Resident-Led Conceptual Proposal
Tanjung Bungah Coastal Park

08 February 2026 Version 1.1

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1.Introduction & Purpose of Submission

1.1 WHAT THIS DOCUMENT IS

This document is a resident-led, planning-level Conceptual Design submission (Level 0) for the proposed Tanjung Bungah Coastal Park, located at the Tanjung Bungah coastal park site (commonly referred to as the “Sore Thumb”), Penang. It presents a clear conceptual planning and spatial framework for the future use of the site as a public coastal park, supported by indicative drawings and reference precedents.
The submission has been prepared with professional landscape architectural input appointed by residents, to ensure the content is planning-aware, environmentally responsive, and technically realistic at a conceptual level.

1.2 PURPOSE OF SUBMISSION

The purpose of this submission is to support consideration by PLANMalaysia Pulau Pinang and the relevant Local Authority (MBPP) by:
articulating a coherent public-interest vision for the site as a coastal park,
demonstrating, at a planning level, the feasibility of a safe, inclusive, and terrain-responsive park, and
establishing that slope stability and coastal/beach erosion can be addressed in principle through low-impact, environmentally responsible approaches

The submission is intended to inform planning discussion and decision-making in a constructive and evidence-based manner.

1.3 DESIGN LEVEL AND STATUS

This submission is explicitly limited to Conceptual Design (Level 0) and is non-statutory. It does not constitute an application for planning permission, nor does it present a fixed or final design solution.

All drawings and diagrams are indicative and illustrative only, included to demonstrate spatial feasibility and design intent. They are not to be interpreted as construction drawings, engineering solutions, or an approved layout. Any subsequent design development, technical studies, or statutory submissions would be subject to separate scope.

2. Status of Document & Design Declaration

This document is prepared strictly at Conceptual Design Level (Level 0). It is non-statutory in nature and is intended solely to illustrate planning intent and spatial feasibility.

All plans, diagrams, and sections are indicative only and do not include fixed dimensions, detailed alignments, technical specifications, or construction information.

The submission does not constitute a development proposal, detailed design, or engineering solution, and is not intended for construction or cost estimation.

It does not seek to pre-empt or replace any statutory processes, technical studies, or approvals, all of which would be subject to separate scope, professional appointment, and consideration by the relevant authorities.

3. Site Context & Understanding

3.1 OVERALL LOCATION AND CHARACTER

The Tanjung Bungah Coastal Park site, located in Tanjung Bungah (including a part commonly referred to as the “Sore Thumb”), occupies a prominent position along the northern coastline of Penang. The site directly adjoins the sea and is situated adjacent to the One Tanjung Condominium, within a predominantly residential coastal corridor characterized by strong visual and physical connections to the shoreline.

The site forms part of a continuous coastal edge where open space, coastal landscapes, and public access play an important role in the character of Tanjung Bungah. Its sloping landforms, open exposure to the sea, and uninterrupted coastal views distinguish it from surrounding built development and contribute to its identity as a transitional space between the urban fabric and the marine environment.



Photo. Tanjung Bungah Location.(2025)



Photo. Sore Thumb before the trees clearing (c.a.2024)



Photo. Sore Thumb before the tees clearing(c.a.2024)

In addition, the presence of the Sore Thumb landforms has unintentionally shaped the character of the adjoining beach, creating a secluded, calm coastal pocket that is sheltered from heavy traffic and large-scale beachfront activity.

This quieter setting supports the broader character of Tanjung Bungah as a residential and community-oriented coastal area, offering a rare sense of retreat along an otherwise increasingly urbanized shoreline.



Plan: Public access is currently limited and poorly signed, unintentionally gate-keeping the beach for private users — a growing concern in Penang.



Photo. Public Access seen from the street (2025)



Photo. Public Access seen from the beach (2025)



Photo. Public Access seen from the beach (2025)

Although the beach **remains publicly accessible**, its entrance is poorly defined, with no signage, unclear way-finding, and a lack of safe, formalized access such as steps or graded paths, which limits its usability and visibility.

Local residents strongly value the ability to reach and use the shoreline, particularly in a context where many beaches in Penang are becoming de facto private due to gated developments and restricted access through private land.



Plan. The introduction of a second public access will improve accessibility to the beach for a wider range of users.

The proposed **Coastal Park seeks to directly address these shortcomings** by clarifying and safeguarding public access to the beach.

By integrating the beach with a clearly legible public park, the project will make the shoreline easier to find, safer to access, and more enjoyable to use, while retaining its calm and intimate character.

Despite its secluded nature, the beach already serves as a shared space during national holidays, when it is actively used by both Malaysians and visitors alike—highlighting its importance as a genuinely public coastal asset worthy of protection and enhancement.

3.1 HISTORICAL BACKGROUND AND RELATIONSHIP TO THE SEA

Tanjung Bungah is among the **earliest coastal settlements** on the northern side of Penang Island, with its name and location historically linked to the sea. Early references describe the area as a **coastal kampung and fishing landscape**, where daily life, movement, and livelihoods were oriented toward the shoreline. The coast functioned as a working edge—used for fishing, landing boats, and informal social activity—long before large-scale urbanization reached this part of the island.

A key landmark in this maritime landscape was **Pulau Tikus**, which served as one of the most prominent **navigational reference points** along Penang's northern coast. Its visibility from the sea made it an important marker for sailors and fishermen, and as a result it appears on some of the earliest maps depicting Penang, where coastal features were recorded primarily for navigation rather than settlement. The early cartographic presence of Pulau Tikus **underscores the historic importance of this stretch of coastline** as a maritime-oriented landscape, shaped by movement, orientation, and life along the sea.



Photo: Tanjung Bungah c.a. 1914



Photo: Tanjung Bungah c.a. ??

During the late 19th and early 20th centuries, Tanjung Bungah began to evolve as a l**ow-density residential and recreational area**, distinct from the increasingly busy commercial and port-related districts closer to George Town.
Its relative distance from the urban core, combined with coastal breezes and open landscapes, made it attractive to residents seeking quiet living in close proximity to the sea. This **character has remained a defining feature** of Tanjung Bungah, setting it in contrast to more intensively developed and congested parts of Penang.

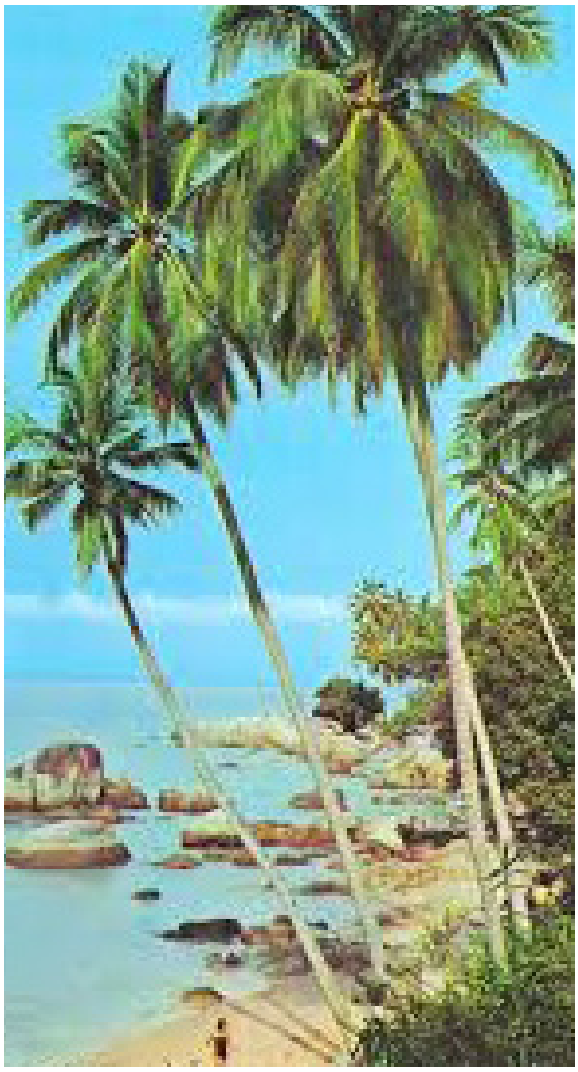






Photo: Tanjung Bungah c.a 1960

One of the earliest major formal developments in the area was the Penang Swimming Club, established in the early 20th century along the Tanjung Bungah shoreline. The club's siting directly at the water's edge reflects the long-standing recreational relationship between the community and the sea, reinforcing the area's identity as a coastal leisure environment rather than an industrial or commercial one.



Photo: Penang Swimming Club: founded in 1903

More recently, this relationship is also symbolically expressed through the Tanjung Bungah **Floating Mosque (Masjid Terapung Tanjung Bungah)**, which is deliberately positioned in close dialogue with the water. The mosque's setting reinforces the cultural and spiritual significance of the sea within the local landscape, and reflects a continued tradition of integrating built form with the coastal environment rather than separating it through hard barriers.

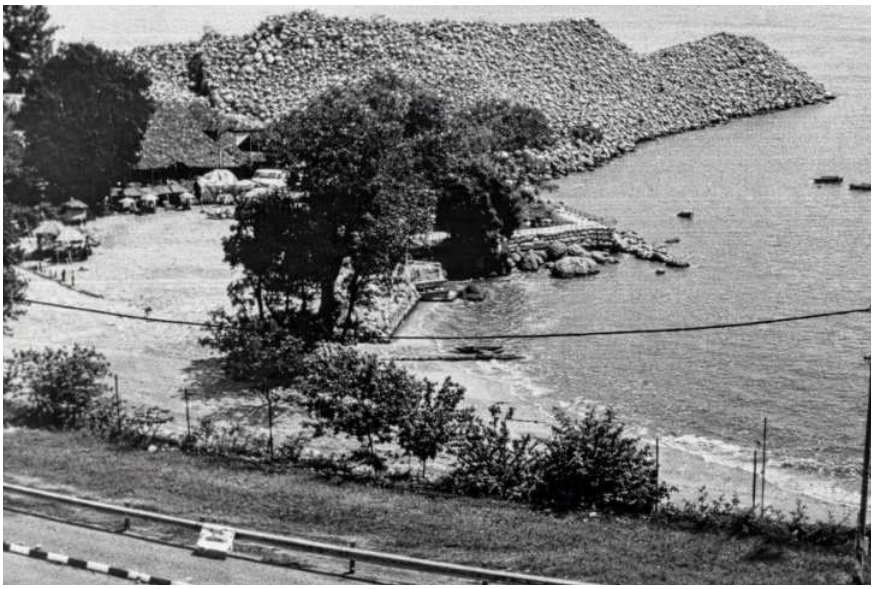


Photo: Masjid Terapung Tanjung Bungah by Hafiz Ismail c.a 2024



Photo: Before Masjid Terapung Tanjung Bungah

The subject site itself originated from a past unauthorized **land reclamation,** which altered the original shoreline configuration. While this intervention was not formally planned, the resulting landform has since become embedded within the broader coastal fabric of Tanjung Bungah. Over time, natural coastal processes and vegetation establishment have reshaped the site, allowing it to reconnect functionally and visually with the sea. In this sense, the site reflects the layered history of Tanjung Bungah—where natural systems, informal coastal use, and later residential development have coexisted and evolved along the shoreline.



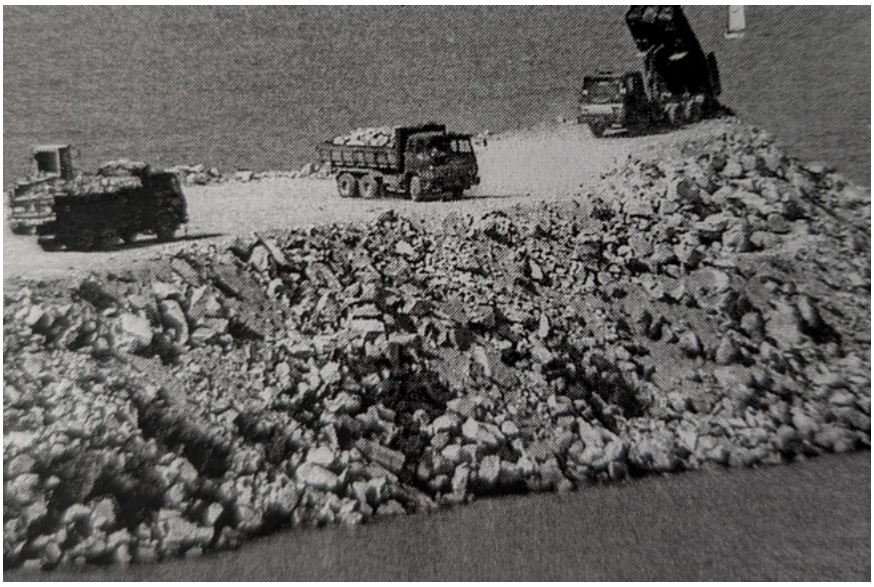


Photo: Land reclamation (alleged illegal):
the extensive footprint of the "Sore Thumb" is clearly visible

3.2 ENVIRONMENTAL IMPORTANCE AND ECOLOGICAL ROLE

Despite its artificial origin, the site has evolved into a **functioning coastal ecosystem** through natural succession. Vegetation has established across the sloping landform, creating ground cover that supports surface stability and moderates erosion.

This naturalized landscape now provides **habitat and foraging opportunities** for a range of coastal and terrestrial fauna, including birds and other small animals commonly associated with shoreline environments.

Although the site is relatively new and its ecological value is modest at the island-wide scale, it plays a pivotal role in shaping local ecology, landscape identity, and environmental continuity for the Tanjung Bungah area.

The site functions as a **local ecological haven** within an increasingly urbanized coastal stretch, providing refuge, feeding grounds, and movement space for a range of coastal and terrestrial wildlife. Its position along the shoreline allows it to operate as **a local ecological corridor,** supporting continuity between land-based habitats and nearshore marine environments. This connective role is particularly important in Penang, where much of the natural coastline has already been fragmented or replaced by hard engineering.



Photo: A continuous green link supporting wildlife movement between Penang's hill forests and the shoreline.

Integrated Coastal Ecosystem

The area supports a delicate and interdependent coastal ecosystem composed of native coastal vegetation, inter-tidal organisms, and shorebirds. These elements function as a single integrated system:

Native coastal plants—including sea grasses, creeping vines, and salt-tolerant shrubs—stabilize soil, slow surface runoff, and filter sediments before they reach the sea. These plant communities form a natural buffer against wave action and erosion. Once removed, they are extremely difficult to re-establish on compacted or artificial surfaces, leading to long-term soil instability, accelerated erosion, and increased sedimentation in nearshore waters.

Intertidal organisms, such as crabs, molluscs, barnacles, and small fish, depend on the natural rhythm of tidal exposure across sandy and rocky zones. Leveling, filling, or the construction of retaining walls would smother or fragment these microhabitats, disrupting nutrient cycling and breaking food chains that support higher species. Once displaced, these organisms rarely return, as salinity gradients and habitat structure are permanently altered.

Shorebirds, including plovers, herons, and sandpipers, rely on shallow, undisturbed beach margins for foraging and nesting. Even temporary construction activity can cause nesting abandonment and long-term loss of feeding grounds, as many species do not recolonize disturbed sites.

Together, these components contribute to shoreline resilience, biodiversity support, and the ecological health of both land and sea.

Natural Coastal Protection Function

Beyond its ecological value, the vegetated slope and open coastal edge perform an important **protective and regulatory function**. The natural landform buffers wave energy, absorbs rainfall, and reduces surface runoff velocities, thereby **mitigating erosion pressures** along the beach. This "soft" coastal interface benefits not only the natural system but also adjacent development, offering a more adaptive and **resilient alternative** to hard coastal engineering, which is costly to maintain and vulnerable to failure during extreme weather events.

Protected Wildlife and Legal Significance

The site is habitat to several species protected under Malaysia's Wildlife Conservation Act 2010 (Act 716), reinforcing its environmental and legal importance:

- **White-bellied Sea Eagle** (Haliaeetus leucogaster) – Totally Protected. Nest disturbance, tree felling near nesting sites, or noisy works without written approval from PERHILITAN constitute an offence.
- **Brahminy Kit**e (Haliastur indus) – Totally Protected. Dependent on coastal trees and open shorelines for hunting and nesting.
- **Asian Small-clawed Otter** (Aonyx cinerea) – Totally Protected and Vulnerable (IUCN). Requires intact tidal access points and undisturbed banks for foraging and denning.
- **Smooth-coated Otter** (Lutrogale perspicillata) – Totally Protected and listed as Vulnerable on the IUCN Red List. Highly sensitive to shoreline modification and drainage changes.
- **Dusky Leaf Monkey** (Trachypithecus obscurus) – Totally Protected. Relies on continuous mature canopy for food and movement.
- **Asian Water Monito**r (Varanus salvator) – Protected under Act 716 and listed in CITES Appendix II, meaning capture, harm, or trade requires special permits.

Disturbance of these species, their nesting trees, dens, or movement corridors—particularly in the absence of ecological surveys, buffers, and wildlife management measures—poses a clear risk of non-compliance with national wildlife legislation.

Implications for the Conceptual Park Proposal

The presence of legally protected species and a functioning coastal ecosystem underscores the **need for a low-impact, nature-led park approach**. Rather than clearance or hard construction, the site calls for careful stewardship that maintains existing landforms, vegetation, and ecological processes. By doing so, the proposed park can safeguard biodiversity, enhance coastal resilience, and fulfill both environmental and statutory responsibilities, while offering meaningful public access to a rare and valuable natural coastal landscape.



Photo: At the Tanjung Bungah Beach - **Asian Water Monitor** (August 2025)



Photo: At the Tanjung Bungah Beach - **Dusky Leaf Monkey**(December 2025)



Photo: At the Tanjung Bungah Beach - **Otters** (August 2025)



Photo: At the Bukit Olivia- **White-bellied Sea Eagle**(2024)

Visual Corridors, Coastal Identity ans Social Importance

The Sore Thumb occupies a prominent coastal location and is visible from a considerable distance, contributing to the **visual legibility and overall appeal** of this part of the island.

This visual role is further strengthened by its **relationship with Pulau Tikus**, a long-established offshore landmark that has historically guided navigation along the northern coast. Together, these features form a recognizable visual pairing—land and sea markers that anchor orientation, enhance the sense of place, and echo the historic way this coastline has been read and understood from both land and water.



Photo: Tanjung Bungah seen for Abbas Beach (October 2025)



Photo: Paulu Tikus and Sore Thumb (January 2026)

Protecting this site directly supports the **Penang Green Agenda and Penang 2030** aspirations, which emphasize not only environmental resilience but also **social wellbeing, inclusivity, and people-centred urban development.** Public access to the coast is a vital social asset in Penang, supporting everyday recreation, informal community life, and a shared sense of place that has long defined the island's coastal settlements.

The **public protest held on the beach** after access was fenced off is a clear demonstration of this social importance. It revealed strong local concern and collective resistance to the gradual loss of public shoreline, and underscored that this space is not perceived as vacant land, but as a shared community resource. The protest was not an isolated incident, but part of a broader public response to a growing pattern of restricted coastal access across the island.



Photo: Tanjung Bungah Public Protest (1st November 2025)

Coastal protection does not always begin with large-scale projects—often i**t starts with small, deliberate decisions to retain existing landscapes,** respect natural systems, and respond to public needs. This Conceptual Design is a direct, constructive response from the community to proposals that conflict with public wishes, offering an alternative that aligns environmental responsibility with social values.

Safeguarding this stretch of coast as a public, accessible natural edge therefore preserves not only ecological value and coastal resilience, but also Penang's social fabric—ensuring the shoreline remains a place where people can gather, express collective voice, and maintain an enduring relationship with the sea for generations to come.

4. Mass movement, Slope Erosion and Coastal Erosion

This chapter introduces the **dual erosion context of the site,** recognizing that slope erosion and beach erosion are distinct processes that **must be considered independently** while coordinated within an overall site strategy. Subsequent chapters address each process in greater detail and outline appropriate, site-responsive measures for each condition.

The site is subject to **both slope erosion and coastal (beach) erosion**, which are related but fundamentally different in origin, behavior, and management response. In addition, the site has experienced localized **mass movement events**, such as limited rock or soil displacement, which occurred historically and are not currently active. These episodic processes differ from gradual erosion and require a preventive, risk-management approach rather than continuous structural intervention.

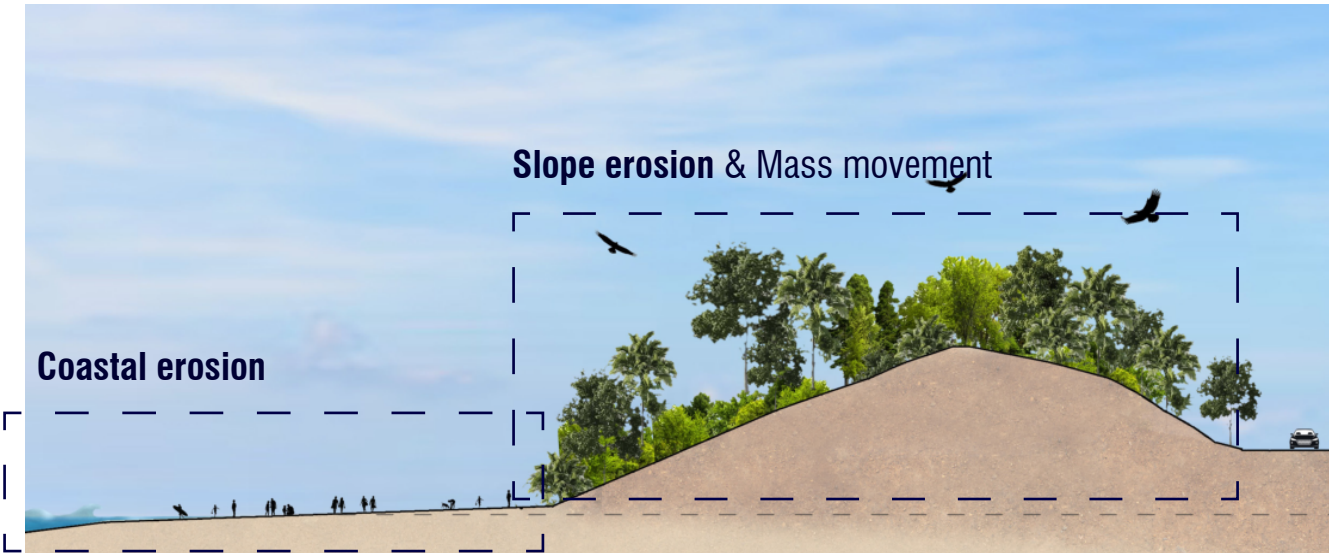


Diagram:. Tanjung Bungah - Although both occur within the same site, slope erosion and beach erosion act on different landscape zones and must be managed through separate, targeted strategies.

Process	Main Causes	Typical Characteristics	Most Appropriate Treatments
Slope erosion	• Surface runoff from rainfall • Loss or disturbance of vegetation • Concentrated drainage paths • Foot traffic and informal access	• Gradual loss of surface soil • Rills and shallow gullies • Exposure of underlying rock or soil	• Retention and reinforcement of vegetation • Surface stabilization (mulch, erosion mats) • Dispersed drainage and permeable surfaces • Defined paths to prevent trampling
Coastal (beach) erosion	• Wave action and tides • Seasonal monsoon conditions • Sea level rise • Altered sediment supply (reclamation, structures)	• Seasonal beach width changes • Sand loss during storms • Shoreline retreat	• Setbacks and managed retreat • Dune and upper-beach vegetation • Elevated or relocatable access • Preservation of nearshore features • Monitoring and adaptive management
Mass movement	• Historic disturbance or reclamation • Weathering of rock and soil • Intense rainfall events • Loss of root reinforcement	• Sudden, localized movement • Discrete rock or soil displacement • Episodic rather than continuous	• Vegetation retention and surface stabilization • Drainage control to prevent saturation • Targeted rockfall netting or mesh (localized) • Setbacks, access management, monitoring

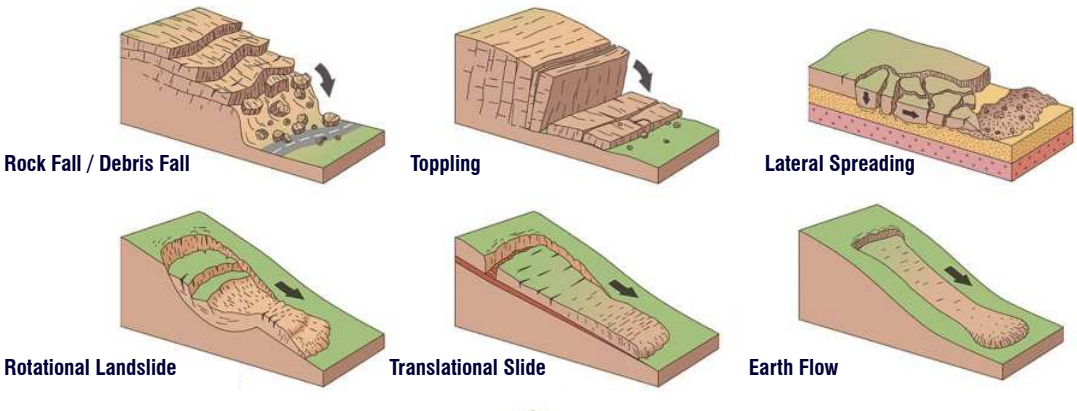


Diagram:. Typical types of **Slope Erosion**

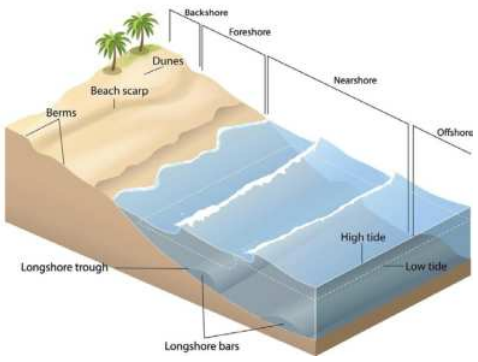


Diagram:. **Coastal Erosion** *and Deposition*

5. Planning-Level Considerations: Slope Erosion

5.1 SLOPE EROISON AT SORE THUMB

The Tanjung Bungah Coastal Park site is characterized by a natural coastal slope formed through past land reclamation and subsequent naturalization processes. Over time, the slope has developed **stable surface conditions** supported by vegetation cover, natural drainage pathways, and soil consolidation. At a planning level, **the slope is understood as a landscape system in equilibrium,** where stability is influenced by landform geometry, vegetation, surface water management, and human disturbance.

Existing vegetation plays a critical role in slope stability and erosion control, providing surface binding, interception of rainfall, and reduction of surface runoff velocity. The retention of existing plant cover and soil structure is therefore recognized as a primary preventive measure against surface erosion and shallow slope failure. Disturbance of this system through extensive cutting, filling, or hard structural intervention can increase erosion risk by altering established drainage patterns and soil behavior.



Photo: Slope BEFORE the vegetation clearing



Photo: Result of vegetation cutting, September 2025

Recent site clearing has resulted in the loss of approximately one third of the vegetated area, including the removal of **several large mature trees** with trunk circumferences **exceeding 1 meter**. This represents a substantial reduction in vegetation cover and has temporarily reduced slope stability, leading to increased surface erosion.



Photo: Tree stump ca=1,6m, October 2025



Photo: Tree stem ca=1,9m, October 2025

However, as the root systems of the removed trees were left in situ, they continue to play a **critical role in subsoil reinforcement and ground stabilization** and should therefore not be disturbed or removed. Since the clearance took place, natural regeneration has already begun, and **newly established vegetation has significantly reduced visible erosion on the slope.**

By formally integrating the slope into a park design and introducing targeted **planting selected for root structure, soil binding capacity and erosion control performance,** there is a strong basis to maintain and further improve long-term slope stability. A landscape-led approach that priorities vegetation-based stabilization provides an effective and low-impact alternative to heavy structural interventions.



Photo: Result of vegetation cutting, September 2025

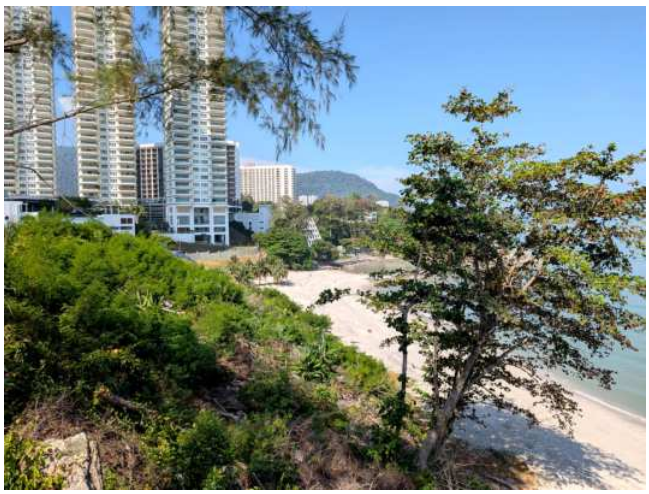


Photo: Vegetation regeneration, January 2026

5.2 SLOPE EROSION CONTROL: PRINCIPLES AND MEASURES

Slope erosion is a natural process that can be significantly accelerated by vegetation removal, surface disturbance and unmanaged runoff. Effective erosion control relies on selecting measures that are proportionate to the severity of site conditions, rather than defaulting to heavy engineering solutions.

Any proposal that depends on extensive structural slope stabilization or major alteration of the existing landform should be supported by ***site-specific geotechnical evidence*** *demonstrating that landscape-led measures are insufficient.*

Best practice in slope management follows a graduated response, where the level of intervention matches the degree of risk:

- **Low-risk slopes** with shallow erosion and existing vegetation require minimal intervention focused on surface stabilization and vegetation recovery(Sore Thumb),
- **Moderate-risk** slopes with partial vegetation loss and surface runoff benefit from combined bioengineering and light structural measures.
- **High-risk slopes** with deep-seated instability, active slips or geotechnical failure may require engineered solutions, supported by detailed geotechnical assessment.

In the absence of evidence of deep slope failure, landscape-led and bioengineering approaches are generally preferred.



Photo: Example of a Hight Risk Erosion



Photo: Example Low-risk erosion resulting from recent vegetation clearing at the site.

Hierarchy of Measures

Slope erosion can be effectively managed through graduated, site-responsive measures, where the level of intervention matches the severity of on-site conditions. In the absence of evidence of deep-seated slope failure, landscape-led and vegetation-based solutions should be prioritized.

Low to Moderate Risk (preferred approach)

- Retention of existing root systems
- Re-vegetation using native, deep-rooting and soil-binding species
- Groundcovers and shrubs to protect exposed soil
- Biodegradable erosion control mats (coir, jute)
- Surface runoff slowed using shallow swales and contour planting

Moderate Risk (localized support only)

- Light, permeable structures supporting paths or steps
- Small retaining elements integrated into landscape
- Drainage measures to intercept and disperse surface water

High Risk (only if proven by evidence)

- Engineered slope stabilization
- Structural retaining systems
- Requires site-specific geotechnical assessment

6. Planning-Level Considerations: Slope Mass Movement

6.1 MASS MOVEMENT AT SORE THUMB

Mass movement is the downslope movement of soil, rock or debris driven primarily by gravity, where material moves as a unit, often suddenly or episodically. This differs from erosion, which is a gradual process involving the removal and transport of individual soil or rock particles by agents such as water or wind rather than by gravitational collapse.

Parts of the slope within the Tanjung Bungah Coastal Park site show evidence of **historic localized rock and soil movement**, where small amounts of material have shifted downslope in the past and subsequently stabilized. These movements are **not recent** and there is no indication, at planning level, of an active or progressive slope failure.

Such conditions are typical of coastal slopes formed through reclamation and **naturalization processes** and are commonly managed through preventive and risk-management approaches, rather than wholesale reconstruction of the landform.



Photo: Historic localized rock and soil movement, that needs addressing by localized interventions, February 2026



Photo: Vegetation protecting the slope, February 2026

Drainage and Surface Water Management (Conceptual)

Surface water is a key trigger for shallow movement on coastal slopes.
At concept level, prevention focuses on:

- Avoiding concentration of runoff from paths or structures,
- Encouraging infiltration through permeable surfaces,
- Guiding water gently across the slope rather than directly downslope,
- Maintaining natural drainage patterns.

These measures reduce erosion pressure without introducing hard drainage infrastructure.

Existing vegetation is a key stabilizing element, reinforcing surface soils, intercepting rainfall, and reducing runoff and erosion. Retaining and selectively strengthening this cover is a first-line preventive measure, while extensive clearing or re-grading risks destabilizing currently stable areas.

Low-Key Physical Prevention Measures

Where there is a potential risk of isolated rockfall or minor surface movement, a range of low-impact, visually discreet measures can be considered as part of future detailed design, without resorting to large retaining structures.

These may include:

- **Rockfall protection netting or mesh,** selectively installed in localized areas to intercept small falling rocks while allowing vegetation growth and water movement.
- **Stabilization fabrics or erosion control mats**, used to protect surface soils and encourage re-vegetation.
- **Planted toe zones or shallow catch areas**, designed to safely intercept minor downslope movement without hard barriers.
- **Targeted removal or repositioning of loose material only,** leaving stable rock and soil undisturbed.

Mass movement at the site has occurred **as localized, episodic events** rather than as continuous slope failure, and should therefore be addressed through targeted, localized treatment. Preventive measures may include lightweight interventions such as rockfall netting or mesh installed only in less stable areas, designed to intercept minor movement without altering the overall landform. These measures can be combined with vegetation-based stabilization, allowing plant growth to continue through and around the structures, thereby maintaining slope performance, ecological function, and visual continuity while managing residual risk.



Photo: Metal mesh – a simple, low-cost protective measure used to contain loose rock and prevent small-scale rockfalls, while preserving the natural slope profile and allowing vegetation to establish.



Photo: Geogrid – an efficient, low-cost, low-tech method for stabilizing slopes by reinforcing soil while allowing vegetation and natural drainage to remain intact.

Where mass movement has occurred as localized events, treatment should be equally localized and proportionate. In addition to lightweight measures such as **rockfall metal netting or mesh** in less stable areas, selected rocks may be repositioned or rearranged to moderate steeper sections of the slope, improve surface stability, and create conditions more conducive to vegetation growth.
These low-key, cost-efficient measures help reduce risk without interrupting the overall slope system, allowing vegetation to establish and the wider slope to continue functioning naturally.

Avoiding Unnecessary Structural Intervention

At a planning level, the presence of historic, stabilized movement does **not automatically justify extensive structural stabilization, slope regrading, or retaining walls.** Such measures are typically reserved for situations where ongoing instability is demonstrated through site-specific investigation. In the absence of evidence of active failure, preventive, landscape-led measures are widely recognized as appropriate, proportionate, and climate-resilient responses.

7. Planning-Level Considerations: Coastal / Beach Erosion

7.1 RECENT COASTAL EROSION IN PENANG (JANUARY 2026)

Severe erosion has been observed along Batu Ferringhi and Tanjung Bungah beaches, where stretches of shoreline have been progressively worn away, sand has been lost, and trees have toppled into the sea due to wave action and tidal forces. This continued erosion has been serious enough to prompt government attention and planned mitigation works.



Photo: Erosion in Penang, January 2026

However **no comparable level of erosion has been recorded along the Tanjung Bungah Beach adjacent to the Sore Thumb**. The shoreline in this area has remained relatively stable, with beach width and landform largely intact when compared to more exposed sections nearby.

This indicates that the **beach is currently sufficiently protected** by its existing coastal configuration, including the natural landform of the Sore Thumb itself, which acts as a physical buffer against wave energy. The presence of this natural shore structure has helped dissipate wave forces and reduce direct erosion pressure, reinforcing the importance of retaining the site's existing form rather than introducing interventions that could disrupt this established balance.

Coastal scientists and local reports generally point to multiple interacting causes of beach erosion rather than a single factor:

1. Natural coastal dynamics
The shoreline is shaped by wave action, tides, seasonal monsoon winds, and spring tides, which naturally redistribute sand and sediment along the coast and periodically reshape beach profiles.

2. Rising sea levels and climate-related change
Sea level rise associated with climate change raises baseline water levels, allowing waves to reach further inland and increasing long-term erosion risk along low-lying beaches.

3. Storms and extreme weather events
Stronger and more frequent storm events can accelerate erosion over short periods, rapidly removing sand and destabilizing vegetation and beachfront areas.

4. Altered sediment supply (including past reclamation)
Land reclamation, dredging, and coastal infrastructure can disrupt natural sediment movement, altering wave and current patterns and, in some cases, reducing sand supply to adjacent beaches.

5. Reduced natural buffers
The loss or degradation of mangroves and other coastal vegetation diminishes natural wave attenuation and sediment stabilization, increasing beach vulnerability to erosion.

7.2 COASTAL EROSION AT TANJUNG BUNGAH BEACH

Effective protection of beaches that are **not yet significantly eroded** is best achieved through preventive, landscape-led management rather than hard structural intervention. Coastal science and planning practice consistently demonstrate that strengthening natural systems and maintaining flexibility are more effective and resilient than attempting to “fix” the shoreline.

This approach is **directly applicable to the Tanjung Bungah site,** where the beach remains functional and benefits from existing natural protection. The shoreline is naturally positioned within a small bay, reducing direct exposure to open-sea wave energy, and is further supported by an existing rocky spur (natural rocky groyne) extending from the beach into the sea.
Together, these features help dissipate wave energy and influence local sediment movement, reinforcing the case for working with existing coastal formations rather than introducing rigid artificial structures.

Preventive beach management focuses on:

- Maintaining natural sediment movement,
- Absorbing and dissipating wave energy, and
- Retaining adaptability over time

7.3 COASTAL EROSION PRINCIPLES AND APPROPRIATE MEASURES

Setbacks and Managed Space (most important measure)

Keeping permanent structures **away from the active beach zone** is the most effective and lowest-impact preventive strategy:

- Maintain setbacks from the shoreline
- Allow seasonal and long-term shoreline movement
- Design paths and facilities to be relocatable

Why it works:
This approach avoids hard obstructions to wave action, prevents wave energy reflection, and maintains natural sediment movement, making it a low-cost strategy that reduces the risk of future erosion problems.

Regulatory Context: Coastal Development in Penang

In Malaysia, coastal development is regulated to reduce risk from natural shoreline dynamics and erosion, with guidance that development should be set back from dynamic beach and coastal zones.
As indicated in national planning guidelines, a minimum setback of **approximately 60 m from the Mean High Water Spring (MHWS)** line is generally recommended for sandy beaches to ensure that built structures remain outside the highly active coastal zone.

These setback principles aim to **respect natural coastal processes**, maintain sediment movement, and avoid placing permanent development within zones subject to erosion and deposition, with exceptions considered only where **existing** high-value development exists and the minimum setback cannot be met.

Dune and Upper-Beach Vegetation

Dune and upper-beach vegetation function as coastal infrastructure rather than decoration. Creeping vines such as *Ipomoea pes-caprae*, coastal grasses including *Spinifex* and low shrubs such as *Scaevola* and *Vitex* play a critical role in trapping and retaining sand, stabilizing surface sediments, reducing wind erosion, and absorbing wave run-up energy. Healthy, continuous vegetation cover in these zones is therefore a key indicator of beach resilience and an essential component of preventive coastal management.



Photo: Coastal Vegetation: Spinifex littoreus



Photo: Coastal Vegetation: Scaevola taccada



Photo: Coastal Vegetation: Vitex trifolia



Photo: Coastal Vegetation: Ipomoea pes-caprae

The proposed concept **reinforces and enhances this natural protection** by introducing and supporting vegetation that is well suited to coastal conditions and effective for beach stabilization.
The planting approach priorities **native and coastal-adapted species** that tolerate salt spray, wind, and sandy soils, and that contribute directly to sediment retention, surface stabilization, and erosion prevention. Importantly, the entire Sore Thumb hill functions as a large-scale natural buffer, reducing wind exposure, intercepting runoff, and dissipating wave and storm energy before it reaches the beach. In the context of climate change and rising sea levels, retaining and strengthening this vegetated landform provides a **resilient, landscape-led defense against land and sand loss**, demonstrating that the site already performs a significant protective role without the need for hard coastal structures.

Preservation of Natural Nearshore Features and Breakwater Function

Natural nearshore features such as **shallow reefs, rocky outcrops, and natural seabed formations** play an important protective role by functioning as a natural breakwater system. These features dissipate wave energy offshore, reduce wave height before it reaches the shoreline, and help stabilize nearshore sediments, supporting the natural balance of sand movement along the coast.

At the Tanjung Bungah “Sore Thumb” site, this function is already present through an existing of-shore **rocky breakwater** extending from the beach into the sea. This formation contributes to partial sheltering of the beach and influences local sediment dynamics, reducing direct erosive pressure on the shoreline.

The removal or alteration of such nearshore features often worsens erosion by eliminating this first line of wave energy dissipation and disrupting sediment pathways. For this reason, **preservation of existing formations is a key preventive measure**.

Should future monitoring indicate the need for additional protection, the existing natural breakwater function could be carefully reinforced or elaborated, building on what already works rather than introducing rigid artificial structures. This approach maintains flexibility, limits environmental impact, and supports long-term coastal resilience.

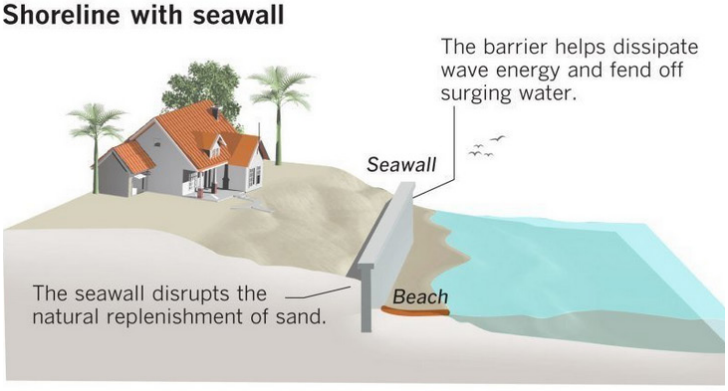


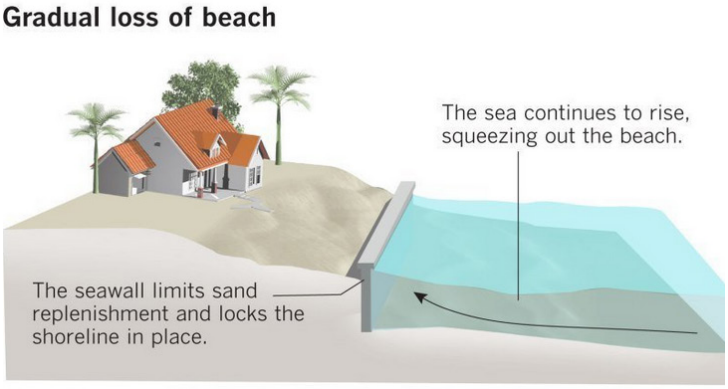
Photo: Existing breakwater efficiently protecting the beach

7.4 WHY HARD COASTAL DEFENSE SHOULD BE A LAST RESORT?

Seawalls can be highly damaging when introduced without clear necessity and robust evidence. By reflecting wave energy rather than absorbing it, **they often increase scour at their base, accelerate beach narrowing**, and lead to the eventual loss of the beach in front of them ("coastal squeeze").
They can also **transfer erosion to adjacent, unprotected areas** and create long-term **maintenance liabilities**.
For these reasons, proposing a seawall without strong, site-specific evidence of unavoidable risk is **poor coastal practice**.







Seawalls are typically **justified only in highly constrained urban locations**, where critical infrastructure or dense development already exists immediately behind the shoreline and no space remains for retreat or adaptation—conditions that do not apply to most functioning natural or semi-natural beaches.

Infrastructure built directly at the shoreline is **inherently costly to maintain** and **highly vulnerable to damage or failure** during extreme weather events. Continuous exposure to saltwater, wave impact, and tidal action accelerates material deterioration, increasing the risk of structural damage, repeated repair, and eventual demolition.





Photo: Infrastructure built close to the shoreline is never a one-time investment, as ongoing maintenance and damage repair from wave action and extreme weather result in high long-term costs.

Experience in Penang has shown that seawalls, where previously introduced, often make beach spaces **difficult or unusable**. By fixing the shoreline, they commonly lead to beach narrowing or complete loss of the beach during high tides, reducing public access and recreational value.
Seawalls are not only **expensive to maintain, prone to deterioration in harsh marine conditions,** and **vulnerable to vandalism**.

Ecologically, they create a “dead coast”—a hard edge with little or no habitat value for coastal flora and fauna. Over time, these impacts undermine both environmental quality and public benefit, while locking authorities into long-term maintenance costs.





Photo: Narrowing beach reduced escape space during high tide increases public health and safety risks, potentially trapping beach users between rising water and hard structures with limited ability to avoid wave impact. Penang 2025

8. Planning & Environmental Principles

The conceptual approach for the **Tanjung Bungah Coastal Park** is guided by a set of planning and environmental **principles that respond directly to the site's coastal character, topography, and ecological role.** These principles are intended to inform future design development without prescribing a fixed solution.

8.1 RETENTION OF NATURAL LANDFORM

The existing coastal slope and landform are recognized as defining site attributes. The concept priorities **retaining the natural terrain and working with existing levels**, rather than reshaping the site through extensive cutting, filling, or structural containment. This environmental function benefits not only the natural system but also adjacent development by providing a soft, adaptive interface between built structures and the sea.

8.2 MINIMAL INTERVENTION

Interventions are envisaged to be limited in scale and extent, focusing on necessity rather than maximization. By **minimizing physical disturbance** and retaining existing vegetation where possible, this approach supports natural surface stabilization, reduces erosion risk, and aligns with low-impact development principles promoted under the Penang Green Agenda.

8.3 CLIMATE-RESPONSIVE COASTAL DESIGN

The concept acknowledges the dynamic nature of the coastal environment, including exposure to sun, wind, heavy rainfall, and wave action. Design intent is therefore oriented toward **adaptable, lightweight, and reversible strategies** that respond to climate conditions and allow the site to perform as a resilient coastal landscape rather than relying on rigid, hard-engineered solutions.

8.5 PUBLIC ACCESS WITHOUT OVER-ENGINEERING

Safe and inclusive public access is considered achievable through terrain-responsive paths, stepped routes, and rest points that **follow the natural slope**. This approach avoids large engineered platforms and continuous hard structures, demonstrating that accessibility, safety, and **environmental sensitivity** can be achieved concurrently.

*These principles are consistent with the objectives of the **Penang Green Agenda 2030,** which promotes climate-resilient planning, protection of natural assets, and low-impact, adaptive approaches to public open space and coastal environments*

8.6 PHASED, ADAPTABLE IMPLEMENTATION

The concept supports incremental and **adaptable implementation**, allowing elements to be introduced, monitored, and refined over time in response to site performance, coastal processes, and patterns of use. This phased approach reduces upfront environmental impact and supports adaptive management in the context of climate change.

A well-designed public park begins with respect for place.

*Good park design **works with nature** rather than against it, treating existing landform, vegetation, and natural processes as assets, not constraints.*

*It builds on what is already present—**adding value** without subtraction—and responds carefully to the specific character of the site and its wider surroundings.*

*At the same time, it **remains firmly people-oriented**, ensuring that basic needs such as safety, comfort, accessibility, and enjoyment are met without excess or over-design.*

*Successful parks do not need to be expensive or grand; they are often simple but never simplistic, where restraint, clarity, and **landscape-led thinking result in the strongest outcomes**.*

*Above all, a meaningful park should **reflect its own identity**—not aspire to be another Dubai or Singapore, but to be authentically Tanjung Bungah.*


Where the hill meets the sea - a landscape journey


Where the shoreline stays public and peaceful


Where nature leads and design listens

9. Conceptual Design Proposal

The Conceptual Design Proposal for Tanjung Bungah Coastal Park presents a Level 0, landscape-led vision that demonstrates how the site can function as a safe, accessible, and **environmentally resilient public park** while retaining its natural coastal landform and ecological character.

The concept works with the site's existing rocky terrain and elevated slope (up to approximately 22 m), using these features as assets rather than reshaping them through hard engineering.

Public access is achieved through terrain-responsive, low-impact pathways, steps, and viewing points, designed to weave through existing vegetation and landform with minimal disturbance.

A coastal park shaped by nature led by the landscape.

Key elements such as lookout points, learning steps, and small decks are indicative only, illustrating how people can experience the coast, views, and wildlife without enforcing retaining walls, shoreline hardening, or large engineered platforms.

The proposal priorities erosion prevention and climate resilience through vegetation retention, natural drainage, and adaptive design, while reserving parts of the site as coastal habitat and biodiversity zones that support existing wildlife. Overall, the concept demonstrates—at a planning level—that a low-cost, low-carbon, and environmentally responsible coastal park is feasible in principle, aligned with the Penang Green Agenda and Penang 2030 aspirations, without pre-empting detailed design or statutory approvals

LEGEND

1. Coastal Habitat Zone
2. The Learning Steps
3. The Foreshore Steps
4. Eagle's Watch Point
5. Kingfisher Deck
6. Nature Challenge Course
7. Arrival point
8. Visitors Parking
9. Fishing spot


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9.1 COASTAL HABITAT ZONE

A coastal habitat conservation zone is proposed **within the portion of the site that has not been disturbed by recent tree clearing** and where established mature vegetation remains intact. This area represents an important remnant of the original coastal ecosystem and retains high ecological value.

To minimize risk to public safety and prevent further ecological disturbance, **this zone will be designated as non-accessible**. The existing uneven terrain and exposed rock outcrops present inherent safety hazards, and limiting access will reduce the likelihood of injury while also protecting sensitive ground conditions. A clearly defined buffer, combined with appropriate fencing and warning signage, will be implemented to discourage unauthorized entry.

By restricting human activity, the habitat zone will function as a l**ow-disturbance refuge**, allowing natural ecological processes to continue with minimal intervention. The retained tree canopy and coastal vegetation provide suitable conditions for avian and arboreal fauna, with potential to support the return of species such as the white-bellied sea eagle (Haliaeetus leucogaster) and to offer shelter and nesting opportunities for langur monkeys. More broadly, the area will contribute to local biodiversity by providing foraging habitat, roosting sites and ecological connectivity along the coastline.

This strategy is consistent with environmentally **sensitive area (ESA)** principles, prioritizing in-situ conservation, risk avoidance and nature-based management. It supports long-term coastal resilience while balancing public safety requirements and aligns with best practices outlined in ecological impact assessments and sustainable coastal park planning.


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9.2 THE LEARNING STEPS

Learning Steps provide a simple and intuitive means of access to the upper part of the hill. They are conceived as lightweight, low-impact elements, constructed from timber or a timber-and-earth combination, and aligned as closely as possible with the natural contour lines to minimize ground disturbance and avoid the need for heavy construction.

The design intent includes safe handrails and, where feasible, ramp-like alternatives or gentler gradients to support inclusive use by people with mobility impairments, parents with prams, children, and elderly visitors. An intermediate landing at approximately +6 m is envisaged as an accessible terrace, offering a resting and viewing space that can be reached more easily by users with limited mobility. In this way, the Learning Steps demonstrate how the park can remain natural in character while being inclusive and socially accessible.



LEGEND

1. Accessible ramp
2. Accessible Viewing Point
3. Educational Elements





Photo: Nature-based paths provide safe, low-impact access along natural slopes without intrusive construction.











Photo: Example of different types of natural steps are possible. Final detailing can be adapted to respond to site conditions and address specific needs in the most appropriate way.

In addition, the **Learning Steps** may be complemented by a simple **educational program** for children, introducing **coastal ecology, local wildlife, and environmental processes** in an engaging and informal way. This approach supports learning through play and observation, encouraging awareness of the coastal environment while reinforcing the park's educational value.

Any learning elements are envisaged as l**ow-cost, durable installations made from natural materials, consistent with the park's landscape character and low-impact design principles.** The content and format of the educational program would be developed in collaboration with **local environmental groups**, with input from relevant government agencies to ensure accuracy, appropriateness, and alignment with broader environmental education objectives.



Photo: Example of low-cost, simple play–learn elements that are a well-established way to enrich park experiences for both adults and children, supporting informal learning about the local environment.

Local Environmental Groups (Penang, Malaysia)

Friends of Penang Botanic Gardens (FoPBG)
Strong in environmental education, nature walks, and school engagement. While forest-focused, they have experience translating ecology into child-friendly learning and could advise on program structure and interpretation.

Penang Green Council
A key state-linked organization supporting sustainability education, community programs, and public awareness. Well positioned to help align content with Penang 2030 goals and broader environmental messaging.

Centre for Marine and Coastal Studies (CEMACS)
Based at Universiti Sains Malaysia (USM), CEMACS specialists in marine and coastal ecology, including shoreline processes, intertidal life, and coastal conservation. Ideal for ensuring scientific accuracy in coastal and marine topics.

Water Watch Penang
Experienced in public education related to rivers, water quality, and coastal pollution. They frequently work with communities and schools and are well suited to hands-on, observation-based learning.

Langur Project Penang (LPP)
The educational program focuses on wildlife conservation, education, and community engagement in Penang. Although best known for its work with dusky leaf monkeys (Trachypithecus obscurus), its programs also promote broader wildlife awareness, habitat protection, and responsible human-nature coexistence — all of which align well with a coastal ecology education initiative.

Entopia by Penang Butterfly Farm
A locally based environmental education center with strong experience in hands-on learning for children, specializing in insects, life cycles, and ecosystem awareness through simple, engaging interpretation.

The Habitat Penang Hill
A conservation-led nature park recognized for its low-impact access design and educational programs that promote biodiversity awareness and respect for sensitive landscapes.

Tropical Spice Garden
A community-oriented environmental attraction focused on plants, ecology, and cultural landscapes, with extensive experience in informal, sensory-based learning using natural materials.

9.3 FORESHORE STEPS

The foreshore steps are designed with a different character from the learning steps. As they provide direct access to the beach, they are not intended to accommodate wheelchair users due to the natural constraints of the terrain.

The timber structure is designed to lightly span above the ground, allowing existing and proposed vegetation to grow beneath and around it with minimal disturbance. Resting platforms are provided at appropriate intervals along the route and also function as viewing points towards the sea. These areas are equipped with benches and benefit from shade provided by strategically placed vegetation.



LEGEND

1. Steps
2. Landing with a viewing platform









9.4 EAGLE'S WATCH POINT

The Eagle Watch Point is conceived as a discreet lookout platform for birdwatchers and nature enthusiasts, providing a safe and carefully positioned location from which to observe wildlife. The structure is set within the coastal habitat zone and is accessed via a narrow path of stepping stones to minimize ground disturbance.

The lookout is intentionally screened and visually unobtrusive, allowing visitors to observe wildlife without causing disruption.

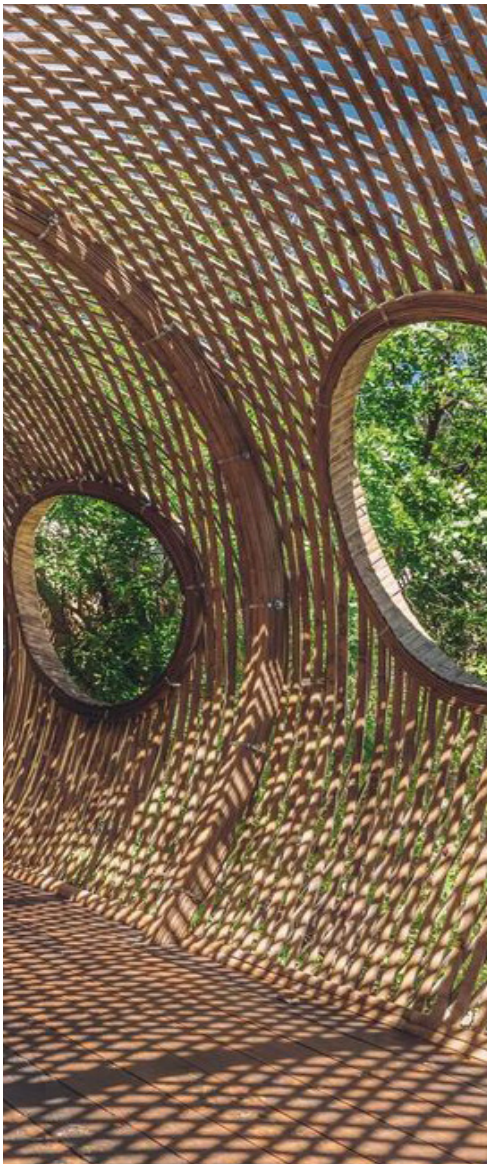


LEGEND

1 Eagle's Watch Point







The design draws inspiration from the cultural heritage of the site, referencing the form and craftsmanship of traditional woven fishermen's baskets. This approach creates a subtle architectural language that blends with the landscape while paying homage to local history and celebrating traditional craftsmanship.





9.5 KINGFISHER DECK

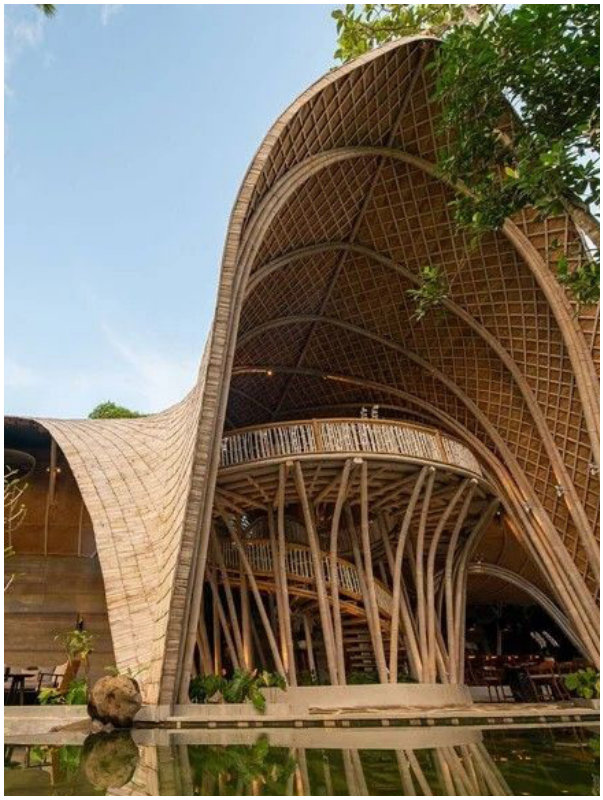
The second pavilion has a distinct character and is located at the heart of the park. It is conceived as a breezy shelter that can function as a resting place or informal picnic spot. The pavilion/deck overlooks the central lawn and children's play area, while also offering views across the surrounding landscape.

The design concept may draw inspiration from local craftsmanship, particularly the woven forms of traditional baskets, as well as from the elegant wing patterns of the kingfisher, a bird commonly found in the area and the namesake of the pavilion. These references help root the structure in local culture and ecology while maintaining a lightweight, nature-responsive character.



LEGEND

1 Kingfisher Deck



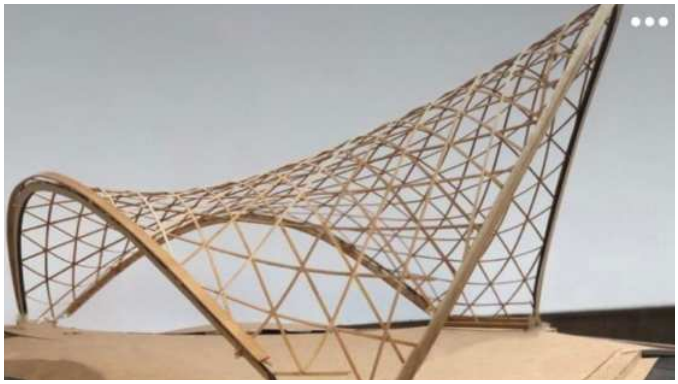




Photo: Biophilic design uses natural materials and forms inspired by nature, blending gently into the park.



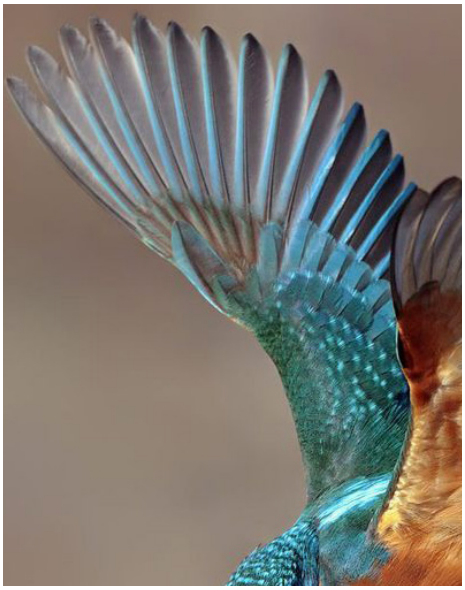




Photo: Liang Hin Rattan Shop (102 years old), run by third-generation craftsman Mr. Chow. Traditional rattan craftsmanship offers opportunities to integrate local heritage and skills into the park.

9.6 NATURE CHALLENGE COURSE

The children's playground and obstacle course are conceived as a **nature-based play** environment, integrated into the existing topography and shaped by it.
Using natural materials such as timber, driftwood, stones, and earth, the design avoids over-elaboration and instead leaves space for **imagination, exploration, and self-directed play**.
This approach reflects a well-established **international trend in playground design**, where natural play landscapes are valued for supporting physical development, creativity, risk awareness, and connection to nature.
By working with slopes, level changes, and existing landforms, the playground becomes an organic part of the park rather than an imposed structure.



LEGEND

1 Nature Challenge Course



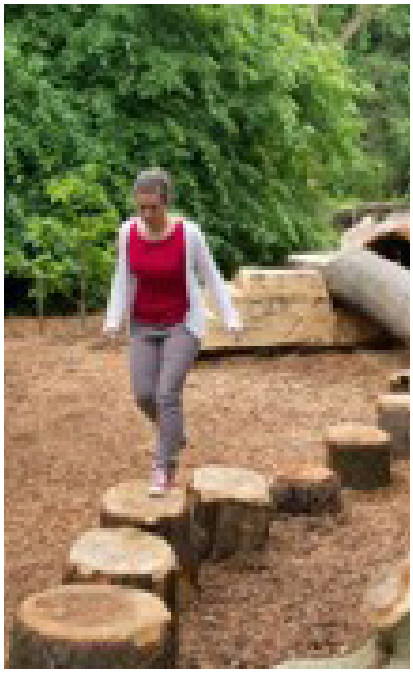


Photo: Nature-based playgrounds are increasingly popular in Asia, using natural materials and forms that blend with the landscape and encourage imaginative, exploratory play.



Photo: Forest Ramble — Jurong Lake Gardens, Singapore
A large, nature-inspired play garden with log trails, climbing stations, water play and naturalistic features that let children explore like animals in the landscape.



Photo: Coastal PlayGrove Nature Playgarden — East Coast Park, Singapore. A nature play area within a coastal park that includes natural elements like sand, logs, and bamboo for imaginative, landscape-based play.

9.7 ARRIVAL POINT, VISITORS PARKING, FISHING SPOT

The nearby roundabout is currently an underutilized space and presents an opportunity to be reconfigured as a small, comfortable parking area for park visitors. Given the modest size of the park and its role as a neighborhood destination, the majority of users are expected to arrive on foot; therefore, parking provision is intentionally limited in scale. The parking area is integrated into the park through tree planting, providing shade for vehicles while clearly defining the park entrance and creating an appropriate location for signage and wayfinding.

Adjacent to the site, a small rocky peninsula—currently used informally by local fishermen—would benefit from sensitive upgrading. With minimal intervention, it can be transformed into a safe, quiet, and well-defined fishing spot, enhancing the park's offer for recreational users while respecting existing local practices.



LEGEND

1. Arrival point
2. Visitor's parking: (17no Car, 6no Motorcycle,10no Bicycle)
3. Fishing spot



Photo: Example of contemporary way-finding signage that informs visitors while fostering a sense of belonging. Site-specific design draws on local heritage and landscape character to reflect the identity of the location.

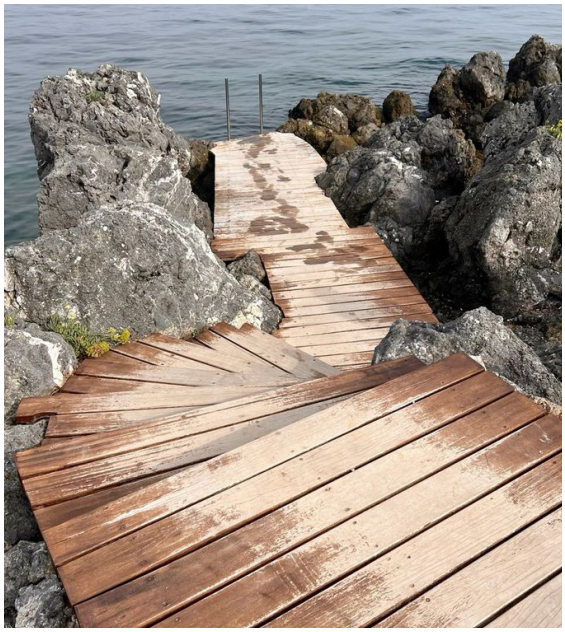


Photo: Beauty in simplicity: a modest and elegant fishing spot, carefully designed to respect its set-ting and spatial footprint.

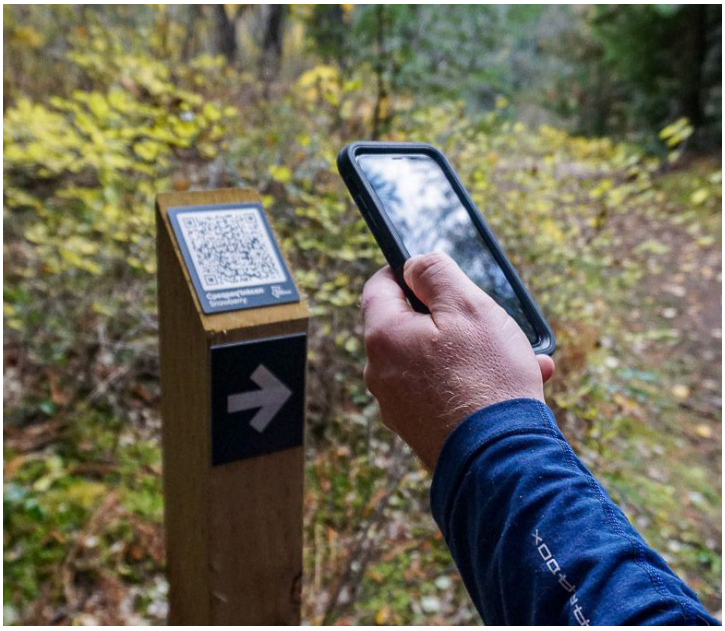


Photo: Digital technologies allow minimal signage to carry layered information. QR codes support wayfinding and offer deeper insights into the park's nature, ecology, and features.



Photo: Currently underutilized space around the existing roundabout that could be easily converted into visitor parking.

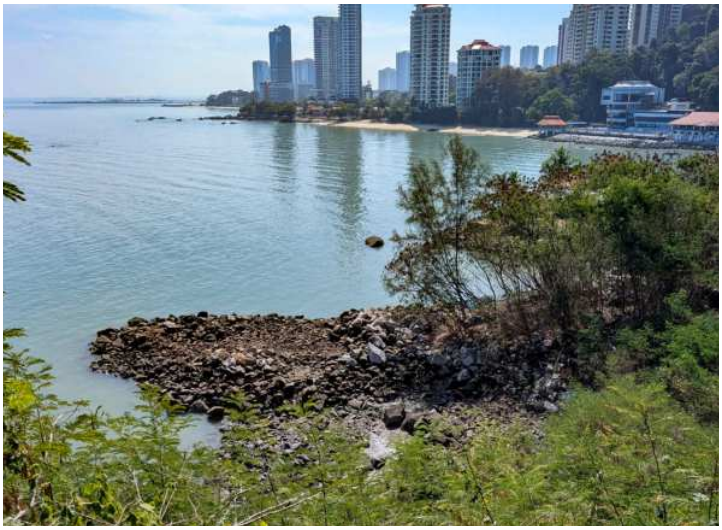


Photo: Existing rocky peninsula used by locals as an informal fishing spot

9.8 VIEWS

The site is situated at an elevated position, reaching approximately 18–20 meters above sea level, and offers expansive views of the surrounding coastline, Tikus Island, and the open sea. This natural vantage point is a key asset of the site and forms a strong focal element for the park's design.

By working with the existing topography rather than altering it, the proposal maximizes these views with minimal intervention. This approach is cost-efficient, environmentally responsible, and closely aligned with the principles of the Penang Green Agenda. The views themselves become the park's primary attraction — an existing quality that requires no construction, no additional resources, and no ongoing maintenance.

In this sense, the landscape is not something to be created, but something to be revealed.



LEGEND

1 2 3 Views from the Eagle's Nest Viewpoint
4 5 Views from the Kingfisher Nest
6 7 Views from Viewpoint Walk
8 Views from Accessible Viewpoint


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10. Conceptual Planting Design

10.1 PLANTING PALETTE

The planting design adopts a zoned, **slope-responsive approach** using **native coastal and climate-resilient species** selected for their proven performance in saline, wind-exposed, and free-draining conditions.

Planting is structured across the top, middle, and bottom of the embankment to support slope stabilization and coastal protection functions. **Deep-rooted tree and shrub species contribute to soil reinforcement and surface stabilization** by binding loose substrates and reducing erosion risk, while mid-storey and groundcover species limit surface runoff and improve soil cohesion. At the foreshore, **salt-tolerant dune and pioneer species** provide natural buffering against wind, wave action, and sand movement, supporting beach stability.

Existing vegetation that has naturally regenerated following previous clearing is retained and incorporated into the planting framework wherever feasible. Supplementary planting is introduced selectively to strengthen ecological continuity, address gaps in slope coverage, and enhance long-term resilience. This incremental, site-responsive approach minimizes disturbance, reduces establishment costs, and results in a robust, low-maintenance landscape system appropriate for long-term management and future climatic conditions.

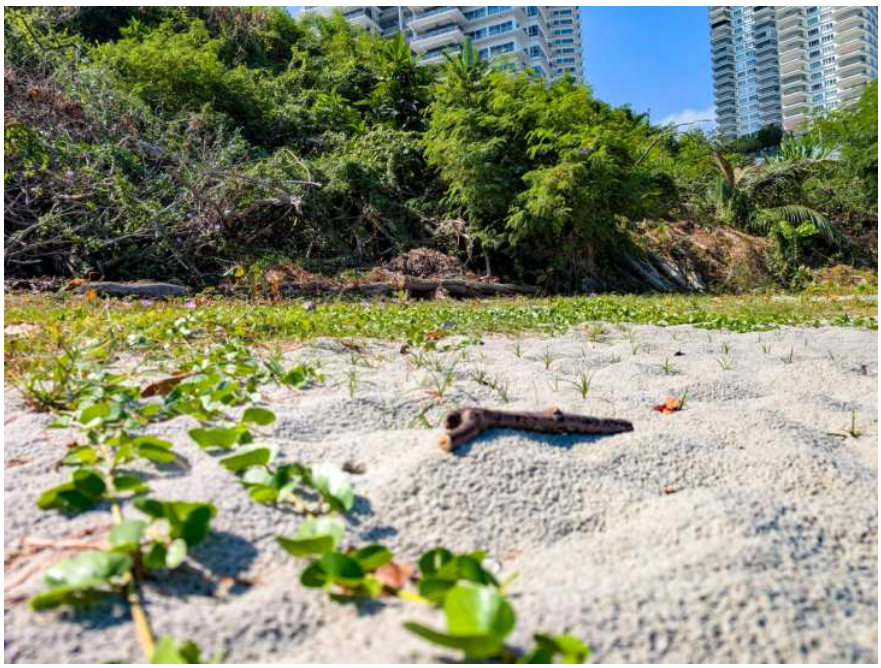
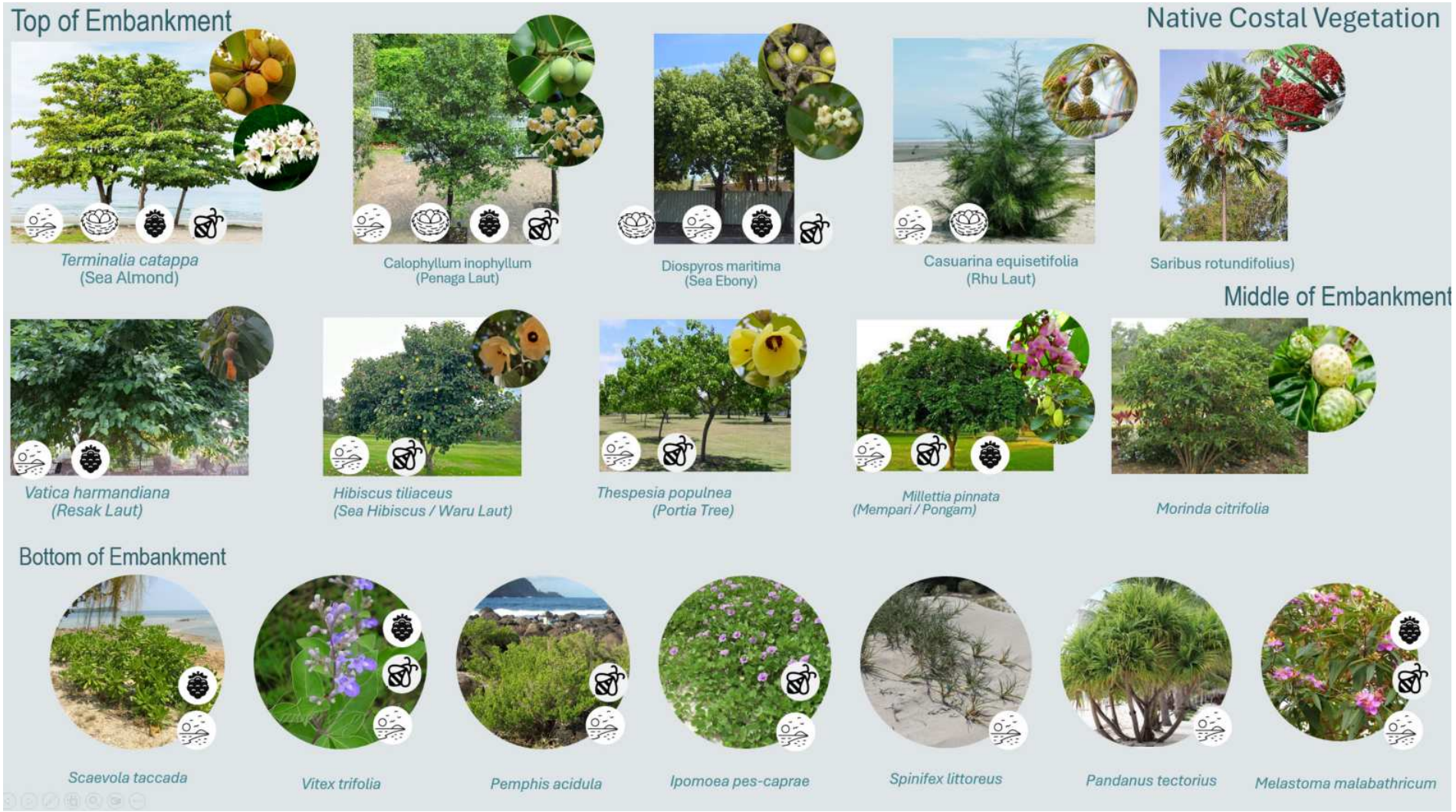


Photo: Five months after clearance, vegetation is regenerating strongly, with fresh greenery and pioneer species naturally re-stabilising the slope cover


Top of Embankment
Native Costal Vegetation
Terminalia catappa
(Sea Almond)
Calophyllum inophyllum
(Penaga Laut)
Diospyros maritima
(Sea Ebony)
Casuarina equisetifolia
(Rhu Laut)
Saribus rotundifolius)
Middle of Embankment
Vatica harmandiana
(Resak Laut)
Hibiscus tiliaceus
(Sea Hibiscus / Waru Laut)
Thespesia populnea
(Portia Tree)
Millettia pinnata
(Mempari / Pongam)
Morinda citrifolia
Bottom of Embankment
Scaevola taccada
Vitex trifolia
Pemphis acidula
Ipomoea pes-caprae
Spinifex littoreus
Pandanus tectorius
Melastoma malabathricum

10.2 NATIVE COASTAL PLANTS

Upper Slope / Top of Embankment (Primary Shade & Identity Trees)

Species	Height	Function	Notes
***Terminalia catappa* (Sea Almond)**	20–25 m	Main canopy / shade tree,	Main canopy / shade tree,
***Calophyllum inophyllum* (Penaga Laut)**	~20–25 m	Signature native heritage tree	Wind-tolerant, long-lived, symbolic of Penang (name origin).
Diospyros maritima (Sea Ebony)	~12–15 m	Signature native heritage tree	Grows in coastal forests, naturally adapted to saline conditions
Morinda citrifolia	~4–8 m	Fruiting native tree; supports birds & bats	Strong wildlife food source Thrives on rocky/soil coastal slopes
Saribus rotundifolius (Serdang Palm)	~10–15 m	Wind-tolerant palm; vertical structure	Native to Malaysia; fruits feed birds and bats

Mid-Slope (Soil Stabilization & Mid-Canopy Layer)

Species	Height	Function	Notes
Vatica harmandiana (Resak Laut)	~12 m	Perfect for your rocky embankment	Native species found on coastal headlands & rocky ridges
Hibiscus tiliaceus (Sea Hibiscus / Waru Laut)	~7–10 m	Root stabiliser, low canopy, habitat plant.	Fast-growing; roots bind soil in shallow crevices. Good for screening and framing paths.
Thespesia populnea (Portia Tree)	~6-10m	Colour and structure; salt-resistant	Mix with Hibiscus for layered foliage and yellow flowering contrast.
Millettia pinnata (Mempari / Pongam)	~15–25 m		Coastal or near-coastal tree with deep roots for slope stability
Barringtonia asiatica (Sea Poison Tree)	~7–10 m	Dramatic pom-pom flowers; shade	Large heavy nuts — don't place near children's seating or pathways.

Toe of Embankment / Windbreak Line (Salt-Spray Tolerant & Structural)

Species	Height	Function	Notes
Casuarina equisetifolia (Rhu Laut)	~6-12m	Windbreak, erosion control	Plant at 2–3 m offset from beach edge to avoid root exposure. Provides roosting habitat for birds.
Impomoea pes-caprae	Creeper	Anti-errosion, soil binding	
Spinifex littoreus	2–4 m	Excellent slope stabiliser White flowers → pollinators Fleshy fruits → birds	Hedges
Vitex trifolia (Simple-leafed Vitex)	1–3 m	Purple flowers loved by bees Fruits eaten by birds	Survives sandy/rocky soils and wind exposure
Pemphis acidula (Pemphis / Cangkok Laut)	1–2 m	Extremely wind- and salt-tolerant Forms beautiful sculptural shapes	Iconic littoral shrub of Penang's natural coast
Melastoma malabathricum	1–2 m	Purple flowers feed bees and butterflies Fruits eaten by birds	Widespread Malaysian native Thrives in disturbed soils — good for early succession
Guettarda speciosa	3–8 m	Shade, fruiting, supports moths & birds	One of the most characteristic native coastal shrubs in Penang Fragrant white flowers (night) + fruit eaten by birds Perfect for viewpoints and mid-slope



Photo: Existing vegetation at the Sore Thumb, forming a foundation that can be strengthened by carefully chosen supplementary planting to support local wildlife and site conditions.

11. Conceptual Phasing Proposal

Park Phasing Strategy

The park is conceived as a **flexible, scalable project** that can be delivered in phases, allowing implementation to respond to funding availability, approvals, and evolving site conditions. The phasing strategy is i**ntended to demonstrate feasibility rather than a fixed construction sequence**, ensuring that the park can be realized progressively while remaining usable and safe at each stage.

The phasing table outlines a logical **progression from essential, low-cost interventions to more specialised elements.** Early phases focus on **safety, access, and immediate public use**, while later phases introduce educational, recreational, and interpretive features. Each phase is designed to function independently, meaning that **the park can be partially opened and enjoyed while subsequent phases are planned or delivered**.

Importantly, the **elements within each phase are interchangeable,** and both the number and duration of phases may be discussed and adjusted in consultation with authorities, stakeholders, and funding bodies. Certain components may be advanced, delayed, combined, or reallocated between phases depending on priorities, available resources, or observed patterns of use once the park is operational. For example, infrastructure such as parking or specific viewpoints may be implemented earlier or later without compromising the overall concept.

This **adaptable approach** allows the project to respond to real conditions on the ground rather than relying on rigid assumptions. It also **supports a cost-sensitive and low-impact delivery**, prioritizing minimal intervention, reuse of existing site assets, and incremental enhancement over time.

Overall, the phasing strategy ensures that the park can evolve organically, guided by community needs, environmental considerations, and practical constraints, while maintaining a clear long-term vision and alignment with sustainability and resilience objectives.

Phasing Principles and Implementation Framework

The phasing strategy presented in this document is conceptual and strategic in nature and is intended to guide decision-making rather than prescribe a fixed construction prog ram.

Progression between phases will be subject to clearly defined triggers, including funding availability, statutory feedback, confirmation of land status, and observed site performance following partial opening.

Public safety and environmental protection are treated as non-negotiable priorities and are addressed from the earliest phases, with conservation areas established upfront and access expanded only where risks are appropriately managed.

Maintenance and operational implications are considered throughout, with early phases designed to minimize long-term management burden.

The flexible phasing framework allows elements to be adjusted, combined, deferred, or advanced in response to regulatory processes, site conditions, and external factors, ensuring that the park can be delivered responsibly, incrementally, and in alignment with Penang planning requirements.

Indicative Phasing Plan for Park Implementation

Phase	Focus	Key Elements
Phase 1 **Minimum Viable Park**	Safety, access & views	• Learning Steps; • Primary circulation / viewpoint path; terrain safety measures (surface stabilization, localized protection); • Modest visitor parking; • Basic park furniture; • Initial wayfinding; • Protective fencing defining wildlife conservation areas with "no-entry" signage
Phase 2 **Foreshore Access**	Coastal connection	• Foreshore steps; • Improved access to fishing spot with basic safety and seating
Phase 3 **Learning & Play**	Education & community use	• Learning Steps enriched with educational and interpretive elements; • Kingfisher Deck viewing platform with roof (form and size to be determined); • Nature-based play and learning features; biodiversity interpretation
Phase 4 **Eagle's Viewpoint**	Wildlife observation & interpretation	• Eagle's Viewpoint – a small, secluded structure designed for bird and wildlife observation; • Advanced interpretation; digital / QR-based content

Primary Purpose	Park Status
• Establish a safe, publicly usable park, • Clearly define protected areas, • Demonstrate feasibility with minimal intervention	Park partially open
• Improve safety and comfort while formalizing existing informal coastal use	Park open
• Strengthen the park's role as a learning landscape while remaining low-impact and inclusive	Park open
• Complete the park with a discreet wildlife-focused lookout, delivered when funding allows	Park open

12. Reference Projects & Precedents

12.1 ASIAN REFERENCE PROJECTS

Labrador Nature Reserve
Singapore · Commenced: 2002 (phased upgrades)

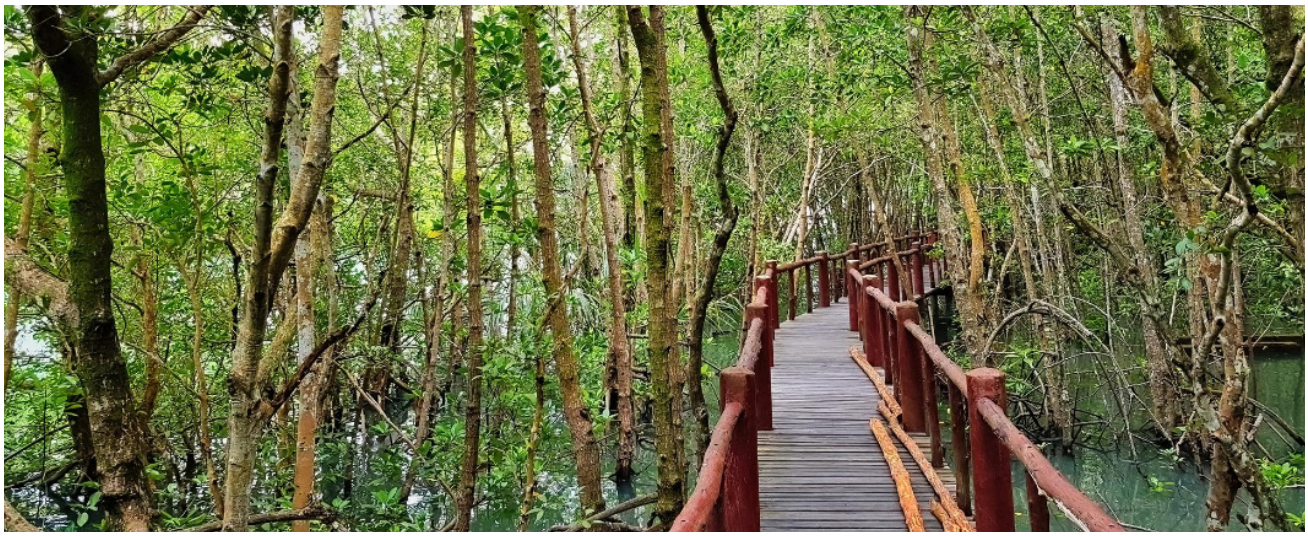
Located on Singapore's southern coast, Labrador Nature Reserve **demonstrates how a small coastal park can balance public access with environmental protection**. The project uses boardwalks, simple paths, and minimal infrastructure to protect sensitive coastal and mangrove habitats while offering clear wayfinding and scenic viewpoints. Its low-impact construction, phased upgrades, and emphasis on existing natural features make it a strong precedent for neighbourhood-scale coastal parks.





Red Boardwalk Bridge
Samut Sakhon, Thailand · Commenced: c. 2016

The Red Boardwalk Bridge in Samut Sakhon is a low-impact public walkway set within a restored mangrove landscape. The **elevated boardwalk allows visitors to experience the mangrove ecosystem without disturbing soil, roots, or tidal flows**, while its simple linear form ensures clarity of movement and minimal footprint.
The project demonstrates how **modest infrastructure can support ecological recovery**, environmental awareness, and local recreation simultaneously. Its emphasis on habitat protection, controlled access, and durability makes it a strong regional precedent for small-scale, ecology-first coastal parks.





Mangrove Education Walk, Tanjung Piai
Johor, Malaysia · Commenced: 2001

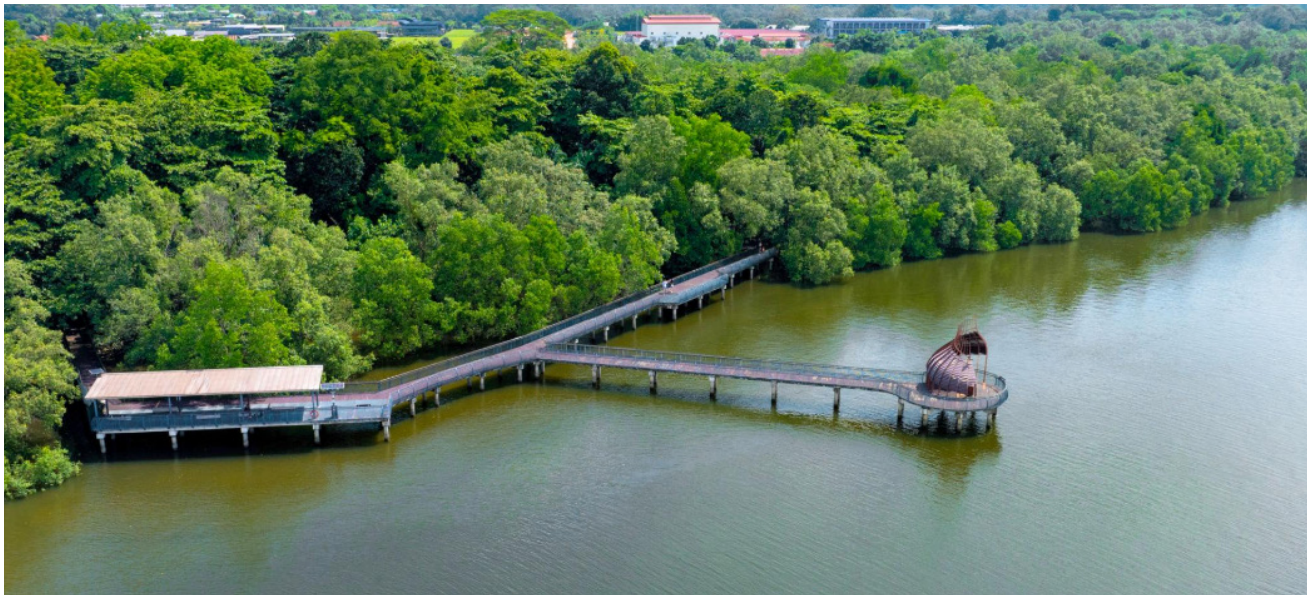
Tanjung Piai National Park includes a network of timber boardwalks through dense mangrove forests at the southernmost tip of mainland Asia. The project focuses on **environmental protection, coastal resilience, and public education,** using minimal built elements to allow visitors to experience the mangrove ecosystem safely. It is a strong Malaysian precedent for low-impact coastal access and habitat interpretation.





Pasir Ris Park
Singapore · Commenced: 1986 (phased development)

Pasir Ris Park is a neighbourhood-scale coastal park that successfully integrates a public sandy beach with protected mangrove habitats. Elevated boardwalks provide controlled access through sensitive ecological zones, while open beach areas allow for informal recreation without compromising habitat integrity. The park is delivered in clearly zoned and phased layers, separating active public use from conservation areas. Its combination of beach access, mangrove protection, low-impact infrastructure, and long-term manageability makes it a particularly strong precedent for small coastal parks that balance ecology, public access, and cost-efficient maintenance.





Mount Maunganui (Mauao) Reserve
Tauranga, New Zealand

Mount Maunganui (Mauao) Reserve is a coastal park that uniquely combines a prominent **natural hill with sandy beaches** on both sides, forming a continuous public landscape of high ecological and recreational value. The volcanic hill is protected as a cultural and ecological reserve, with carefully **managed walking tracks that follow natural contours and minimize erosion.** At its base, open **beaches provide public access** and informal recreation, clearly separated from sensitive slopes and vegetation zones.
The park demonstrates how **topography, views, and natural systems can define the park's identity with minimal built intervention.** Its emphasis on controlled access, erosion management, and respect for natural landform makes it a strong precedent for coastal parks where views and terrain are the primary assets.





Bishan–Ang Mo Kio Park
Singapore · Commenced: 2007 (redevelopment completed 2012)

Bishan–Ang Mo Kio Park, developed with Singapore's National Parks Board and Public Utilities Board, is a seminal example of **bringing landscape and ecology to the center of an urban park's identity**. As part of the Active, Beautiful, Clean Waters Program, a formerly straight, concrete drainage channel of the Kallang River was transformed into a naturalized, meandering river system. Stormwater management, soil bio-engineering, and native planting are integrated to create a dynamic ecological landscape that is both functional and accessible to the public. The project successfully combines hydrological performance with everyday recreation, allowing direct interaction with water while enhancing biodiversity and urban resilience. Reuse of existing materials and ecologically driven bank stabilization demonstrate how natural processes can guide sustainable and resilient public space design.



