TRANSFORMING A WASTE LANDFILL INTO A LIVING LANDSCAPE MUSEUM PARK: USING LANDSCAPE ARCHITECTURAL STRATEGIES - CASE OF MEETHOTAMULLA WASTE LANDFILL, SRI LANKA

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Abstract: This paper investigates the transformation potential of the Meethotamulla waste landfill in Sri Lanka into a "Living Landscape Museum Park" through landscape architectural strategies. Meethotamulla, once one of the largest unsanitary landfills in the country, operated for over three decades before collapsing in April 2017, resulting in significant loss of life and property damage. Post-collapse stabilisation measures by the Urban Development Authority in 2020—such as reshaping, soil capping, and leachate control—improved safety but fell short of international post-closure standards. The site remains unused, environmentally vulnerable, and socially disconnected. Drawing on global precedents (Nanjido Park, South Korea; Ariel Sharon Park, Israel; Freshkills Park, USA; Okhla Landfill, India), this study analyses adaptive design strategies applicable to the Meethotamulla context. A mixed-method approach integrates literature review, precedent analysis, and site-specific research to propose a master plan incorporating ecological restoration, cultural commemoration, public recreation, and environmental education. The design emphasises wetland systems, morphological landform strategies, and native planting to ensure long-term ecological resilience. The project offers one of the first comprehensive landfill-to-park frameworks in Sri Lanka, demonstrating how post-industrial landscapes can be rehabilitated to restore ecological function, reconnect urban communities, and inspire public stewardship.

Keywords: *Landscape Design, Post-closure Landfill Design, Drosscape, Landfill, Landfill-to-Park Transformation*

1. Introduction

Urban waste landfills present significant environmental, health, and spatial challenges, especially in rapidly urbanising regions with limited waste infrastructure. The Meethotamulla landfill, located in Kolonnawa, 6 km from Colombo's central business district, exemplifies these challenges. Used for over 30 years, it accumulated an estimated 1.2 million m^3 of unsorted waste, producing leachate, landfill gas, and severe pollution.

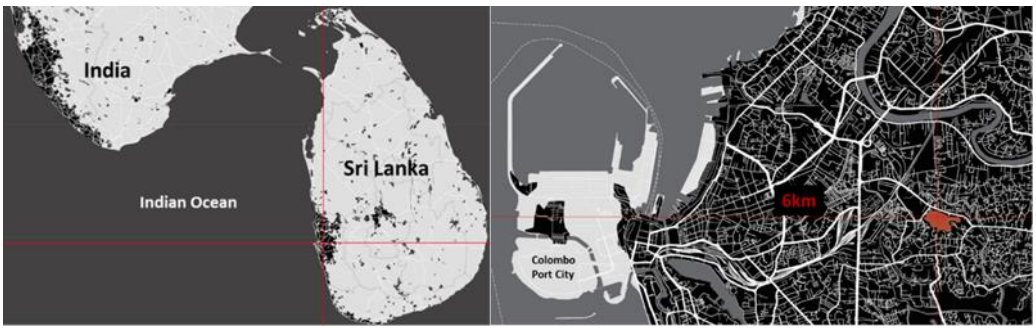

Figure 1. Location of the Meethotamulla Waste Dump
[Source: Compiled by the Author]

In April 2017, a catastrophic slope failure killed over 30 residents and destroyed nearby homes, prompting public outrage and legal intervention to close the site. The Urban Development Authority reshaped the 48.8 m-high mound to 33 m, capped it with soil, and introduced basic drainage, leachate, and gas control measures. While stabilised, the site remains undeveloped and disconnected from the community. Given Colombo's shortage of public green spaces, especially in the Kolonnawa Urban Council area-the landfill's location presents a critical opportunity for ecological restoration and community benefit.

This study proposes a landscape architectural framework to transform the Meethotamulla landfill into a living landscape museum park that integrates environmental restoration with cultural, educational, and recreational functions. As one of Sri Lanka's first landscape architecture-led landfill rehabilitation proposals, it combines global best practices with site-specific strategies to create a replicable model for post-closure sites, advancing both ecological recovery and sustainable urban design.

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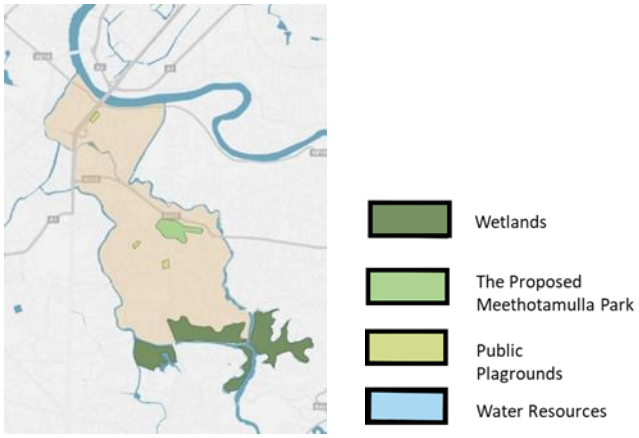


Figure 2. Limited Public Open Spaces in Kolonnawa Urban Council Area
[Source: Compiled by the Author]

2. Research Methodology and Structure

This study adopts a mixed-method research approach comprising a literature review, comparative global case studies, and a site-specific analysis. First, relevant academic literature, government reports, and technical documents were reviewed to establish a theoretical foundation for landfill transformation and ecological restoration. Second, four global case studies, Nanjido (South Korea), Hiriya (Israel), Freshkills (USA), and Okhla (India), were examined. Data for these case studies were collected through published academic research, planning documents, institutional reports, and official project websites. Each case was analyzed using comparative analysis techniques focusing on ecological strategies, public space integration, long-term management approaches, and design outcomes. Third, a site-specific analysis of the Meethotamulla landfill was conducted using field observations, satellite imagery interpretation, spatial mapping, and a review of available government and environmental reports. The collected data were synthesized to identify site constraints, ecological potentials, and design opportunities. Based on these analyses, a landscape design proposal was developed that emphasizes ecological restoration, public-use integration, and long-term sustainability.

3. Global And Local Perspectives on Waste Landfills

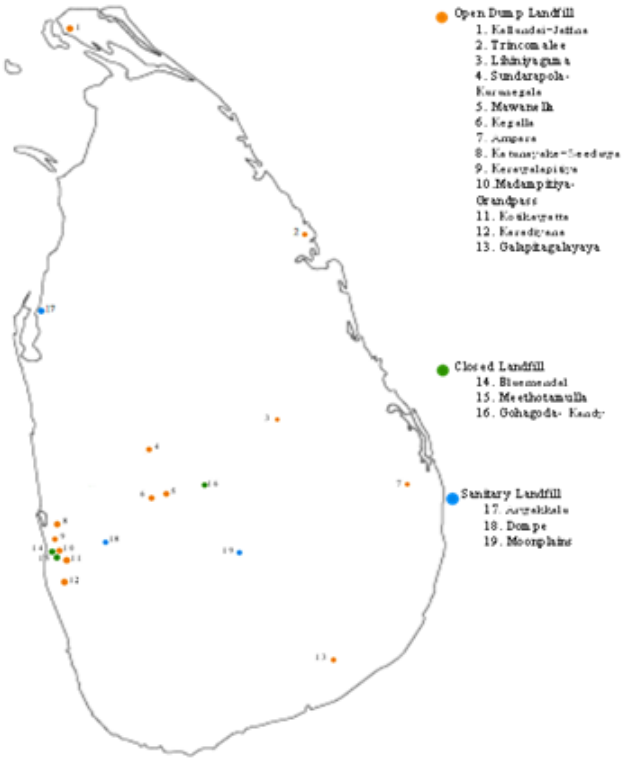


Figure 3. Distribution of Landfills in Sri Lanka
[Source: Compiled by the Author]

Waste is an unavoidable by-product of human activity (Brunner & Rechberger, 2014), and landfills remain the most common method of disposal worldwide **(**Bagban et al.**,** 2016). Poorly managed landfills**,** especially open dumps**,** generate leachate and landfill gases (LFG), which contaminate soil, air, and groundwater.

Landfills are commonly classified based on their engineering standards and environmental protection measures. This classification includes open dump landfills, controlled landfills, and engineered landfills (Ozbay et al., 2021). In Sri Lanka, most landfills remain open dumps, with limited closure or post-closure care. Closed sites, such as Bloemendhal and Meethotamulla, have received partial rehabilitation, but often lack engineered capping, gas capture, and leachate treatment. This gap highlights the need for integrated closure and reuse strategies.

4. Case Studies

The case studies - Nanjido Park (South Korea), Hiriya Landfill (Israel), Freshkills Park (USA), and Okhla Landfill (India), were selected for their relevance to transforming Meethotamulla into an ecological public park. Nanjido illustrates integration with adjacent water bodies, Hiriya highlights waste-to-resource strategies and public education, and Freshkills demonstrates large-scale, long-term ecological restoration. Okhla provides a comparable South Asian precedent in climate, socio-environmental conditions, and scale, with plant species suitable for Sri Lanka.

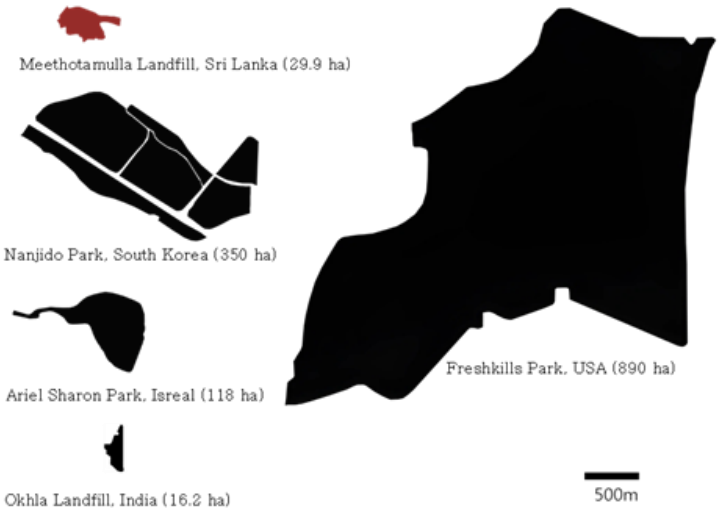


Figure 4. Size Comparison of the Case Study Sites
[Source: Compiled by the Author]

Table 1. Summary of Case Studies

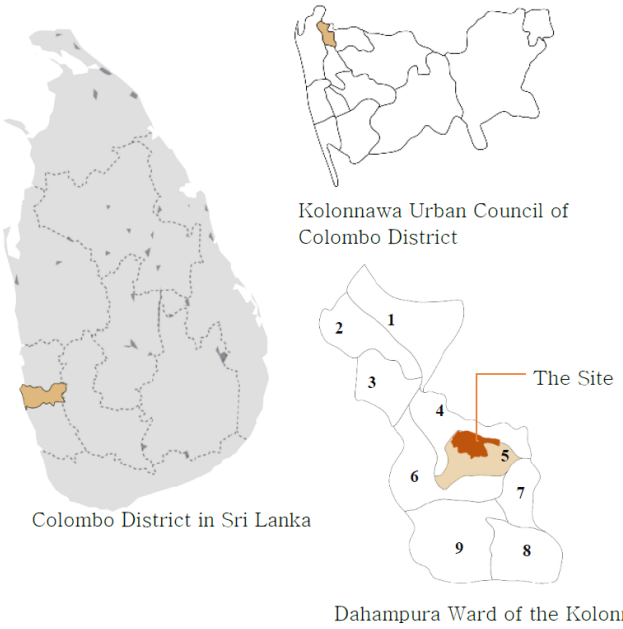
Case Study (Location)	Site Size	Design Concept	Key Design Strategies	Explanation
Nanjido Park, Seoul, South Korea	350 ha	"Mutual Coexistence and Symbiosis" – Harmony between ecology and human use	Riverfront Restoration	Transformed a degraded Han River edge into an ecological and social corridor, offering a model for restoring waterways near landfill sites.
			Planting Strategy	Used ecological zoning with native planting to support biodiversity, habitat quality, and soil stabilization.
			Education & Culture	Balances ecological restoration with public use and education, emphasizing interpretive elements in landfill park design.
Ariel Sharon Park, Tel Aviv, Israel	118 ha	Environmental renewal through ecological and technological integration	Stormwater Harvesting & Drainage System	Uses stormwater harvesting and innovative drainage to manage water sustainably, restore hydrology, and support biodiversity.
			Planting Strategy	Multi-layer soil cap and drought-resistant native species ensure contaminant isolation, low maintenance, and long-term ecosystem health.
			Community Engagement & Education	Serves as both a green space and an educational platform on waste management and environmental restoration.
Freshkills Park, Staten Island, USA	890 ha	"Lifescape" – A dynamic, evolving ecological system	Phasing Strategy	30-year phased strategy allows for landfill stabilization, ecological recovery, and public trust.
			Planting Strategy	Phased native vegetation plan supports ecological succession, stormwater and soil management, habitat restoration, and pollinator pathways.
Okhla Landfill, Delhi, India	16.2 ha	Green urban buffer with phased ecological recovery	Planting Strategy	Phased native planting is planned to stabilize the site and support ecological recovery.

5. The Site and the history

The Meethotamulla Waste Dump in Kolonnawa, located about 6 km from central Colombo, served as a major municipal solid waste site for over 30 years, receiving mixed waste without proper sanitary practices. This led to severe environmental and health issues, including pollution, foul odors, and disease risks for nearby communities. In April 2017, a 48 meters high section of the dump collapsed after heavy rain and a fire, resulting in 32 fatalities and destroying over 100 homes (Karunawardena, 2017). The site was permanently closed, and the Urban Development Authority later stabilized and reshaped the mound, reducing its area and height to minimize further risks.

Although stabilization of the Meethotamulla site was mostly completed by 2020, long-term redevelopment plans were halted due to funding, technical, and political issues. The site remains inactive, facing challenges like illegal dumping and poor management, which continue to pose environmental and safety concerns, while also presenting opportunities for future ecological and landscape restoration.

The site is situated in the Colombo District, Western Province, Sri Lanka, and belongs to the Dahampura Ward of the Kolonnawa Urban Council area.



Kolonnawa Urban Council	
WARD No	**WARD Name**
1	Sedawatta
2	Wadulla
3	Orugodawatta
4	Wellampitiya
5	Dahampura
6	Kolonnawa
7	Singhapura
8	Salamulla
9	Gajabapura

Figure 5. Administrative Boundaries of the Site
[Source: Compiled by the Author Based on data from Survey Department]

The site area was once a paddy field called Pothuvila Kumbura, administered by the local Agrarian Services Centre. It had been integral to the livelihoods of villagers in Kolonnawa, with a community of residents subsisting from its produce (Ravishan, 2017). During this period the villagers had strong and healthy relationships with each other as well as the environment. People worked together in various activities, such as harrowing, sowing seeds/ planting saplings, harvesting etc., where much of the agricultural practices worked harmoniously with nature including very little to no damage to nature and the wildlife (Ravishan, 2017).

The Pothuvila farm was abandoned in 1978. By mid-1980s, the abandoned nature of this large extent of low-lying land also proved convenient for the Kolonnawa Urban Council (KUC) to dump the garbage collected within its jurisdiction. Hence 5 acres out of the total 23 acres of land was utilized for unsanitary landfill. The dumping of garbage created an unpleasant environment for the residents of the area, a majority of which moved away. As the Colombo District swelled with the influx of economic migrants from rural areas, the land was soon filled with occupants, both legal and illegal, who settled in the area by gradually filling the marshland (Ravishan, 2017).

In 1989, the Gam Udawa Programme, formalized part of the community at Pothuwila Kumbura, into a model village called Dahampura, with legal title deeds for their land, while another group was absorbed into the National Housing Scheme of Pansalhena (Ravishan, 2017). The expansion and partial collapsing of the Bloemendhal garbage dump in 2009, gave new momentum to public movement and environmental protests, which lead to permanent shutdown of the dump following a court decision in March 2009.

Therefore, the Colombo Municipal Council (CMC) was ordered by the Supreme Court to dispose garbage within 0.8 hectares of land at Meethotamulla, an already maturing garbage mound; as a temporary measure. The garbage dump

continued to grow, exceeding the specified land area. Recycling and compost production within the site to sustain the landfill were soon overwhelmed and discontinued.

The joint garbage disposal by the Colombo Municipal Council (CMC) and the Kolonnawa Urban Council (KUC) from 2009 to 2017 transformed Meethotamulla to its present condition. Within these eight years, the amount of waste at the Meethotamulla garbage dump exponentially increased, growing until it towered above the rooftops of the settlements in the area; a behemoth covering over 8.5 hectares and reaching up to 48 meters (Ravishan, 2017).

Figure 6. Formation of the Landfill
[Source: Google Earth Historical Image]

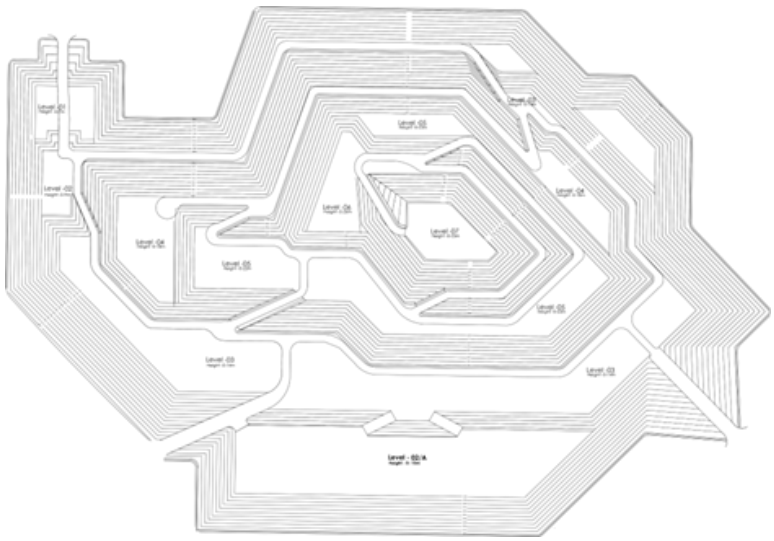


Figure 7. Existing Contour Map of the Waste Landfill after the Stabilization
[Source: Urban Development Authority, Sri Lanka]

6. Design Proposal: Living Landscape Museum Park

The design reimagines Meethotamulla as a Living Landscape Museum Park where ecological restoration, cultural remembrance, and public recreation coexist. Morphological strategies reshape the landfill into terraces, slopes, and viewpoints; zoning defines cultural, ecological, and recreational areas; a multi-stage wetland treats leachate; and native planting supports biodiversity and slope stability.

6.1. MORPHOLOGICAL STRATEGY

Corner (1999) highlights that geometric and formal systems in landscape design act as organizational tools, framing ecological processes and enhancing legibility. Meyer (2008) adds that bold, even unnatural forms can enhance

environmental performance by attracting attention and fostering emotional engagement. In post-waste landscapes, Berger (2006) advocates using expressive geometries such as lines, grids, and circular cuts—to reframe contaminated sites for new ecological and cultural uses. Colour, particularly intense hues like red, can serve as spatial cues, fostering awareness and interaction (Berger, 2006). The contrast between geometric and organic forms fosters a dialogue between human impact and ecological restoration, enhancing visitor experience (Kaplan & Kaplan, 1989).

Table 2. Application of Morphology

Morphological Element	Design Application	Purpose	Source / Citation
Geometric Forms (axes, grids, circles)	Used to structure circulation paths, plazas, and memorial zones; symbolize the industrial past and human control over the site.	Organizes space for clarity and legibility; represents the landfill's artificial and controlled legacy.	Corner (1999); Berger (2006)
Organic, flowing shapes	Incorporated in planting layouts, wetlands, and landforms to represent natural processes and ecological succession.	Expresses resilience, renewal, and the site's transition to a living ecosystem.	Forman (2014)
Red circular motifs	Strategically placed as visual cues and focal points in gathering areas, memorial sites, and educational installations.	Acts as psychological markers to draw attention, create awareness, and encourage reflection.	Berger (2006)
Contrast between geometric and organic forms	Combines rigid and fluid spatial elements to create a dialogue between past human impact and future ecological healing.	Enhances visitor engagement and reinforces the concept of coexistence between memory and nature.	Corner (1999); Meyer (2008)
Structured spatial organization	Guides visitor movement and experience through interpretive zones representing past, present, and future.	Facilitates storytelling through space and reinforces the temporal narrative of the Museum Park.	Kaplan & Kaplan (1989)

6.2 MASTER PLAN

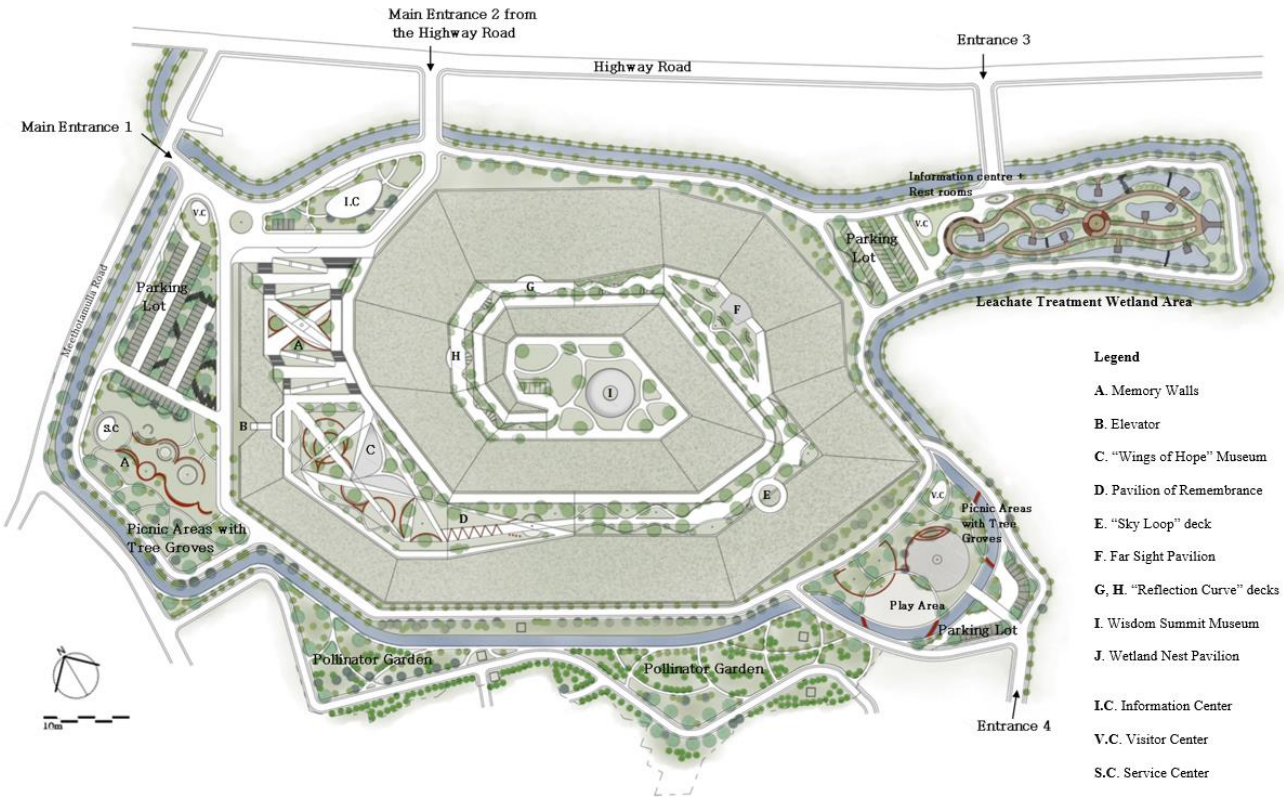


Figure 8. Master Plan [Drawn by the Author]

6.3. LANDFORM DESIGN STRATEGY FOR THE LANDFILL AREA

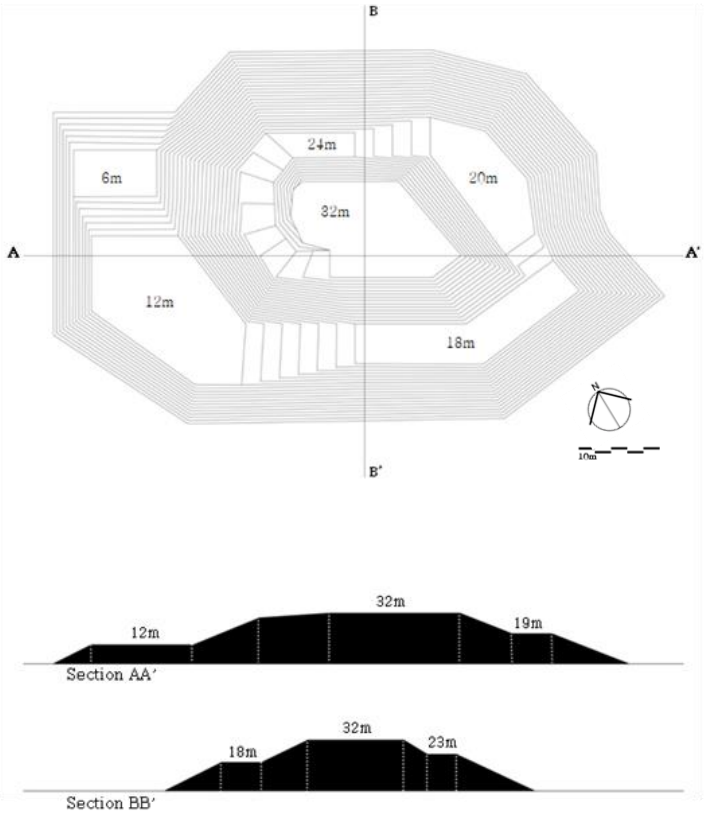


Figure 9. Proposed Landform [Drawn by the Author]

6.4. PERSPECTIVES

Figure 10. Perspective Views

6.5. SITE CIRCULATION PLAN

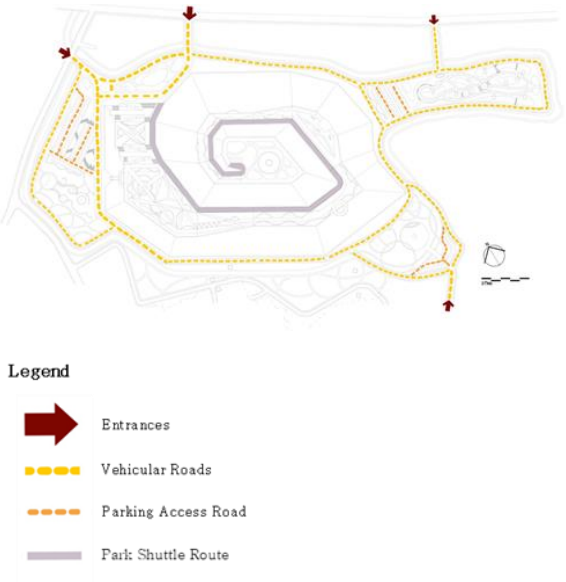
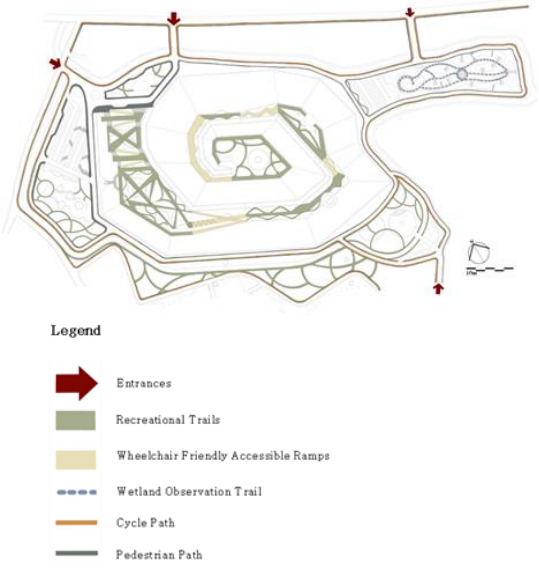


Figure 11. Vehicular Circulation Figure



12. Non-Vehicular Circulation

6.6. SITE DRAINAGE STRATEGY

The drainage system for the proposed ecological park is designed to manage two key water flows: stormwater and landfill leachate. The design integrates natural treatment methods such as bioswales and constructed wetlands to ensure environmental safety and sustainable water management

Figure 13. Site drainage plan

6.7. OVERALL PLANTING STRATEGY

Figure 14. Planting plan

Table 3. Planting Strategy for theLandfill Area

Slope Ratio	Plant Type	Tree Height (m)	Root Size	Comments
1:2 (Steep Slope)	Ground Covers + Bushes	Up to 1.5 m	Shallow (< 0.5 m)	Dense, Shallow-Rooted to Stabilize Soil
1:4 (Moderate Slope)	Ground Covers + Bushes + Small Trees	2–4 m	Shallow to Moderate (0.5–1 m)	Individual Small Trees with Limited Rooting Depth, Not Planted in Clusters
1:12 (Gentle Slope) and Flat Areas	Ground Covers + Bushes + Small & Tall Trees (Clusters)	2–6 m (Small), 6–12 m (Tall)	Moderate to Deep (0.5-1.5)	Mixed layers: Clusters Enhance Microhabitats

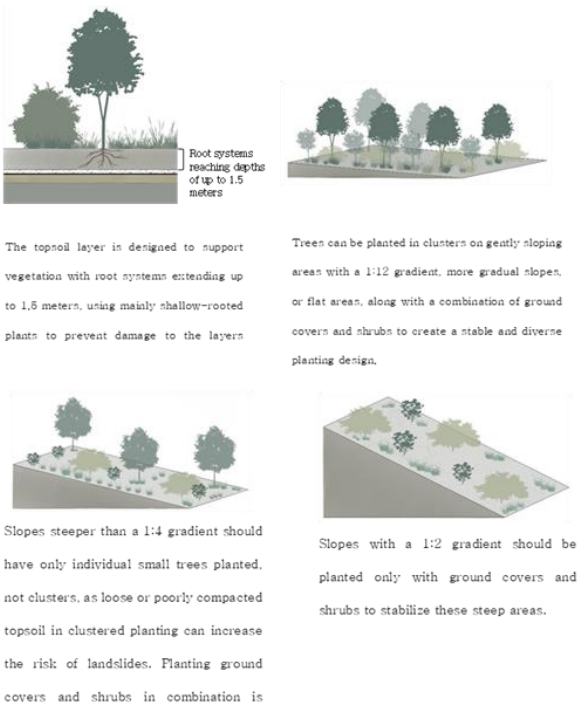


Figure 15. Planting Strategies for the Landfill Area

7. Conclusion

This study demonstrates that the Meethotamulla landfill presents significant opportunities for ecological restoration and public engagement when approached through landscape architectural strategies. Comparative case study analysis highlighted that integrating geometric and organic morphological elements, phased planting, and interpretive zoning supports both ecological recovery and visitor experience. Site-specific analysis confirmed that terraces, native vegetation, and wetland systems are feasible strategies for improving biodiversity, stabilizing slopes, and managing leachate. The research findings provide evidence that a landscape architecture-led transformation can simultaneously address ecological, cultural, and social dimensions, offering a foundation for future interdisciplinary interventions.

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