Transforming the Design Studio Through an Engagement with Melbourne's Hydropshere

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How does a deliberate engagement with a hydrosphere injured by climate change impact the development of new curricula for the design studio? Given the anticipation of major destabilizations to our hydrological cycles, it is vital to question whether the conventions of design practice as well as teaching still hold water? As the development of established disciplinary and practice standards in architecture have been informed by the presumption of a stabilized Holocene, when formulating new design courses, could the design fields acclimatize to a new set of contexts and practices?

This paper will elaborate on this by reflecting on an ongoing series of design studios that we have initiated and directed within architecture as well as urban design programs in Melbourne, Australia that focus on cultivating design practices that respond to climate challenges associated with the hydrosphere. These threats are defined by oscillations between two extremes; its acute overabundance and an austere scarcity. Climate change is anticipated to bring an increased frequency and severity of flood events to the city's neighborhoods while extended droughts will threaten the capacity for water as a resource to sustain Melbourne's existing ecologies and projected populations.[1]

The possibility of wild swings between tempestuous weather and protracted droughts challenges the idea of place. Notions of the enduring sense of place, which has figured heavily in design education and discourse, are questionable when designers face an environment defined by dramatic instability. In lieu of site and place, these design studios are contextualized within wider dynamic urban and ecological systems. The studio context or site benefits from its reconceptualization as an ecosystem wrought from mutable associations of energy, population and material flows.

Emphases placed on scale specificity is also probed in the studio, whereby an immersion within the hydrosphere obliges an engagement with multitudes of local and inter-regional scales, spanning between tangible locations in the city to global structures. The Melbourne studios adopt hydrological cycles across this wide spectrum of scales and its embeddedness within food, waste and energy systems as the specific contexts of their speculative interventions.

As the conceptualization of site shifts, the studio brief is also transformed. Rather than standard programmatic briefs, design strategies emerge from a dedicated investigation of the context systems and metabolisms. Consideration of how design may augment the hydrosphere precedes any concrete definition of the nature of the proposal itself. Our studio curriculum is defined by conjectural sensibilities and lyrical dialogues with instability. This obliges us to cast a critical eye over the traditional outcomes of the design studio and to elaborate on design proposals that also overturn disciplinary stability by bridging to other fields. Design migrates from the exclusive material definition of proposals to the search for adaptable and mutable interventions capable of assuming multiple conditions, behaviors and associations. This submission aims to elucidate on the transformation of the design studio curriculum through these Melbourne-based studios provoked by the urgency for design action within the hydrosphere.

BACKGROUND

Since 2017, we have actively undertaken the construction and delivery of courses at the Melbourne School of Design's Masters of Architecture and Masters of Urban Design programs.

Two principal guiding mandates shaped the courses.

a) To establish and refine a series of studio courses which actively integrate climate change concerns as the core concern.

b) To structure these courses as a vehicle for design research with the potential for producing new knowledge and practices that address the climate challenges anticipated for the city's hydrosphere.

These larger ambitions have been tested in eight design studios conducted in advanced option and thesis studios. Also underpinning these studios was a larger ambition to contribute towards the cultivation of new models of graduate design education, where students will be equipped with the critical

and operational tools that enable them to better address climate challenges as future professionals. The possibility of identifying design strategies and wider practices within the "testing-ground" of the design studio was also a tacit ambition.

The development of these curricula have been informed by two main factors:

Firstly, it is tied to our own history as design educators, where we have been part of teams which have worked to deliver new interdisciplinary design curricula with explicitly ecological and environmental concerns. This includes our participation as design studio instructors in the Architectural Association Graduate Design Landscape Urbanism program (between 2004 and 2007), studio directors in the advanced option studio streams in the Masters of Architecture at Cornell University (between 2007 and 2010) and through our teaching and co-coordination of the Harvard GSD core landscape architecture 4 studio (between 2010 and 2017).

To articulate the background of this paper, it would also be important to acknowledge the design research which influenced these earlier curricula. In all cases, there is a recognizable influence of landscape architecture research which were informed by an engagement with the ecological sciences as well as digital cartography of the 1960's and 70's at the University of Pennsylvania and Harvard GSD. The research of the Harvard Laboratory for Computer Graphics and Spatial Analysis[2] together with the ecological planning explorations led by Ian McHarg at UPenn[3] are clear progenitors of a mode of research and subsequently: teaching. The courses we taught at Harvard and the Architectural Association combined the capacities offered by computation for describing ecological concerns with a creative practice approach. Design is preceded by an extensive period of analysis through mapping and diagramming the ecological patterns of the site.

The Landscape Urbanism program at the Architectural Association was also influenced by a wider interdisciplinary momentum. Many units and graduate programs at the school were invested in locating opportunities for extending the organizational range and performance of architecture by engaging with landscape and infrastructural forms and concepts. A parallel interest in the development of different forms of diagrammatic design processes, included the "machinic" process explored within the program.[4]

At the GSD, the influence of landscape urbanism was explicit. A diagrammatic and cartographic process informed the pedagogy, within an ecological frame of reference. In 2012, the impact of Hurricane Sandy sharpened the focus of the course on issues of resilience and engaging with climate change.

The success of these earlier endeavors motivated us to extend this at Melbourne. The Architectural Association's Landscape Urbanism program and the Harvard GSD's Landscape Architecture 4 core studio have been subjects of research in interdisciplinary teaching programs focused on a landscape and ecologically-led model for urbanism.[5]

At the University of Melbourne, specific Australian legacies and cultural histories offered other influences as well as providing instructive models of creative practice. Secondly, Melbourne's hydrosphere and its imbricated relationship with the city's urbanization provides an enriched setting for these pedagogical efforts.

Melbourne's intertwined first nations, colonial settler and migrant histories offer a number of nuanced lessons about engaging with the environment. Australia's indigenous cultural memory extends back tens of thousands of years. Their cultural memory of the city site recalls a highly dynamic relationship with water.[6] This is compounded by the man-made massive transformations which came with European colonization and the industrialization of the waterways.

The city's European urbanization in the nineteenth century resulted in parks and gardens becoming the preeminent public spaces in lieu of the traditional squares of older European cities. This association with the garden was matched by the suburban subdivision being assumed as the dominant template for the city.

Notable design precedents from history have a strong association with the garden suburb as the site of exploration. Walter Burley Griffin and Marion Mahoney, migrants from America, would bring with them a landscape infused architectural and planning sensibility informed by their associations with Lloyd Wright. Their prize winning and partially built design for the nation's capital: Canberra integrated landscape as the dominant medium in the city's organization. Glenard Estate, Eaglemont and Castlecraig were garden suburbs planned by the couple in Melbourne and Sydney. These were planned to follow topography, while providing large landscape reserves and fenceless subdivisions to allow for common gardens.[7]

These local exemplars of land stewardship and design offer a series of local references of practices for the construction of the studios. Through these references, the studios gained local references of temporal and environmental emphasis in the shaping of the built environment.

The specific Australian and more specifically: Melburnian context has also helped to ground the courses. The early colonial settler history can be characterized as narrative of hardship associated with the unfamiliarity and harshness of the natural landscape. This characterization of the Australian wilderness as a treacherous place still permeates the public imagination with major environmental and resource challenges being major matters of concern.

Today and projected into the future, Melbourne's littoral zone is now registering an impending transformation with projections for significant impacts as a consequence of climate change induced sea-level rise as well as an increased severity and regularity of storm-events. The bushfires of 2020 and the millennium drought also place the water as a resource challenges as a major priority.

Culturally, the coastal zone was also framed by the Common Law understanding of this zone as a Crown Land .[8] For first-nations communities, the shore also holds an important cultural significance. In Melbourne, the association of the coast with public life reverberates with the wider national sentiment, where many of the country's most celebrated public spaces are public beaches. This cultural significance afforded to the coast also helped to inform the framing of the studio. With rising sea levels, the tensions between private property and crown land will also make this zone a contested space.

METHODS

When structuring these design studios, we established three main principles which informs the methodologies and strategies adopted in the courses.

a) Interdisciplinary – Architecture, Urban Design & Landscape Architecture

b) Reconsideration of site as a larger ecosystem

c) No brief (no program) – studios conducted as design research (thesis).

Based on our previous experiences, there was an appreciation of the benefit in assuming an interdisciplinary approach, adopting techniques and strategies from architecture, urban design and landscape architecture amongst others.

In these studios, the process of addressing climate change-related water risks began with identifying the specific areas of design intervention. This was also structured by a multi-scalar description of the concerns and context, whereby the issues of climate and Melbourne's hydrosphere permeate across a range of scales, from the specific scale of the architectural site, the city, the region, national up through to larger global considerations. Building a capacity to traverse and negotiate these scales of consideration calls upon skills and conceptual frameworks which go beyond the conventions of architectural practice and benefit from an engagement with planning, urban design, landscape and ecological knowledge and know-how.

Extending our earlier experiences in defining interdisciplinary design studio curricula, the studios at the MSD enriched a pre-existing base knowledge by extending the conventional concepts and tropes associated with architecture's understandings of site as well as reconsidering the design studio brief and scope.

At the MSD, engaging the eInfrastructure of advanced analytics, simulation modelling and visualization platforms for eResearch" through AURIN (the Australian Urban Research Infrastructure Network) afforded us the capacity to extend an engagement with analytical tools in the studio. Each studio began with an extensive period of research to allow students to locate the specific sites, programs and concerns identified during the investigative phase. This phase lasts up to six weeks, approximating a process closer to constructing a thesis. This allowed students to study issues and operate at scales more common to planning and ecology while also exposing them to larger systems and processes (such as weather patterns, hydrology, water management, food and energy production.).

This also places an emphasis on developing design approaches which account for a range of scenarios as well as variables that may also change over time. Temporality and change have been prevalent as considerations guiding practice and concepts in these disciplines. Seasonal and diurnal change together with ecological succession have helped these fields to emphasize a culture and practice that promotes an understanding of cultivating the built environment as one of stewardship and management. It has also placed an emphasis on design strategies which may adopt transformation or evolution as major operational constraints.[9]

The specific context of Melbourne's hydrosphere offered an immediately recognizable series of themes which helped to reframe the notions of context and site typical of architectural discourse. The notion of the site as being subject to change and transformation is inherent in a hydrosphere. By adopting an ecological understanding of the site where different urban metabolisms, such as food, energy and waste cycles were embedded into the reading of the city as an ecosystem, site was recast as a wider ecology where multiple systems coexist, operating at varying temporalities. This involved an understanding of the site as being supported by exchanges of matter, energy, populations and resources. The focus of these studios involved the students reframing the site or context through a variety of lenses, moving the discussion away from site as an ideal, authentic or static place.

This also reframed these sites as dynamic systems subject to transformation. Students would be challenged with a conception of site as being one sustained by a range of processes with the potential for shifts and changes. An evaluation of their designs would be contingent on a capacity to operate within a range of possible states or conditions.

In these studios an engagement with site also involved focus at a range of scales. From the larger regional scale, seeing the bay together with the riverine network as a larger system and

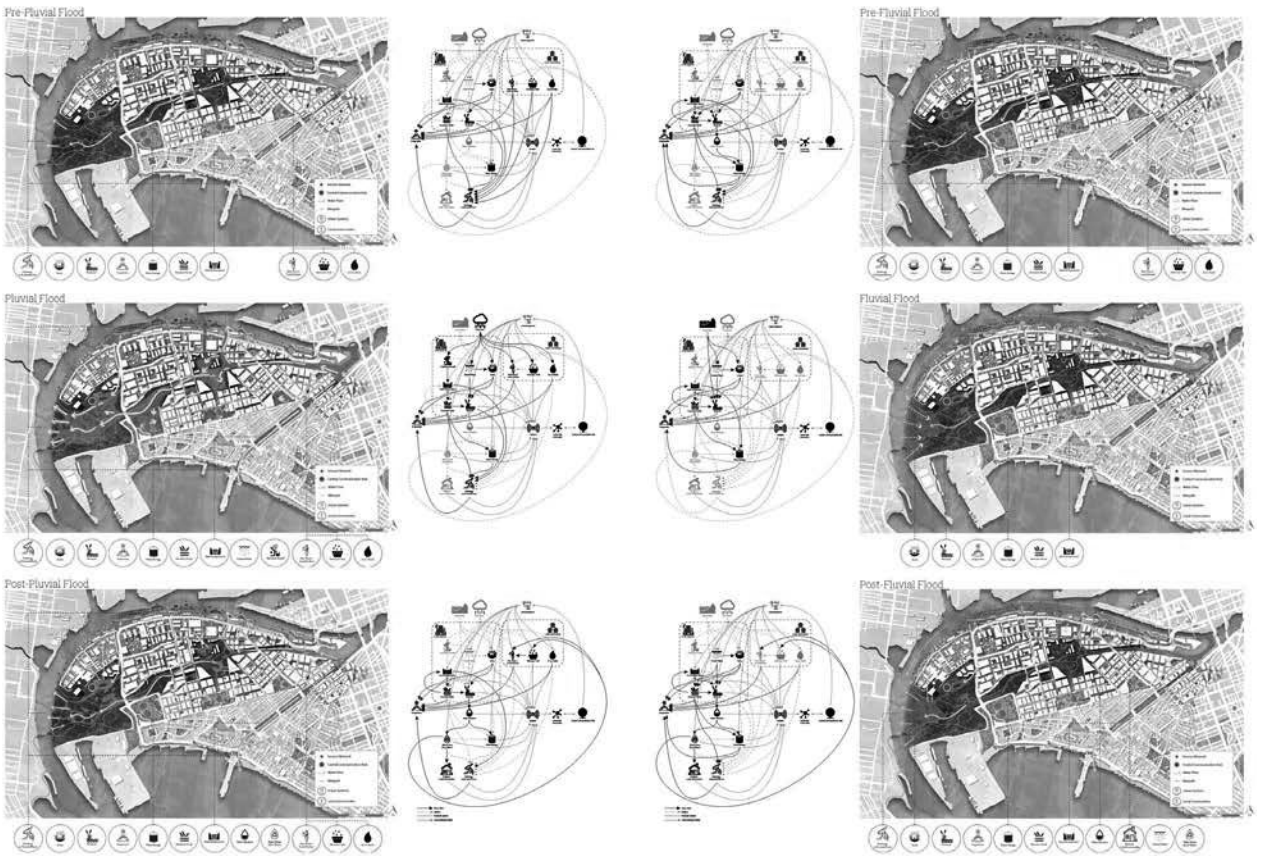

Figure 1. Proposed networked hydrological infrastructure scenarios. Laure Acosta Carillo, Kayla Dunn, Sam Shaw & Martin Trivieri, MSD 2020.

constellation, to a focused study of specific areas within this larger ecosystem. These studios engaged with retrofitting established neighborhoods already vulnerable to inundation, a reorganization of agricultural land along regenerative practices through to planning major inner-city postindustrial sites within flood plains pegged for massive development in the future.

The studios also adopted a less prescriptive brief whereby site and program were not articulated. The general site was set as Melbourne's wider hydrosphere, allowing students to identify their own sites of intervention. Programs were also not prescribed, to allow students to identify the crucial services, amenities and infrastructures which would be needed for Melbourne's future under climate change.

The larger focus on the hydrosphere also afforded students the ability to address a range of topics, where the risks and threats posed by water in its overabundance framed explorations into fluvial, pluvial and coastal flooding. On the flipside, the threats to water as a resource to sustain urbanization was an equally compelling sphere of study where students elaborated on new practices and infrastructures which could help to address the challenges posed by the risk of more frequent and severe droughts compounded with projected population growth. The flexibility of the brief, modelled on a thesis-like didactic framework was supportive of establishing the design studio as a site for design exploration and research.

At an operational level, the studios supported students in developing design capacities which were informed by the identified opportunities presented by our earlier experiences with machinic or associative approaches in the definition of form and organization. These approaches help to place an emphasis on the design of material forms and organizations as mutable or transformable entities. Conceptually it does not prioritize a fixed arrangement nor a constant steady state but lends itself to seeing designed elements as being an instantiation within a larger array of possible variations.

When applied to the design considerations of the studios, this offered a design tool which allow for the representation of material configurations as having the capacity for differentiating in degrees, approximating the notion of design elements with latent capacities for incremental transformation or renovation. It lends itself to iterative design processes tested against a range of scenarios.

RESULTS AND REFLECTIONS

The studios have been offered consistently between 2017 and 2021, with ongoing plans to remain as offerings for the

Figure 2. Elwood Water Corridor . Victor Alegria, Yang Bai & Lingas Tran, MSD 2019.

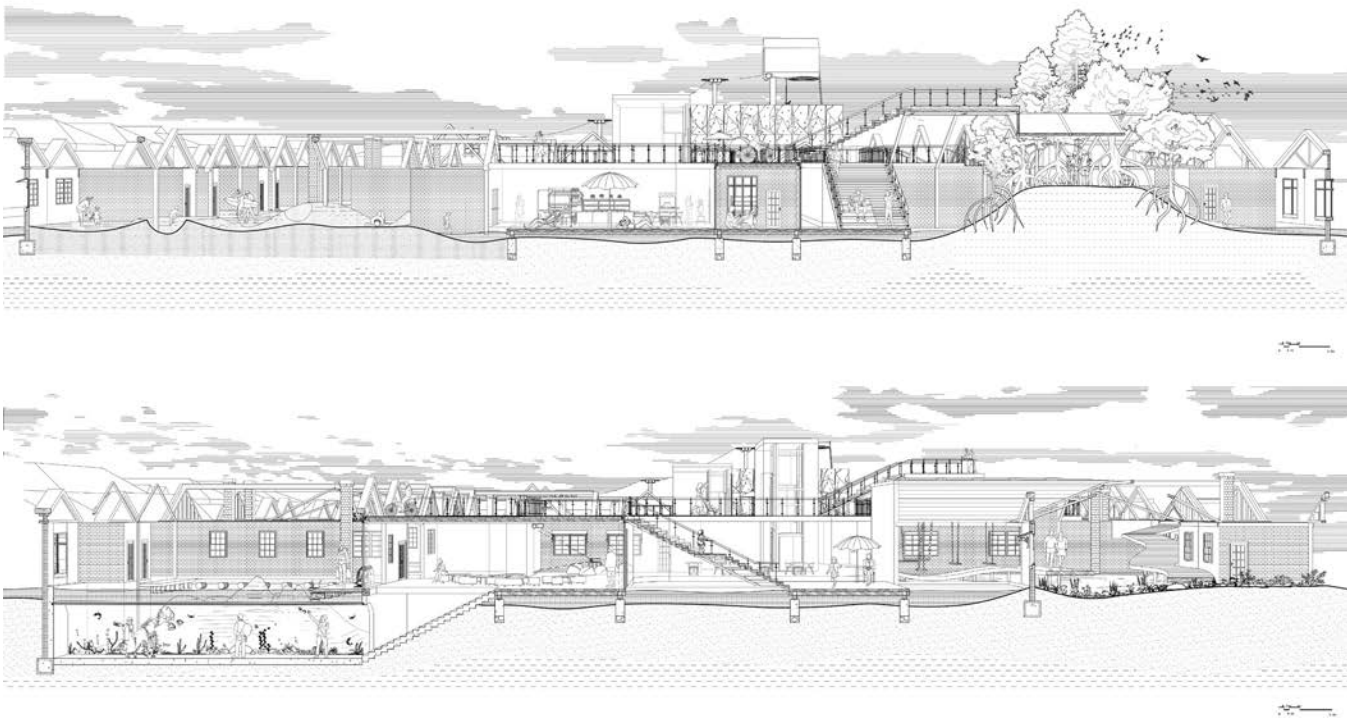

Figure 3. Coastal ecologies garden reclaimed from future coastal ruins. Jie Hu, MSD 2019

Masters of Architecture and Urban Design curricula. Over this time, the studio emphasis has been able to grow and evolve. The scope of the work was initially bounded by a focus on the coastline and flooding vulnerability in specific neighborhoods of the city. This afforded us the ability to build up the knowledge base of the course while also getting acquainted with the Melburnian context.

Over the last couple of years, this has opened up towards a wider field of interest, acknowledging that an engagement with the city's hydrosphere is not limited to flooding risks nor was effective action limited to the coastal zone. A willingness to address the water impacts of wider economic and societal practices which sustain urban life allowed students to venture into other imbricated urbanization processes. This extended into projects focused on intervening in food and energy production as well as land and waste management, with a wider view towards water as a scarce or dwindling resource.

The evolution of the studios over these five years has enabled the creation of a wide spectrum of projects many focusing on establishing novel public spaces to retain the littoral zone as a public site, ranging from lyrical projects which reclaim the ruins of sea-level rise as a garden of coastal ecosystems, the reorganization of desalination plants into novel public realms through to a proposal for cultivating a constellation of coastal parks and gardens designed to absorb inundation along the coast of the Port Philip Bay.

Since early 2020, we have conducted a number of these hydrosphere-related studios as the representative for the University of Melbourne's participation in the global Arc-DR3 research initiative. Within these more recent studios, two projects offer a view of the spectrum of the course outcomes.

The project developed by students: Laura Castillo Acosta, Kayla Dunn, Martin Trivieri and Sam Shaw focus on proposing an alternative planning framework for the Fisherman's Bend development close to Melbourne's CBD. This large redevelopment project is planned for a new working population of 80,000 and an equal residential population, significantly transforming this post-industrial site. The complications in planning this development stems from this legacy where the site has pockets of contaminated land and is located in a floodplain.

Their proposal involved strategies and material designs operating at a range of scales. For the larger site, the team proposed an intricate network of canals, constructed wetlands, holding basins, rain gardens and bioswales embedded in the urban fabric. Together with a bold proposal to partially bury the Westgate freeway bisecting the site and constructing a large linear park and coastal berms, this network would be interlinked within an "internet of things" system, leveraging connected sensors and sluice gates. This was proposed to allow for a system that could be programmed to respond differently to a range of scenarios. The planned intricacy and redundancy of different waterways to hold different flooding

Figure 4. Bay Soak Garden. Yixuan Cao, Fengqiao Li, Jicheng Dong, Siyu Chen, MSD 2017

regimes according to diverse patterns of activation highlighted the team's acknowledgement of the varying pressures associated with the fluvial, pluvial and coastal flooding that affects the site. This strategy was also most pertinent for the fact that the vast majority of Fisherman's Bend is defined by large privately owned industrial parcels.

At the architectural and urban design scale, specific material configurations for new development types were also explored, with floodable courtyards and podium levels multiplying the ground. This also extended to a reconsideration of other urban types including streets, squares, sports fields and a rewilding of the shoreline.

Another project: Regenerative Hydroscapes by Yutong Jin, Venus Lee, Haoxin Shi and Claudia Siric focuses on a reconsideration of agricultural practices that is incorporated with water banking processes. This proposal adopts regenerative agricultural processes and deploys a system of leaky weirs in relationship to the topography and property boundaries of the site. A networked weir organization also embeds UTFI (Underground taming of floods for irrigation) to help with the recharge of the aquifer while also helping to mitigate the risks associated with this flood prone area.

The overall system establishes a relationship between the water banking process, flood mitigation and irrigation. It is anticipated that this will also allow for maintaining soil quality on site with water being drawn from the aquifer in times of prolonged drought and a system for evacuating flood waters in severe weather events.

The agricultural fields are also configured to minimize erosion and ensure consistent irrigation. Regenerative practices such as the absence of tiling, crop as well as livestock diversification and rotation were also outlined to offer a practice which greatly reduces the carbon outputs of conventional farming.

At a smaller scale, the team also defined an anaerobic digester plant on the current landfill to harvest agricultural waste for energy production and outputs used to manage a new constructed woodland. The architectural definition of the plant and landforming of the site offer a smaller instantiation of the processes enabled by the larger reorganization of agricultural land. Along with recreational and short stay accommodation leveraging adjacency to wetland and weirs, this provides the public with a didactic landscape showcasing closed loop processes which dramatically reduce its impact on water resources and carbon production.

Taken together, these projects outline the wide area of exploration facilitated by the studio structure while also highlighting the importance of revisiting the conventions of design practice so that it may benefit from an interdisciplinary position, reconsider how we may design for dynamic sites while also acknowledging the wide spread of issues which are closely entangled with the hydrosphere.

FINDINGS AND CONCLUSIONS

When evaluating the impact of these courses, we have outlined a number of measures that we propose as areas for consideration and indicators of some early successes.

a) Student evaluations

The student evaluation surveys conducted at the end of each studio have consistently returned a positive reaction and feedback from those who completed the courses. There was a high level of engagement and appreciation of the course structure and emphasis.

b) Embedded in larger global research initiatives

After the initial successes of the earlier studios, we were invited by leadership at the MSD to lead the University of Melbourne studios for the Arc-DR3 research initiative[10]. This offered us the opportunity to develop these studios within a larger international research initiative and also provided us with the ability to engage and compare the curricula and outcomes of the studios with peers from other universities from the APRU (Association of Pacific Rim Universities).

c) Wider engagement -industry, governance, research

The courses have also been deliberate in engaging stakeholders from industry, governance and research as guest lecturers and reviewers. This has allowed for the course to establish a link with these fields and has also allowed us to field what has largely been very positive feedback from them.

d) Publication: professional and academic journal

The outcomes of the studio have been published and exhibited in scholarly as well as professional journals and exhibitions with plans for their inclusion in major forthcoming shows and books.

e) Longer commitment to embed courses in programs

As a consequence of the positive reception of the course outcomes, there is a commitment for an ongoing offering of these courses at the MSD.

f) Future – Impact on profession & discipline

A more distant measure for the success of the studios could be conducted by tracking the wider impact on the profession and discipline when graduates from these courses move into profesional and academic careers. This would require a long term commitment and unfortunately, there are no current plans for systematically pursuing this.

In conclusion, this paper reflects how an engagement with the hydrosphere to inform the way in which a series of studios may be framed and structured has affected the methods adopted and the outcomes produced. As is outlined above, this has had a considerable influence over the way that these studios have been conducted, offering a limited insight into how a pedagogy invested in climate action may transform the conventions of the design studio.

ENDNOTES

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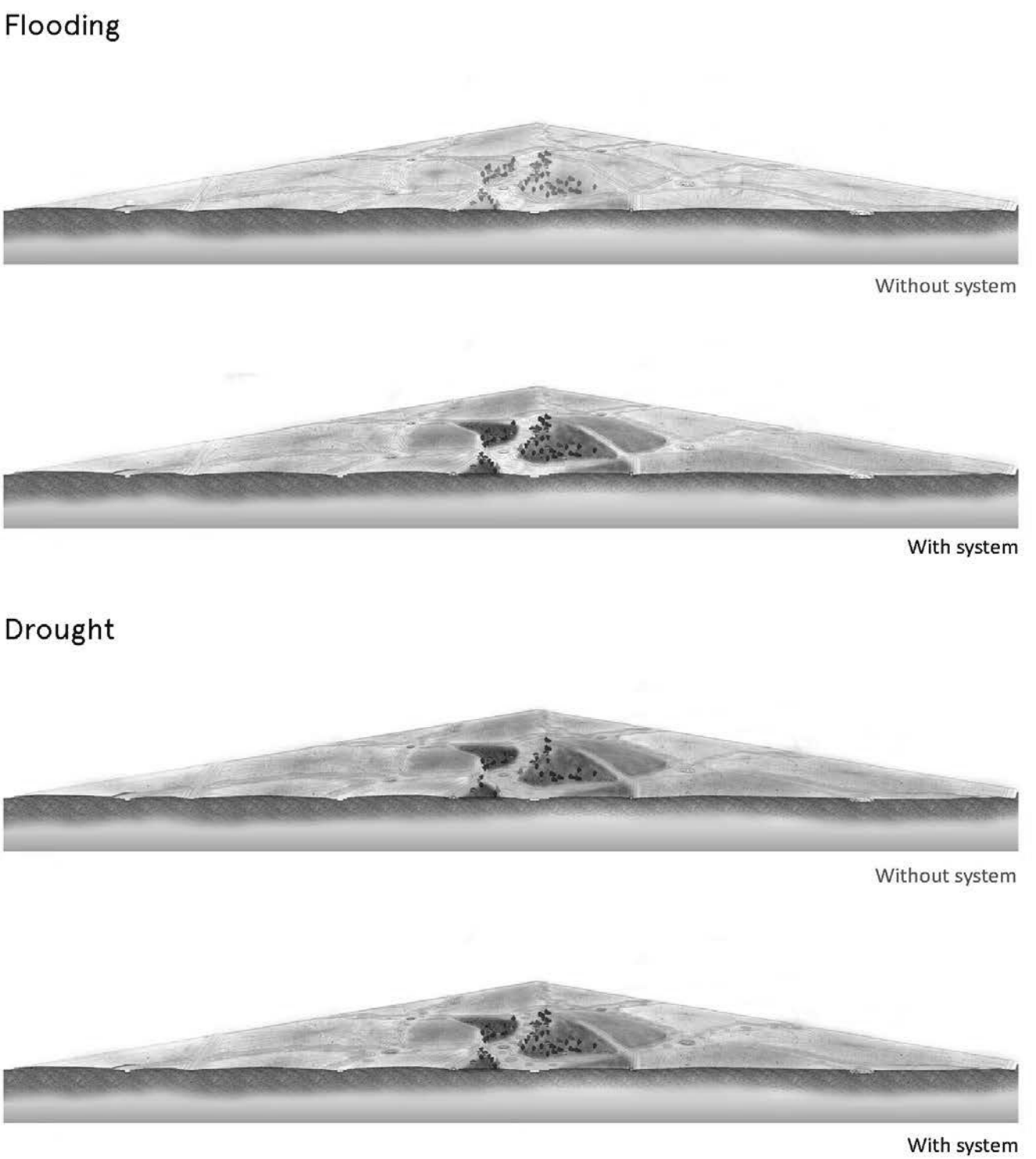

Figure 5. Regenerative Hydroscape - scenarios. Yutong Jin, Chuen Fan Lee, Haoxin Shi, Claudia Siric, MSD 2021