

WaterLines: Speculative Design in the Threshold Between Land and Water

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Coasts and deltas constitute extraordinary environments built by geological forces in a geological timeframe. They are spaces constantly evolving, altered by the actions of natural and man-made transformation processes. This landscape is dotted with natural and man-made scenes where dynamism and unpredictability are exacerbated by the forces of rising sea levels and climate change. They are simultaneously territories of opportunity to interrogate about the challenges and possibilities for an unpredictable urban and landscape scenario in the climate emergency.

Design Studios, conceived as an ongoing series of interconnected themes, explores the implications of living in the threshold between land and water as space altered by the transitory action of water, man-made transformations and unpredictable events exacerbated by climate change. Studio's briefs are interrogating whether such dynamic and vulnerable environments and spaces can remain inhabited by humans, and if so, how that should occur? What are the models for coastal and delta habitation that can survive and prosper in a disintegrating territory between the unpredictable rivers and ocean, and the unstable land? What are the new urban landscapes and architectures design for a planet exposed to the effects of the climate we are changing? What are the operations that are needed to navigate new coastal and delta scenarios?

Projects propose speculative urban and architectonic scenarios for New South Wales' coastal and estuary environments in 2050-2100, developing tools and techniques appropriate for working on a particular type of landscapes of change. The paper is presenting the context and the evolutionary methodology applied three consecutive years, and interjects some students realizations reimagining the connection between water, humans and nonhuman habitation; envisioning challenges and opportunities for waterfront cities being exposed to the dynamics forces of climate change; and speculating with methods and approaches to design in the threshold between land and water as an instrument to re-think the design of the city and its relationship with the non-built environment.

AGENCY | THE WHY

The simultaneously imperceptible and colossal effects of the climate we change has major implications in the way we are going to design and construct in the Anthropocene era. Architecture education and practice must, as other disciplines, respond to the challenges of habitation by leading, creatively and mindfully, a new paradigm, instead of denying it as an architectural problem or perpetuating reactionary responses to guidelines and green certifications. The role of education is fundamental in interrogating critical questions concerning the future of inhabitation and enriching the curricula with the ethos of promoting spatial, social, cultural and environmental awareness and responsibility, taking an active role in the climate action. "Success is uncertain. Instead, the path forward requires difficult learning, experimentation and adaptation [...]. Loss and sacrifice are foreseeable and often inevitable". "The task is to save the Earth; it cannot be escaped".

A section of the coast of New South Wales is the body of speculation, where coastline, estuaries and deltas compose a unique mutable landscape, a wealth of biodiversity, including marine environments, rivers, estuarine wetlands, creeks and coastal rain-forest areas. Before European settlement in Australia, the coastal Aboriginal tribes made such environment and water systems an integral part of to their culture and a way of living. These landscapes have been strongly modified by an intensive history of land reclamation, urbanization, industrial activity, and coal extraction since the early 18th century. Vulnerable ecosystems have been destroyed and shorelines has been strongly modified, resulting in a disconnection between the built environment and the natural and water ecosystems. As with coasts, deltas and estuaries worldwide, the region is suffering very severe climate extremes, from severe drought and temperature extremes to the intensification of rainfall episodes, high ocean tides and storm surges resulting in floods and oceanic inundation, exacerbated by the sea level rise. The current impacts of unpredictable events linked to climate change are amplified without the natural protection inherent to water ecosystems, exponentially impacting and threatening inhabitation.

The conceptualization of site changes through the years, levitating around transitional or liminal zones situated in the threshold between land and water, under threat due to the

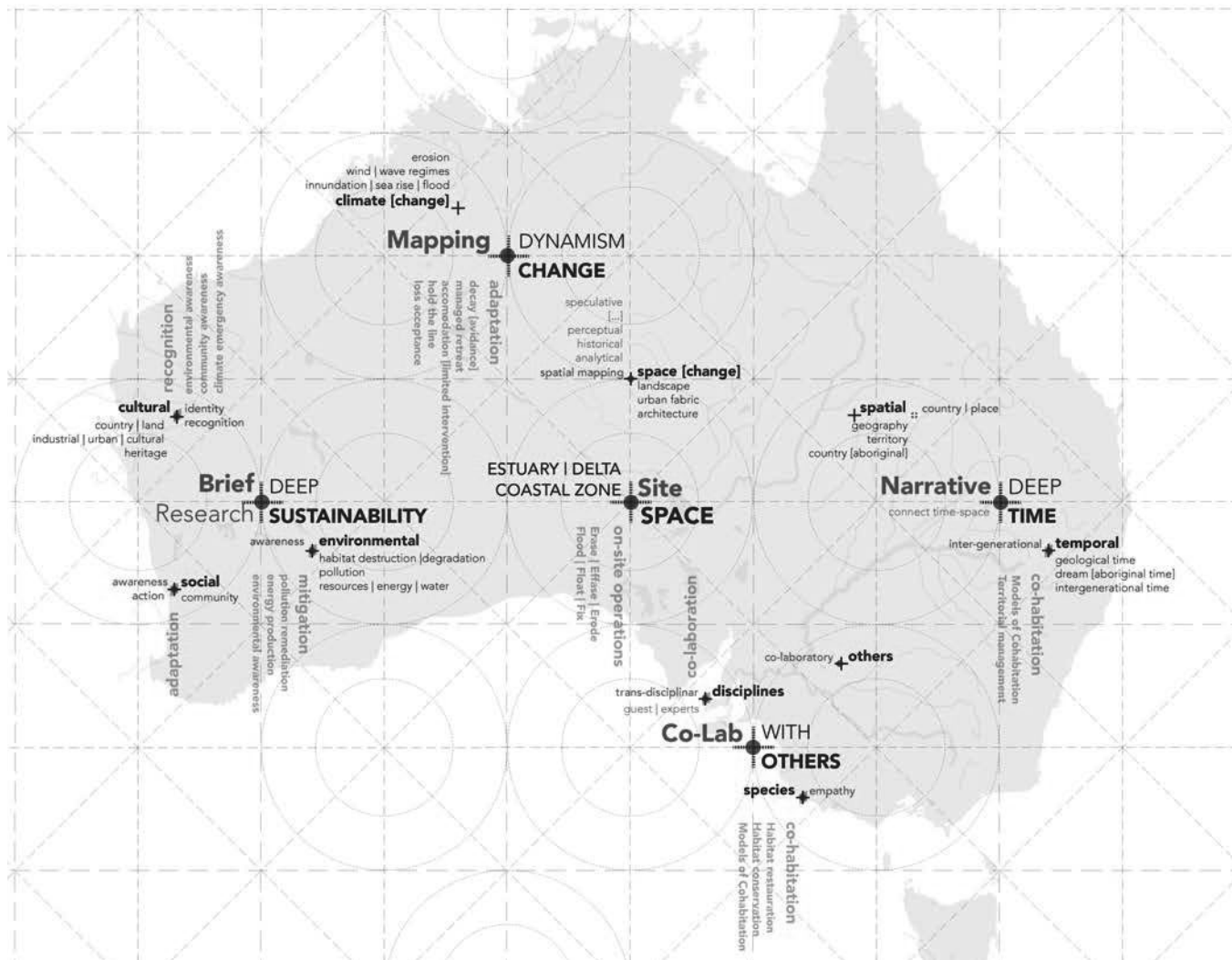


Figure 1. Methodology. The WHY | Agency; The How | Method; The WHAT | Results. Irene Perez Lopez.

impact of climate change. Such *SPACES*, constantly altered by the transitory actions of natural and man-made transformation processes, are mutable and *DYNAMICAL SYSTEMS* dominated by forces that scape human control, although these forces are exacerbated or being created by the action of mankind. Whereas landscape architects, coastal scientifics or geologists are used to design with time or elaborate models based on uncertainty and change within dynamic systems, architecture's master narratives insist on permanence and immutable models for designing the city and the architecture of the city. "The emphasis shifts from static object-space to the space-time of relational systems". Hence, the challenge is how to identify and test models that enable architecture to respond adaptatively to such dynamics environment and what are the research, design, and communication tools and techniques appropriate for working on this particular type of 'spaces of change' through time.

Introducing Australian First Nations cosmology connecting *Country*, kinship and time offer a fundamental insight on how to approach place as a space not only in its physical conditions but as a cultural construction through time. First Australian Nations' space-time cosmology can be a breaking point in the manner in which space and time are being examined, studied, and represented through the western cultural tradition, informing future practices and awaking awareness of the complexity and diversity within every system. Incorporating *DEEP TIME* and *DEEP SUSTAINABILITY*, concepts strongly connected to First Nations cosmology, as tools of design and pre-requisite to define narrative and brief, promote a multi-generational agenda within the project. These facilitate a feasible 'future conversation', claiming for the possibility of a future, otherwise uncertain under current capitalism model and levels of environmental destruction and social injustice.

METHODOLOGY | THE HOW

Every brief and course are unique but interconnected with previous in the construction of multi-year studio. The methodology connects former presented concepts with operative tools and strategies that facilitate site, brief and narrative conceptualization and its translation into design propositions. Studio is conceived as an evolutive co-laboratory that mutate and evolve course to course, where multiple disciplines are invited to share knowledge, nurture narratives, and provide feedback in different phases of design. As space and theme change, the methodology and scope slightly change based on the theoretical and disciplinary focus, site specificities, time span, and set of rules and operations to navigate in such scenarios. Studios are designed as integrated research studio, that do not separate the study of site and forces interacting from the act of designing. Design commences from the first moment, erasing the limits between analysis and design phases.

The Course's brief does not impose a site, but a given area (i.e., a section of the coast). Site goes beyond the physical site. The research is not limited to the area of intervention but also its area of influence, operating between scales. Students will observe, study, and represent spatial, ecological and cultural systems and processes to 'construct' a site that informs narrative and brief, and *vice versa*. Site is not -only- as given or found but as construct or imagine. Through an intensive and immersive process of mapping, perceptual, analytical, spatial and speculative scenarios, are documented and represented through a number of on-site and off-site operation. The representation of dynamic systems though time is complex but essential as a design practice, enabling the visualization of intricate and complex system of relationships that mutate instant to instant. Mapping confirms its unlimited capacities as a tool of representation and as a creative, operative and processual tool of speculation and proposition. The study and documentation of past, starting from geological forces and times, and current conditions, together with the 'construction' of prospective scenarios linked to the impact of climate change, reveal unexpected landscapes, new territories to work on, "openings up new ways of seeing complexity in the world and engenders multiple design possibilities".

"If someone a hundred years ago had looked ahead and assigned himself the task of orchestrating the next hundreds years, it would have seemed absolutely impossible"

—Andri Snaer Magnason. *On Time and Water*

Rather than imposing a given brief, Studio promotes the 'construction' of a spatial-temporal narrative, that assists students in articulating time, site and brief by utilizing the power of story-telling and communication. It also helps in introducing the complexity of relations that define a place, its societal challenges and its environmental constraints conducting them into the definition of their brief. The narrative, and its translation

into a brief, must incorporate a length of time that connects at least three generations or one hundred years. Incorporating time as a tool of design has implications in design articulation, phases, growth, evolution and change. It is also intended to create awareness of the time span of our decision as designers and decision makers. A project does not start with a client's brief, neither finish once built. On the contrary, looks backwards to encounter what was, is and always will be there, not only in terms of architectonic lifespan, but also the impact the proposal has in future generations, connecting deep time with deep sustainability. "Your time is the time of the people you know and love, the time that mould you. And your time is also the time of the people you will know and love. The time that you will shape. Everything you do matters. You create the future every single day".

Instead of imposing a programmatic brief, the brief emerges from the construction of an intergenerational narrative responding to a sustainable agenda and the changes and constraints that climate change is imposing to the 'selected' site. Studio works in a scenario for 2050-2100 when global temperature will rise 2°C, the climate has dramatically intensified drought, floods, storms and other unpredictable events, the sea level has risen between 1 to 5 meters and substantial change has occurred in the natural and built environment. In such scenario, zero carbon-free economy is already a fact, starting now and moving into the future as a common societal responsibility. Consequently the Studio has a double agenda: On the one hand, mitigating the effects that construction's industry imposes on climate and the environment, while responding to the projects' life span sustainability including, if applicable, dismantling and recycling; On the other, establishing the set of architectural, landscape and/or urban operations to respond to a space under threat and in constant evolution due to the impact of climate change, pollution and contamination, loss of biodiversity and/or other manners of inequity.

The goal is to 'inoculate' a deep sense of sustainability in projects, expecting those solutions are not delegating in 'technologies to come' to fix the problem. On the contrary, projects must contribute to re-think sustainable model, as pre-industrial societies and first nations did, counteract-acting and when possible contributing to solve environmental and social issues. Each and every one of the projects operate under a deep decarbonation agenda and real energy transition: zero emission or positive energy production, water equity and efficiency, zero waste, 'low-tech' carbon sequestration; An agenda to counteract or respond to pollution and contamination (i.e. Ocean acidity, plastic pollution, hazardous waste, water, air or land contamination), or promote active response to biodiversity destruction, human-other species coexistence, land conservation, afforestation, restoration of wetlands and rainforest; And/or strategies to balance social equity including gender equity, job equity, climate equity, food security and

equity or cultural recognition, introducing the principles of social and community sustainability and responsibility.

A Co-Laboratory is the operative model, based in a symbiotic relationship between actors and actions to be taken. Students develop their own research and design agendas understanding that the first compromise is about living with other -human and non-human- in a long-time span. Connecting and working with others, inside and outside Studio, is a learning and design strategy. Interdisciplinary guest's lectures bring knowledge and approaches from a kaleidoscope of disciplines. Coastal engineers, scientific, geologist, biologist, landscape architect and artist, present projects and research or participate in tutorials and critics. Cultural (Aboriginal) and geological walks contribute to connect intergenerational place -*Country*- and deep time -both geological and Aboriginal. All to understand the complex forces that shape any particular space, which will inform future design decision. Although the traditional workgroup has erased, the collaboration between students is founded through a number of actions that promote optional partnerships and interactions. The major contribution come toward the end, when projects are mature to build a common strategy or a network of projects connecting narratives and de-carbonization agendas.

RESULTS | THE WHAT

Robert Nicholls highlighted that all levels of government and other institutions need to be involved in three categories of adaptation which commonly should be promoted as a hybrid mix of: Planned retreats -nature takes its course and people retreat; Accommodation -nature prevails and people adapt to the challenges they face; and Protection -nature is controlled by hard and soft engineering, minimizing the impact on people. Similarly, the Australian Department of the Environment and Energy, through the National Change Adaption Research Facility NCCARF, classifies options for managing coastal risks as: climate change avoidance, managed retreat, accommodation or limited intervention, hold the line, and loss acceptance, implemented through a cross-sectorial combination of measures (technological, ecological, educational and political)

Despite the fact projects are developed over several years, both in undergraduate and master courses, working with different briefs, theme focus and areas of intervention, it is feasible to interject common strategies and approaches interconnecting studios and propositions. Strategies respond to a hybrid mix of previous adaptation and mitigation categories incorporating mutability and change, deep time and deep sustainability as design component. In general, the strategies that are implemented tend to accept losses, accommodate new scenarios and plan retreat instead of taking drastic measures such as hard protection or holding the line at any cost.

A major target area for intervention has been the lower Hunter River basin and Newcastle's delta. The industrial history and

heritage of the area has been transformed from that of an estuary into a major coal port facility and industrial site, followed by extensive urbanization, land reclamation and natural habitat transformation. The previous generated heavily contaminated land and water bodies, due to mine subsidence, the increase of salinity in the river basin from mines, the leaching of heavy metals from industry, as well as destruction and contamination of water bodies. When sea level rises and storms increase in intensity and frequency due to climate change, water pollution will move inland and land contamination will move to the basin exacerbating the problem, both in reclaimed and lower lands.

Proposals addressing contamination within and around the area combine adaptation and mitigation strategies, utilizing obsolete architectures, industrial sites and terrain vague as a body of intervention. Projects operate by phases, with 50-to-100-year spans, responding to de-contamination and re-generative agendas returning sites to their pre-industrial and pre-colonial- state. Deconstruction and/or adaptive reuse of redundant industries are combined with technology and nature to assist in de-contamination and habitat rehabilitation while re-establishing human and non-human interfaces with the natural environment and water bodies. Such urban and architectonic heritage and ecosystems, strongly connected with the community, are transformed into 'green productive industries' in a symbiotic relationship between nature, humans and the built environment.

Major contamination issues may be addressed in phases. Phase one prepares the conditions to accommodate climate change -sea level rise, water salinity, intense weather episodes and associated floods. In subsequent phases, decontamination continues while architectural and spatial conditions are created for new occupancy, allowing marine life and vegetation to inhabit intertidal zones. Afterwards, interventions in existing and proposed architectures facilitate human occupation and interaction. These offer new productive and recreational models to create community awareness, recognition and acceptance of climate change. Often, both the body of the architecture and its symbiosis with others -mangroves, oysters, sand- are conceived as sacrificial 'bodies' that are lost after completing their function. Rising sea levels will overwhelm sites, the architecture will be flooded, people will retreat or adapt, and the system -or part of it- will be left to nature.

Projects occupying lower and reclaimed lands are under imminent risk due to sea level rise and the effects of extreme storm events and stormwater run-off, threatening inhabitation and exposing residents, infrastructure and properties to extreme risk. Students working on such scenarios propose mitigation and adaptation measures to minimize impacts, manage retreat or accept loss. These strategies differ in scale and scope, from a network of micro-interventions and 'acupuncture' in the urban and built environment that mitigate the effects of sea

level rise and the impact of floods, to very speculative propositions where communities accept lost and self-organize to manage retreat allowing nature to reconquer sites (Figure 2-3).

Radical propositions envision a future floodable scenario, a city archipelago, where only certain infrastructures and architectures, strongly linked to communities, will be saved. A new landscape that blurs the thresholds between land and water constitutes a new beginning for humans and nature. Some of the proposals connected with loss acceptance develop models of cohabitation with other species. A dramatic 2050-2100 flooding scenario with human retreating provides

opportunities for other species to reconquer sites and other spaces to prosper. Interesting models of retreat emerge, combine with co-habitation, where humans are mere guests or instruments to 'operate' these new conditions.

Particularly challenging are projects working with coastal transformation processes including erosion, ocean storm intensification and associated inundation, overlap with changes in waves, wind and king tides regimes, all exacerbated by climate change and sea level rise. The coast is dotted with unique natural and man-made structures, from beaches, cliffs and coastal rainforest reserves to coastal infrastructure,

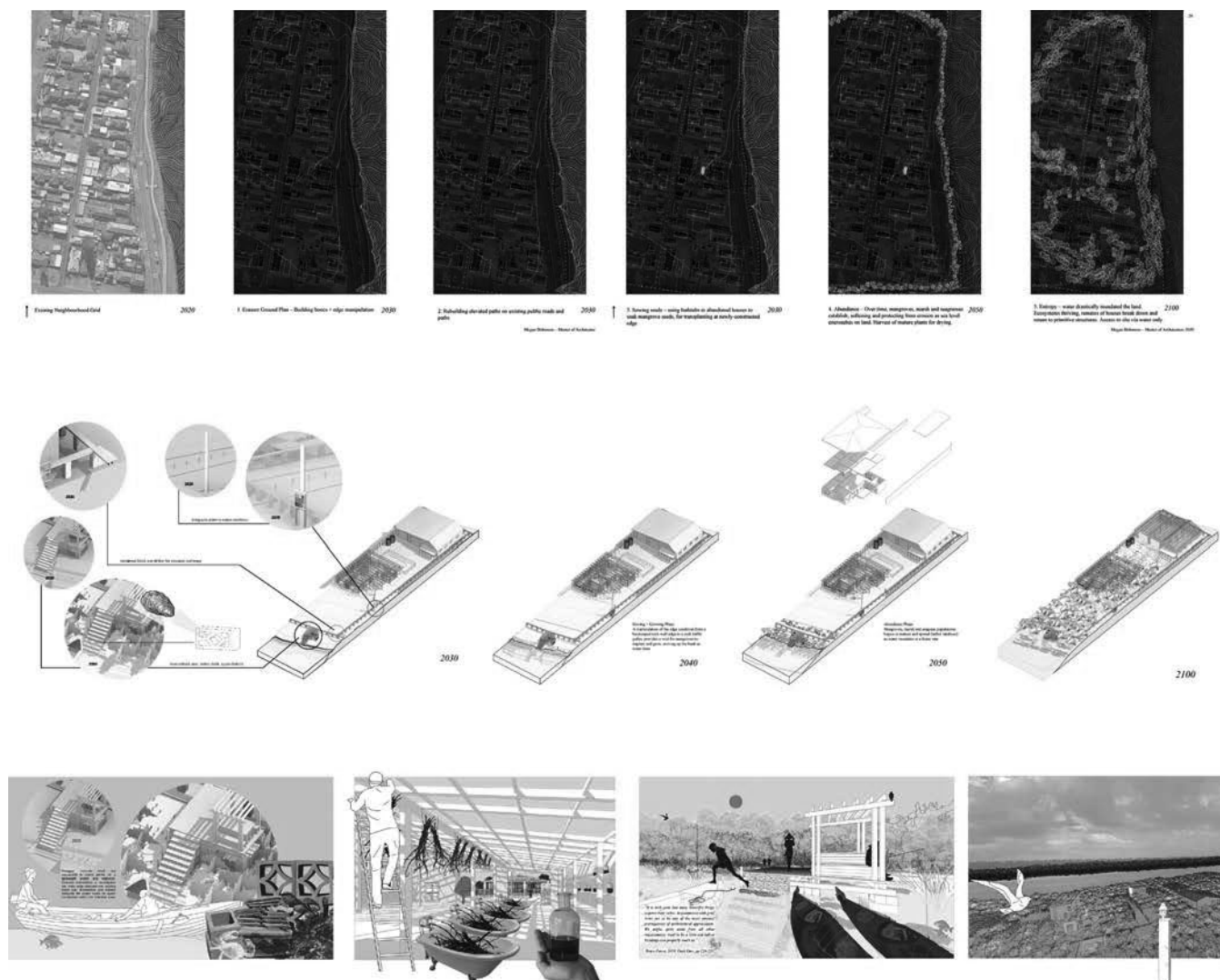


Figure 2-3. Medicine Gardens of Aquarius “explores the transformation of coastal settlements in Swansea (NSW) from human-centric suburban occupation, to an environment shared among more-than-human beings, as the line between the ‘nature’ and the built environment begins to blur. The project operates as an incubator for an adaptive response to this change, by combining ‘managed retreat’ and ‘living shoreline’ strategies, at the suburban-domestic scale. Humans have retreated from this place, found higher ground and returned to the site once called home to care for it - as a garden. The project, carefully and mindfully, erase, salvage and reappropriate domestic construction materials to transform a neighborhood from an Anthropocene graveyard into a thriving blue carbon habitat used to harvest plant medicines. The result is a tidal medicine garden.” Megan Dobison, Master of Architecture Final Compendium.

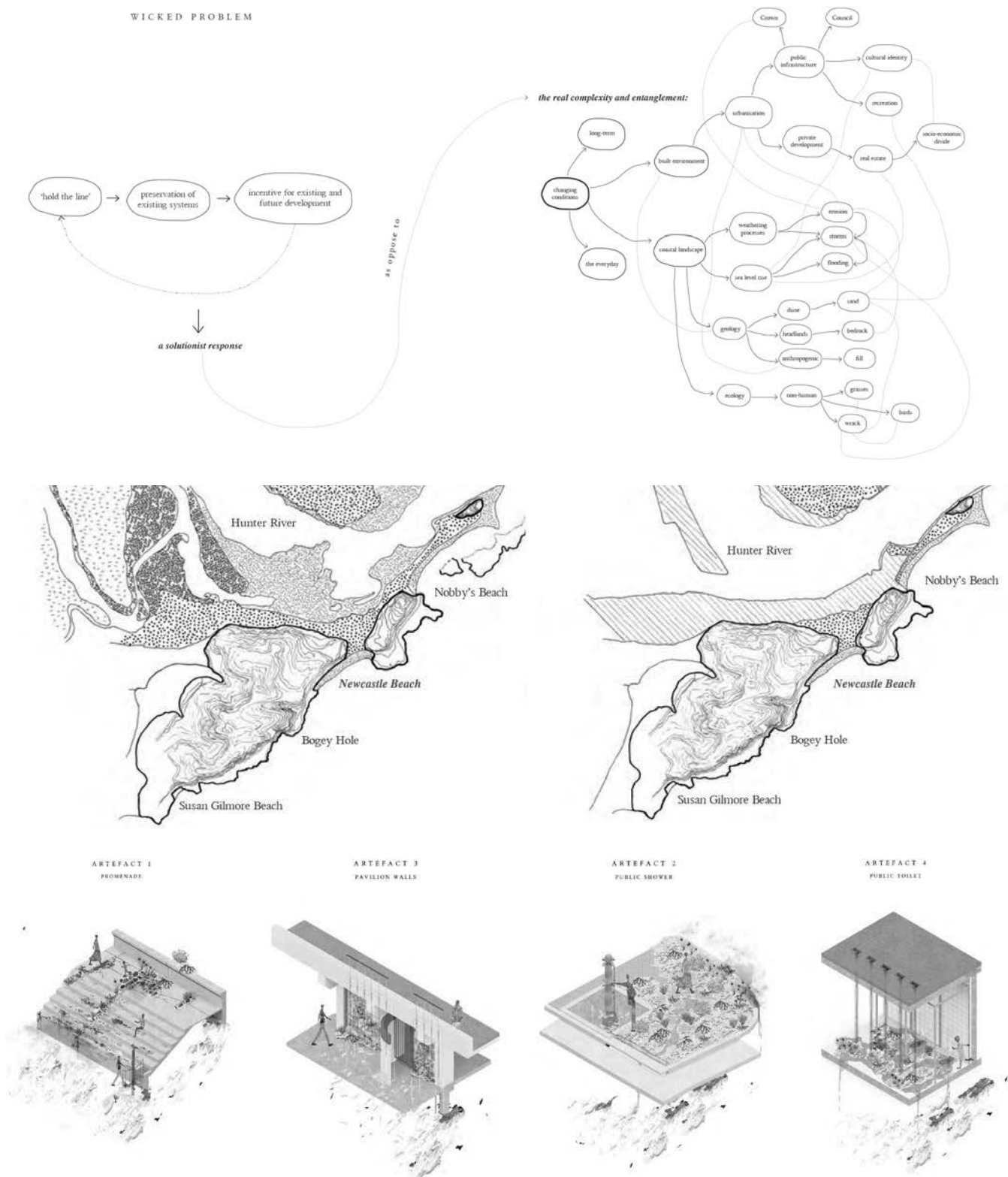


Figure 4-5. 'Blur the Line' "rethink the parameters of Newcastle/a beach environment and relieve the anthropogenic pressures from both seaward and landward directions, giving the beach room to breathe and exhale as a dynamic system. Utilizing existing phenomena of weathering and decay, the place continues to be transformed by moments of growth and decay, curated by acts of maintenance and repair that 'blur the line' between landscape and the built environment" Alex Grech's Master of Architecture Final Compendium.

architecture and public domains along the coastline. The problem is particularly complex: a landscape constantly evolving, strongly connected to communities' cultural identity and highly threatened.

Coastal Management plans tend to propose measures to hold the line and save real state, infrastructure and facilities. Private property and public investments are 'saved' while public domain and natural assets are 'sacrificed', although only the latest are effective in preventing further erosion and inundation. In contrast, students' proposals rarely hold the line through hard architectural and engineering measures unless risk severely impacts structures strongly connected to communities, such as public ocean baths and pools, surf clubs, coastal promenades and public domains. In such cases, proposals work with dynamic and mutable systems, re-negotiating a new symbiosis between the 'stable' coastal infrastructures and real state and the dynamic environment. Projects work across scales, from macro to micro; timeframes, from geological times to future predictions; and question how the built environment should interact with such complex and dynamic natural environments, evolving and mutating through time.

Three major action-led projects are proposed: No actions, accepting lost and limiting proposals to minimal interventions. Projects 'exhibit' the impact of climate on the built and non-built environment to future generations, as a form of climate change anti-monument; Limited interventions, where proposals accommodate changing circumstances whilst preserving, adapting and caring for public spaces, access to beaches and facilities strongly connected with communities (Figure 4-5), and; Adaptative retreat strategies, dismantling progressively private properties and hard edges that constrain natural cycles to occur. The role of architecture in this process is to orchestrate retreat and set the conditions for a new intertidal zone, providing alternative forms of occupation and cohabitation.

CONCLUSION

Responding to a prospective scenario for 2050-2100, students respond conceptually to dynamic systems adopting a methodological approach that facilitate the documentation and 'invention' of place, the construction of a narrative through time, the definition of a brief addressing a sustainable agenda, and the challenge of living, learning and designing with others. The representation and articulation of time and space, within a self-conducted brief, transforms time and space in design tools. The representation of complex and dynamic systems is a major communication and design challenge, addressed through an intense research agenda, a intensive mapping process, large format drawings and models that respond to the scale and level of technical resolution and competency required by Accreditation. Design responses move in between the territories of the possible, investigating policies and guidelines to challenge them, and the very speculative propositions, to destabilize the status quo and 'business as usual' models.

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ENDNOTES

1. Smout, Mark, Allen, Laura, and Spiller, Neil. *Augmented Landscapes*. (New York: Princeton Architectural Press, 1996. Accessed July 25, 2021), 55.
2. "It seems appropriate to assign the term 'Anthropocene' to the present, in many ways human-dominated, geological epoch, supplementing the Holocene — the warm period of the past 10–12 millennia" Paul J. Crutzen, "Geology of mankind". *Nature* 415, 23 (2002). <https://doi-org.ezproxy.newcastle.edu.au/10.1038/415023a>
3. "Unless there is a global catastrophe [...] mankind will remain a major environmental force for many millennia. A daunting task lies ahead for scientists and engineers to guide society towards environmentally sustainable management during the era of the Anthropocene. This will require appropriate human behavior at all scales, and may well involve internationally accepted, large-scale geo-engineering projects, for instance to 'optimize' climate. At this stage, however, we are still largely treading on *terra incognita*", Crutzen, *Geology of mankind*, 23.
4. Tay Keong Tan, et al (Eds). *Struggles and Successes in the Pursuit of Sustainable Development*, 1st ed. (Routledge, 2020), <https://doi.org/10.4324/9781351140560>, accessed 25 July, 2021.
5. Andri Snaer Magnason, 1973 and Lytton Smith 1982. *On Time and Water*. (London: Serpent's Tail, 2020), 300.
6. Perez Lopez, Irene. "New Perspectives for Design in The Urbanized Delta: Living with Water in Newcastle's Threshold Between Land and Water". *IOP Proceedings on the Earth and Environmental Science Journal* 588, 1.15-1.19 (2020).
7. Paul J. Crutzen, *Geology of mankind*, 23.
8. "Climate change is beset with deep-seated uncertainties on top of deep-seated uncertainties on top of still more deep-seated uncertainties". Gernot Wagner and Martin L. Weitzman, *Climate Shock: The Economic Consequences of a Hotter Planet*. (Princeton, New Jersey: Princeton University Press, 2015), 74-75.
9. James Corner, "The Agency of Mapping: Speculation, Critique and Invention", 92-94, In Martin Dodge, R. Kitchin and C. Perkins, eds. *The Map Reader: Theories of Mapping Practice and Cartographic Representation*. (John Wiley & Sons, 2011) <https://doi.org/10.1002/9780470979587.ch12>.
10. First Aboriginal Australians Nation, refer to land as Country: "The land is the mother and we are of the land; we do not own the land rather the land owns us. The land is our food, our culture, our spirit and our identity." Dennis Foley, accessed August 5, 2021, <https://www.creativespirits.info/aboriginalculture/land/meaning-of-land-to-aboriginal-people>.
11. "Kinship moves in cycles, the land moves in season cycles, the sky moves in stellar cycles and time is so bound upon those things that it is not even a separate concept from space. We experience time in a very different way from people immersed in flat schedules and story-less surfaces. In our spheres of existence, time does not go in a straight-line, and it is as tangible as the ground we stand on". Tyson Yunkaporta. *Sand Talk: How Indigenous Thinking Can Save the World*. (Melbourne, Victoria: The Text Publishing Company, 2019), 44-45.
12. "There are no start and finish but a constant state where past, present and future are all one thing, one time, one place. Every breathe ever taken is still in the air to breathe [...] Always was, always is, always will be". Tyson Yunkaporta, *Sand Talk*, 44-45.
13. "Pre-industrial cultures have worked within self-organizing systems for thousands of years to predict water pattern, seasonal activity and the dynamics of social groups, then manage responses to these complexities in non-intrusive ways that maintain systemic balance [...] Systems are heterarchical -composed

of equal parts interacting together. Imposing a hierarchical model of top-down control can only destroy the indigenous models of governance based on respect for social, ecological and knowledge systems and all their component or members [...] Complex kinship structures reflect the dynamic design of natural systems through totemic relationships with plants and animals. Totems can also include other elements of these systems like wind, lightning, body parts and substances. The whole is intelligence, and each part carries the inherent intelligence of the entire system. Knowledge is therefore a living thing that is patterned within every person and being and object and phenomenon within creation", Tyson Yunkaportas, *Sand Talk*, 94-95.

14. "Let's do some maths [...] When is someone you will love still going to be alive? [...] Can you imagine that? The person you'll love most in all the world will still be alive in 2260! Imagine your time. I was born in 2008 and you'll know a person who'll still be alive in 2260. That's the length of time you connect, more than 250 years. The time you can touch with your own hands". Andri Snær Magnason, *On Time and Water*, 308-309.
15. The mapping time frame starts with geological maps looking forward to a prospective scenario for 2100, including sea level rise predictions, king tides, PMF flood and flash events, and tsunami.
16. "For the landscape architect and urban planner, maps are sites for the imaging and projecting of alternative worlds. [...] The map 'gathers' and 'shows' things presently (and always) invisible, things which may appear incongruous or untimely, but which may also harbor enormous potential for the unfolding of alternative events. In this regard, maps have very little to do with representation as depiction. Mapping is neither secondary nor representational but doubly operative: digging, finding and exposing on the one hand, and relating, connecting and structuring on the other. Through visual disclosure, mapping both sets up and puts into effect complex sets of relationship that remain to be more fully actualized. James Corner, *The Agency of Mapping*, 98.