More-Than-Human Future Cities: From the design of nature to designing for and through nature.

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ABSTRACT

This paper examines ways in which media architecture and information design can contribute to multispecies wellbeing and coexistence in urban and peri-urban environments. It argues that a radical shift is needed, from looking at design as a tool to plan tamed nature into urban fabric towards design actions for understanding and working with the unruliness of the natural world in its manifold forms. We present a review of existing literature and an analysis of a selection of projects-in-progress from the CUBIC research group at Lancaster University, UK. In doing so, we aim to propose a new approach for how we think of, and design for, more-than-human future cities. Media architecture is core to this endeavour because we need to find new ways to communicate these new knowledges and contribute toward a better understanding of the complex issues of multispecies coexistence and flourishing. Far from providing an established framework or guidelines, we share this provocation from the outset as a catalyst for emerging collaboration and through which further open-ended questions can be explored.

CCS CONCEPTS

• **Contribution Statement: This paper calls for the need for designers to prioritise intentional processes of direct engagement with place, to understand its rhythms, complexities, and multi-species interactions**;

KEYWORDS

more-than-human places, darkness, tides, cartography, visualization processes, design actions

1 INTRODUCTION

Cities are essentially anthropocentric entities (see for example [1]). It is perhaps for this reason that we tend to think of nature in cities as a set of services and infrastructures. The term 'ecosystem services' in particular has been widely adopted by researchers and policy-makers in the last 15 years to convey "the benefits provided by natural ecosystems that contribute to making human life both possible and worth living" [2]. To describe the natural capital of cities as ecosystem services and human wellbeing that the definition of ecosystem services implies [3]. However, such a description is premised on a human-centred perspective for the way cities are conceived, designed, delivered and maintained. By contrast, we aim to explore the potential for ecology-centred, approaches that seek to provide an account of architecture and landscapes as 'mediated matter' that supports the coexistence of multiple species. For the purpose of our inquiry, we define 'mediated matter' as the result of entanglements between anthropogenic and more-than-human processes, systems, rhythms, and activities. Within these entanglements, there is a continuous sharing of resources, which puts into question traditional disciplines and calls for novel forms of design that are centred on engaging with these complex ecologies, as recently captured by Tsing et al. in their Feral Atlas [4].

The view of urban natural capital that is limited to parks and open spaces runs the risk of overlooking important patches of biodiversity that escape the logic of planning and system modelling [5]. This is the type of nature that cannot be planned or controlled (from

microscopic fungi to large-scale geological phenomena); while it might not serve any direct benefit to humans, it is essential for the health of the whole ecosystem, as it provides vital links that ensure those interactions between species that are essential for ecological processes [6], [7]. Despite their anthropocentric definition, cities exist as entanglements of the artificial with unruly, unplanned nature in place. They are not isolated, bounded, self-sufficient entities, but exist in the context of their bioregion, which is defined not only by geographical boundaries but also by their ecological identity. Thackara [8] identifies the bioregion as a crucial concept to reconnect cities to the broader meaning of place: "its geographic, climatic, hydrological, and ecological qualities—its metabolism—can be the basis for meaning and identity because they are unique."

At the 2018 Media Architecture Biennale, Froth and Cadwell called for a better understanding of the impact of media displays on non-human species, while also advocating for a broadening of the Media Architecture discourse to support more-than-human entanglements [9]. In this paper, we expand on Froth and Caldwell's insights to argue that media architecture can be employed to unveil and understand the complexity of more-than-human nature and its interactions in cities, as a complementary and preliminary step to planning and decision-making activities. From a methodological point of view, we believe that in order to do so, it is necessary to spend time in place and experience its rhythms and atmosphere, so that design processes can begin with the careful noticing of nature's entanglements [10], rather than by working only with measured quantities and data points that can be further mediated. In doing so it would enable more-than-human cities that could be capable of tackling significant challenges facing the 21st century by integrating cities with all their stakeholders and beyond, including material-cycles (carbon cycles), microorganisms, flora, and fauna.

We propose that media architecture can be extended to unveil and understand the complexity of cities by reflecting on the processes and outcomes from three of our own research projects, all of which engage with more-than-human interactions within cities through mapping and documenting processes. It is important to acknowledge that these three projects are at different stages of development: the first one is complete, the second one is underway, and the third one is at the very beginning. We deliberately chose to share these inner workings of our CUBIC research group as an attempt to reflect the open and exploratory ethos that underpins our approach.

2 VISUALISING MORE-THAN-HUMAN PLACES: THREE DESIGN PROJECTS

CUBIC is a newly established research group within Imagination-Lancaster, the design and architecture research lab at Lancaster University, UK. As a group, we undertake design research to address the complex challenges of urban futures using speculative methods and prototyping. We develop and employ various visualisation processes and fieldwork practices. A key theme in our research and practice is to question the anthropocentric view of urban futures. As we consolidate our research purpose, objectives, and practice, we are developing an approach for engaging with more-than-human cities through exploratory design actions, which

will be presented, shared, and consolidated at MAB20. This approach draws from the learning outcomes from three main projects, overviews of which will be presented in this paper: Tracing Tides, Sensing More-than-human Worlds, and Life After Dark.

2.1 Tracing Tides

Tracing Tides was a project that initially sought to respond to the technical question of how to create a cartography of places that are in constant state of change. Sunderland Point is one such place: a peninsula in Morecambe Bay, UK, so heavily influenced by tides that it is twice a day cut off from the mainland. However, it is not only the geography of Sunderland Point that is in a continuous state of flow. The peninsula is in an area of constant environmental and historical change, happening at different scales. Natural and historical 'tides' shape the seascape, and urban and rural landscapes, of Morecambe Bay. However, the ephemeral and transient nature of stories, histories, and shifting geographies means that the complex identities of the bay can be captured effectively through the understanding of their temporalities.

For this reason, an interdisciplinary group of people was involved in the located co-design of a map of natural and historical flows as an experiment in methods to create a better understanding and promote engagement with coastal and intertidal places by capturing multiple temporalities. As a prototype for this method, Tracing Tides sought to combine space and time in a cartographic process with artefacts that brought together heterogeneous data and multiple perspectives.

2.1.1 Tracing more-than-human tides. Cartography has historically been the practice of tracing the natural or administrative features of a place on a map to make them visible and legible to the reader [11]. In this sense, cartography as a medium often does bring together the natural, the anthropogenic, and the political, by combining different layers of information on the same canvas. However, a challenge of cartography is how to make the interaction between different layers of information visible, especially when these interactions – and their influence on place – change over time [12].

The village in Sunderland Point, mostly populated by fishermen and their families, shows traces of its maritime past through a series of buildings dating back to the 1700s, when the village was effectively the main commercial port for the city of Lancaster. The mouth of the river Lune, which runs through Lancaster into Morecambe Bay, is tidal and shallow, making navigation impossible when its bed turns into saltmarsh. At these times, it is the perfect habitat for a large variety of species that thrive in the sands and for waders, who feed on these critters [13]. Moreover, as the seasons progress, the strength of the tides change, alongside the vegetation and the behaviour and presence of the various species.

2.1.2 Uncovering flows in space. In November 2018, an interdisciplinary group of researchers and practitioners met in Sunderland Point for a walk. The walk started with the crossing of the tidal sands through the causeway leading to the village; we then walked through alleyways, trails, fields, and the beach to explore the different landscapes of the peninsula.

Figure 1: Participants using their kits to record data during the walk (on the left); a map printed on a perforated grid (on the right)
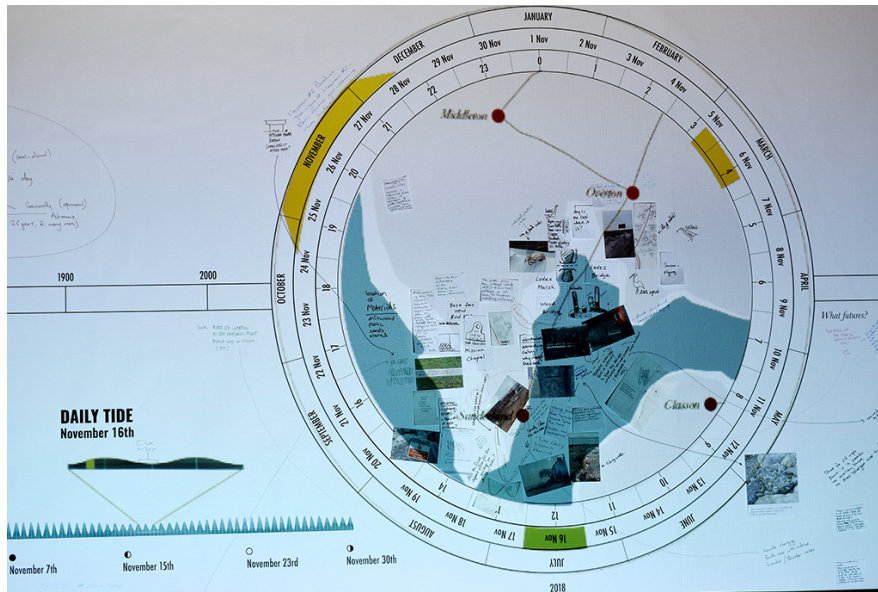

Figure 3: The dynamic map of flows of Sunderland Point at the end of the workshop. A baseline dynamic map showing the changes of tides digitally projected on the wall is annotated by participants to the workshop who recorded their observations and the conversations that took place during the day.

Participants were provided with a simple kit that included a notebook for field notes, a guide to local birds, binoculars, and a map of the area with a perforated grid (Figure 1).

During the walk, historians, geographers, designers, environmental scientists, and some members of the local communities shared their knowledge and annotated the maps with their impressions and observations.

In the afternoon, we then gathered at an indoor location in Lancaster city centre. Using the perforated grid to tear off sections of their map, participants transferred their observations and data on a large, dynamic map projected on a printed layout on the wall.

The map used georeferenced data on high/low tides to visualise cyclical changes in the topography of the coastline, thus allowing us to combine the observations conducted at a specific moment in time with longitudinal data.

This prototype of the collaboratively-built cartography unveiled the importance of deep observation and understanding of place. The pictures and notes taken on the day, and the accounts brought by the historians and local residents, showed that the bay, with its shifting sands and mutable weather patterns, often defies modelling attempts, and, as one participant remarked, "does not behave the way it is supposed to." For example, local accounts abound of failed
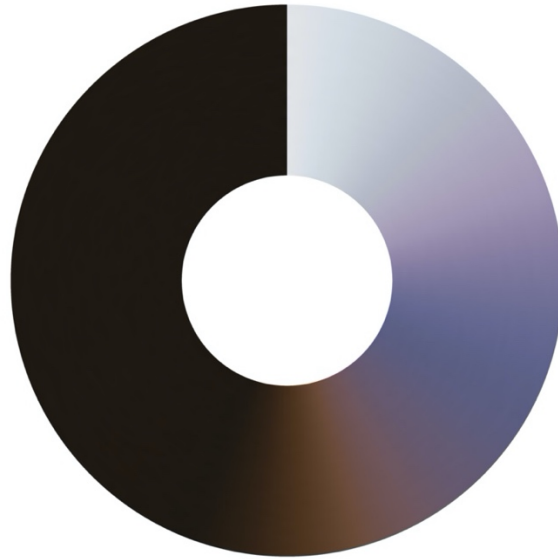
Figure 4: Four-hour light recording at dusk from day through civil, nautical, and astronomical twilight. Glasson Basin Marina, April 2020

interventions to make the mouth of the river navigable, and some participants raised questions about the possible impacts of the nearby nuclear station on the water and seabed.

At the end of the event, we found one major issue with the collaboratively developed map: as an artefact, it was not easily transportable, and the wealth of information that it contained was impossible to categorise into a legible format without compromising the richness of the details embedded in handwritten notes and sketches. While this would be considered a failure in traditional approaches to information visualisation and cartography, it points to the importance of the process, rather than the outcome, of mapping when this is done with the purpose of developing a better understanding of place, and not of simply representing it.

2.2 Sensing More-than-human Worlds

Sensing More-than-human Worlds is an going project to develop a toolkit of experimental methods and fieldwork techniques. The aim of this toolkit is to find ways to make the urban environment meaningfully legible as a more-than-human ecology by recording and communicating descriptions of the environment. Here, more-than-human is taken to mean biotic, abiotic and technological agents and actants that together can be considered an urban ecology. This work challenges anthropocentric approaches to nature and society, developing practices that collapse distinctions between human and non-human life and matter.

The example presented here took place at a marina adjacent to Glasson Dock, on the River Lune estuary, separated from the Irish Sea by a lock. Sunderland Point, the site of the previously mentioned project, lies on the opposite side of the estuary. Such estuarine locations are ecological interstices —they sit at the boundary between land and sea, and, more importantly, at the boundary between river and sea—between fresh and salt water. This creates a complex and constantly shifting habitat with an ecology that differs from those of more stable environments. These habitats are classed as ecotones – regions of transition between biomes – and are characteristically productive, complex, and dynamic natural ecosystems [14]. Here, many human and non-human rhythms of activity intersect, such as the tides, sunlight and moonlight, seasons, the movement of ships, and the loading and unloading of cargo. Thus, the site is an interesting candidate for addressing the following questions: how can we make complex, more-than-human environments legible—particularly those elements that are difficult to perceive or are outside of the human sensorium? Specifically, this project develops visual descriptions of changes in environmental light and sound over time.

Light is a central driver of human and non-human behaviour [15], while sound is often a consequence of such behaviours. Both phenomena can easily be recorded over time using photographic and sound field recording techniques. Using sound spectrograms and photographic image processing, these recordings can be used
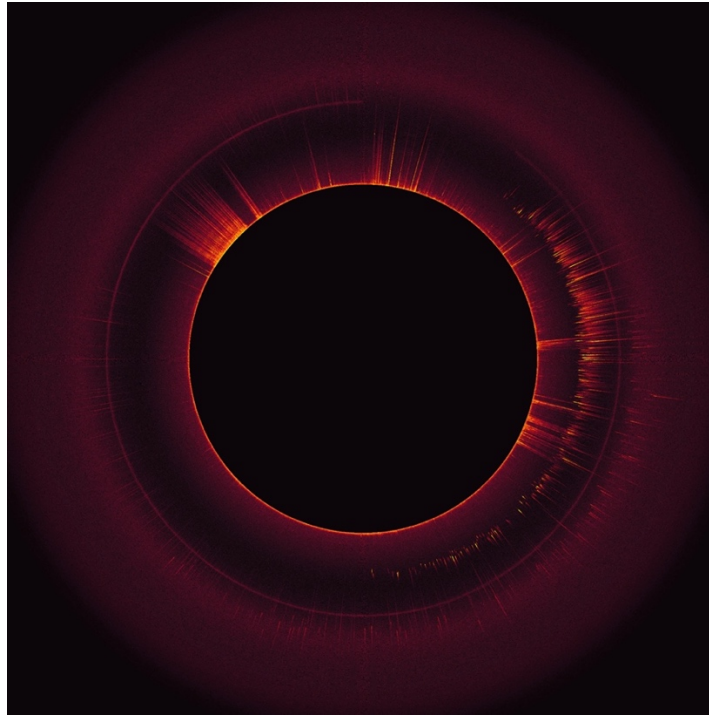
Figure 5: Four-hour sound recording at dusk from day through civil, nautical, and astronomical twilight. Glasson Basin Marina, April 2020. This sonogram shows frequencies from 3 Hz to 50 KHz (extending above and below the range of human hearing)

to make legible the dynamics of the environment and the activities taking place therein over time (Figure 4; Figure 5; Figure 6).

Figure 4 shows a recording of changing light levels over a four-hour period around dusk in Glasson Basin Marina: the transition from day to night, through civil, nautical, and astronomical twilight. Such changes in light levels are important behavioural cues for many lifeforms, from flora and fauna to insects, fungi, and cyanobacteria as well as entraining the circadian clocks of most lifeforms. While light is a driver of behaviour, sound can be used to monitor those behaviours. Figure 5 and Figure 6 show sonograms over the same period as Figure 4, illustrating how human and non-human activities differ in their relation to light. Sonograms have been used for many years by bioacousticians, such as Bernie Krause, who makes use of sonograms to record the natural biophony of tropical rain forests to determine their health or their freedom from human intervention. He demonstrates the aural partitioning of various species and the overall symbiotic symphony of those rare and disappearing soundscapes that have so far been unaffected by human intervention [16, p. 26]

Figure 5 shows frequencies between 3 Hz and 50 KHz. This covers the range of human hearing (approximately 20 Hz to 20 Khz), but also extends outside the audible range into infrasound (very low frequencies) and ultrasound (very high frequencies). The bright band in Figure 5 that appears from approximately the 2 o'clock position to the 6 o'clock position shows the inaudible, ultrasonic feeding calls of insectivorous pipistrelle bats. As the light begins to fall, swarms of midges appear above the water and, in response to this, the bats come out to feed.

In contrast, Figure 6 shows low frequency sounds for the same time period: from 3 Hz to approximately 300 Hz. This covers infrasonic frequencies, below human hearing, into the lower frequencies audible to humans. These lower frequencies tend to show sounds related to machines and mechanical activities– sounds that tend to originate with humans. It can be seen here that there is no obvious relation between the changing light levels and human activity.

These two, very brief examples illustrate the use of sound spectrograms and light recordings to create a temporal, rather than a spatial, understanding of the environment that contains information about human and non-human presences, forces, and behaviours. Such methods can contribute to a thick description of the urban landscape from a more-than-human perspective, embracing its many dimensions—from the celestial and meteorological to the material, affective, and imaginary.

2.3   Life After Dark: Reimagining More-than-human Urban Futures

In this paper, we have so far presented two projects that propose immersive methods for visualising and understanding more-than-human pasts and presents of a place. This third project, very much at the beginning stages, explores how immersive actions of deep understanding of place and its thick descriptions can play a role in the envisioning of more-than-human futures.

The Life After Dark project seeks to examine how we can develop positive visions for cities that embrace the full spectrum of human and non-human patterns and behaviours, including those
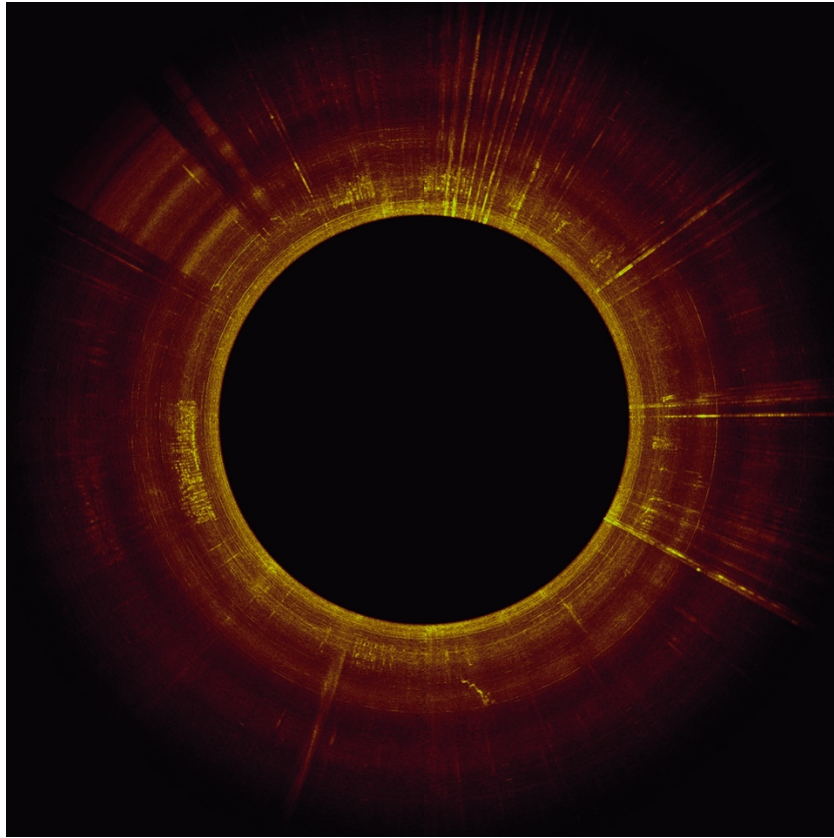
Figure 6: Four-hour sound recording at dusk from day through civil, nautical, and astronomical twilight. Glasson Basin Marina, April 2020. This sonogram shows frequencies from 3 Hz to 300 Hz (from below the human hearing into the lower audible frequencies)

that occur at night. The effects of anthropogenic urban life upon non-human species have been significant and largely detrimental. In particular, the impacts of artificial illumination and light pollution in urban centres has resulted in serious consequences for multispecies coexistence and wellbeing [17], [18], [19]. Where it has been employed in the night time built environment, design to-date has principally been used to reduce and work against darkness, rather than designing for and with it. An emerging body of work has identified how important it is to address this issue with a view to achieving a better balance for the circadian rhythms of multispecies through the shared environments we inhabit and move through [20]–[22]. Key here is the 'who' in such processes. Jacques Ranciere [23, p. 13] explains how making sense of such a situation is inherently political because it concerns, "what is seen and what can be said about it, around who has the ability to see and the talent to speak, around the properties of spaces and the possibilities of time." This suggests the methods we currently use to envision urban futures are clearly anthropocentric and raises an important and urgent need to develop radical alternatives that acknowledge the biodiversity of cities in both the daytime and the nocturnal. Of specific interest here is the invisibility of more-than-human activity at night. More-than-human places may be legible in the daytime city but are far less so after nightfall. For many

urbanites, the more-than-human at night is unknown and uncanny; thus, the deployment of excessive artificial illumination to offer the reassurance that the urban landscape is under control and people are safe. Enabling constructive visions for cities at night beyond practices of consumption requires people to have positive encounters and experiences of urban places after dark and understand the more-than-human life that flourishes there.

2.3.1 Chronicling More-Than-Human Nocturnal Landscapes. Night is far from being a uniform space. The more-than-human activity of the nocturnal city is dynamic and subject to major disruptions as a result of anthropogenic changes. A serious challenge is that of light pollution. To record the changes to the more-than-human landscape, we have been documenting the city of Manchester, UK, through an ongoing series of surveys since early 2014 when the city council announced its intention to rollout the replacement of 56,000 lamps with LEDs. This activity has led to many hundreds of hours nightwalking through nocturnal urban ambiances and the production of an archive of photographs, maps, and field notes. We need to establish nocturnal design values as a way of turning our attention to those elements that are often underrepresented or excluded from design [24]. A critical step towards more-than-human design will be to make the nocturnal biome meaningfully

Figure 7: New Islington, Manchester, 27 February 2020

legible as a more-than-human ecology [25]. This will enable us to better understand the non-anthropocentric implications of what we design, how we design, and why. An increasing element over the two years of our documentation of the Manchester city region's nightscapes has been accounting for the nocturnal kin in such places. In Figure 7, for example, there are Canada geese, a dog walker, a security guard, and swans nearby (although these are not visible).

3   A DESIGN-LED APPROACH FOR ENGAGING WITH MORE-THAN-HUMAN CITIES

This paper started as a reflection on the current gap in knowledge and lack of methods to support multispecies wellbeing and coexistence in urban and peri-urban environments. Through the discussion of three projects, we have aimed to disclose new areas of inquiry and share our design research practices as a means of opening up new collaboration possibilities. In doing so, it is our intention to build further dialogue towards establishing an ecology-centred approach to the design, delivery and maintenance of future cities. Fundamental to this dialogue is the contribution of media architecture and information design, with their ability to augment space with site-specific visualisations. More recently this has been complemented with a host of mediums and responsive systems that facilitate a better understanding of the invisible, not directly perceivable, and ephemeral. While the projects presented in this paper do not fit exactly within the realm of media architecture (defined as the integration of digital information within the built environment [26]), they describe an approach that can be applied to various

design fields concerned with the understanding of, and design with, more-than-human interactions. These projects exemplify the approach we have been taking that we believe pertains to a more expansive view of what media architecture can contribute towards multispecies wellbeing and coexistence in urban and peri-urban environments. This is critical if media architecture is going to assume a valuable role in the shaping of such places without disrupting their biodiversity by unintentionally exacerbating negative, anthropogenic impacts on environments. All three projects demonstrated that slower, process-oriented engagements with the non-human can lead to a more nuanced understanding of the complexities of the environment, by creating spaces for conversation (2.1), augmented sensorial awareness (2.2), and non-anthropocentric explorations of familiar places (2.3).

We also believe that the processes of developing these visualisations are key to a richer awareness of the more-than-human in places, if these processes are designed to be opportunities to engage with the environment by facilitating mediations or exchanges between all the nuanced components that constitute them.

The identity of place is always in a dynamic process of becoming. By gaining better insights into architecture and landscapes as mediated matter that supports our coexistence with other species, we aim to open up a collaborative space within which media architecture can contribute. The rationale for this is based on what we identify as a gap in knowledge and methodologies when considering the role of media architecture in urban environments. The approach that we are developing extends Froth and Caldwell's call for more-than-human media architecture [9] by arguing that the design process must start with a preliminary process of immersive engagement with place and the complex interactions within

it. Focusing carefully and explicitly on this stage of the process is essential for building a better understanding of what constitutes the more-than-human city. Towards this goal and to stimulate dialogue, collaboration, and further research with the media architecture community, we present our five-point action plan for more-than-human future cities:

- To shift perspectives based on the design of nature to approaches that design with and through nature.
- To create and co-create visualisations as a way of understanding new knowledges, rather than simply communicating them.
- To develop practice-based methods that engage with places by making more-than-human aspects meaningfully legible.
- To evolve a making-with approach for reimagining, reconfiguring, and giving agency to the multispecies city.
- To establish a transition from human-centred design to more-than-human design.

These are shared in the spirit of developing future trajectories of theory and practice through a flexible framework, rather than as an absolute protocol. Significantly, these five actions points, along with our three projects, illustrate how human activities and human-made environments have skewed biological ecologies; as a result, we have yet to create a 'niche' that fully enables, integrates and nourishes more-than-human requirements. In addressing this issue, this paper lays the foundation for the development of new forms, practices, approaches, matters/materials and understandings of 'mediated matter', both physical and non-physical, that can create opportunities for designing cities for, and through, nature by embracing its entanglements and complexities.

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