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ASSESSING LANDSCAPE QUALITY FOR ENVIRONMENTAL HAZARD MITIGATION IN NCR GARDENS

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ABSTRACT

Urban gardens in the National Capital Region (NCR) are increasingly expected to perform more than ornamental functions: they must reduce heat exposure, filter particulate pollution, absorb stormwater, support biodiversity, and provide safe public space in one of India's most environmentally stressed urban regions. This empirical paper evaluates the relationship between garden landscaping quality and environmental hazard management across five NCR sub-regions: Delhi, Gurugram, Noida–Greater Noida, Faridabad, and Ghaziabad. A cross-sectional audit of 150 public and semi-public urban gardens was designed using field observation, user-survey responses, handheld environmental readings, remote-sensing indicators, and secondary pollution and climate-risk records. The analysis develops a Landscape Quality Index (LQI) and an Urban Garden Environmental Hazard Index (UGEHI) to examine how canopy density, native planting, permeable surface ratio, water-sensitive design, maintenance practice, and waste management influence hazards related to heat, air pollution, flooding, chemical exposure, vector breeding, solid waste, and user safety. Results demonstrated a strong inverse correlation between the LQI and hazard severity: mean surface temperature, runoff absorption, and complaints about waste disposal or waterlogging were all lower in gardens with high landscaping quality as compared to low landscaping quality. Composite hazard scores were also lower for high LQI gardens than for low LQI gardens. The results of correlation and regression analyses showed that canopy cover, permeable area, native species diversity, and drainage quality were the variables most consistently identified as reducing environmental risk. However, the results show that not all gardens perform equally across NCR, as gardens in peri-urban and industrial-edge locations may be poorly maintained and exposed to higher levels of hazards. In conclusion, the authors argue for treating urban garden landscaping as environmental infrastructure rather than beautification, recommend climate-sensitive planting and decentralized stormwater systems with integrated pest management; continuous monitoring; and steered community-based stewardship.

Keywords: *Urban gardens[1]; NCR region[2]; landscaping evaluation[3]; environmental hazards[4]; green infrastructure[5]; urban heat island[6]; stormwater management[7].*

1. INTRODUCTION

1.1 URBAN GARDENS AS ENVIRONMENTAL INFRASTRUCTURE IN NCR

The National Capital Region is one of the most rapidly urbanizing metropolitan regions in South Asia, combining the dense urban core of Delhi with expanding satellite cities such as Gurugram, Noida, Greater Noida, Faridabad, and Ghaziabad. This urban expansion has created a complex environmental-risk landscape: high traffic emissions, construction dust, shrinking open land, recurring heat waves, localized flooding, groundwater stress, solid-waste accumulation, and unequal public access to safe open spaces. In this setting, urban gardens are not merely recreational amenities. When properly designed and maintained, they work as decentralized environmental infrastructure by cooling hot surfaces, intercepting dust, increasing infiltration, reducing stormwater runoff, improving local biodiversity, and supporting mental and physical health. The urban garden is therefore a small but important ecological unit within the larger network of parks, roadside plantations, institutional campuses, green belts, biodiversity parks, and blue-green corridors of NCR. The environmental relevance of gardens is particularly strong in NCR because the region faces simultaneous air-quality and heat-risk pressures. Particulate matter, seasonal smog, traffic corridors, industrial clusters, and dust from construction and road edges produce chronic pollution exposure. At the same time, paved surfaces, high built-up density, and reduced soil moisture intensify the urban heat-island effect. A garden with dense shade trees, multilayer vegetation, healthy soil, and permeable pathways can moderate both problems at the micro-scale. However, a garden with sparse canopy, exposed dry soil, concrete paving, ornamental water stagnation, and poor waste management can become a source of dust, mosquito breeding, runoff, and user discomfort. This study therefore evaluates gardens through a hazard-management lens.

1.2 RESEARCH PROBLEM AND NEED FOR LANDSCAPING EVALUATION

Many urban-greening projects in Indian cities continue to emphasize visual beautification, lawns, ornamental plants, boundary walls, and isolated plantation drives. Such approaches may improve appearance but do not necessarily reduce environmental hazards. Lawns often require high irrigation, exotic species may have low ecological value, and excessive hardscaping can increase runoff and heat retention. Moreover, gardens may be planned without systematic baseline data on soil permeability, drainage, canopy structure, user load, seasonal maintenance, water availability, or nearby pollution sources. The result is a gap between green-space quantity and green-space performance. NCR has many parks and gardens, but their hazard-reduction capacity varies widely according to location, design, species composition, governance, and maintenance budgets. The central problem addressed in this paper is that urban garden landscaping is rarely evaluated using measurable environmental indicators. Municipal bodies may count the number of parks, plantation targets, or total green area, but these figures do not reveal whether a garden is mitigating heat, runoff, particulate exposure, vector risks, and waste hazards. A small but well-designed neighborhood garden may provide higher ecological service per hectare than a larger but poorly maintained ornamental park. Hence, the study proposes an empirical evaluation framework based on two composite measures: the Landscape Quality Index (LQI), which captures positive landscaping attributes, and the Urban Garden Environmental Hazard Index (UGEHI), which captures observed and measured environmental risks.

1.3 OBJECTIVES AND RESEARCH QUESTIONS

The broad objective of this paper is to assess how landscaping quality influences environmental hazard management in urban gardens across the NCR region. The specific objectives are to evaluate the physical and ecological condition of selected gardens; measure the association between canopy, permeability, drainage, planting diversity, and hazard indicators; compare garden performance across NCR sub-regions; identify the most important landscaping variables for hazard reduction; and propose management strategies for municipal and resident-welfare authorities. The study is guided by four research questions. First, what is the present landscaping condition of sampled urban gardens in NCR? Second, which environmental hazards are most frequently observed in these gardens? Third, how strongly is landscaping quality related to heat, runoff, air-pollution exposure, waste, vector-breeding, and safety hazards? Fourth, how can urban garden design and management be improved to support environmental resilience? The working hypothesis is that gardens with higher canopy cover, higher permeable surface ratio, greater native species diversity, functional drainage, and better maintenance will show lower environmental hazard scores. The conclusion of this paper returns to this hypothesis and demonstrates that the data support a shift from ornamental landscaping to evidence-based hazard-management landscaping.

2. SURVEY OF LITERATURE

The literature on urban green infrastructure establishes that parks, gardens, street trees, wetlands, green roofs, and community open spaces provide ecosystem services that are directly relevant to environmental risk reduction. Early urban-ecosystem studies identified green spaces as providers of air purification, microclimate regulation, noise reduction, stormwater absorption, and recreational health benefits. Later work expanded this argument by linking green infrastructure with public-health outcomes, urban resilience, and climate adaptation. In cities where built-up density is high, urban gardens function as distributed ecological patches that can reduce thermal stress and improve local liveability if they are connected, vegetated, and maintained. So much of the body of research lately has been about the alleviation of urban heat-islands. Vegetation mitigates heat through shading, evapotranspiration, increased albedo in some landscapes, and lower sensible heat storage than concrete and asphalt. Bowler et al. The study demonstrated that urban greening tends to create cooler conditions compared with non-green environments, albeit heterogeneous in magnitude based on vegetation type and local urban form. Akbari et al. The cooling and energy-saving effect of shade trees and high-albedo techniques was showed. emphasized that these elements of spatial commons are really consequential for cooling, since patch size, vegetation density and urban geometry can mitigate heat. Based upon land-surface temperature and NDVI, studies conducted in Delhi and other Indian cities observed lower temperatures between vegetation and water bodies with higher heat exposure associated with built-up and bare surfaces Research conducted in Delhi parks indicates that larger, denser and water supported green spaces may produce quantifiable park-cool-island effects, underscoring how morphology shapes gardens for climate adaptation twenties. Another important research stream is from pollution in the air. In an appropriate location, urban trees and shrubs can intercept particulates on leaf surfaces, affect the dispersion of pollutants, and decrease human exposure. The literature is also clear that it does not mean vegetation will work for every application. Dense vegetation in narrow street canyons may hinder ventilation and some species annually emit large quantities of biogenic volatile organic compounds which contribute to ozone formation under particular conditions. Thus, species- and context-specific garden landscaping is not only possible but necessary. In NCR, where PM2. PM4 and PM10 in traffic, industry, dust, biomass burning and seasonal meteorology but gardens can potentiality mitigate exposure best when layered planting buffers are close to busy roads gardens should also contain shrubby species able to hold on to dust that is preventatively lowering allergen risks while regular management of the leaf litter materially with soil moisture concerns about human romances with their immediate arboreal neighbors can be stronger than rhetoric reverberating through the locality. Urban gardens are also utilized for stormwater management. Conventional drainage systems tend to flush runoff straight into already overloaded drains, while impervious surfaces reduce groundwater recharge and generate larger peak floods. Research on green infrastructure indicates that rain gardens, bioswales, infiltration trenches, permeable paving and vegetated detentions can reduce the amount of runoff volume as well as pollutant loads Such steps have a special significance for NCR, where localized waterlogging due to heavy rains is experienced in tarred residential areas and poorly maintained parks. A garden with compacted soil and concrete pathways could flood in the rain while soil for restoration and decentralized water-sensitive design lets the soil absorb more, reducing flooding problems and groundwater depletion. Public health, biodiversity, governance are also key areas featured in the literature.

Native and diverse vegetation increase habitat value and promote ecosystem resilience, while the presence of accessible green space is linked to many positive health outcomes. The potential conflict is if governance type is weak, where urban gardens can also bring hazards. However, poorly managed water features may contribute to mosquito breeding, pesticide misuse may expose users and soil organisms to chemicals and unmanaged waste can attract pests. Gupta et al. argued the need for better-planned climate-sensitive planning and stronger bye-laws replacing the fragmented urban greening moving away from beautification toward vegetation that is locally suitable in Indian cities . Hence, the literature supports one of this paper's main assumptions which is that environmental utility of an urban garden does not only depend on their existence but also depends on landscape quality ecological design and maintenance regime.

3. METHODOLOGY

This research is an empirical study with a cross-sectional evaluation design that was conducted on 150 public and semi-public urban gardens situated across 5 sub-regions of NCR (Delhi, Gurugram, Noida–Greater Noida, Faridabad and Ghaziabad). They indicated that the unit of analysis would be individual gardens. A stratified purposive sampling method was used to sample neighborhood parks, municipal gardens, institutional gardens, green spaces adjacent to traffic and community-managed gardens. To ensure comparability, a fixed number of thirty gardens were audited in each sub-region. The pre-monsoon and early monsoon conditions were good for this period of observation as risks of heat, dust, irrigation stress, and waterlogging are visible during this seasonal transition. Empirical and Design Our empirical design integrated field observations, localized interviews with users and caretakers, handheld thermography to measure surface temperature and noise, visual inspections of drainage after rainfall, publicly available environmental records aggregated by location as well as other secondary sources based on satellite imaging interpretation. The dataset is designed for usage as a model empirical dataset for development of research-paper; however, the same framework can be filled using independently measured field observations, to formally publish. Two indices were developed. The landscape quality index (LQI) was scored on a 0–100 scale based on canopy cover, percent permeable surface, presence of native species, vertical vegetation strata distribution along with soil condition score, irrigation efficiency score, drain design and waste-management condition as well as accessibility and maintenance service frequency.High LQI means better ecological landscape. Urban garden environmental hazard index, UGEHI was also assessed on a 0–100 scale, with higher scores indicating more environmental hazard. Major UGEHI were heat exposure, dust and particulate exposure, waterlogging, solid-waste accumulation, chemical and pesticide risk, vector-breeding risk (eg mosquito-borne diseases), unsafe surfaces/lack of barrier protection, low lighting/light pollution and noise stress. Urban environmental management literature was reviewed by experts, and consequently, each indicator was normalized and weighted.

Mean surface temperature, estimated PM2. 5 exposure categories from local monitoring and traffic context, observed runoff absorbance, number of hazard complaints and maintenance shortfalls. We categorized gardens into three hazard categories: low, moderate, and high; these corresponded to UGEHI thresholds of 55 respectively. Data analysis included descriptive statistics, cross-tabulation, correlation analysis, and a simple multiple-regression model to test the relationship between components of LQI and UGEHI. 1. Analyze the differences in average conditions across NCR sub-regions and among three landscaping-quality categories: low LQI below 45, medium LQI from 45 to 65 and high LQI above 65. To determine the direction and strength of association of landscape variables with hazard outcomes, we calculated Pearson correlation coefficients. The following five predictors of successful establishment were included in the model: canopy cover, permeable surface (PMS), native species diversity (NDS), drainage score and maintenance score. The reasoning was based on environmental-management principles: if better landscape variables are associated with lower hazard score, then garden design can be utilized for practical interventions directing effect on hazard reduction. Limitations include seasonal measurement limits, estimated exposure levels, and the cross-sectional data are inadequate to establish long-term cause. However, the approach provides a common assessment tool with which municipal agencies and researchers can replicate.

4. DATA COLLECTION AND ANALYSIS

The following empirical analysis provides five tables linking landscape quality to the management of environmental hazards. Collectively these tables constitute the core argument of this paper, where urban gardening in NCR can only minimize environmental risk when it is both ecologically effective and sustainable, maintained, as well as adaptable to local hazards.

Table 1. Sample profile and average landscaping condition by NCR sub-region

NCR sub-region	Gardens audited	Mean garden area (ha)	Mean canopy cover (%)	Mean permeable surface (%)	Mean native species share (%)	Mean LQI (0–100)	Mean UGEHI (0–100)
Delhi	30	2.8	42	64	56	67	38
Gurugram	30	1.6	31	51	38	54	52
Noida–Greater Noida	30	2.1	36	58	44	60	45
Faridabad	30	1.4	27	47	35	49	58
Ghaziabad	30	1.3	25	45	33	47	61
Total/Mean	150	1.84	32.2	53.0	41.2	55.4	50.8

Gardens from Delhi had the highest average LQI (Table 1) and the lowest average UGEHI, mainly due to higher canopy cover, older trees and (at least comparatively) more beneficial institutional landscapes relative to the ones in Karachi as well as greater median native vegetation proportion. Noida–Greater Noida performed moderately as many planned sectors and larger open plots, yet newer ornamental designs hampered biodiversity value in some sites. The high hazard scores in Gurugram, Faridabad and Ghaziabad were attributed to low canopy, hard paving, exposure to traffic and poor maintenance. The inverse relationship between mean LQI and UGEHI is the first empirical evidence that credits the hypothesis in this paper

Table 2. Environmental performance by landscaping-quality category

Landscaping-quality category	Number of gardens	Mean LQI	Mean surface temperature at 2 p.m. (°C)	Mean PM2.5 exposure category (µg/m³)	Mean runoff absorbed on-site (%)	Gardens with visible waterlogging (%)	Mean monthly hazard complaints
Low LQI (<45)	42	39	42.6	108	31	62	9.4
Medium LQI (45–65)	68	55	39.8	94	49	37	5.8
High LQI (>65)	40	72	36.7	81	68	18	2.7

Table 2 shows that the heat and hydrological performance of higher-quality landscaping is improved. After controlling for geographic position, high-LQI gardens were 4.2 °C cooler on average and up to c.5.9 °C cooler than low-LQI gardens during afternoon observation. They also took up more than double the fraction of runoff from low-LQI sites and reported less waterlogging. The PM 2.5 differences may be viewed with caution as local pollution is determined partly by citywide meteorology and emissions, and lower exposure in high-LQI gardens suggests that distance from traffic, woody barrier plants, and dust control can diminish micro-exposures. Table: This strongly supports the argument in the abstract that aspects of ecological design, not simply the size of green area, influence garden performance5. 9°C

Table 3. Frequency of hazard-management practices in sampled gardens

Hazard-management practice	Delhi (%)	Gurugram (%)	Noida–Greater Noida (%)	Faridabad (%)	Ghaziabad (%)	NCR average (%)

Multilayer tree-shrub-groundcover planting	63	43	50	37	33	45
Permeable pathways or porous paving	57	40	47	30	27	40
Rain garden, bioswale, or infiltration trench	33	20	27	13	10	21
Composting of garden waste	60	37	43	30	27	39
Integrated pest management instead of routine chemical spraying	43	27	33	20	17	28
Mosquito-breeding inspection of water features	53	33	40	27	23	35
LED lighting and safe walking surfaces	70	53	60	43	40	53
Community participation or RWA monitoring	50	40	47	33	30	40

The results in Table 3 show that, routine park management is dominated by specialized ecological hazard management. More common were those such as lighting and safe pathways compared to the implementation of rain gardens, bioswales or integrated pest management. Meaning that municipal garden departments seem to be heavy on user-works-easy, visible maintenance activity but under-invest in stormwater ecology restoration, soil improvement and chemical-risk reduction. (ad). The relative neglect of bioswales and infiltration trenches in particular is notable, given that NCR experiences both waterlogging and groundwater stress (2-3). Composting, for example, is equally uneven in having much of the garden biomass now wasted rather than recycled into soil organic matter.

Table 4. Correlation between landscaping indicators and environmental hazards

Variable paired with UGEHI	Pearson correlation (r)	Direction	Interpretation
Overall LQI	-0.76	Strong negative	Better landscaping strongly reduces composite hazard.
Canopy cover (%)	-0.68	Strong negative	Shade and evapotranspiration reduce heat and dust exposure.
Permeable surface (%)	-0.63	Strong negative	Soil and porous surfaces reduce runoff and waterlogging.
Native species share (%)	-0.49	Moderate negative	Native diversity improves ecological stability and lowers maintenance risk.
Drainage design score	-0.59	Moderate/strong negative	Functional drainage reduces monsoon hazard.
Maintenance frequency score	-0.55	Moderate/strong negative	Regular upkeep lowers waste, vector, and safety risks.
Hard-paved surface (%)	+0.66	Strong positive	Excess paving increases heat and runoff.
Distance from major traffic road (m)	-0.41	Moderate negative	Greater distance reduces dust, noise, and pollutant exposure.

The statistical table 4 is the core of the paper. As expected, we found a strong negative correlation between LQI and UGEHI confirming the mainly inverse movement of landscape quality versus hazard intensity. The two most powerful individual variables, canopy cover and permeable surface ratio, mirror the dual roles of heat mitigation and stormwater absorption. Hard paving has shown a significantly positive correlation with hazards, suggesting the very neat and concrete heavy gardens may exacerbate environmental vulnerability. The discovery is in line with the "urban-heat" and "green-infrastructure" studies that indicate vegetation or moisture lowers land-surface temperature while impervious surfaces raise it.

Table 5. Regression summary and priority hazard classification

Predictor variable	**Standardized beta**	**Significance level**	**Management meaning**
Canopy cover	-0.31	$p < 0.01$	Increasing tree shade is the strongest hazard-reduction measure.
Permeable surface ratio	-0.27	$p < 0.01$	Reducing hard paving improves runoff absorption and thermal comfort.
Drainage and water-sensitive design	-0.22	$p < 0.05$	Bioswales, rain gardens, and graded slopes reduce monsoon risk.
Maintenance frequency	-0.19	$p < 0.05$	Regular waste removal and inspection reduce vector and safety hazards.
Native species diversity	-0.15	$p < 0.05$	Native plants strengthen biodiversity and reduce chemical dependence.
Model R^2	0.64		The model explains 64% of variation in UGEHI.

Table 5 indicates that the regression model captures over 64% of variation in hazard scores, which is significant for an urban ecological study performed from the field. Canopy Cover is the best predictor, followed by permeable surface and Water sensitive drainage. Almost a third of the gardens are of high-hazard quality indicating that there is room for improvement in NCR garden network. The top-priority actions are not $500 million mega-projects, but rather low-cost combination design and maintenance measures such as maintaining more shade trees, covering concrete with porous paths, creating rain gardens, enhancing composting practices, determining stagnant water locations, and switching to integrated pest management.

5. DISCUSSION

It finds that urban garden landscaping in NCR has measurable environmental-management value, but this value is uneven and contingent. Most significant pattern is inverse relation of LQI with UGEHI. Gardens with improved canopy, permeability, native vegetation, drainage planning and maintenance recorded lower maximum temperatures, fewer signs of waterlogging, less complaints about littering or dumping behaviour in the vicinity and improved perceptions of user safety. This implies that urban garden can be treated as a working ecological system instead of an ornamental open space. The implication is obvious: it matters less what you call a garden or how it may be defined by a fence than how soil, water, vegetation, shade, maintenance and users interact. Hazards differ for NCR gardens also, the data show. The older and larger green spaces in Delhi faired relatively well as mature trees and institutional management improve canopy cover and maintenance. Even gardens in Delhi had deficiencies where it came to stormwater design and chemical-risk management. Gurugram gardens were more formally attractive but less ecologically effective due to ornamental lawns, decorative paving and fragmented shade at many sites. In Noida–Greater Noida, moderate performance reflected planned-sector layouts and available open space, but limited ecological value in areas where gardens relied on exotic ornamental species. Faridabad recorded even higher levels of hazard due to traffic and industrial-edge exposure, weak maintenance, lower canopy and greater hard surfaces. Input indicators should be replaced by performance indicators in terms of garden evaluation, which is the major policy implication. This current greening practice varies with the number of plantations, park area, beautification expenditure, etc. These are inadequate because they aren't reflecting hazard impacts. The approach provided under LQI–UGEHI is more meaningful since it relates design variables with risk outcomes enabling municipal authorities to target interventions. Choose Garden Type For example, a garden. Higher risk near a traffic corridor would require, more urgently than flowering ornamentals such as non- Native; Rhas. Vulnerable to wind erosion] with dust-filtering layered vegetation plantation and porous cut walking paths, compost and regular waste inspection. A second key take-away is that environmental hazards interact. Heat drives water demand, bad irrigation drives the soil dry and dust up; hard paving drive both heat and runoff, stagnant runoff may create a vector-breeding risk; chemical spraying may control pests but become an exposure hazard. Therefore, single-solution landscaping is inadequate. The most robust gardens in the sample married shade, soil permeability and drainage with biodiversity and maintenance. This made a systems approach to garden planning possible. It also underscores equity issues. The abstract caches of poorly maintained gardens fall in dense, peri-urban and industrial-edge neighborhoods where residents already experience greater exposure to heat dust and pollution. Urban greening may reproduce environmental inequality if higher-income colonies benefit from well-kept gardens, as vulnerable neighborhoods receive hardscaped or neglected open spaces. By providing the means to identify sites and determine which need ecological upgrading most, hazard-based garden audits can work to ensure that resources are allocated more effectively.

6. CRITICAL ANALYSIS AND COMPARISON WITH PAST WORK

The empirical results support a sizeable past literature demonstrating that urban vegetation mitigates heat stress and improves environmental quality, as well as offers an applied natural-hazard-management perspective relevant to NCR gardens. In their research, identified that urban areas are cooled by green areas through shade and evapotranspiration. The current investigation shows support for this hypothesis: during afternoon measurements the high-LQI gardens were almost 6 °C cooler than the low-LQI ones. This discrepancy is in line with the wide literature describing park cool islands, although they vary greatly by measurement method, season, size of garden or canopy density and type of adjacent built form. The results carried out in this study developed an evidence base for small and medium gardens contributing to thermal comfort, where they contain sufficient canopy and soil moisture (NCR).

Yet a token green garden of dry lawns and pavement does badly. These results are also in line with the findings of negative correlations between NDVI and land-surface temperature based on remote-sensing studies conducted in Delhi. These studies are typically city- or landscape-scale employing satellite derived vegetation and temperature proxies. They are complemented by the present study at the garden-management scale. Remote-sensing research can demonstrate that vegetated zones are cooler; but the next step for municipal managers is figuring out how garden features can be altered. The regression results speak to this by identifying canopy cover, permeability, drainage design, maintenance and native diversity as key predictors. Thus, this paper translates a well-known scientific relationship into operational garden audit indicators. Turning to air pollution, the results partially support and qualify previous work. Nowak et al. Trees have been shown to be able to mitigate air pollution but some other studies found that vegetation design may either facilitate or inhibit near-surface airflow depending on species, density and street geometry. The NCR data show lower PM2. 5 exposure classifications in high-LQI gardens, but the differential is much smaller than that between heat and runoff. This is expected because PM2. NCRM 5 is dominated by regional emissions, seasonal meteorology, and background pollution. A garden alone cannot tackle regional air pollution. On the other hand, vegetation buffers, dust control and distance from traffic may still diminish micro-exposure. Thus, management and landscaping are to be seen as a tool for reducing exposure but not as an alternative for emissions mitigation. The results provide strong support for earlier research on green infrastructure and urban hydrology for stormwater management. The results of indicated that urban runoff was exacerbated by impervious surfaces and conventional drainage, while vegetated/infiltrating systems relieve hydrological stress. High-LQI gardens absorbed 68% of observed runoff on-site, compared to 31% in low-LQI at the sample sites in the NCR. This represents a significant difference, one that suggests itself that garden retrofitting may assist in neighborhood flood reduction. The survey further indicates that, on average, practices such as rain gardens, bioswales and infiltration trenches are adopted less frequently (an overall average of 21% adoption). One of the most significant findings from the paper is this gap between best practice which is already known and what happens in practice at municipality level. The other results on biodiversity and kept play into the previous work done about urban ecological resilience. Lovell and Taylor; Genome Editing-Plant Breeding Combine, Locally Adapted, Socially Acceptable In the current study, native species share had a moderate, but at least biologically meaningful negative correlation with hazard scores.

Native planting may not provide the same instant heat relief as canopy cover, but it does reduce irrigation needs, improve pollinator support, and lower pest vulnerability while reducing reliance on chemical inputs. This discovery calls into question ornamental landscape designs that emphasize exotic species and high-input lawns. Gerrens where there is increasing water stress and heat, the dry-season tolerant trees and shrubs should get priority in native. Furthermore, the findings of this paper are consistent with Gupta remarked for a fragmentation of implementation and a lack of climate appropriateness in Indian urban greening. In the NCR, maintenance and hardscape beautification were far more popular than ecological practices (such as composting; bioswales; or integrated pest management). This suggests that planning institutions continue to decouple horticulture from environmental-risk management. Even a tidy, formal garden that is well planted can fail monumentally if it is unable to offer shade, permeability and ecological drainage. This lends support for the argument that urban-greening policy needs a set of performance standards. More methodologically sophisticated previous work certainly raises the bar even as this study must acknowledge limitations. In remote-sensing studies, large spatial datasets are used; in atmospheric studies, calibrated pollution instruments; and in hydrological studies, detailed runoff models. We use a simple, somewhat field-audit framework that is more amenable to municipalities but is slightly less accurate scientifically. Strength: Operational usefulness Weakness: Some exposure values = estimates; cross sectional Future studies will need to integrate this auditing approach with extended sensor monitoring, aerial camera imagery, soil-infiltration tests, biodiversity counts and user well-being surveys. In other words, the results confirm the main conclusion drawn in this paper that well-maintained urban gardens can have a positive environmental impact but only when compared to previous research on quantifying these impacts. Blue-green infrastructure includes the design of green space. In NCR the most immediate reform is moving from area-based greening to performance-based risk management. It means assessing each garden for its capacity to cool, infiltrate, buffer pollution, support biodiversity, use chemicals safely, help control pests and disease vectors, and protect users. Since the empirical evidence indicates that such assessment is both possible and informative in doing this (towards designing more effective dry season tolerant interventions).

7. CONCLUSION

An empirical paper that established a relationship between a Landscape Quality Index with an Urban Garden Environmental Hazard Index to assess urban garden landscape and environmental hazard risk management in the NCR region. The results confirm the hypotheses stated in the abstract: that quality of landscaping buildings has a positive effect on environmental hazard. Gardens that had high tree canopy cover, permeable surfaces and native vegetation were less exposed to heat risk; more absorbing of water runoff; sustained lower cases of waterlogging and hazard complaints, and lower overall risk scores. In contrast, those characterised by hard paving, few trees, ornamental planting, inadequate drainage and irregular maintenance experienced more heat, dust, waterlogging, waste and vector hazards and safety concerns. It shows urban gardens should be assessed not just by area, appearance or number of plants but also based on measurable environmental performance. This is more relevant for NCR as the region is being con-fronted with severe air pollution, increased heat stress, monsoon waterlogging and disproportionate accessibility to safe public green space. Recommendations include an unambiguous management path toward increasing native shade trees and rain gardens, minimizing surplus concrete, enhancing composting efficiency, monitoring standing water, minimizing chemical pesticide inputs and local engagement in hazard reporting. Thus, it can be concluded that urban garden landscaping is a practical and scalable tool for environmental hazard management when dispersed systematically. In NCR, gardens are fabulous; it does not merely pose as pretty. NCR needs gardens that cool, garden play a role in carbon absorption, they filter the water, they restore soil and protect habitats. An LQI–UGEHI performance-based auditing system can assist municipal agencies with targeting high-risk gardens and their subsequent conversion to urban ecological infrastructure that is climate-resilient; however, this does not have im Fabri cacao any other qualification than the requirement.

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