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Native versus Exotic Planting Systems in Urban Landscapes: A Comparative Assessment of Biodiversity, Water Demand and Maintenance

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Abstract - *Urban landscapes can contribute to biodiversity conservation, water management, and environmental sustainability, but their performance depends on plant selection and site management. This paper develops a comparative assessment framework for native and exotic planting systems across three urban landscape types in Chennai, Tamil Nadu: Jains Sunderbans (residential), Thamarai Square at VR Mall (commercial), and Koyambedu Eco Park (Public Park). The framework considers plant composition and geographical origin, biodiversity-support potential, water demand, maintenance intensity, and invasive potential. The study combines a literature review with a preliminary plant list supplied for the selected sites; scientific identities and regional origins require verification before definitive classification. Biodiversity is assessed through potential resources such as flowers, fruits, seeds, host-plant relationships, and habitat structure. Water and maintenance are considered qualitatively unless supported by site records. The available information does not establish measured differences in irrigation consumption, pollinator activity, or maintenance costs. The paper therefore presents a literature-informed comparative framework rather than a validated quantitative ranking of the three sites. It recommends prioritising locally appropriate native vegetation, screening introduced species for invasive potential, grouping plants by irrigation requirements, and evaluating performance at species and site levels. Future fieldwork should measure irrigation volumes, survival, maintenance labour, and standardised biodiversity indicators over seasonal cycles.*

Key Words: Native plants, exotic plants, urban landscapes, biodiversity, water demand, landscape maintenance, sustainable planting.

1. INTRODUCTION

Urban landscapes are important components of urban ecological systems because they provide vegetation cover, wildlife habitats, shade, recreational spaces, and environmental benefits. Parks, residential gardens, institutional campuses, roadside plantations, and public open spaces can contribute to biodiversity conservation when their vegetation composition and management practices are ecologically appropriate [1], [9]. The effectiveness of these landscapes depends on species selection, vegetation structure, soil conditions, and the continuity of green spaces [10], [11].

Native plants occur naturally within a defined geographical region, whereas exotic plants are introduced beyond their natural ranges. Native plants can provide food and habitat resources for locally associated organisms, while selected exotic plants can offer ornamental diversity and useful landscape functions. However, some introduced species can become invasive and alter existing ecological relationships [3], [5]. Research comparing native and non-native plants suggests that plant origin can influence biodiversity support, although individual species and environmental conditions remain important [2], [4].



Fig- 1. Native planting system

Chennai provides a relevant contextual setting for evaluating planting systems because its urban landscapes experience high temperatures, seasonal rainfall, variable soil conditions, and increasing pressure on water resources. Green infrastructure can contribute to urban environmental improvement when its design responds to local climatic conditions and long-term management requirements [7], [8], [16]. Accordingly, urban planting should be assessed not only by visual appearance but also by biodiversity value, water demand, and maintenance feasibility.

1.1 Need for the Study

Planting decisions may prioritise immediate appearance, nursery availability, or ease of installation without sufficiently considering ecological compatibility, long-term irrigation, maintenance inputs, or invasive risk. A structured assessment can help landscape architects make transparent decisions that balance biodiversity, resource use, and design objectives [1], [8], [12].

1.2 Aim

To develop a comparative assessment of native and exotic planting systems in urban landscapes, focusing on biodiversity-support potential, water demand, and maintenance requirements.

1.3 Objectives:

- To document the plant composition and geographical origin of plants recorded at three selected urban landscapes in Chennai.
- To assess potential biodiversity-support functions using documented ecological resources and habitat structure.
- To compare indicative water demand and maintenance requirements using consistent, species-level criteria.
- To identify the importance of invasive potential and site suitability in plant selection.
- To propose a practical framework for sustainable planting decisions in Chennai.

1.4 Scope of the Study

The study considers urban parks, residential landscapes, institutional campuses, streetscapes, and public open spaces. Chennai is used as the regional context for discussing planting suitability and resource management. The assessment focuses on biodiversity, water demand, and maintenance, with additional consideration of plant survival, invasive potential, and ecosystem services [14], [18].

The study is literature-based and does not report measured differences from monitored planting plots. Its findings therefore provide a comparative conceptual framework that requires field validation.

2. LITERATURE REVIEW

2.1 Native Plants and Urban Biodiversity

Native plants can support local biodiversity by providing nectar, pollen, fruits, seeds, shelter, and host-plant resources for insects, birds, and other wildlife. The ecological value of vegetation depends on species composition, habitat structure, and the availability of resources across seasons [1], [2]. Tallamy and Shropshire [4] demonstrated the importance of plant selection for supporting lepidopteran diversity, while subsequent research has further investigated relationships between non-native vegetation and insect populations [21], [23].

Urbanisation can produce changes in species richness and community composition, sometimes resulting in biotic homogenisation in which different urban environments increasingly support similar species [9], [10]. Maintaining a diverse range of locally appropriate trees, shrubs, climbers, grasses, and groundcovers can provide different habitat opportunities and strengthen the ecological value of urban green spaces [13], [18].

2.2 Exotic Plants and Ornamental Diversity

Exotic plants are frequently used in urban landscapes for their ornamental qualities, distinctive growth forms, flowering characteristics, screening functions, and adaptability to particular planting conditions. The presence of exotic plants does not automatically imply ecological harm, because their performance varies by species and location [3], [12].

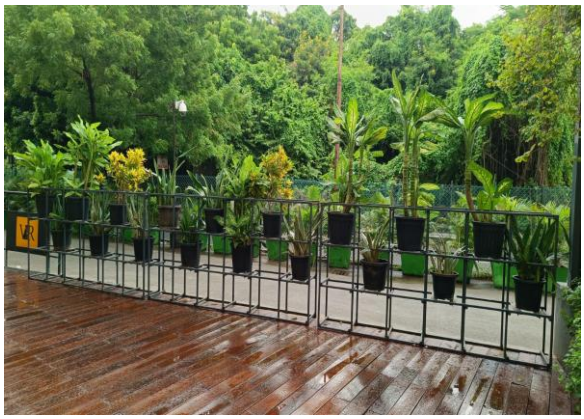


Fig- 2. Exotic ornamental planting system

However, introduced plants can become naturalised or invasive under favourable conditions. Richardson et al. [5] established important distinctions between introduced, naturalised, and invasive plants, while Richardson and Pyšek [6] examined the relationship between species invasiveness and community invasibility. These distinctions are important for landscape architecture because the selection of exotic plants should include an assessment of invasion risk, ecological suitability, and long-term management implications.

2.3 Water Demand and Climate Adaptation

Plant water requirements are influenced by physiological characteristics, rooting depth, leaf area, soil moisture, plant age, and climatic exposure. Responses to water deficit differ

among species and depend on their physiological adaptations and environmental conditions [7]. Consequently, neither native nor exotic plants can be assumed to have uniformly low or high-water requirements.

Urban tree and vegetation systems can provide environmental benefits, but their performance depends on appropriate species selection and management [15], [16]. In water-limited landscapes, strategies such as mulch application, soil improvement, rainwater harvesting, and grouping plants by irrigation requirement can reduce unnecessary water use [17], [29].

2.4 Maintenance Requirements in Urban Landscapes

Landscape maintenance involves irrigation, pruning, fertilisation, pest management, litter removal, and replacement of dead or damaged plants. These activities depend on species characteristics, planting density, environmental conditions, and the intended landscape appearance. A formal hedge, for example, may require frequent pruning, whereas a naturalistic planting system may require less routine shaping.

Urban ecological research indicates that landscape management needs to consider multiple environmental and social objectives [1], [8]. Similarly, ecosystem-service assessments of urban trees demonstrate the importance of considering the relationship between vegetation characteristics and landscape benefits [27]. Maintenance planning should therefore incorporate recurring labour, resource inputs, and replacement requirements rather than relying solely on initial planting costs.

2.5 Research Gap

Existing research addresses urban biodiversity, plant invasions, plant responses to water stress, and urban green infrastructure [1], [5], [7], [18]. For landscape practice, there remains a need for a transparent, integrated decision framework that considers plant origin alongside biodiversity-support potential, water demand, maintenance, and site suitability. This paper addresses that practical need by organizing the available plant inventory and proposing consistent indicators for the three selected Chennai landscapes. It does not claim to establish quantitative causal differences between native and exotic planting systems.

3. RESEARCH METHODOLOGY

3.1 Research Design

The study uses a literature-informed comparative case-study framework. It combines (i) a preliminary plant list supplied for the selected sites, (ii) a proposed protocol for botanical verification, and (iii) qualitative criteria for assessing biodiversity-support potential, water demand, maintenance intensity, and invasive potential. The available information does not include replicated plots, measured irrigation volumes, standardised fauna observations, or maintenance time logs. Consequently, findings are descriptive and framework based.

The research process comprises four stages: literature review, identification of assessment indicators, comparative evaluation, and development of planting recommendations. This approach is consistent with broader urban ecological research that examines vegetation in relation to biodiversity and ecosystem services [1], [18], [19].

3.2 Study Area: Chennai, Tamil Nadu

Chennai, Tamil Nadu, was selected as the regional context for assessing native and exotic planting systems in urban landscapes. The city's-built environment includes residential developments, commercial complexes, institutional landscapes, and public open spaces with different planting objectives and management requirements [8], [16], [28].

Three urban landscape types were selected for comparative assessment: Jains Sunderbans as the residential landscape, Thamarai Square at VR Mall as the commercial landscape, and Koyambedu Eco Park as the public urban park. These sites represent different landscape functions and provide a basis for examining variation in plant composition, vegetation structure, irrigation practices, and maintenance approaches.

The study uses a comparative case-study approach. Each site is assessed separately before similarities and differences are examined across the three landscape categories. The assessment considers the recorded plant species, their geographical origins, vegetation layers, potential ecological functions, and available information on water management and maintenance.

The sites differ in their functions, spatial characteristics, and management practices. Consequently, differences between them cannot be attributed exclusively to plant origin. The comparison therefore considers site conditions and management context when interpreting the ecological and resource-related characteristics of each planting system.

Site areas, planted areas, precise locations, survey dates, and management details should be documented through field surveys or reliable records. Where such information is unavailable, it is identified as a limitation rather than estimated without evidence.

Table- 1. Study area and Landscape type

Study area	Landscape type	Planting system type
Jains Sunderbans, Apartment	Residential landscape	Native / Ornamental planting system
Thamarai Square, VR mall	Commercial landscape	Ornamental planting system
Koyambedu Eco park	Public urban park	Ornamental/Ecological planting

3.3 Plant Inventory and Botanical Verification

The following table consolidates the plant names supplied in the original study material. It is not a verified botanical inventory. The source lists contain inconsistencies between narrative lists and classification tables; these are flagged rather than silently resolved.

Table- 2. Preliminary Plant Inventory and Botanical Verification Requirements for the Selected Study Sites in Chennai

Site / list	Common names supplied	Verification note
Jains Sunderbans — list A	Jasmine; henna; oleander; weeping fig; hibiscus; neem	Scientific names and regional origins need confirmation; species-level identity required for jasmine and hibiscus.
Jains Sunderbans — list B	Copper leaf; Indian nettle; pygmy date palm; crape jasmine; neem	Confirm botanical identity of copper leaf and Indian nettle; verify regional origin for all entries.
Thamarai Square / commercial site	Bougainvillea; Heliconia; Wedilia; neem; golden pandanus; red button ginger; Syzygium myrtifolium	The associated classification table lists Canna lily but omits Bougainvillea and Heliconia. Reconcile against field notes and photographs.
Koyambedu Eco Park	Spider lily; areca palms; foxtail palms; gold mound; Dracaena reflexa; false heather	Confirm species-level identity, especially common names; verify geographical distribution.

A final species table should contain: site, common name, accepted scientific name, family, growth form, regional origin, native/non-native classification, naturalization/invasive status, evidence source, and confidence or verification status.

3.4 Plant Selection Criteria

Plant species should be selected according to geographical origin, biodiversity value, water requirements, maintenance needs, urban suitability, and invasive potential. Nativeness should be defined at a consistent geographical scale because a plant native to India is not necessarily native to Chennai or the Coromandel Coast [5], [6].

Table- 3. Plant Selection Criteria

Criterion	Assessment indicator	Evaluation method
Geographical origin	Regional nativeness	Regional flora and botanical records
Biodiversity	Food, shelter, and host-plant value	Literature review and field observations
Water demand	Irrigation volume and frequency	Water measurement and maintenance logs
Maintenance	Pruning and management requirements	Maintenance records
Plant survival	Survival and replacement rates	Repeated plant inventory
Ecological risk	Invasive potential	Regional invasive-species records
Urban suitability	Soil, heat, exposure, and rooting space	Site assessment

The framework draws on research concerning plant invasions, urban biodiversity, and the ecosystem services of urban vegetation [2], [5], [15].

3.5 Layer wise Planting Assessment

The selected species were analysed based on their role in the structure of the landscape. These roles include the canopy layer, the sub-canopy or small-tree layer, the shrub layer, the groundcover layer and the climber layer. This way of analyzing shows how each layer contributes to the ecology. It also helps in building a layered planting system in urban areas. Each layer has its role to do and together they create a more diverse and balanced environment.

3.5.1 planting layer composition at site 1-Residential park

Plants identified: Jasmine, Henna, Oleander, weeping fig, Hibiscus, Neem



Fig- 3. Planting layer composition at site 1

Table- 4. Planting species classification

S.no	Plant	Origin	Type
1.	Jasmine	Native	Shrub
2.	Henna	Native	Shrub/Ground cover
3.	Weeping fig	Native	Tree
4.	Hibiscus	Native	Shrub/tree
5.	Oleander	Native	Shrub

3.5.2 planting layer composition at site 1-Residential park

Plants identified: copper leaf, Indian nettle, pygmy date palm, crape jasmine, Neem



Fig- 4. Planting layer composition at site 1

Table- 5. Planting species classification

S.no	Plant	Origin	Type
1.	Copper leaf	Exotic	Shrub
2.	Indian nettle	Native	Shrub/Groundcover
3.	Pygmy date palm	Exotic	Tree
4.	Crape Jasmine	Native	Shrub
5.	Neem	Native	Tree

3.5.3 planting layer composition at site 2-Urban Square

Plants identified: Bougainvillea, Heliconia, Wedilia, Neem, Golden pandanus, red button ginger, syzygium myrtifolium.



Fig- 5. Planting layer composition at site 2

Table- 6. Planting species classification

S.no	Plant	Origin	Type
1.	Cana lily	Exotic	Shrub
2.	Wedilia	Native	Shrub/Groundcover
3.	Neem	Native	Tree
4.	Golden pandanus	Native	Shrub/tree
5.	Red button ginger	Native	Shrub
6.	Syzygium myrtifolium	Exotic	Shrub/tree

3.5.4 planting layer composition at site 3 - Urban Eco Park

Plants identified: Spider lily, Areca palms, Foxtail palms, Gold mound , Dracaena reflexa , False heather.



Fig- 6. Planting layer composition at site 3

Table- 7. Planting species classification

S.no	Plant	Origin	Type
1.	Spider lily	Exotic	shrub
2.	Areca palms	Exotic	Tree
3.	Foxtail Palms	Exotic	Tree
4.	Gold mound	Exotic	Shrub
5.	Dracaena reflexa	Exotic	Shrub
6.	False Heather	Exotic	Shrub

3.6 Comparative Assessment Indicators and Rating Criteria

Biodiversity-support potential is assessed through documented ecological resources, including flowers, nectar, pollen, fruits, seeds, host-plant relationships, and habitat structure. These are indicators of potential support, not direct measurements of biodiversity. Actual ecological response requires standardised observations of pollinators, birds, or other fauna [1], [4], [23].

Water demand is assessed from species characteristics and, where available, irrigation records. Water use should be reported as volume per planted area over a defined time interval. Establishment irrigation should be distinguished from long-term irrigation [7], [17], [27].



Fig- 7. Irrigation and water management

Maintenance intensity is assessed using irrigation frequency, pruning, fertilisation, pest management, litter removal, replacement, and invasive-growth control. If maintenance records are absent, the assessment remains qualitative and cannot be interpreted as measured labour or cost.

Table – 8. Comparitive assessment indicators and rating criteria

Indicator	Low	Moderate	High
Water demand	Relatively low irrigation under suitable local conditions	Periodic irrigation depending on soil and climate	Relatively high or frequent irrigation
Maintenance intensity	Limited routine intervention after establishment	Periodic pruning or other management	Frequent pruning, specialised care or replacement
Biodiversity-support potential	Few documented ecological resources or habitat functions	One or more useful ecological resources	Multiple documented resources or habitat functions

These categories are proposed descriptors, not measured results. Each species rating must be supported by botanical or horticultural evidence and the same criteria must be applied consistently.

3.7 Proposed Field Data Collection

A future field-based extension should identify comparable plots dominated by regionally native plants and plots containing selected non-invasive exotic plants. Plots should be matched as closely as possible for area, soil, sunlight, planting density, vegetation maturity, and landscape function. Monitoring should ideally cover a full annual seasonal cycle.

Data collection should record irrigation volume, maintenance labour, pruning and fertiliser inputs, pest management, plant survival and replacement, flowering and fruiting periods, and standardised pollinator or bird observations. Repeated observations and independent replicated plots are needed to distinguish planting-system effects from site-specific conditions [2], [18], [30].

Table- 9. Comparative assessment

Plant	Water required	Maintenance	Biodiversity
Jasmine	Moderate	Moderate	High
Henna	low	Easy	Moderate
Weeping fig	Moderate	High	Low
Hibiscus	Moderate	Moderate	High
Oleander	Low	Low	Moderate
Copper leaf	High	Moderate	Moderate
Indian nettle	Moderate	Moderate	Moderate
Pygmy date palm	Moderate	Low	Moderate
Crape Jasmine	Moderate	Easy	High
Neem	Easy	Easy	High
Cana Lilly	High	Moderate	Moderate
Wedilia	low	Easy	High
Neem	Moderate	High	Low
Golden Pandanus	low	Moderate	Low
Red button ginger	High	Moderate	High
syzygium myrtifolium	High	Moderate	High
Spider lily	low	Moderate	High
Areca palms	Moderate	Moderate	Moderate
Foxtail Palms	low	low	moderate
Gold mound	Moderate	Moderate	Low
Dracaena reflexa	Moderate	Moderate	low
False Heather	low	Moderate	High

3.8 Data Analysis

Species richness is the number of distinct, verified plant species recorded at a site. The proportion of native species may be calculated as (verified native species / all verified species) × 100; the exotic proportion is calculated in the same way. Unverified species should be reported separately.

Where data are available, water demand is calculated as W = V/A, where V is total irrigation volume during the specified period and A is the corresponding planted area. Maintenance intensity is calculated as M = H/A, where H is maintenance labour hours during the specified period and A is planted area. Plant survival is calculated as (surviving plants / initial plants) × 100.

Biodiversity indicators may include species richness, flowering and fruiting resources, pollinator visits per standardised observation period, and bird observations. Because the current material does not provide independent replicated measurements, no inferential statistical tests or claims of statistical significance are justified.

4. RESULTS AND DISCUSSION

4.1 Status of Available Evidence

The available material provides preliminary common-name plant lists for three urban landscape types and a literature-based rationale for evaluating them. It does not provide a fully verified scientific inventory, quantified site areas, irrigation records, standardised biodiversity observations, or maintenance logs. Therefore, numerical comparisons between the sites cannot be reported reliably at this stage [2], [4].

This distinction is important: a list of planted species can describe plant composition, but it does not establish how many pollinators or birds use a site, how much water is consumed, or how many labour hours are required for maintenance. Those outcomes require separate measurements.

4.2 Biodiversity-Support Potential

Literature indicates that regionally appropriate native plants can provide important resources for locally associated organisms, particularly where ecological relationships involve specific host plants or seasonal food resources [2], [4]. Nevertheless, native status alone does not guarantee high ecological value. Species composition, plant abundance, flowering and fruiting periods, vegetation structure, and management practices also influence habitat quality.

Exotic species may provide flowers, fruits, shade, or shelter, but their contributions vary by species and local fauna. Introduced status should not be treated as synonymous with invasiveness, and invasive risk should be evaluated separately [3], [5], [6]. The three sites should therefore be compared only after their plant identities and regional origins are verified.

Table -10. Biodiversity comparison framework

Parameter	Regionally native planting	Exotic planting
Food and habitat resources	Potentially strong where species match local	Variable; depends on species and local

	ecological relationships	fauna
Seasonal continuity	Can be designed using species with complementary flowering and fruiting periods	Can supplement seasonal resources where appropriate
Invasive risk	Generally, not associated with the same introduction risk for genuinely local native species	Requires species-specific screening
Evidence required	Verified plant identity and documented ecological functions	Verified identity, ecological functions and invasion-risk screening

Table interpretation: this is a qualitative literature-informed comparison, not a measured result from the three sites.

4.3 Water Demand

Water demand is affected by species physiology, soil moisture, root development, plant age, climatic exposure, and establishment requirements [7]. A native species may need substantial irrigation when planted in unsuitable soil or maintained as a formal ornamental, while a well-adapted exotic species may require relatively little water. Plant origin alone is therefore insufficient to rank water efficiency.

For Chennai, management can reduce avoidable water use through appropriate species selection, mulching, soil improvement, rainwater harvesting, efficient irrigation, and grouping plants according to similar water requirements [16], [17], [29]. However, the present study contains no measured irrigation volumes. The water ratings in the original draft should be treated as provisional hypotheses until their criteria and evidence are documented.

Table- 11. Water-Demand Assessment Framework

Factor	Native planting system	Exotic planting system
Regional climatic adaptation	Often favourable for suitable local species	Species-dependent
Establishment irrigation	May be necessary	May be necessary
Long-term irrigation	Potentially low for suitable species	Ranges from low to high
Drought tolerance	Species-specific	Species-specific
Irrigation efficiency	Improved through appropriate planting design	Improved through appropriate planting design

Source: Literature-based synthesis [6], [7], [16], and [29]. Actual water consumption must be established through field measurements.

4.4 Maintenance Requirements

Maintenance depends on growth rate, mature size, desired landscape character, plant health, planting density, and site conditions. Both native and exotic species may require pruning, fertilisation, pest management, or replacement. Maintenance should be compared using labour hours, irrigation events, material inputs, and replacement records whenever possible [15], [19], [27].

The original draft assigns qualitative maintenance levels to individual plants but does not state the evidence or rating procedure used. Those ratings should not be presented as verified findings until supported by consistent rubric, botanical evidence, or management records.

Table- 12. Maintenance Comparison Framework

Activity	Native planting system	Exotic planting system
Irrigation	Depends on species and establishment	Depends on species and establishment
Pruning	Depends on growth habits and design	Depends on growth habits and design
Fertilisation	Guided by soil and plant requirements	Guided by soil and plant requirements
Pest management	Species-specific	Species-specific
Replacement	Depends on survival and site suitability	Depends on survival and site suitability
Invasive growth control	Usually less relevant for genuinely local native species	May be required for invasive species

Source: Comparative framework informed by [3], [5]–[8], and [27].

4.5 Interpretation by Landscape Type

Residential landscapes such as Jains Sunderbans may need to balance privacy, shade, ornamental value, habitat resources, and manageable irrigation. The final assessment should consider the verified species list and available maintenance information.

Commercial landscapes such as Thamarai Square may place greater emphasis on visual identity, pedestrian experience, and a consistently maintained appearance. Their ecological

and resource performance depends on the actual plant composition, irrigation, and management regime.

Public parks such as Koyambedu Eco Park can potentially combine recreation, shade, habitat, and layered vegetation. The value of their planting systems depends on the diversity and arrangement of vegetation and on whether water and maintenance inputs are compatible with management objectives.

These are contextual interpretations of landscape functions, not measured rankings of the selected sites. Differences between the sites may be due to area, planting density, maturity, soil, irrigation, or management rather than plant origin alone.

4.6 Integrated Planting Selection Framework for Chennai

The study proposes a five-stage decision framework:

- Botanical verification: confirm accepted scientific names and regional distributions.
- Ecological assessment: document flowers, fruits, seeds, host-plant relationships, habitat structure, and invasive potential.
- Water assessment: establish species-level irrigation needs and separate establishment from long-term water use.
- Maintenance assessment: evaluate pruning, fertilisation, pest management, labour, and replacement inputs.
- Landscape suitability: match plants to soil, heat, exposure, rooting space, design function, and management capacity.

Locally appropriate native trees, shrubs, climbers, grasses, and groundcovers can form the basis of many planting schemes. Carefully screened non-invasive exotic species may be included when they offer clear functional or aesthetic benefits without undermining ecological objectives. The framework is a proposed decision-support approach and requires field validation.

generic images as if they were site evidence.

4.7 Limitations of the Study

The current assessment is limited by incomplete botanical verification, inconsistencies between some narrative plant lists and classification tables, and the absence of quantified irrigation, maintenance, and biodiversity measurements. The sites are different landscape types rather than matched experimental plots, so differences cannot be attributed solely to native or exotic plant origin. Qualitative ratings are not measurements and should not be interpreted as statistically established outcomes [2], [7], [18].

Future research should document site and planted areas, survey dates, species identities, irrigation volumes, plant survival, maintenance labour, replacement costs, and standardised biodiversity observations. Replicated plots and seasonal monitoring would enable more robust comparisons [19], [27], [28], [30].

5. CONCLUSIONS

This study develops a literature-informed framework for assessing native and exotic planting systems across residential, commercial, and public park landscapes in Chennai. It integrates geographical origin, biodiversity-support potential, water demand, maintenance intensity, and invasive potential into a practical plant-selection process [2]– [6].

Regionally appropriate native plants can provide valuable resources for local fauna, but their ecological performance depends on species characteristics, habitat relationships, and management. Exotic plants are not uniformly unsuitable; their selection should be based on functional benefits, site compatibility, and screening for invasive potential. Likewise, water demand and maintenance cannot be reliably inferred from plant origin alone.

For Chennai, the framework recommends prioritising locally appropriate native vegetation, diversifying planting layers, grouping plants by irrigation needs, and evaluating recurring maintenance inputs. The present evidence does not establish quantitative differences between the three sites. Botanical verification and field measurements are required before definitive comparative claims can be made. Future studies should monitor irrigation, survival, maintenance labour, replacement, and biodiversity indicators over seasonal cycles to support evidence-based urban planting decisions [2], [8], [19], [27], [30].

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REFERENCES

[1] M. A. Aronson et al., “Biodiversity in the city: Key challenges for urban green space management,” Frontiers in Ecology and the Environment, vol. 15, no. 4, pp. 189–196, 2017. doi: 10.1002/fee.1480.

[2] E. S. Tartaglia and M. F. J. Aronson, “Plant native: Comparing biodiversity benefits, ecosystem services provisioning, and plant performance of native and non-native plants in urban horticulture,” Urban Ecosystems, vol. 27, pp. 2587–2611, 2024. doi: 10.1007/s11252-024-01610-5.

[3] A. Kendle and J. Rose, "The aliens have landed! What are the justifications for 'native only' policies in landscape plantings?" Landscape and Urban Planning, vol. 47, nos. 1–2, pp. 19–31, 2000. doi: 10.1016/S0169-2046(99)00070-5.

[4] D. W. Tallamy and K. J. Shropshire, "Ranking lepidopteran use of native versus introduced plants," Conservation Biology, vol. 23, no. 4, pp. 941–947, 2009. doi: 10.1111/j.1523-1739.2009.01202. x.

[5] D. M. Richardson, P. Pyšek, M. Rejmánek, M. G. Barbour, F. D. Panetta, and C. J. West, "Naturalization and invasion of alien plants: Concepts and definitions," Diversity and Distributions, vol. 6, no. 2, pp. 93–107, 2000.

[6] D. M. Richardson and P. Pyšek, "Plant invasions: Merging the concepts of species invasiveness and community invasibility," Progress in Physical Geography, vol. 30, no. 3, pp. 409–431, 2006.

[7] M. M. Chaves, J. S. Pereira, J. Maroco, M. L. Rodrigues, C. P. P. Ricardo, M. L. Osório, I. Carvalho, T. Faria, and C. Pinheiro, "How plants cope with water stress in the field. Photosynthesis and growth," Annals of Botany, vol. 89, no. 7, pp. 907–916, 2002.

[8] F. O'Sullivan, I. C. Mell, and S. Clement, "Novel solutions or rebranded approaches: Evaluating the use of nature-based solutions in Europe," Frontiers in Sustainable Cities, vol. 2, article 572527, 2020. doi: 10.3389/frsc.2020.572527.

[9] M. L. McKinney, "Urbanization as a major cause of biotic homogenization," Biological Conservation, vol. 127, no. 3, pp. 247–260, 2006.

[10] M. L. McKinney, "Effects of urbanization on species richness: A review of plants and animals," Urban Ecosystems, vol. 11, pp. 161–176, 2008.

[11] J. Niemelä, "Ecology and urban planning," Biodiversity and Conservation, vol. 8, pp. 119–131, 1999.

[12] I. Kowarik, "Novel urban ecosystems, biodiversity, and conservation," Environmental Pollution, vol. 159, nos. 8–9, pp. 1974–1983, 2011.

[13] M. J. McDonnell and A. K. Hahs, "The future of urban biodiversity research: Moving beyond the 'island' model," Perspectives in Plant Ecology, Evolution and Systematics, vol. 15, no. 2, pp. 97–108, 2013.

[14] J. Colding, "Ecological land-use complementation for building resilience in urban ecosystems," Landscape and Urban Planning, vol. 81, nos. 1–2, pp. 46–55, 2007.

[15] D. J. Nowak, D. E. Crane, and J. C. Stevens, "Air pollution removal by urban trees and shrubs in the United States," Urban Forestry & Urban Greening, vol. 4, nos. 3–4, pp. 115–123, 2006.

[16] L. Bolund and S. Hunhammar, "Ecosystem services in urban areas," Ecological Economics, vol. 29, no. 2, pp. 293–301, 1999.

[17] C. N. Gill, J. F. Handley, A. R. Ennos, and S. Pauleit, "Adapting cities for climate change: The role of the green infrastructure," Built Environment, vol. 33, no. 1, pp. 115–133, 2007.

[18] S. T. A. Pickett et al., "Urban ecological systems: Scientific foundations and a decade of progress," Journal of Environmental Management, vol. 92, no. 3, pp. 331–362, 2011.

[19] T. Elmqvist et al., "Benefits of restoring ecosystem services in urban areas," Current Opinion in Environmental Sustainability, vol. 14, pp. 101–108, 2015.

[20] R. T. T. Forman, Urban Ecology: Science of Cities. Cambridge: Cambridge University Press, 2014.

[21] D. W. Tallamy, D. L. Narango, and A. B. Mitchell, "Do non-native plants contribute to insect declines?" Ecological Entomology, vol. 46, no. 4, pp. 729–742, 2021.

[22] D. L. Narango, D. W. Tallamy, and P. P. Marra, "Nonnative plants reduce population growth of an insectivorous bird," Proceedings of the National Academy of Sciences, vol. 115, no. 45, pp. 11549–11554, 2018.

[23] K. T. Burghardt, D. W. Tallamy, and W. G. Shriver, "Impact of native plants on bird and butterfly biodiversity in suburban landscapes," Conservation Biology, bibliographic details to be checked against the original publication before submission.

[24] M. F. J. Aronson et al., "A global analysis of the impacts of urbanization on bird and plant diversity reveals key anthropogenic drivers," Proceedings of the Royal Society B: Biological Sciences, vol. 281, article 20133330, 2014.

[25] M. van Kleunen et al., "Global exchange and accumulation of non-native plants," Nature, vol. 525, pp. 100–103, 2015.

[26] D. J. Nowak, R. E. J. Greenfield, R. E. Hoehn, and E. Lapoint, Sustaining America's Urban Trees and Forests. U.S. Department of Agriculture, Forest Service, Northern Research Station, General Technical Report NRS-62, 2010.

[27] S. Roy, J. Byrne, and C. Pickering, "A systematic quantitative review of urban tree benefits, costs, and assessment methods across cities in the United Kingdom," Urban Forestry & Urban Greening, vol. 11, no. 4, pp. 351–363, 2012.

[28] T. R. Oke, G. Mills, A. Christen, and J. A. Voogt, Urban Climates. Cambridge: Cambridge University Press, 2017.

[29] United States Environmental Protection Agency, Stormwater to Street Trees: Engineering Urban Forests for Stormwater Management. Washington, DC: U.S. Environmental Protection Agency, 2013.

[30] A. Russo, M. Esperon-Rodriguez, A. St-Denis, and M. G. Tjoelker, "Native vs. non-native plants: Public preferences, ecosystem services, and conservation strategies for climate-resilient urban green spaces," Land, vol. 14, no. 5, article 954, 2025. doi: 10.3390/land14050954.