

## Shantou Mangrove Forest

# THE EXPERIENCE OF ECOLOGICAL LANDSCAPE DESIGN

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Images by AECOM

Additional images as credited





**PROJECT CREDITS**

**Location:** Shantou City, Guangdong Province, China **Client:** Citic Limited, China **Date Commenced:** 2014 **Expected Completion:** 2017 **Landscape Architect:** AECOM Shanghai **Environmental Planner:** Environmental and Ecological Planning (EEP), AECOM China **Site Area:** 112 ha

When designing Shantou Mangrove Forest, the essential question that immediately came to mind was which parts of the ecological process can actually be visible to form and inform the landscape.

At the intersection of land and sea, mangrove forests support a wealth of life. They live life on the edge, with one foot on land and one in the sea. They are among the most productive and biologically complex ecosystems on earth, but only in the last few decades have people begun to realise their importance. Mangroves around the world have disappeared with alarming speed due to coastal real estate development. Shantou Mangrove Forest, in the coast of Shantou City, Guangdong Province, China, is one such example. Aquaculture, future urban development, and road construction through a water channel into the mangrove core could obstruct tidal and freshwater flows to the habitat if they are not curbed.

Shantou Mangrove Forest has diverse types of habitats, such as estuaries, lagoons, intertidal mudflats, and non-peat swamps. It is one of the most biodiverse and important habitats for resident and migratory wildlife in the region. Among the current major issues surrounding it are habitat loss and fragmentation, due to the uncontrolled limnetic aquaculture in the past few decades. Secondly, the lack of clear forest boundary designations, public pedestrian network, and uncontrolled public access to the core of the mangrove habitat have further threatened the habitat. One of the main design briefs of this project was therefore to increase the size of the existing habitat patches and public awareness, with particular emphasis on the ecological core and public outreach programmes.

Since 2014, the landscape architecture team from AECOM's Shanghai office, in collaboration with its environmental and ecological planning team in China, has provided landscape conceptual planning and design solutions for Shantou Mangrove Forest. The design approach to the landscape architecture at the forest is being reinvented, as the designers shift towards the view of a landscape where processes must be accounted for in the long term, with several stages of development extending beyond a decade, based on accumulative growth and ecological processes. It is a landscape where static and fixed compositions cannot survive.

### Framework

AECOM has proposed a carefully gauged framework—a matrix of interacting systems—that will rehabilitate damaged habitats and accommodate future urban development, circulation, human activities, hydrological, as well as ecological dynamics of the site. The basic framework of the plan integrates three interacting systems—circulation, programming, and habitat—into one cohesive and dynamic unit.

### Circulation

An expansive network of paths, recreational waterways, and enhanced access to and from the North Shore Expressway through a system of park drives will help to create an animated, interconnected park. People will be able to experience the site by canoe and on foot.

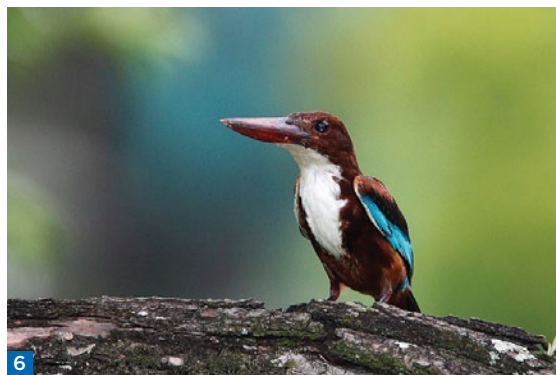
Four interlocking networks will provide broad ribbons with pathways and services that allow for the development of all active programmes, event spaces, and facilities. Together, they will orchestrate and concentrate active programmes along and within the unrestricted zone.

There are four primary networks:

- Adventure trail
- Jungle track
- Educational group trail
- Paddling trail

### Programming

Shantou Mangrove Forest will host an incredible variety of public spaces and facilities for educational, cultural, and physical activity and for learning and play. The site is large enough to support adventurous activities and programmes that are unusual in the city, including the adaptive reuse of the quarry sites, jungle tracking, bird watching, fish feeding, abseiling, nature trails, and kayaking.





1. Overview of Shantou Mangrove Forest.

Mangroves are the only trees that are capable of thriving in salt water. They form unique intertidal forests at the edge of land and sea and are found on tropical and subtropical coasts.

2. *Kandelia obovata* (水筆仔 or 秋茄樹) is a species of mangrove in the Rhizophoraceae family, mainly found in Southern China. Its propagules can survive desiccation and remain dormant for weeks, months, or even over a year until they arrive in a suitable environment.

3. New mangrove communities seeded in the early stages of the project will establish over time and finally inhabit the site.

4. View towards the mangrove core.

5. *Aegiceras corniculatum*, commonly known as 桐花树 in China, is a species of shrub or tree mangrove in the Myrsine family (or Primrose family), with a distribution in coastal and estuarine areas in Shantou.

6. Over 40 species of birds have been sighted at Shantou Mangrove Forest. *Halcyon smyrnenensis*, the White-throated Kingfisher, is commonly found. It is widely distributed in Asia from Turkey east through the Indian subcontinent to the Philippines (Photo: Christopher Lee).

7. One of the observatory towers can be accessed from the visitor centre by paddle boat.

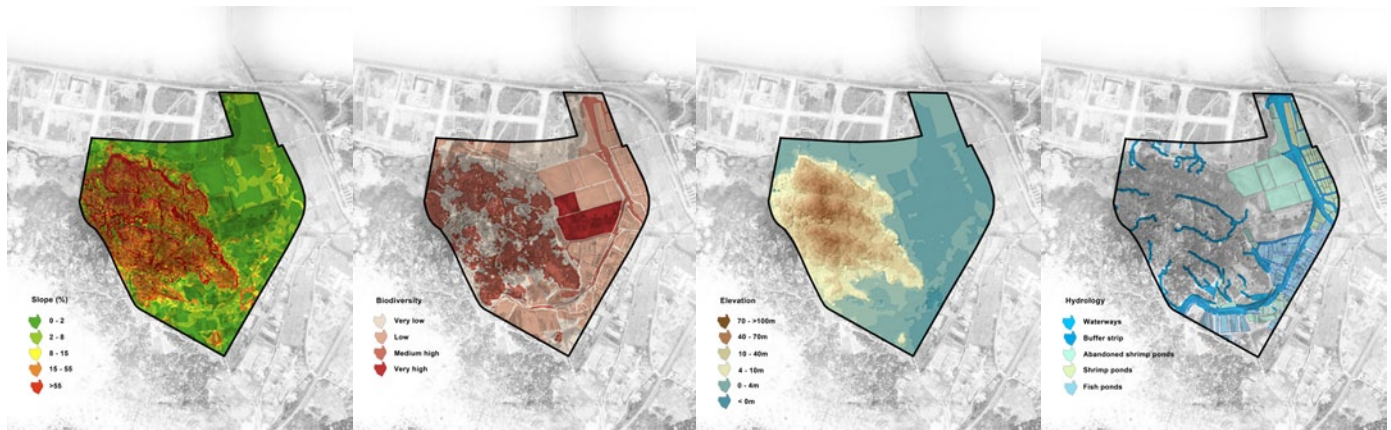
#### Habitat

Shantou Mangrove Forest will also support richly diverse habitats for wildlife, birds, and plant communities as well as provide extraordinary natural settings for recreation. Through ecological innovation and creative design, new mangrove communities seeded in the early stages of the project will establish over time and finally inhabit the site. The initial ecological framework (of corridors, patches, and matrix) is continually evolving into a self-regenerative landscape. Over time, nature will plant the mangrove species in the correct tidal zones without major human intervention.

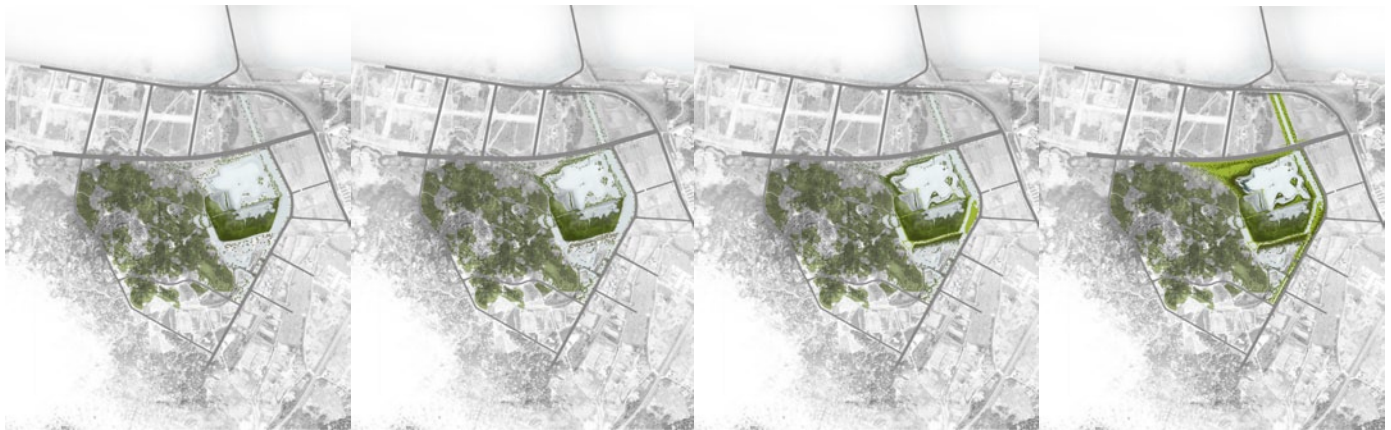
#### The Experience of Ecologically Designed Landscapes

The paradigm shift towards an open-ended landscape, where immediate consumption and fixed control become temporal and ephemeral and promote opportunism over time, presents a number of arguments relating to an ecological landscape design and the manner in which it may be experienced and “read” by people. The ecological landscape design that this article considers primarily takes place at the interface of the built environment and ecological systems, between the landscape forms of human needs and the landscape forms of biodiversity. How these two systems engage and the mediating role of the designers are the subject of this article.

There are a large number of ecologically designed landscapes in China and across Southeast Asia. Tampines Eco Green in Singapore, for instance, is an ecologically designed park that offers a sanctuary for flora and fauna and a place for nature recreation. It is a new kind of ecologically integrated project in the country with measurable ecological benefits that should increasingly be infiltrated into the urban landscape and that offers many lessons about the science of ecological design.



8 Applications of geographic information systems (GIS) in landscape analysis: slope, biodiversity, elevation, hydrology (left to right).



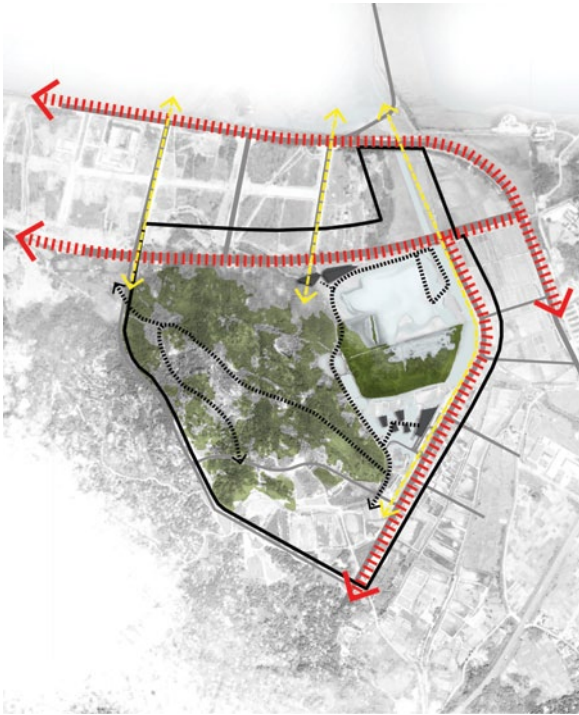
9 Phase 1 to 4 of habitat diversification through habitat planting.

However, a project may have profound ecological value, but visitors may never appreciate this value if the landscape experience is dull, in the same way a person is not expected to fully understand nature's hydrological processes from standing outdoors in the rain. Ecological process, as John Lyle states, "involve(s) numerous variables" and "a complex web of interactions" (Lyle 1994). The dynamism and flux of ecological process, unmediated by other landscape conventions, quickly slip from the grasp of comprehension and interest (Gobster 2007).

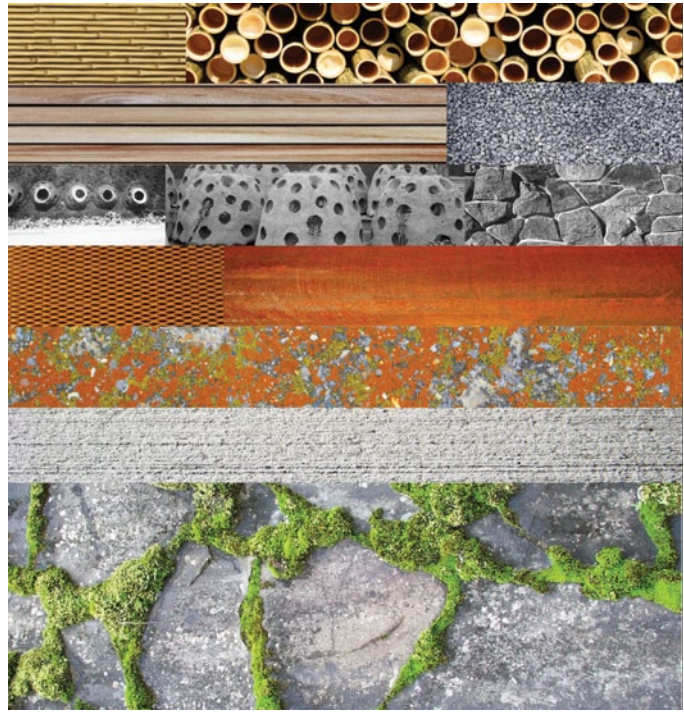
When designing Shantou Mangrove Forest, the essential question that immediately came to mind was which parts of the ecological process can actually be visible to form and inform the landscape. As discussed above, many parts of ecological systems are invisible. What are visible are the surface manifestation of the ecosystems and the material conclusions of ecological process. To promote ecological design, making a perceivably visible landscape experience is important because the experience of a site is where a society can grasp previously theoretical discussion.

As in all potent design visions, ecological design needs to exploit the power of contrast, which in the case of Shantou Mangrove Forest, lay in the visual contrast between the cultural and ecological domains. For instance, oyster reef balls made from ashes and concrete are introduced to the forest as a strategy for oyster restoration. They create safe artificial homes for oysters that emphasise the contrast between ecological and cultural (or aquacultural) domains. This explicit juxtaposition engages rather than repudiates the cultural milieu in which most ecological design takes place. The artefact, the concrete reef ball in this case, is not completely artificial but developed to pursue natural processes in the surroundings according to ecohydrological rules and maintained by cultural processes. This visible artefact symbolises the ecology of both the natural and cultural technical systems.

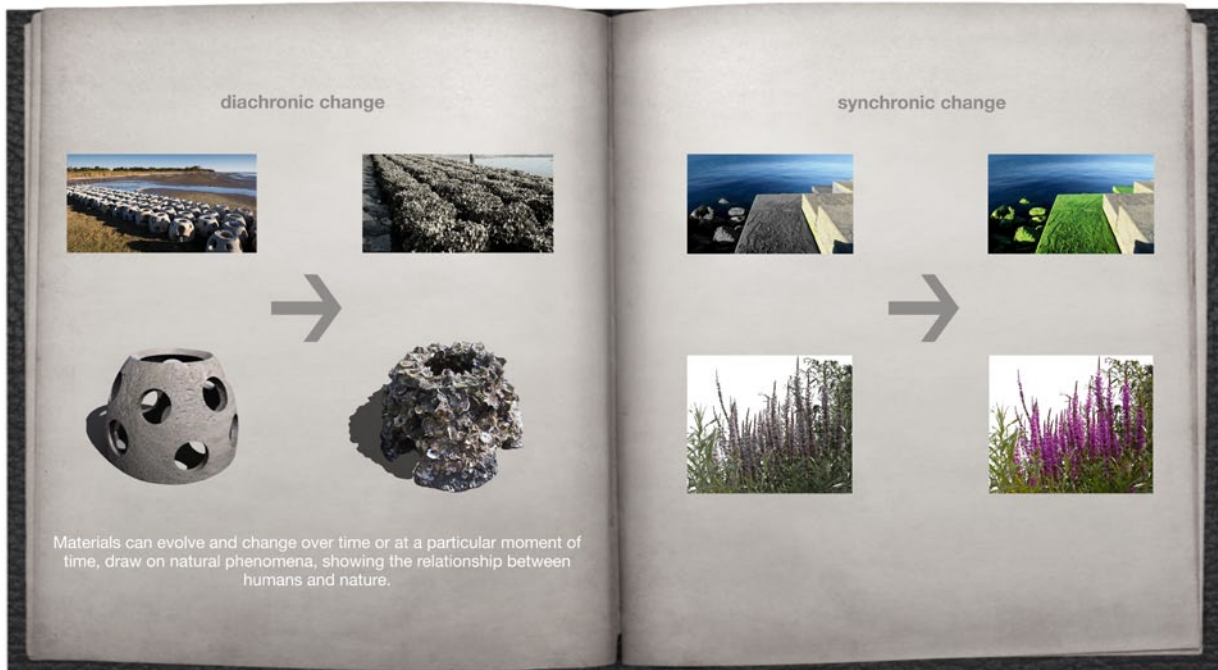
The second challenge encountered when designing Shantou Mangrove Forest is overcoming the issue of landscape aesthetics. The traditional notion of "aesthetics" is presented as insufficient to describe the totality of the experiential quality of ecological landscapes. Landscape aesthetics prizes a static



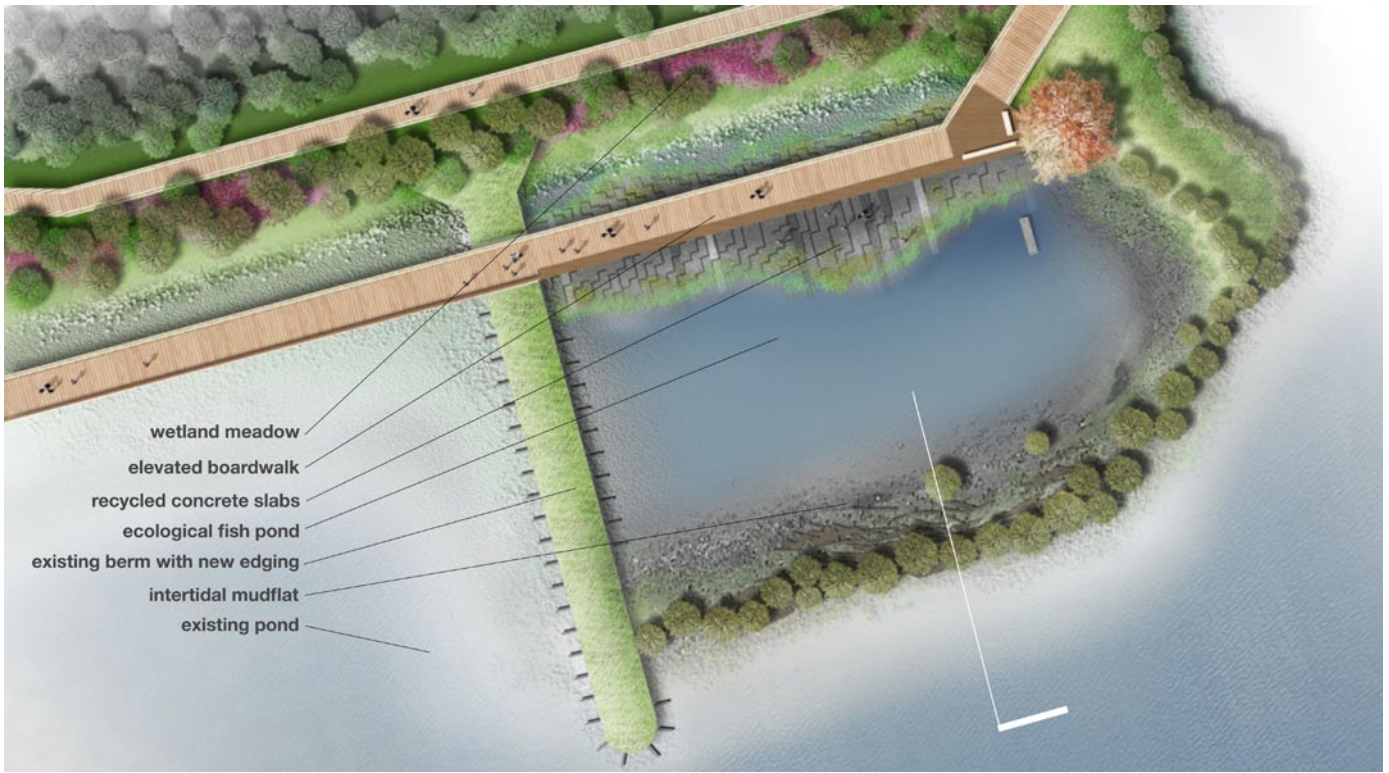
10 Circulation plan physically connects, frames, and encircles the site.



11 Range of materials selected to express the natural and cultural colours highlighted during the site analysis studies in stage 1: H4 treated hardwood timber, yellow bamboo cuttings, precast concrete oyster reef balls, recycled concrete slab, corten steel, white granite stone, HDG expanded metal deck, gravel chips, and cast in situ concrete with broom finishing.



12 Materials are envisioned to evolve and change over time or at a particular moment in time.



13 Plan of the recreational fish pond. The existing embankment from the former aquacultural practice has been retained in the design of the fish pond.



14 Typical cross section of the recreational fish pond.



The acceptance of change, of moving beyond the fixed pictorial version of landscape, is ecologically necessary.



- 1 Oyster habitat bench
- 2 Existing river
- 3 Floating observatory platform
- 4, 6 Footbridge
- 5 Stone edging
- 7 Existing mangrove habitat
- 8 Expanded metal deck


15 Detailed plan of proposed oyster habitat bench.

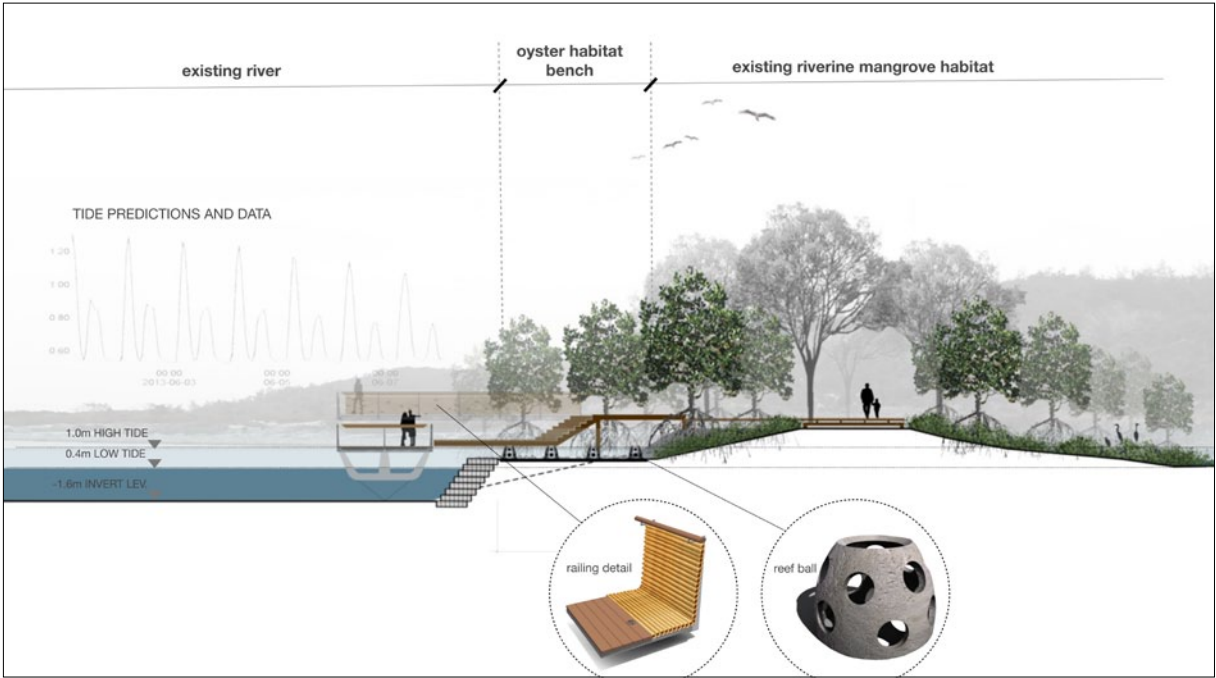
vision imposed upon the land. Since the eighteenth century, the landscape has been viewed as an autonomous two-dimensional pictorial object that operates within the flatness of the picture plane. Pictorialism prioritises how a landscape appears as a static picture rather than how it works as a process, a continuing activity or a set of relations that change over time. Historically, gardens have forced their constancy; we take pleasure that Avenue des Champs-Élysées in Paris or Central Park in New York appear to have changed little over many decades or centuries. This desire for constancy of visual image is at odds with the fundamental force underlying ecological design.

Hence, hydrological processes, inherently fluctuating, direct the articulation of spaces in Shantou Mangrove Forest. There will be times when the meadow is dead, the marsh is creepily muddy, the recycled concrete slabs are colonised by moss, the poem on the concrete platform is exposed during low tides, and the reef balls that are overgrown with oysters and colonising organisms become unrecognisable. The acceptance of change, of moving beyond the fixed pictorial version of landscape, is ecologically necessary.

This emphasis on natural landscape processes is not meant to exclude spatial form but rather seeks to construct a dialectical understanding of how it relates to the processes that flow

through, manifest, and sustain it (Corner 2006). One of the more outspoken proponents of the renewed importance of the landscape as a model for contemporary landscape is the Dutch landscape architect, Adriaan Geuze, who is the principal of landscape architectural firm West 8. In one of West 8's landscape projects, the Eastern Scheldt Storm Surge Barrier in the Netherlands, the designers organised dark and light mussel shells, forming parallel strips of shoulder along the highway that connects the constructed islands of the barrier. Corresponding flocks of similarly shaded dark and light birds naturally adapted to feed from them. This work of urban ecological landscape organises an ecology of natural selection and renders it for public perception via the highway for automobiles. By contrast, historical precedents for urban parkways typically reproduce a pictorial pastoral image of nature but do not intervene in their ecological surroundings in any substantial way.

It is believed that truly sustainable and ecologically designed landscapes have no singular style, but rather express a unique sense of visual and spatial pluralism. The domain of aesthetics must come to be seen as coextensive with the ecosphere, rather than narrowed to its traditional applications in art criticism, so that aesthetic values may no longer be isolated from ecological ones. 



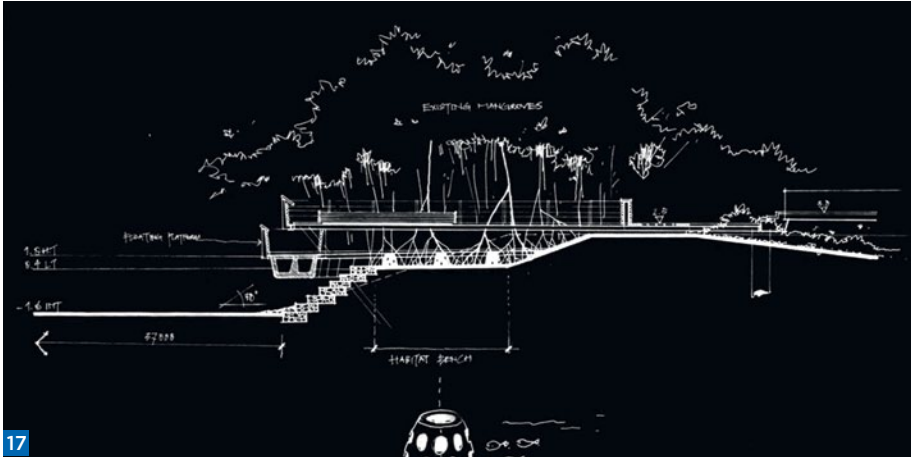
16 Cross section of river bank with section of typical oyster habitat bench.

References

Corner, James. 2006. *The Landscape Urbanism Reader*. New York: Princeton Architectural Press.

Gobster, Paul H., Joan I. Nassauer, Terry C. Daniel, and Gary Fry. 2007. "The shared landscape: what does aesthetics have with ecology?" *Landscape Ecology* 22: 959-972.

Lyle, John. 1994. *Regenerative Design for Sustainable Development*. New York: John Wiley & Sons.



17, 18. Oyster habitat bench sketch and perspective.