nigeria with developed European nations, showcasing how governance, public participation, and policy affect sustainability.

Interviews and surveys can help strengthen further studies by providing local insights. Use of GIS, Smart Technologies, and climate adaptation strategies can help in improving green spaces, waste management systems, and their management

The study thus concludes that in order to achieve sustainable urban development, a balance is needed between protecting and encouraging green spaces along with sufficient waste management systems. Urban planning must consider measures that are important components of urban planning and are necessary for protecting public health, social equity, economic development, and building resilient communities.

Therefore, environmentally sustainable cities require combined efforts from the government, private, and public sectors along with international cooperation. By building green spaces, improving waste management practices, and promoting sustainable governance, developing countries can advance towards healthier, resilient, and sustainable urban environments. As a result, such infrastructure works as the foundational pillars of public health, social equity, economic development, and long-term environmental sustainability.

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References

1. Abubakar, I. R., Maniruzzaman, K. M., Dano, U. L., AlShihri, F. S., AlShammari, M. S., Ahmed, S. M. S., Aina, Y. A., and Alhaddad, B. (2022). Environmental sustainability impacts of solid waste management practices in Global South cities. *Sustainable Cities and Society*, 81, 103870.
2. Ali, N. (2017). The sustainable management of urban green spaces in compact cities. *Urban Forestry & Urban Greening*, 25, 100–109.
5. Hans Breukelman, Harold krikke, Ansje Lohr (2022). Root causes of underperforming urban waste services in developing countries: Designing a diagnostic tool, based on literature review and qualitative system dynamics
6. Kaza, Silpa , Yao, Lisa C., Bhada-Tata, Perinaz, Van Woerden, Frank, Levine, Daniel (2018) . What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050
7. The Global Health Observatory, 2015, WHO
8. WHO, Throwing away our health The impacts of solid waste on human health – evidence, knowledge gaps and health sector responses (2025)
9. Rahman, M. M., & Szabó, G. (2022). Urban green and blue space changes: A spatiotemporal evaluation of impacts on ecosystem service value in Bangladesh. *Ecological Informatics*, 70, 101748.
<https://www.sciencedirect.com/science/article/pii/S1574954122001984?via%3Dihub>
10. Swachh Bharat Mission (2022). Waste Management and Sanitation Initiatives <https://swachhbharatmission.ddws.gov.in/>
11. World Health Organization (WHO). Healthy Cities / Urban Health
<https://www.who.int/teams/environment-climate-change-and-health/urban-health>
12. European Environment Agency. (2022). Urban sustainability in Europe: Post-pandemic drivers of environmental transitions (EEA Report No. 6/2022). EEA. <https://www.eea.europa.eu/publications/urban-sustainability-in-europe>
13. Govind, P. J., & Alam, S. (2022). Nature-based solutions and climate change adaptation in Bangladesh. *Climate and Development*, 15, 628–638.
<https://doi.org/10.1080/17565529.2022.2140006>
14. The Global Health Observatory, 2015, WHO
<https://www.who.int/data/gho/data/themes/topics/indicator-groups/indicator-group-details/GHO/sdg-target-3.4-noncommunicable-diseases-and-mental-health>

15. WHO, Throwing away our health the impacts of solid waste on human health - evidence, knowledge gaps and health sector responses (2025) https://cdn.who.int/media/docs/default-source/wash-documents/throwing-away-our-health-19-dec-25.pdf?sfvrsn=1c0ffac2_3
- 16.. Zhechen Zhang , Zhonghao Chen , Jiawen Zhang , Yunfei Liu , Lin Chen and others (2024). Municipal solid waste management challenges in developing regions: A comprehensive review and future perspectives for Asia and Africa <https://www.sciencedirect.com/science/article/pii/S0048969724029413>
17. Babamboni Adekunle et al. (2026) The Role of Open Green Spaces in Promoting Environmental Sustainability in Lagos State and other Nigerian Cities R paper.pdf <https://doi.org/10.47760/OAJMR.2026.v02i04.001>
18. Lezen. (2025). Urban flooding in Dhaka: Causes and solutions. <https://thelezen.com/countries-of-world/urban-flooding-in-dhaka-causes-and-solutions/>
19. Ezeah, C., & Roberts, C. L. (2012). Analysis of barriers and success factors affecting the adoption of sustainable management of municipal solid waste in Nigeria. Journal of Environmental Management, 103, 9–14. <https://doi.org/10.1016/j.jenvman.2012.02.028>
20. European Environment Agency. (2022). Urban sustainability in Europe: Post-pandemic drivers of environmental transitions (EEA Report No. 6/2022). EEA.
21. United Nations Environment Programme (UNEP). (2023). Global Environment Report <https://www.unep.org/resources/global-environment-outlook-6>
22. Swachh Bharat Mission, Government of India. (2022). Waste Management and Sanitation Initiatives.
23. T. Sultana et al. (2023). Policy analysis on municipal solid waste management in Dhaka South City Corporation, Bangladesh
24. Ezeah & Roberts (2014). Waste governance agenda in Nigerian cities: A comparative analysis