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Sympoietic shores—An interscalar architecture for Sri Lanka's coastal futures

Fig. 1 Autumn Dsouza (2024). Sri Lanka coastal actors collage [Digital drawing]

Introduction

Coastlines, home to nearly half the world's population, have long served as dynamic zones of human habitation, cultural exchange, and agriculture. Along the shores of the planet, stories, cultures, and commodities flow. It is estimated that oceans contribute 60 per cent of the total economic value of the biosphere, making them crucial to human activity and welfare.[1]

Shorelines are arenas of creation, transition, destruction, and rebirth—where the ever-changing boundary between land and sea presents spiritual and existential significance for many cultures. These liminal spaces challenge humanity's perceived dominion over nature, revealing the forces of Earth's systems that exist beyond human control. The constant ebb and flow of tides and the reshaping of the shoreline by storms and rising seas highlight the tension between human ambition and the ancient rhythms of the planet and its inhabitants.[2]

More recently in the planet's lifetime, coastal towns and ports have served as conduits for colonisation, leading to lasting legacies of inequality and vulnerability.[3] Today, coastal regions are among the most susceptible to the devastating impacts of climate change. Rising sea levels, plastic-choked oceans, coastal erosion, and extreme weather events pose growing risks to coastal communities, infrastructure, and ecosystems.

Sri Lanka's coastlines present evolving landscapes shaped by myriad multiscalar entanglements of natural and human forces. Hikkaduwa, a coastal town in the Galle District of southwest Sri Lanka, has been subject to centuries of settler–colonial interference and is now a highly popular tourist destination. Hikkaduwa's coastal environment, significantly changed by urbanisation favouring capital-intensive tourism development, now coexists precariously with increasingly pressured natural systems.[4]

This article presents two architectural proposals for coastal rehabilitation embedded within Hikkaduwa's specific contexts and developed through a critical investigation of eight "interscalar objects." These objects serve as lenses through which to examine the layered multiplicities that constitute Hikkaduwa and to articulate a place-based intervention that supports new relational modes of living.

My relationship with coastal geographies was shaped long before I had the language to articulate it. Growing up along the shores of southwestern India, the sea shaped daily rhythms and instilled an understanding of reciprocity between land, water, ecology, and people. Over time, I've witnessed these coastlines shift—not through sudden events, but through the slow erosion of place, agency, and ecology driven by climate change and capital-led development. These personal experiences echo broader conditions of the Anthropocene, where global crises manifest through local ruptures. Yet what endures is the quiet resilience of coastal communities and the vitality of the ecosystems they inhabit. My early encounters with Hikkaduwa, through visits to family, were shaped partially from my viewpoint as a tourist. Returning as a researcher has required a more accountable stance—one that recognises both my distance and my affinity, and that understands design not simply as a tool for adaptation, but as a form of resistance and care. It is a way of returning to the shore with something to offer.

In what follows, I draw on my graduate thesis research at Carnegie Mellon University, which examines how the built environment has historically intersected with processes of colonisation, shaped coastal landscapes, and contributed to a web of multiscalar narratives involving contamination, extraction, and proliferation along the southwestern shores of Sri Lanka. I explore these themes through several key theoretical concepts, outlined below.

Many current coastal rehabilitation strategies reinforce capitalist frameworks, favour high-tech solutions, and lead to the dispossession of local communities from their land and resources. These technocratic, carbon-intensive approaches—modern extensions of the colonial systems that shaped the country's economic and ecological landscapes—continue to marginalise subaltern voices. A stark example is Colombo's Port City, a large-scale land reclamation project in Sri Lanka's capital, where the government, in partnership with the Chinese company CCCC is expanding port infrastructure, intending to attract foreign investment and multinational corporations.[5] These strategies exemplify what environmental critic Rob Nixon describes as "slow violence"—a form of "attritional catastrophes that overspill clear boundaries in time and space [and are] marked above all by displacements—temporal, geographical, rhetorical, and technological displacements that simplify violence and underestimate, in advance and in retrospect, the human and environmental costs."[6] The unprecedented sea mining associated with this development has caused devastating effects such as coastal erosion, intensified storm surges, and depleted fish stocks—ecological disruptions that frontline coastal communities are forced to contend with daily.

These human interventions in natural and built environments often catalyse what Anna Tsing describes as "feralities"[7]—the unpredictable, emergent outcomes of human impact on landscapes. These feralities materialise as layered traces of infrastructural change—ecological, economic, and social—that unfold across multiple scales. This research examines such feralities through a methodology informed by Gabrielle Hecht's concept of interscalar vehicles.[8] Hecht positions these vehicles as analytical tools for unpacking the Anthropocene as a crisis of scale—entities or phenomena that traverse and connect the local with the planetary, the intimate with the systemic. To understand their often-violent consequences, Hecht urges us to "refract history through new prisms,"[9] enabling more nuanced understandings of how landscapes are continuously transformed and entangled within the complex systems they inhabit.

A place on the planet—A Sri Lankan Anthropocene

Hikkaduwa, like many coastal areas in South Asia, has a complex and painful history of colonisation, beginning with the Portuguese in 1505, followed by the Dutch in 1638, and later the British, who extended their control over the entire island in 1798.[10] European global expansion relied on coastal towns and ports as primary sites for extraction, exploitation, and strategic control within the settler–colonial enterprise.

The colonisation by the Portuguese in 1505 and the Dutch in 1638 marked a turning point in Sri Lanka's agricultural landscape. Driven by the lucrative cinnamon trade, vast tracts of arable land were transformed into cinnamon plantations. This shift profoundly impacted traditional farming communities, who were gradually dispossessed of their land and coerced into labour on the plantations.

Before the colonial era, the use of lime in construction was largely restricted to royal palaces and monumental structures. This exclusivity gave way during the Dutch period, when lime became more widely adopted, prompting the emergence of a coral mining and lime production industry along the southwest coast.

The transition from Dutch to British rule in 1798 marked yet another significant shift in Sri Lanka's landscape, as coconut cultivation supplanted cinnamon as the dominant economic activity. This change brought about a substantial reduction in labour demand, leaving many individuals unemployed.

By the late nineteenth century, the lime industry had firmly established itself. In 1895, a railway platform was constructed in Hikkaduwa to facilitate the loading of coral—then a crucial raw material for lime production.

After Sri Lanka gained independence in 1948, the town experienced rapid growth. In 1966, the Sri Lankan government introduced policies to promote private investment in tourism, with a focus on the south coast. Offering fiscal incentives to attract developers, these initiatives transformed Hikkaduwa into a premier tourist destination, celebrated for its vibrant coral reefs, pristine beaches, and scenic marine landscapes.

In this geographical area, the unchecked exploitation of natural resources has become the prevailing norm rather than the exception. Currently, Hikkaduwa stands as one of the most popular coastal destinations in Sri Lanka and serves as a stark example of unplanned development.[11] Tourists, typically visiting for short durations, are largely insulated from the consequences of this degradation, which

local communities experience daily. The mounting pressure on ecosystems and wildlife continues to escalate, exacerbated by the slow pace of top-down strategies that often lack proper enforcement. As fishing practices have expanded unsustainably, fish yields in the region have reached critical lows[12]—a situation further aggravated by the damage inflicted upon the coral reefs by rising ocean temperatures.

The coastal environment is not solely inhabited by humans, be they transient tourists or long-term residents, but also by a remarkable assemblage of marine life. Five species of sea turtles—green, loggerhead, olive ridley, hawksbill, and leatherback—frequent the shores to nest, contributing not only to their survival but also to the health of the beach ecosystem.[13] Turtles control the population of sea sponges and crustaceans, which help regulate the balance of life in the reefs. The coral reefs—vital yet increasingly vulnerable ecosystems—serve as critical habitats for many marine species, including over three hundred species of fish, molluscs, and crustaceans.[14] Marine mammals, such as dolphins and whale sharks, rely on these environments for migration and feeding, while coastal and migratory birds contribute to the ecosystem by controlling pest populations and dispersing seeds. The preservation of these animals and their habitats is vital, not only for biodiversity but also for the cultural and economic practices of local communities that depend on these natural resources.

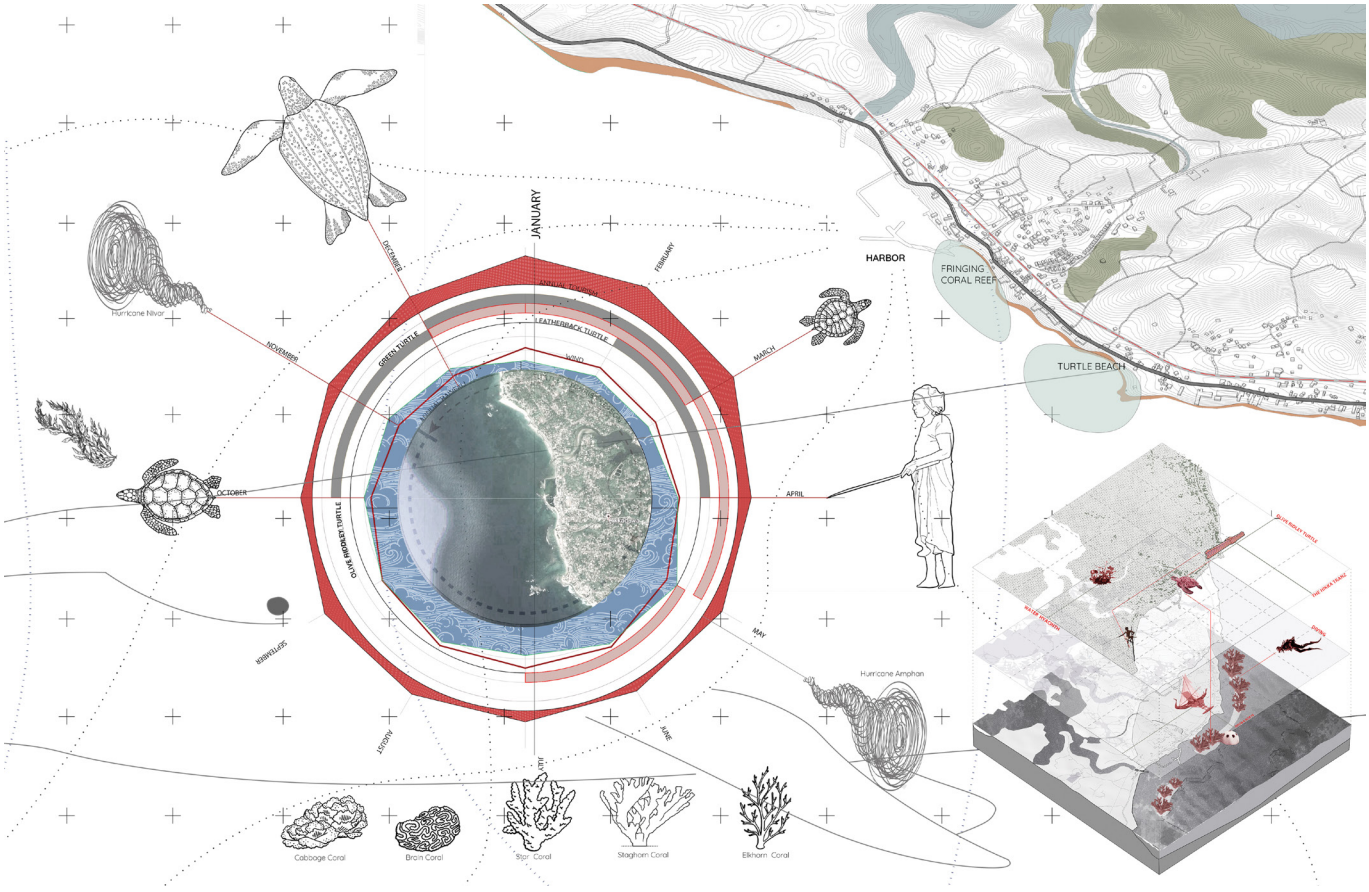

Fig. 2 Autumn Dsouza (2024). Coastal actors and annual wheel [Digital drawing]

Coral reefs are integral to managing the earth's atmosphere and maintaining the balance of life. Having existed for over sixty million years, these remarkable ecosystems are responsible for producing a significant portion of the world's oxygen and act as vital carbon sinks. They also serve as natural buffers against the adverse effects of climate change, protecting coastlines from the destructive forces of the Earth's oceans.

The situation in Sri Lanka is, however, dire. According to the Marine Environment Protection Authority, 90 per cent of the country's corals are already dead, with projections suggesting that the remaining 10 per cent will be lost within the next decade.[15] The historical interplay of colonialism and architecture has significantly contributed to the destruction of this vital natural habitat. Coral mining for lime extraction—introduced as part of the colonial export economy—was widely practiced and continues to have lasting impacts. This history of extraction calls for an urgent shift towards regenerative, place-based architectural practices that prioritise ecological preservation alongside human activity.

Interscalar objects

In the aftermath of the 2004 tsunami, local communities and organisations in Hikkaduwa took proactive steps to address the degradation of coral reef ecosystems. Among them, the Foundation of Goodness—a community-based organisation in Seenigama, six kilometres from Hikkaduwa—worked with local divers, offered training in coral propagation, facilitated beach clean-ups, and promoted material recycling.[16]

These efforts partly arose from the lived recognition that coral reefs are crucial protective infrastructures. Prior to their degradation, Hikkaduwa's reefs helped buffer coastal settlements from the force of waves and storm surges, softening the impact of tsunamis in some areas. The reefs' decline has since rendered these communities more vulnerable to future disasters. These community efforts signal an ontological shift—one that resists framing nature as a passive backdrop to human activity and instead affirms its role as an active participant in shared lifeworlds. Such a reorientation foregrounds the entanglement of human and more-than-human communities in ongoing processes of care, restoration, and transformation.

In partnership with the Sri Lanka Navy, Blue Resources Trust, and local organisations including the Foundation of Goodness, the Tokyo Cement Group has introduced reef balls—hollow structures fabricated from recycled concrete waste—into nearshore waters.[17] These reef balls serve as substrates for marine life and new corals to grow on, while also functioning as storm barriers. Yet an irony persists: the very material used to construct them—cement—has historically depended on lime extraction, a practice that contributed to the destruction of the reefs they now seek to restore. These repurposed structures, viewed through a reparative lens, raise critical questions about the limits and possibilities of regenerative action in landscapes marked by extractive pasts.

Reef balls—and the coral substrates they aim to support—constitute the first of this project's "interscalar objects."[18] These objects are not simply physical artefacts; they operate as symbolic condensations of layered interactions across ecological, cultural, and economic domains. As analytical devices, they reveal

Fig. 3 Autumn Dsouza (2024). Interscalar objects [Digital drawing]

entanglements with colonial extractive histories, tourism economies, and shifting local livelihoods. Anna Tsing's observation that "as contamination changes world-making projects, mutual worlds—and new directions—may emerge" extends this reading. Here, contamination is not merely a disruption but a generative condition: an entanglement of disparate and often contradictory forces that continuously reshape landscapes and unsettle fixed notions of ecological or cultural purity. Rather than seek a return to an idealised past or project utopian futures, these objects invite us to dwell in ambiguity, tracing the messy and co-constituted futures that unfold through interscalar entanglements.

The project is particularly focused on the "second lives" of these objects, exploring the unexpected ways they are repurposed and imbued with new meaning. Through this lens, the story of Hikkaduwa unfolds, examining the interscalar objects such as coconut stumps, ghost nets, coral bricks, oruwa boats, stilt fishing, water hyacinths, and Tokyo reef balls.

Architectural imaginings

In "Stirring the Anthropological Imagination: Ontological Design in Spaces of Transition," Arturo Escobar elaborates on the impetus placed on designers to rethink how we design cities and spaces. He notes that "the development of new modes of earthly habitation has become an imperative, which means changing the practices that account for contemporary forms of dwelling in ways that enable us to act futurally instead of insisting on strategies of adaptation to defuturing (future-destroying) conditions."[19]

Arturo Escobar's idea of ontological design starts from a simple but radical claim: "We design the world, and the world designs us back."[20] Architecture and design are seen as ongoing, reciprocal practices that co-create ways of being—ontologies—for humans and non-humans alike. In Escobar's framing, the task is to move from a dominant, modern ontology that treats the earth as inert matter for extraction and accumulation, towards pluriversal ontologies that recognise many worlds, many lifeways, and many ways of knowing. Architecture and design are thus considered key tools in shifting perspectives and stirring the collective imagination, offering a unique opportunity for catalysing positive transformation.

The project's narrative approach in presenting Hikkaduwa's story and its unique "world-making" scenario is inspired by *The Feral Atlas*,[21] a work by Anna Tsing, Feifei Zhou, and collaborators. This text approaches the Anthropocene as a complex, layered landscape defined by patchiness, unpredictability, and feraliity—qualities shaped by varied and often conflicting forces. These landscapes reveal underlying social inequalities, presenting a vision of the Anthropocene not as a cohesive era but as a fragmented reality woven through with both human

Fig. 4 Autumn Dsouza (2024). Original 8" x 12" mural [Digital drawing]

and non-human influences. The project's own mural becomes a methodological template for tracing the emergent and contested world-making practices unfolding along Hikkaduwa's shorelines.

The project's eight-by-twelve-foot mural draws from *Feral Atlas*'s approach of collapsing traditional categories and timelines to illustrate Hikkaduwa's entangled systems. It highlights seven interscalar objects—cultural, economic, and ecological knots that converge in the design. Rejecting linear chronologies, the mural uses a visual web to convey the interconnectedness of these systems, underscoring the complexity and hybridity that characterise contemporary world-making projects. It encourages a perception of Hikkaduwa's landscape as a pluriversal reality, shaped by overlapping histories, practices, and indigenous knowledge. Through architectural annotations, the seven interscalar objects are translated into an architectural imagining aiming to dismantle the single growth-oriented "development" narrative and replace it with relational, emergent, and situated possibilities.

Fig. 5 Autumn Dsouza (2024). Zoomed interscalar object cards [Digital drawing]

Two architectural propositions emerge from this framework: The Amphibious Commons, a floating reef restoration system that entangles architecture with multispecies cohabitation; and The Port Cooperative, a reimagined coastal market space that supports fish processing, plastic recycling, and community education through a fisherwomen-led cooperative model. By operationalising design strategies rooted in pluriversal ontologies, these interventions rehearse new ways of living, where coastal residents, marine species, and geomorphic processes co-author space. This project offers one framework for reimagining radical coastal futures in Sri Lanka.

The materials and construction techniques proposed in the architecture are grounded in a critical tracing of local skills and wisdom, knowledge that has been adapted and transformed in some ways through the colonisation of the land. One example is the now defunct oruwa (outrigger canoe), a significant piece of Sinhalese maritime ethnotechnology.[22] Another material is the invasive water hyacinth, originally native to the Amazon basin and introduced to Sri Lanka in 1905 as an ornamental species.[23] The plant quickly became a prevalent invasive species in water bodies across the country. In this case, the hyacinth is a "ferality"—a species co-opted by local communities. Water hyacinths excel at phytoremediation and currently function within Hikkaduwa's existing waste stabilisation ponds. The stalks of the plants are woven into various products, ranging from interior screens to baskets and clothing, a craft predominantly carried out by Sinhalese women.

Traditionally, architecture's dependence on coral lime extraction has left lasting damage on the fringing reefs, which, due to their slow growth, struggle to recover. Recent advancements in coral science, however, have introduced techniques to stimulate coral reproduction, including the replication of coral polyps' sexual reproduction vital for sustaining reef genetic diversity and methods for cultivating mature coral fragments.

Building on local material knowledge and broader scientific innovations, the first intervention, The Amphibious Commons, proposes an architectural response to regenerate the fringing coral reef along Hikkaduwa's shoreline through the deployment of mobile floating platforms. These interconnected platforms form a hybrid structure that merges architecture and reef ecosystems, advancing a vision of amphibious architecture tailored to a just ecological regeneration. This design approach reframes the "interscalar objects" featured in the mural, repurposing their histories into a living architectural fabric that engages directly with multispecies lives.

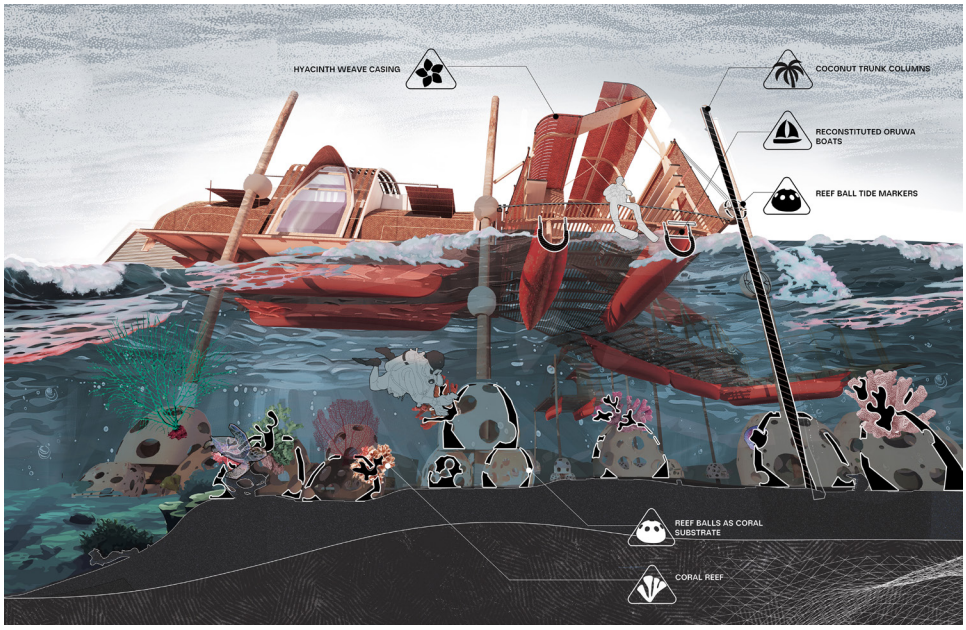

Fig. 6 Autumn Dsouza (2024). Zoomed-in coral eye perspective section of reef restoration platforms [Digital drawing]

Fig. 7 Autumn Dsouza (2024). Zoomed-in section of reef restoration platforms [Digital drawing]

The mobile platforms—floating on oruwa hulls and constructed from timber, bamboo, and water hyacinth—integrate essential functions for coral reef propagation and are anchored by recycled reef balls. These reef balls serve as a substrate for coral nubs that have been untangled from fishing nets above the water. This intervention aids in regenerating the fringing coral reefs and acts as a storm barrier, providing essential protection for the coastline. Additionally, the reef restoration assemblages provide spaces for fisherfolk to gather, rest, and play. The structures are designed for disassembly and relocation and can be detached from the columns once the reef is healthy, then moved along the assemblage to new locations. These "sympoietic"[24] systems highlight the entangled agencies of humans and non-humans that collectively produce and sustain one another. The reefs, once destroyed to facilitate architectural construction, are now being regenerated through a reparative architectural vision.

Fig. 8 Autumn Dsouza (2024). Perspective of reef restoration platforms [Digital drawing]

The second intervention, The Port Cooperative, addresses intertwined socio-ecological pressures confronting coastal communities, including the marginalisation of women, the precarity of traditional fishing practices, and the proliferation of plastic pollution. The Hikkaduwa Restoration Task Force[25] underscores fishing as the second-highest economic driver in the region. Yet, depleting fish stocks—exacerbated by the burgeoning tourism industry and pressures from industrial fishing—cast a shadow over the future of local fisherfolk.

Stilt fishing, which emerged out of necessity during World War II when British troops escalated demand, epitomises this struggle. Perched atop tall wooden poles in shallow coastal waters, fishermen cast lines into the sea, but diminishing returns have increasingly steered them towards tourist photography as a source of income. This adaptation reveals how local customs are commodified for tourism, leaving communities grappling with shifting livelihoods amid the climate crisis. Furthermore, the overlooked role of women in Sri Lanka's fishing industry emerges starkly. Despite their pivotal contributions—spanning fish processing, net mending, and essential support for fishing endeavours—women remain marginalised, their efforts often absent from official records and policy dialogues.

Plastic pollution further compounds these challenges, with ghost nets as visible symbols of how human activity damages marine ecosystems. These abandoned or discarded fishing nets ensnare marine life, damage coral reefs, break down into harmful microplastics, and worsen the ocean plastics crisis. Ironically, ghost nets also attract fish, functioning as makeshift fish aggregation devices, and many fishing communities have developed informal methods to haul in and recycle this waste—a grassroots response to the broader environmental crisis.

Fig. 9 Autumn Dsouza (2024). Zoomed-in section of fisherwoman cooperative [Digital drawing]

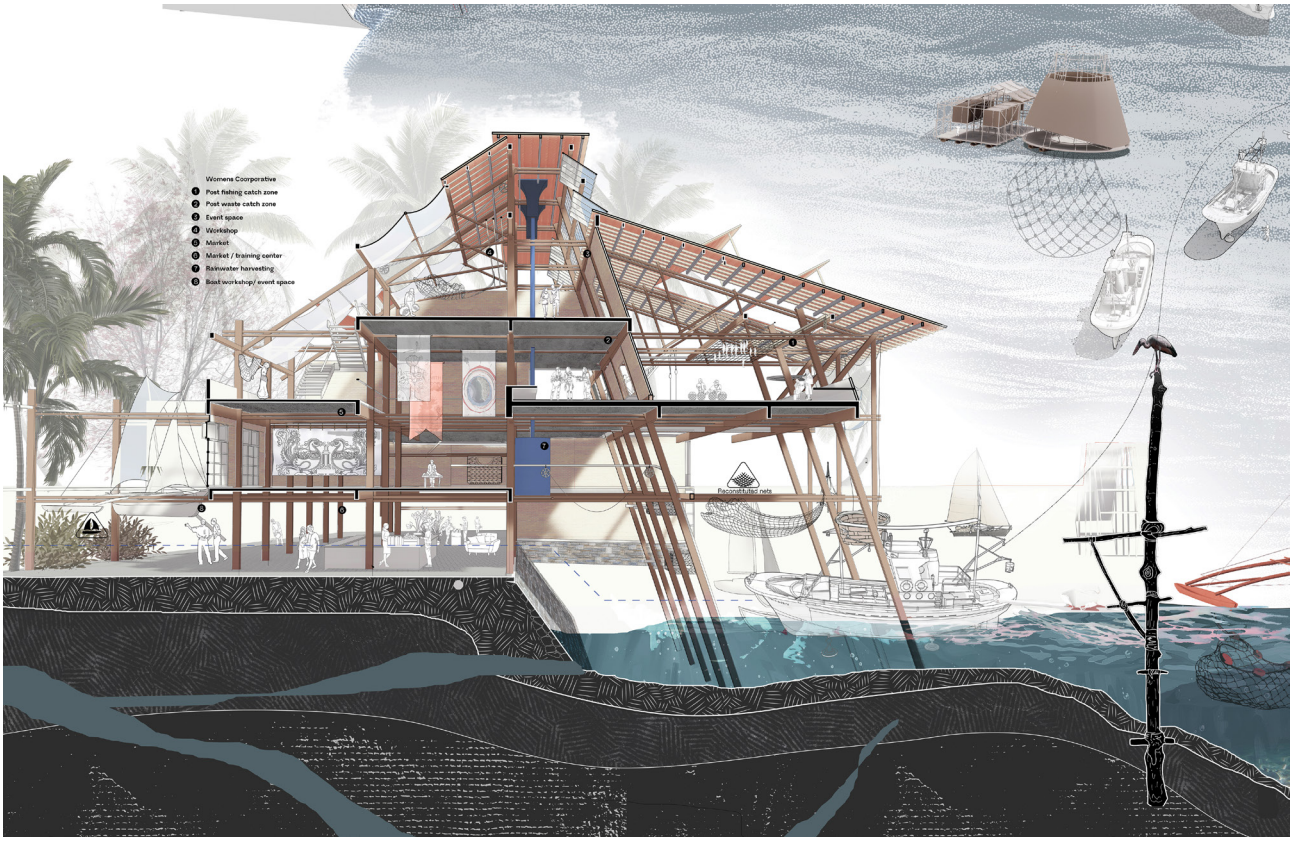

Fig. 10 Autumn Dsouza (2024). Perspective of fisherwoman cooperative processing space [Digital drawing]

Inspired by this research, the project proposes that the existing market space along the Hikkaduwa port be reimagined as a fisherwoman cooperative. Here, fish and plastic waste would be processed, sorted, and recycled. During the tourist season, workshops would educate visitors about coral reefs and involve them in reef protection efforts, such as making reef balls from recycled concrete. In the off-season, the space would transform into a training centre for local artisans. This "port-infrastructure-architecture" supports the cooperative's activities and buttresses functions like fish drying, hauling, and launching the floating restoration platforms.

Fig. 11 Autumn Dsouza (2024). Perspective of fisherwoman cooperative workshop space [Digital drawing]

Conclusion

While the architectural proposals presented in this paper manifest as spatial interventions, their primary intent is not to prescribe a fixed built solution but to provoke re-examination of the systems that govern coastal inhabitation. The project treats architecture as a lever to expose, question, and reimagine institutional logics that organise these environments.

Sri Lanka's coastal zones are shaped not only by physical processes but also by layered regimes of planning, zoning, land tenure, and environmental governance, many of which are holdovers from colonial systems. These frameworks often marginalise informal economies and coastal dwellers, prioritising economic growth through tourism and technocratic infrastructure over long-term community resilience.

The speculative proposals engage these realities not by circumventing regulation but by making its limitations visible and proposing counter-logics. For instance, rethinking the harbour as a space of ecological co-authorship and community stewardship implicitly challenges the commodification of coastal access and state-sanctioned hierarchies of land use. The architectural forms—porous, multi-use, seasonal—are instruments for policy imagination, rehearsing futures where zoning might account for seasonal livelihoods, more-than-human agency, and decentralised governance. By embedding care into the very structure of the port, the architecture gestures towards alternative governance models rooted in justice, autonomy, and ecological well-being.

The project contends that architecture can function as a critical mediator—a practice capable of surfacing contradictions in current planning paradigms and working transversally with law, policy, and activism. By foregrounding epistemological pluralism and ontological experimentation, the work extends architectural expertise into the political realm, not through mastery of regulation, but by actively imagining and enacting alternatives to it.

As Donna Haraway articulates: "One way to live and die well as mortal critters in the Chthulucene is to join forces to reconstitute refuges, to make possible partial and robust biological-cultural-political-technological recuperation and recomposition, which must include mourning irreversible losses."[26] This project unveils the intricate entanglements that have shaped—and continue to shape—the coastal ecologies and cultures of Sri Lanka. Within this framework, the proposed architectures not only make these connections visible but also reimagine our intertwined existence, advancing a vision of resilience founded on collective care and kinship with the Earth and each other. The design proposals foreground plural epistemologies, drawing on indigenous knowledge systems, vernacular material cultures, and situated ecological practices. In doing so, they position architecture as a site for ontological experimentation. Rooted in shared stewardship, the project gestures towards a transformative model for living in reciprocity with our environments, acknowledging both the losses we face and the enduring potential for regeneration.

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