



Ripples: Voices of the Lagoon—Attuning to Multispecies Justice through Tangible and Embodied Interaction

Giulia Jiangxian Zhu*

Politecnico di Milano
School of Design
Milan, Italy
giuliajiangxian.zhu@mail.polimi.it

Zixin Mou*

Politecnico di Milano
School of Design
Milan, Italy
zixin.mou@mail.polimi.it

Sarah Cosentino*

Politecnico di Milano
School of Design
Milano, Italy
sarah1.cosentino@mail.polimi.it

Zhuoyue Song*

Politecnico di Milano
School of Design
Milano, Italy
zhuoyue.song@mail.polimi.it

Andrea Borsato*

Politecnico di Milano
School of Design
Milan, Italy
andrea.borsato@mail.polimi.it

Elisa Giaccardi

Politecnico di Milano
Department of Design
Milan, Italy
elisa.giaccardi@polimi.it

Abstract

The construction of the MOSE gates in the Venice Lagoon, designed to prevent flooding, has unintentionally disrupted the ecosystem’s balance. By blocking natural sediment flow, MOSE has altered hydrodynamics and impacted salt marshes and the species that rely on them, raising questions about resource distribution, ecological privilege, and the consequences of human-centered infrastructure. This more-than-human fabulation speculates on the long-term social, economic, and political impacts of such ecological disruptions. By amplifying the voice of marginalized non-human entities, the interactive installation provokes public debate on power dynamics in resource allocation, challenging existing governance models and advocating for ecologically attuned, regenerative lifestyles. Through embodied interaction—using weight redistribution and audio-visual modulation—Ripples makes resource imbalances tangible, allowing people to experience privilege and scarcity. Interacting with Ripples prompts reflection on governance, tourism, and urban planning, questioning anthropocentric sustainability models and revealing how society might transform ecological change into opportunities for adaptive coexistence.

CCS Concepts

• **Human-centered computing** → Interaction design.

Keywords

More-than-human design, sustainable HCI, ecological governance, multispecies justice, power dynamics, regenerative lifestyles, tangible and embodied interaction

*The first five authors contributed equally to the research and development of the project.



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1 Introduction

Ripples: Voices of the Lagoon is an interactive fabulation that explores resource imbalance and ecological privilege within the Venice Lagoon. The fabulation speculates on how society can transform ecological changes into opportunities for more equitable, adaptive coexistence by giving voice to marginalized non-human entities in environmental decision-making.

1.1 Why Venice? A Case Study in Ecological Governance

Venice has long been a site of environmental and governance debates, particularly in response to rising sea levels in relation to climate change. The MOSE gates, designed to protect the city from *acqua alta*, highlight the tension between urban conservation and ecological impact. While MOSE mitigates flooding for the city’s inhabitants, it also disrupts the natural hydrodynamics of the lagoon, affecting sediment distribution, salt marshes, and the broader ecological balance [23]. The lagoon itself is a complex, dynamic system, shaped by interactions between solid material deposits, freshwater from river systems, and the erosive forces of waves and tides. Its survival is deeply intertwined with Venice’s fate, requiring a socio-economic development model that exists in symbiosis with the surrounding environment [18].

The challenge of Venice exemplifies a broader dilemma in ecological governance: should we prioritize preserving human civilization at the cost of ecological destruction? Or should we reimagine governance structures that consider multi-species agency and participation?



Figure 1: The installation features five totems representing human and non-human entities. The spatial arrangement invites physical and sensorial engagement with issues of power redistribution and multispecies justice, dynamically triggering visual and sound modulations.

1.2 Sustainable HCI and the More-than Human Turn

Venice’s governance challenges underscore the need for sustainability approaches that extend beyond human-centered design. Traditional sustainability models often focus narrowly on human needs and interventions, overlooking the intricate interdependencies between humans and their ecosystems [1]. As these complexities come into sharper focus, it becomes increasingly clear that human-centered approaches are insufficient for ensuring collective survival. Instead, a more-than-human orientation is needed to develop ecologically attuned design practices rooted in relationality and pluriversality [7, 10, 16, 21, 22]. However, speculative practices in support of sustainability goals within HCI often remains rooted in anthropocentric and Western-centric, excluding the perspectives of communities and entities most affected by climate change [20]. This has sparked a growing call for participatory, justice-driven approaches that amplify marginalized voices—including non-human entities as legitimate and active stakeholders [15].

The adoption of posthuman theories and more-than-human design practices in HCI has been recognized as a powerful way to decenter human worldviews and privileges [5, 14], embrace ecological concerns [15], and reorient design towards more relational, multispecies perspectives [8, 19].

1.3 Ripples: An Interactive Fabulation on Multispecies Justice

This paper presents the design and development of *Ripples*. It details how the interactive fabulation was designed to communicate resource imbalance and ecological agency, addressing citizens, policymakers, and tourists as key audiences. The paper also explores the installation’s core interactions and interfaces—including weight redistribution, sound distortion, and visual feedback—demonstrating how these elements materialize power dynamics and governance trade-offs. It reflects on how embodiment and tangibility can challenge dominant paradigms of preservation and anthropocentric governance, while opening space for imagining how more sensorial forms of interfacing can foster multispecies awareness, redistribute

ecological agency, and support participatory, reflexive processes of more-than-human governance.

2 Interactive Narrative Design

2.1 More-Than-Human Fabulation

This project originated within the Final Design Studio of the MSc program in Digital and Interaction Design at Politecnico di Milano, developed and coordinated by Elisa Giaccardi. The studio invites students to explore the intersection of more-than-human design and speculative AI prototyping to envision regenerative lifestyles. Central to this pedagogical approach is the introduction of decentering methodologies such as *noticing* and *attuning*, which foster a heightened sensitivity to multispecies entanglements and the subtle dynamics of ecological systems. Specifically, students are invited to design *with* more-than-human bodies [9, 11] as a relational design concept [6].

Our more-than-human body is an assemblage of tides, spartina, seahorses, salt marshes, Venice citizens, and the MOSE gates, each serving as a key representative and embodying the complex interconnections within the system. In our fabulation, MOSE becomes the narrator, shifting from a human-controlled infrastructure to an entity woven into the Venice lagoon’s more-than-human body—attuned to the multispecies chorus of its fellow entities. The dilemma MOSE faces is one of impossible balance: in deciding when to seal the lagoon from the sea or reconnect it, how much are humans willing to cede for coexistence?

As argued by Couldry [3] access to voice is inherently tied to the distribution of power, a dynamic that is central to the installation’s fabulation. The installation enables the entities in the lagoon to express their own voices, making tangible how power is unevenly distributed across human and nonhuman actors. The audience is invited to step into the position of MOSE, becoming responsible for negotiating the fragile balance between protection and coexistence. Through their interaction, they are confronted with the complexity of managing the tides, and how such decisions affect the multispecies assemblage. In doing so, the fabulation fosters an embodied attunement to the ethical and political tensions of multispecies

justice, exposing systemic imbalances and inviting reflection on the ethics of coexistence and the possibility of regenerative lifestyles.

2.2 Interaction System and Interfaces

The installation consists of five totems (Fig. 1), each representing one of the entities in the assembled more-than-human body. Each totem is equipped with an amplifier for sound output and a screen for visual representation, both dynamically responding to the level of agency attributed to the corresponding entity. Power materializes through the weight of pebbles, which participants can physically redistribute among the totems. As pebbles are moved from one entity to another, the auditory and visual feedback shifts accordingly, amplifying or diminishing the presence of each entity and making the redistribution of power tangible. This dynamic is enabled by an interactive system using Arduino and load cells, with data processed in TouchDesigner. To fully articulate this system, the following sections explain the design process and detail the mechanics of each interaction.

2.2.1 Weight redistribution. As participants step into the role of distributors, the installation offers a tangible representation of agency through pebbles, which serve as a means and metaphor for power redistribution through their natural associations.

A limited number of pebbles is distributed among totems, each equipped with a weight scale that registers the shifting balance. The number of pebbles allocated to each entity directly determines its level of empowerment: the more pebbles an entity receives, the stronger its presence become, both sonically and visually. In the installation's initial configuration, the human totem holds most pebbles, mirroring the current real-world power imbalance in which resources and agency disproportionately favor human interests over those of nonhuman entities.

2.2.2 Audio-visual feedback. The interactive installation employs a dual-modality feedback system, combining audio and visual elements. In the auditory experience, each entity retains its real-world voice, reinforcing the idea that listening requires an expanded perception beyond anthropocentric understanding. The suppression of certain voices is rendered through noise interference: entities with greater privilege are heard clearly, while those with diminished agency are obscured by layers of noise. This auditory imbalance is mirrored visually—entities with less agency appear distorted through glitches, saturation shifts, and ripple-like distortions that evoke the fluid and unstable nature of water. From a distance, the audience encounters a collective soundscape of the lagoon; only through direct engagement do they notice how their actions influence the prominence of individual voices. This experience is further emphasized by a horn-like listening structure placed atop each totem, signaling the need for intentional and attuned listening.

2.3 Speculative Touchpoints

How can this interactive attunement become an invitation for audiences to adopt a more-than-human perspective that questions dominant urban policies and tourism economies, and instead encourages reflection on alternative, ecologically attuned ways of living, where non-human interests are prioritized over human access to the city? To foster this shift in perspective, the installation begins with an

initial touchpoint designed to immerse participants in the fabulation prior to their encounter with the power redistribution system. This narrative introduction takes the form of speculative media and artifacts that envision a future Venice adapted to rising waters. Fictional newspapers feature headlines announcing infrastructural changes, such as elevated pedestrian bridges over a permanently submerged Piazza San Marco, flood warnings integrated into daily forecasts, and the introduction of swimming permits for historical landmarks. Alongside, waterproofed objects and diving gear are displayed as everyday items—suggesting a normalized coexistence with water.

These speculative artifacts, infused with satirical and ironic undertones, invite participants to question whether this imagined future is merely absurd fiction or an inevitable reality.

3 Discussion

3.1 Ripples as a More-Than-Human Fabulation for Rethinking Preservation

Should we continue to prioritize human civilization at the expense of ecological systems, or can governance begin to embrace multispecies agency? As a fabulation, *Ripples* makes tangible how Venice's challenges reveal that what is framed as a dilemma is, in fact, a reflection of entrenched assumptions about sustainability driven by the human impulse to preserve and control. Allowing landscapes and landmarks to change, rather than forcibly maintaining them, may offer a more sustainable approach [4, 13]. The \$8 billion MOSE system [2] epitomizes this tension, revealing the unsustainable nature of attempting to preserve everything indefinitely. Until 2023, Venice was listed as a World Heritage Site in danger [17], with UNESCO warning that "Italy hasn't done enough" to protect it. Ironically, this designation accelerated the crisis, as tourists are now flocking to see the city "before it's too late," hastening its decline. This situation underscores the need for a regenerative perspective—one that views crisis as not as a failure of preservation, but an opportunity for transformation of ways of being and living.

3.2 Ripples as an Interface for More-than-Human Attunement

Through its interfacing [12], *Ripples* materializes the complexities of resource distribution and ecological participation, transforming abstract questions of agency and power into a tangible and embodied experience. Rather than portraying balance as a state of harmony, the installation reveals it as a continuous, fragile negotiation of power and privilege between human and nonhuman entities. Through the act of redistributing pebbles and witnessing the resulting audiovisual shifts, participants are invited to confront the entangled consequences of their decisions and experience governance beyond human agency. In doing so, they come to recognize how seemingly small gestures can shape more-than-human futures, where agency is shared, contested, and always in flux. By foregrounding relationality and interdependence, *Ripples* fosters critical reflection on privilege, multispecies justice, and the conditions required for coexistence.

4 Conclusion

As climate change accelerates, it presents unprecedented challenges not only to ecosystems but also to existing models of governance. The scenario unfolding in Venice is emblematic of a broader, global condition, and it emphasizes the urgent need to rethink sustainability beyond human-centered frameworks and toward more inclusive, multispecies perspectives.

Ripples responds to this challenge by critically examining resource imbalance, ecological privilege, and the question of multispecies justice through a more-than-human fabulation, brought to life in a tangible and embodied interactive installation. Positioned as an interface, the installation invites participants to actively engage with the complexities of ecological governance, making visible how power and agency are distributed—and often withheld—across human and non-human entities. Through the physical act of weight redistribution, coupled with sound and visual modulation, *Ripples* materializes the entangled forces at play and amplifies the often-silenced voices of marginalized nonhuman stakeholders. Ultimately, the installation proposes that ecological shifts need not mark the end of a world but can instead become an opportunity to reimagine more equitable and regenerative ways of living together.

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