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Rain Gardens and Monsoon Flood Management in Mumbai: A Comparative Assessment of Dense Inland Catchments and Newly Reclaimed Coastal Landscapes

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Abstract

Mumbai experiences 2,200–2,800 mm of annual rainfall, much of it concentrated in a few monsoon weeks, producing chronic flooding in low-lying neighbourhoods such as Hindmata Junction. At the same time, the Mumbai Coastal Road project is creating roughly 130 acres of new reclaimed parkland along the city's western shore. This paper asks how much practical potential rain-garden systems have to reduce localised waterlogging in Mumbai's monsoon climate, and how that potential differs between dense inland bowls and newly reclaimed coastal open spaces. The study adopts an identification-and-description strategy using secondary data: Indian Meteorological Department rainfall records, Municipal Corporation of Greater Mumbai drainage reports, media coverage of recent flood events, and international literature on rain-garden performance in tropical cities. Simple volume estimates and typology-based reasoning are used to compare feasible rain-garden configurations at Hindmata and along the Coastal Road parks. Results show that at Hindmata, extreme inflows from a ~2 km² catchment (on the order of 150,000–170,000 m³ per hour during cloudbursts) dwarf the storage that micro-scale rain-garden typologies could realistically provide, limiting their role to mitigating kerb-side ponding and improving water quality. Along the Coastal Road, by contrast, the combination of smaller contributing catchments and contiguous programmable parkland allows park-integrated bioretention basins and bioswale corridors to intercept a meaningful fraction of runoff. The paper argues that urban form is a decisive filter for the feasible role of rain gardens in dense coastal megacities, with implications for how Mumbai and similar cities deploy green infrastructure for monsoon resilience.

Author's Note

This article developed from my final paper for the MSc Sustainability Management course "Critical Urban Infrastructure for Sustainable Development" at Columbia University. During the course I became interested in why some Mumbai neighbourhoods, such as Hindmata Junction, remain chronically waterlogged despite

repeated drainage upgrades, and whether green infrastructure could realistically help. I focus on rain gardens because they are often promoted as simple, low-impact climate-adaptation measures, yet their feasibility in extremely dense, monsoon-affected cities is rarely interrogated. By comparing Hindmata's inland bowl with the new Coastal Road reclamation parks, the article aims to show in accessible terms where rain gardens can and cannot contribute to stormwater management, and why urban form matters for sustainable development. I hope the work can support more place-sensitive approaches to blue–green infrastructure in Mumbai and other coastal megacities.

Keywords: Rain gardens, Green infrastructure, Stormwater management, Mumbai, Monsoon flooding, Critical infrastructure

Introduction

The city of Mumbai receives 2,200–2,800 mm of rain each year, over half of it falling within four to six weeks of the peak monsoon (Zope et al., 2016). Most of the stormwater system, built more than a century ago, was designed for only 25–50 mm/hour of rainfall (Gupta, 2009; Zope et al., 2016). Recent monsoons now bring short bursts of 70–80 mm/hour that routinely exceed this capacity. The network also discharges through more than 200 outfalls to the Arabian Sea and tidal creeks, so during high tide tide-lock prevents gravity drainage and water backs up into low-lying areas. These limits are most visible in chronic flooding that shuts down rail lines and roads, interrupts informal work, and keeps large sections of the city's lowlands under water for hours.

Among the best known examples is Hindmata Junction, repeatedly listed in municipal records as a hotspot of chronic flooding in Mumbai (MCGM, 2023). Hindmata sits in a natural depression where three micro-catchments converge; intense rainfall rapidly collects in this bowl-shaped landform and produces flash flooding (Tripathy et al., 2024). The area also receives runoff from highly paved upstream neighbourhoods, so very little water infiltrates before it reaches the junction. Despite dedicated micro-pumping stations, regular desilting, and drain-widening works, the junction still floods several times every monsoon. This illustrates the structural limits of grey infrastructure in catchments whose topography and tidal regime restrict the physical movement of water and leave engineers with only incremental retrofit options.

These physical realities have shaped a common perception that green infrastructure (GI) such as rain gardens, bioswales and bioretention systems is impossible in Mumbai. The argument points to the city's heavy rainfall, narrow rights-of-way and extremely limited open space. Mumbai's per-capita open space is among the lowest of global megacities. Dense urban form leaves little surface available for infiltration features, reinforcing the idea that GI can only play a symbolic or cosmetic role and that serious flood management must rely on pumps, sea walls and widened concrete drains.

However, this assumption is being challenged by evidence from other tropical and monsoon-intensity cities. Studies from Singapore, which receives rainfall comparable to Mumbai, show that engineered bioretention systems such as curbside planters and modular tree trenches can significantly reduce peak runoff even during heavy tropical storms (Lim et al., 2021; Neo et al., 2022). Because they are embedded in existing streetscapes, these systems also improve shade and microclimate without requiring large parks. In southern China, field experiments demonstrate that rain-garden systems maintain infiltration performance under 45–55 mm/hour storms, within the range of typical Mumbai monsoon bursts (Chen et al., 2023). Syntheses of global studies consistently report runoff reductions between 30 and 90 percent, depending on soil media, vegetation, and construction details (Nazarpour et al., 2023; Vijayaraghavan and Basco, 2021). Together, these results indicate that high-intensity rainfall alone does not preclude successful GI implementation and that the key design question is where and at what scale such systems can be sited.

In this respect, urban morphology is the more decisive constraint in Mumbai. High-density inland catchments offer very little space for infiltration systems larger than small planters or bioswales tucked into leftover corners. Such micro-scale installations can mitigate local ponding at junctions and footpaths but cannot materially change basin-scale flooding governed by pump capacity, high-tide timing and the limited diameter of trunk sewers. By contrast, the recently reclaimed landscapes along the Mumbai Coastal Road create a rare opportunity to test GI at scale. The project will add roughly 130 acres of continuous, city-owned open space in the form of parks, promenades, and landscaped areas (Times of India, 2025; Indian Express, 2024). Unlike older inland neighbourhoods, this reclaimed coastal land is not constrained by existing buildings or buried utilities, making it possible to integrate larger, interconnected bioretention systems, detention lawns and tree trenches into the public realm as part of the project's promised open-space network.

Against this background, the present research examines the question: *"How much practical potential do rain-garden systems have to reduce localised waterlogging in Mumbai's monsoon climate, and how does their feasibility differ between dense inland catchments such as Hindmata Junction and newly reclaimed open spaces along the Coastal Road?"*

The main argument of this paper is that rain gardens can have a small, complementary role in thickly constructed inland basins, but they have an important, scalable potential in the open reclaimed landscapes of the Coastal Road. This particularity is critical in informing pragmatic, place-based solutions to stormwater resiliency in Mumbai.

Literature Review

Rain Gardens and Bioretention Systems

Bioretention systems or rain gardens are vegetated shallow depressions that are designed to receive, infiltrate, and temporarily retain stormwater runoff through the use of porous media and adapted vegetation (Vijayaraghavan and Basco, 2021). They are normally composed of surface ponding layer, engineered soil mix, transition layer of sand and sometimes an underdrain that enables a controlled discharge to neighboring drains. These elements collaborate to reduce the velocity of the run-off, enhance their infiltration, better the quality of water, and even out the peak flows (Nazarpour et al., 2023).

There is evidence of high hydrologic performance in areas of the monsoon. Rain-garden installations in southern China showed resistance to storm bursts of 45 to 55 mm/hour and had excellent infiltration, which was also resilient as per the situation in Mumbai (Chen et al., 2023). Integrating rain-garden systems into high-density residential and commercial areas, Singapore has achieved the success in reducing the peak flow volumes and increasing the water quality indicators including suspended solids and nutrient levels (Lim et al., 2021; Neo et al., 2022). The versatility of bioretention in dissimilar climates is also noted in a global systematic review which indicates runoff-reduction efficiency between 30 and 90% depending on the filter media, vegetation type, ponding depth, and landscape structure (Nazarpour et al., 2023).

The maintenance aspect is a major concern that affects the long-term performance. When the upper layer of soil is clogged, the efficiency of infiltration may decrease, and to eliminate the sediment and replace the plants, this process may need to be carried out periodically (Vijayaraghavan and Basco, 2021). In cities characterized by elevated road-dust levels and intense construction/construction activities, e.g., in Mumbai, there has to be an adaptive consideration in maintenance issues.

Rain-Garden Typologies and Urban-Form Constraints

Rain gardens vary greatly depending on the size of land. Smaller typologies that are mostly commonly used in dense urban environments include curbside bioswales, modular tree trenches, and planter-box rain gardens. They Capture runoff from adjacent lanes / sidewalks and are typically designed for the *first* few centimetres of rainfall and to protect inlets. These systems can be installed in the small rights-of-way and can capture runoff of pavements and small roads (Lim et al., 2021; Neo et al., 2022). They mostly address local ponding and water quality, not whole-basin flooding and have a tendency to be localised with their hydrologic benefits though capable of increasing infiltration and decreasing surface ponding at certain locations.

The larger typologies, such as park-integrated bioretention basins, wet-meadow filtration zones, and bioswale corridors, demand continuous open-space space and deeper soil profiles (Przestrzelska et al., 2024). These systems have greater storage capacity, often sized for 10–50 mm storms over larger areas, a higher infiltration rate, and a connectivity between a variety of cells that generate a much greater cumulative hydrologic impact. Hence, they can contribute meaningfully to peak-flow reduction when networked. These typological differences directly relate to Mumbai. The spatial limitations of GI to micro scale facilities in inland catchments like Hindmata reduce their role in reducing the total floods. On the other hand, the Coastal Road reclamation provides adequate land and continuity to build precinct-based GI networks that will be capable of handling runoff in better ways. The rest of this paper therefore evaluates which of these typologies is realistically deployable at Hindmata and along the Coastal Road, and what hydrologic role each can play in those contrasting urban forms.

Blue–Green Infrastructure and Stormwater Resilience

Blue-green infrastructure (BGI) is a combination of natural and engineered systems that minimize the risk of floods and offer ecological and social amenities. The BGI literature emphasizes the need to have a mix of grey infrastructure (pumps and culverts) and distributed green systems to slow, store, and filter runoff (Perrelet et al., 2024). Such hybrid systems have been demonstrated to minimize peak runoff, augment the quality of water and make the climate more resilient through a diversified drainage pathway (Przestrzelska et al., 2024).

In regions with monsoon strength, effective BGI requires proper soil depth, hydraulic connectivity of the green spaces and care regimes. Research indicates that BGI is best used in open and continuous landscapes as opposed to separate installations (Chen et al., 2024). This observation is in direct design with the opposing urbanistic patterns of Mumbai: inland urban areas do not possess the more or less continuous form necessary to enable effective BGI, whereas the newly reclaimed coastal areas provide the spatial preconditions of networked interventions.

Mumbai's Drainage System and Flooding Characteristics

The BRIMSTOWAD master plan defines the drainage system in Mumbai and establishes a complicated network of drains, culverts, and outfalls (MCGM, 2023). Most structures are still under-sized with regards to current rainfall extremes despite upgrading. The tide-locking is a common issue since when the tide is full, the outlets cannot drain into the coastal waters (Gupta, 2009). As a result, regions that fall below mean sea level or those that are in natural depressions flood very fast even in an occurrence of monsoons.

Flood-mapping projects supported by crowdsourcing verify Hindmata as one of the most at-risk inland basins of Mumbai when it comes to floods, and frequent flooding has been reported throughout the monsoon seasons over the past years (Tripathy et al., 2024). Conversely, the Coastal Road reclamation brings forth an open space, not available in the thick urban fabric in Mumbai before. Planing reports and media suggest that this new land is being developed into parks, promenades, and public spaces in about 130 acres of land (Times of India, 2025; Indian Express, 2024). This level of open space opens new possibilities in the system of rain-gardens in the city stormwater policy.

Research Design

Research Approach

This research is based on an identification-and-description approach that is appropriate in infrastructure research where experiments or hydrological models are not possible. The intention is to collect, analyse and cross-examine the secondary data that sheds light on the way in which rain-garden systems would operate in the monsoon climate of Mumbai. The method focuses more on contextual feasibility and not predictive modelling. The values of benchmark performance are determined based on available evidence of the tropical cities and compared to the flood-prone inland basins in Mumbai and the recently reclaimed coastal landscape in Mumbai.

Data Sources

Climatic information is a fundamental part of the study. The intensity of rainfall in the 2020 to 2024 was taken based on Colaba and Santacruz observatories of the India Meteorological Department. These two stations offer comparative views on the distribution of rainfall in the island city.

The data on institutions were obtained at the Municipal Corporation of Greater Mumbai in the Storm Water Drains Department (MCGM, 2023). These are records of the type of pumping-stations, drainage-zone interconnection, and annual performance statements. The comprehensive literature base presented empirical data on other cities in the tropics or the monsoon. Singapore, southern China, Thailand, and Chennai studies provided hydrological performance data of rain gardens (Nazarpour et al., 2023; Chen et al., 2023; Lim et al., 2021). These performance standards are essential to assessing the constraints of feasibility of Mumbai.

Case Selection Rationale

Hindmata Junction is a situation of the worst possible inland flooding where geomorphology, density and drainage limitation meet. It is fed by a catchment area of approximately 1.9-2.3 km^2, and it is located in a natural depression that is approximately 1.5 m below the surface of the rest of the land (Tripathy et al., 2024). It is particularly dependent on pumps, which makes it a perfect example of considering micro-GI (small green infrastructure).

Mumbai Coastal Road reclamation has been chosen as a contrasting case since it creates a programme-receptive open land of almost 130 acres with no existing built structure (Times of India, 2025). In contrast to Hindmata, the reclaimed land is permitting structured soil profiles, adaptable grade, and decentralized drainage - circumstances applicable in the medium and large scale rain gardens.

Analytical Strategy

The analysis proceeds through structured comparison. Each case is evaluated across:

(a) “hydrological load characteristics”;

(b) “available surface area and soil depth”;

(c) “drainage pathways and tide interactions”;

(d) “compatibility with internationally observed rain-garden performance values.”

Feasibility is evaluated by numerical indicators, which include estimates of catchment inflow, pump capacity, rainfall and infiltration benchmarks. The findings section provides the tables of the analysis of these values. This is a purposefully descriptive and numerically informed design: it is not flood modelling; rather, it is realistic infrastructural judgement based on quantitative evidence.

Findings / Results

Hydrological Comparison of the Two Study Areas

Mumbai's inland and coastal landscapes respond very differently to monsoon rainfall. To clarify these contrasts, Table 1 summarises the key hydrological parameters relevant to rain-garden feasibility.

Table 1. **Hydrological Parameters Relevant to Rain-Garden Feasibility**

Parameter	**Hindmata Junction**	**Coastal Road Reclamation**	**Sources**
Annual rainfall	2,317–2,846 mm	2,317–2,846 mm	IMD; Zope et al., 2016
Peak 1-hr rainfall intensity	78–92 mm/hr	62–74 mm/hr	IMD
Catchment size	1.9–2.3 km²	0.35–0.40 km² (localised)	Tripathy et al., 2024; MCGM
Natural drainage pathway	No (basin)	Yes (towards sea)	MCGM, 2023
Dependence on pumps	Very high	Moderate to low	Indian Express, 2023
Suitable GI scale	Micro-GI only	Medium–large-scale GI	Lim et al., 2021; Neo et al., 2022

Hindmata Junction: Quantitative Constraints on GI Performance

Hindmata's inflow volumes during cloudbursts illustrate why micro-GI cannot meaningfully reduce flooding. A typical intense monsoon hour of 80–90 mm/hr falling on a ~2 km² catchment produces an inflow of:

$$\text{Inflow} \approx \text{rainfall intensity} \times \text{area}$$

$$= 0.085 \text{ m} \times 2{,}000{,}000 \text{ m}^2$$

$$\approx 170{,}000 \text{ m}^3 \text{ of runoff/hour}$$

In comparison, the Hindmata pump capacity is:

$$3{,}000\text{–}3{,}500 \text{ m}^3/\text{hr (Indian Express, 2023)}$$

This means that during a heavy rainfall hour, incoming water exceeds pump removal capacity by a factor of ~50:1.

Internationally, high-performing rain gardens can detain between 40–150 mm of rainfall, depending on design depth and media composition (Nazarpour et al., 2023). Applied to Hindmata's context, even if the city installed multiple curbside rain gardens (for example, 20 rain gardens at 50 m² each), total detention would be:

$$\text{Total storage} \approx 50\ m^3 \text{ to } 150\ m^3$$

against inflows of:

$$170{,}000\ m^3$$

This is less than 0.1% of the runoff entering the basin.

In practice this confines Hindmata to micro-typologies such as curbside bioswales, planter-box rain gardens, and small tree trenches at junctions, whose function is to intercept the first centimetres of runoff and protect inlets rather than provide basin-scale storage. Thus the numbers confirm that rain gardens in Hindmata cannot meaningfully offset incoming floodwater volumes. Their feasible contribution is limited to reducing very localised ponding — for example, capturing the first 10–20 mm of roadway runoff — and filtering debris before it enters the drains.

Coastal Road Reclamation: Numerical Feasibility of Large-Scale Rain Gardens

The Coastal Road reclamation, by contrast, allows rain gardens of significantly larger size and depth. Because reclaimed land can be graded, rain-garden basins of 500–3,000 m^2 are feasible within park designs. If a set of 10 such basins were installed, each with a storage depth of 0.3–0.5 meters, total on-site stormwater detention would be:

$$\text{Storage} \approx 10 \times (1{,}000\text{–}3{,}000\ m^2 \times 0.4\ m)$$

$$\approx 4{,}000\text{–}12{,}000\ m^3$$

This storage potential is several orders of magnitude higher than anything possible inland. It still does not replace the need for grey drainage, but it substantially reduces peak runoff before reaching the coastal outfalls.

International studies show that large-scale bioretention systems in parks can reduce peak flows by 20–60% in tropical cities (Lim et al., 2021; Neo et al., 2022). When applied to the Coastal Road's smaller catchment (~0.35–0.40 km^2), these reductions can meaningfully decrease loads entering outfalls during intense rainfall.

To illustrate, an hour of 70 mm/hr rainfall over 0.35 km^2 produces:

$$\text{Runoff} \approx 0.07\ m \times 350{,}000\ m^2$$

$$\approx 24{,}500\ m^3/hr$$

If rain-garden systems intercept 20–60%**,** this translates to:

$$\approx 5{,}000\text{–}15{,}000\ m^3/hr \text{ reduction}$$

This aligns closely with the feasible detention capacity of the reclaimed park systems, confirming that GI can make a measurable difference in this context. These numbers are only achievable with larger typologies – park-integrated bioretention basins, bioswale corridors along promenades, and linear tree-trench systems flanking internal access roads – which the 130 acres of reclaimed parks can physically accommodate.

Table 2. *Numerical Comparison of GI Impact Potential*

Metric	**Hindmata**	**Coastal Road**	**Interpretation**
Hourly inflow during storm	~170,000 m^3	~24,500 m^3	Coastal catchment is smaller → GI more effective
Max feasible GI storage	<200 m^3	4,000–12,000 m^3	Coastal Road allows deeper, larger basins
GI potential runoff reduction	<1%	20–60%	Large-scale GI feasible only at coast
Pump dependency	Extreme	Low–moderate	Key factor shaping feasibility

Interpretive Findings

The numerical analysis yields main finding: urban structure rather than rainfall determines GI viability in Mumbai. Rainfall intensity at the sites is similar, but their hydrological characteristics differ significantly. Hindmata is fed by large basin inflows and has no gravity outflow, while the Coastal Road reclamation receives smaller volumes and can drain to the sea. As a result, rain gardens in Hindmata serve micro scale purposes, whereas those on the Coastal Road can reduce peak flows and stormwater loads.

Discussion

The comparative evidence shows that practicality of rain garden systems in Mumbai is largely dependent on the urban form and less on the monsoon rainfall intensity. Hindmata and the Coastal Road share the same climatic conditions: an average precipitation of over 2,300 mm per year, frequent cloudbursts higher than 70 mm per hour and tidal movements that make drainage difficult (Zope et al., 2016; Rajeevan et al., 2008). At Hindmata, a large contributing catchment drains into a bowl shaped depression with narrow rights of way, compact subsurface utilities and seasonally high groundwater. In such a geometry the inflows during peak monsoon events rapidly exceed what even the highest performing international rain gardens designed for 40 to 150 mm storms can offset at basin scale (Nazarpour et al., 2023; Chen et al., 2023). The physical environment leaves almost no room for deep infiltration systems, with both space and depth constrained. Even if several rain gardens were placed along the footpaths, their total storage would remain small compared with the inflow, and rising groundwater reduces infiltration capacity and sustained storage. These limitations mean that GI in Hindmata can only play local roles, such as slowing roadway runoff or trapping debris before it enters the drainage system, rather than tackling the wider problem of depression scale flooding.

In comparison, the Coastal Road reclamation offers a spatial context compatible with principles from global blue green infrastructure literature. BGI systems are most effective where continuous surface areas, sufficient soil depth and adjustable ground slopes can be shaped toward decentralised infiltration areas, all of which the reclaimed parks provide (Perrelet et al., 2024; Przestrzelska et al., 2024). Because the land is newly created, designers can regulate soil composition and install permeable substrates with infiltration rates comparable to high performing systems in Singapore and China (Lim et al., 2021; Neo et al., 2022). Numerical analysis indicates that these systems can provide substantial detention volumes and sizeable reductions in peak runoff while gravity outfalls along the coast allow discharge through much of the tide cycle, unlike Hindmata where pump capacity constrains volumes (Nazarpour et al., 2023). In this setting, rain gardens complement rather than substitute the drainage system by reducing the final load on engineered channels.

These opposing results demonstrate a valuable policy lesson: rain gardens in Mumbai do not have the same effect in all locations. GI cannot substitute grey drainage systems in dense inland regions and should not be promoted as the primary flood reducing measure there. Rather, micro GI can support the reduction of small scale ponding, enhance local water quality and help keep street inlets clear by filtering sediment and debris. These localised benefits are not irrelevant but must be framed realistically; overstating their potential risks spending on interventions that do not change basin scale flood occurrence.

Rain gardens may take a different and more significant role in open coastal settings. The new parks created along the Coastal Road give Mumbai a rare chance to create a continuous blue green space that harnesses stormwater flows, cools them and filters them before discharge to the sea. The location of bioretention systems here can demonstrate how hybrid drainage, combining engineered conveyance with natural infiltration, can be incorporated into future reclamation or redevelopment projects. This kind of demonstration is especially significant in a city where land scarcity has long limited the ability to test urban nature solutions at scale.

Spatial differentiation between the two cases supports the importance of site based urban resilience planning. Instead of applying identical green infrastructure solutions across the city, Mumbai needs a zoning based strategy that identifies areas where they can be scaled up, areas where only micro scale installations are feasible and areas where they add little value. Inland catchments still require sustained investment in pumps, outfall management and real time coordination of tides and rainfall, while suburban and coastal regions offer opportunities for more integrated and dispersed GI networks.

The results also suggest that future flood management in Mumbai should be organised around hybrid systems that combine grey and green components. This concept of hybridisation aligns with global research on BGI, which highlights the value of diversifying the routes through which water moves during storms (Kaur et al., 2022; Chen et al., 2024). Such approaches can be tested on the Coastal Road reclamation through scalable, interconnected bioretention systems. Success along this corridor could shift social and institutional attitudes toward GI by showing that green systems supplement, rather than replace, engineered infrastructure.

Lastly, the analysis offers a broader perspective for other megacities in coastal areas facing similar constraints. The diversity of landscapes in Mumbai suggests that monsoon strength is not the sole determinant of GI viability. Instead, land availability, catchment size, drainage gradients and the presence of programmable soil are the decisive variables. Focusing on micro geographies rather than general assumptions about climate and density makes it possible to identify where infiltration based systems are structurally compatible and to target resilience planning more effectively.

Conclusion

The study explored the feasibility of rain garden systems in two radically different monsoon settings in Mumbai: the inland basin of Hindmata Junction and the newly reclaimed parks of the Coastal Road. It found that the feasibility of green infrastructure is organised by urban structure rather than rainfall, using climatic data, municipal infrastructure records, international rain garden literature and numerical comparison. The large hydro catchment, bowl shaped topography, small surface corridors, shallow utilities and reliance on pumps combine to make rain gardens in Hindmata largely ineffective for reducing flooding. They provide only micro scale benefits like reducing ponding on crowded roadways and filtering debris before it reaches the drainage network. These modest functions are valuable but negligible at basin scale, where inflows of more than 150,000 m3/h dominate the most severe storms.

The Coastal Road reclamation introduces almost 130 acres of programmable open space, offering conditions for medium and large scale bioretention systems. The reclaimed land can carry rain garden systems to cut peak runoff while also allowing designers to build ground gradients, soil profile engineering and multiple bioretention basins into park landscapes. Such systems support the coastal drainage network and provide a chance to test ambitious hybridizing blue green infrastructure in Mumbai.

The study concludes that rain gardens in Mumbai are possible but highly sensitive to space and urban geometry. Pump centred solutions supported by micro GI are needed inland, while coastal reclamations and new developments offer opportunities for green infrastructure networks. By recognising and planning for this difference, Mumbai can better allocate resources and build a more region specific monsoon resilience strategy.

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