Considerations Towards Outdoor Impact Mitigation of Site-Related NIME Practice

Xinran Chen*
xchen805@connect.hkust-gz.edu.cn
Computational Media and Arts, HKUST(GZ)
Guangzhou, Guangdong, China

Nicolò Merendino
nicolom@hkust-gz.edu.cn
Computational Media and Arts, HKUST(GZ)
Guangzhou, Guangdong, China

Iurii Kuzmin
ikuzmin@connect.ust.hk
IIP - Computational Media and Arts, HKUST
Hong Kong, Hong Kong SAR, China

Mark Nicholas Grimshaw-Aagaard
mgrimshaw@hkust-gz.edu.cn
Computational Media and Arts, HKUST(GZ)
Guangzhou, Guangdong, China

Abstract

Site-related NIME inevitably establishes relationships with the social and ecological realities of the site. In contrast to a large body of scholarship on longevity and fabrication, current sustainability discourses of NIME have seldom touched on the socio-ecological impacts of on-site practices. To support impact mitigation without overclaiming measurement or prescribing a single model, in this medium paper we position outdoor site-related NIME between artifacts and events, and incorporate insights from sustainability research on events into five reflexive considerations: stakeholders of the site, presence of personnel, materiality of artifacts, on site alterations & emissions, and the anthropocentricity of listening. These are offered as early stage prompts to make impacts visible while alternative designs and less intrusive deployments remain possible.

Keywords

New Musical Interface, Site-Specificity, Environmental Sound Art, Socio-Ecological Impact, Stakeholders

1 Introduction

Sites [1], for many types of art and performance, are often seen as part of constitutive media rather than neutral containers. Unlike traditional gallery space, their material conditions, social situatedness, and more-than-human ecologies co-produce what an artwork can be and do. In NIME, a comparable lineage is visible in works that move musical interfaces to the outdoors - into parks, shorelines, gardens, bridges, or other public and transitional spaces. Accordingly, weather, ambient sounds, pre-existing artifacts, and passersby, whether intentional or not, become part of the "interface" itself. Both deployed in parks, Ferguson et al.'s large-scale distributed system, and Smallwood's installations running for months, are illuminating examples of site-related NIME [21, 56].

At the same time, NIME's sustainability discourse has tended to foreground aspects such as fabrication, longevity, circuit bending, and recently aesthetics [13, 15, 45, 47]. Currently a focused lens on the sonic practices that connect with the site and its surroundings is still inadequate. This paper offers a unique socio-ecological perspective to reflect on where impacts can be mitigated by situating site-related NIME between artifacts and events, and by selectively drawing on sustainable event research. We synthesize five reflexive dimensions: stakeholders of the site, presence of personnel, materiality of artifacts, on-site alterations and emissions, and anthropocentricity of listening. These are prompts intended to make impacts visible early, when alternative designs and less intrusive deployments remain possible.

It should be noted that, while site-related practices are not limited to outdoor settings, we have chosen to focus our context of impact mitigation on the outdoors. Outdoor sites present distinctive affordances for sonic creativity, such as environmental variability and public engagement; as well as distinctive risks of unintended socio-ecological impact, such as potential friction with neighboring communities. Indoor site-related practice, however, involves different institutional and infrastructural regimes, and thus awaits future work.

2 Outdoor Site-Related Practices within NIME

In this section we search for and analyze outdoor site-related practices in the NIME community. The twofold purposes of this section are to provide (1) an overview of outdoor site-related NIME, (2) a generalized interpretation of these works.

In zenodo's NIME proceedings, we searched for site*, outdoor*, environment* and public* as keywords [2]. After excluding irrelevant results based on titles, we used the online big model [3] in conjunction with local python scripts to extract information from downloaded literature, and generate text records. We then performed a close reading of the most relevant literature based on the records. The python script is provided ***here*** and aims to extract information on the types of primary artifacts and sites of performance involved.

2.1 Sites & Genres

In addition to the two examples already mentioned [21, 56], we identified a total of 20 papers presenting sonic artifacts that are deployed in and rely on outdoor environments. These sites can be categorized as urban public spaces, natural spaces, and transitional spaces-such as gardens, communal lawns, or any place that is often not far from human settlements and is inhabited by natural elements:

*Corresponding author
[1] Collins and Cambridge dictionaries provide appropriate definitions of "site", emphasizing the relevance of a place to artifacts and/or events. [14, 50]

NIME '26, June 23–26, 2026, London, UK

[2] The term environmental art and public art are deemed closely associated with site-related practices, we expanded the search by adding environment and public; also, we conducted a targeted search for the missing 2021-2022 literature on NIME.pubpub.org.
[3] deepseek-v3.1:671b-cloud

- Urban: public square [23], highway [64], city bus stop [7], high traffic area [6], town centers [55], pedestrian bridge [1], urban street [25, 27];
- Nature: seashore [44], river [63], canyon [64], mountain pass [64], island [16], nature reserve [1], wetland restoration [16], regional park [64], unspecified natural space [62];
- Transitional: outdoor pavilions [8], community greenery [2], path/promenade/trails near natural sites [1, 4, 55], commons [11], city parks [30, 31, 55];
- Unspecified outdoor settings due to lack of information [34, 53].

Consequently, such artifacts can be characterized into a number of genres: environmentally responsive installations [2, 4, 7, 27, 34, 44, 62–64]; public interactive installations [6, 8, 23, 31, 53]; instrument to support outdoor deep listening [11]; location/movement-based compositions [25, 30, 55]; real-time outdoor recording for compositions [1, 16] [4].

2.2 Generalization of Outdoor Site-Related NIME

Different sites bring out different social or environmental particularities, such as high traffic and pedestrian engagement [6, 23, 27]. The randomness of passersby' identity and their improvised participation were considered valuable to the experience of the sound installation. For natural space, the variety of environmental signals that can be captured is seen as a major opportunity - many cases present artifacts that respond to environmental dynamics (e.g., wind, clouds, waves, etc.) [44, 62–64].

As outdoor settings are often hard to "control", this often means more degrees of freedom and less predictability, which becomes a challenge for some site-related NIME works. For example, several cases refer to the impact of environmental noise on performance [4, 6, 7]. Another common challenge is the material impact, such as humidity, wind resistance, and cloudiness on the artifacts deployed, which can cause functional or structural instability [7, 27, 44, 64]. Finally, the behavior of audiences and non-audiences poses challenges, such as in one case which explicitly states that the artist deployed the core components within an enclosed structure to avoid access and even vandalism by passersby [7].

Across this literature, site-related NIME practice can be described as the design and deployment of sonic systems whose interface, whether deliberate or not, is co-constituted by the site: the surrounding soundscape, ever-present environmental factors (e.g., weather), and the unpredictable social dynamics of the audience, even if these elements were not fully considered during its ideation.

3 Advancing Impact Mitigation

In this section, we aim to illuminate the discourse of impact mitigation for site-related practice by systematizing a series of considerations that we believe useful to the NIME community. To do so we first look into existing scholarship on sustainable events that explores impact mitigation in different contexts of site-related practice. We then examine the scale of outdoor site-related NIME, as well as its transferability to gain insight from other communities. This top-down approach, as illustrated in the figure below, isn't rare in prior sustainability discourse pertaining to circuit bending and sustainable making of NIME [15, 47].

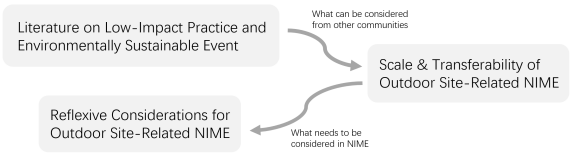

Figure 1: Conceptual Map of Section *Advancing Impact Mitigation*

3.1 Low-Impact Outdoor Practice and Environmentally Sustainable Event

The Sustainability of events, an important topic in sustainability research [17, 40, 60], offers a unique perspective on the socio-ecological impacts of site-related practices. This perspective emphasizes the integration of sustainability into the planning, implementation, and post-activity phases, rather than treating "green initiatives" as an optional addition [60].

Anthropologists have provided a term, liveness, that has implications for further understanding the sustainability of events [28, 54]. In addition to the many cultural benefits (e.g., immersion, co-presence, tactility), the realization and maintenance of liveness inevitably relies on the social and physical qualities that the material reality of a site can provide. This tight coupling reinforces the appropriation, intrusion, and consumption of the site [57]. Music festivals, for example, are a widely studied, large-scale, site-related practice that may involve a range of technological deployments, movement of people, and interactions with the surrounding ecology.

Despite the vast array of sustainability research on events, a few elements have been identified as the most relevant to site-related practice.

3.1.1 Community. A site is never empty. It is managed, inhabited, and lived in. Communities typically refer to human stakeholders, such as residents and indigenous groups who dwell around sites - they could be affected by the ways in which sites are occupied, used, and restored [17]. Sustainable event design emphasizes the role that the community could play and explores ways to engage more actively. Engaging the community on how to conduct on-site should be an ongoing process that includes stakeholder mapping, early dialogue and co-design actions [33, 51]. In recent years, scholarship on indigenous perspectives also considers non-human entities (e.g., animals, plants, ecosystems, and other beings) as integral parts of communities or social assemblages in and around the site of practice concerned [59]. However, communities have their own limitations as site stakeholders due to lack of procedural legitimacy and scientific knowledge. Land managers, conservation officials, and ecologists can also play a role in sustainable site-related practice, which could ensure that non-human vulnerabilities can be properly evaluated through institutions and monitoring [38].

3.1.2 Operation. At the operational level, socio-ecological risks of events depend on how participant behaviors are managed on-site in real time, especially when encountering uncontrollable

[4] Outdoor sites are involved in capturing the soundscapes in real-time

crowd dynamics and time pressures [19, 32, 40]. Optimizing on-site action of events involves site selection, layout, and action routes, as well as clarifying roles of those present [61]. Waste generated by participants is another common issue in operations, and measures to mitigate impacts include waste reusing, recycling, and inventories of what can be brought to the site [39, 40].

In this context, the Leave No Trace (LNT) ethic of practice [5] is significant to the operation of sustainable events [43]. LNT is a set of outdoor ethical principles designed to minimize the impact of human activities on the natural environment, so that future participants can experience the same pristine natural environment [42]. Although rooted in a wilderness hiking context, LNT has been adapted and explicitly extended to many site-related practices, such as the Ultra Music Festival [6], to mitigate ecological impacts (especially waste and site disturbance). Evaluations suggest that structured LNT training can increase participant' awareness over time, leading to low-impact behaviors on site [10]. Similarly, the Ecological Society of America's Code of Ethics explicitly commits researchers to conduct work so as to "avoid or minimize adverse effects on ecosystems and human communities", while also emphasizing legal compliance [18].

3.1.3 Deployments. Before and during an event, a series of constructions, technological systems, artifacts (temporary or semi-permanent) need to be deployed to enable site-related practices [41, 46]. Research on events looks at highly frequent "issues" of deployments, such as disruptions caused by erection/dismantling and energy consumption from technological assemblages [24, 40]. Targeted mitigation efforts need to consider the characteristics of deployed objects throughout their entire on-site lifecycle, but a common optimization logic is always to select low-impact assets at the beginning. Research on preventing emissions emphasizes the adoption of green technologies, such as solar energy [40, 58]; while for installation issues, research prioritizes reusable/modular components [52].

3.1.4 Acoustics. In the ecology of events, sound becomes a socio-ecological issue when event sound-making [7] "reorganizes" the surrounding soundscape beyond the temporal-spatial boundary of event [40]. This matters because anthropogenic noise can mask animal communication and orientation cues [49], while also producing human impacts, such as annoyance and conflict, that shape the legitimacy of site use [17]. Tourism-oriented playback is an example of sound as a site-related practice that may cause negative impact - evidence shows that simulated birdwatchers' playback can change vocal behavior in wild birds, as birds may get accustomed to the artificial sound [65]. In festival contexts, researchers also indicate that loud music playback alone can be an active disturbance to non-humans [3]. Standards and regulation require sound to be managed as part of responsible event delivery and compliance, such as ISO 20121 on event sustainability [35], and ISO 1996-1/ISO 1996-2 on environmental noise [36, 37]. Complementary policy frameworks, for instance the EU environmental-noise law, also further reinforce the point that event sound-making should be planned and managed on-site [5, 20]. A sustainable on-site approach therefore needs to treat sound holistically and considers not only loudness but also many variables such as timing, duration, intermittency/continuity, spatial propagation and tonality, etc [22].

[5]The seven principles are as follows: Plan and prepare ahead; Walk and camp on durable surfaces; Dispose of waste properly; Leave it as it is; Minimize the impact of campfires; Respect wildlife; Think of others. [42]

[6]https://ultramusicfestival.com/mission-home/leave-no-trace/

[7]amplified music, announcements, crowd noise, vehicles/generators, and birdsong playback within some nature tourism used to draw out animals

3.2 Positioning Outdoor Site-Related NIME: between Artifacts and Events

In the previous subsection, we listed the elements most relevant to site-related practices with insights from other communities. Now we will contextualize within the NIME community by looking at the scale of site-related NIME practice.

3.2.1 Different Scales of Outdoor Site-Related NIME. Site-related NIME work often happens in places that are not built for electronics-first performance: parks, forests, shorelines, nature reserves, heritage sites, or communal paths, etc. Numerous cases from event and festival research have shown how these elements such as personnel, technologies, and sound collectively shape impacts on site, which vary with the scales of participation and time [60].

A first point to clarify is that the scale of site-related NIME practice is not fixed; it spans from compact, portable interventions to long-running, large-scale deployments. At the smaller end, Marquez-Borbon's Wave Duet is conceived as a pair of autonomous sonic buoys, where its "scale" is primarily defined by the bounded number of objects and a relatively contained technical ecology (battery power, embedded sensing, and a small set of interacting artifacts), despite the complex environmental forces involved (waves, corrosion, buoyancy constraints) [44]. At the larger end, Ferguson et al.'s Bloom is explicitly a large-scale system: nearly a thousand distributed audio-visual devices installed outdoors for weeks, with demands on network and server infrastructure, hardware processing power, and space in the park. [21]. Between these poles sit works such as Beilharz & Martin's Windtraces - a multi-week outdoor installation with many loudspeakers embedded in a coastal rock formation. Its "scale" was not only in the hardware metrics, but also in the need to account for varying ambient acoustics, climate and audience dynamics [4]. Finally, Smallwood's Coronium 3500 takes on a different scale in terms of duration - it operates over a months-long seasonal exhibition cycle, using solar energy as both a constraint and a compositional driver [56].

3.2.2 Outdoor Site-Related NIME as Artifacts Involving Activities. A useful next step is to examine the transferability between site-related NIME and events. We suggest considering site-related practice as a kind of socio-ecological activity integral within the event assemblage, while acknowledging the scale difference.

First, many site-related NIME practices are inherently epistemic. Such site-related NIME practice often involves entering specific places, observing and intervening, and then writing up what the intervention reveals. This is where field ethics and protocols have already become useful complements: they foreground duties that are easy to underspecify in arts/tech discourse - minimizing disturbance, complying with site rules, and engaging meaningfully with affected stakeholders.

In parallel, site-related NIME also shares a similar "liveness" of practice to on-site events: they require planned installation and deinstallation, management of unpredictable visitors, and continuous attention to reliability under changing environmental conditions. In Windtraces, for example, audibility is inseparable from crowd flow on-site and the fluctuating noise floor produced by sea, wind, and human activity [4]. Simultaneously, many festival events also involve exhibition categories that target art installations. The NIME literature already contains a number of

linkages related to similar events, such as Lantern Field's planned iteration at the Smithsonian during the National Cherry Blossom Festival [8]. In this sense, event (festival) sustainability research is useful less as something to be adopted wholesale, and more as a source of transferable, highly local lessons about what to consider, when temporary cultural artifacts are deployed on-site [8]. The value for site-related NIME, therefore, is in selectively borrowing those elements that overlap with artifacts' realities, rather than importing a full event-management model or treating "the festival" as the default analysis unit.

3.3 Current Awareness among NIME Practitioners

Here we revisit the identified site-related NIME works, with a particular focus on the practitioners' awareness of ecological ethics. Of these 20 papers, one can find:

- The main awareness of practitioners is on the material aspects, which is reflected in their intention to improve the lifespan of site-related NIME (especially in bad weather), or reduce the difficulty of installation and logistics [4, 7, 27, 44, 62, 63].
- Several papers demonstrate awareness on the potential impact of the introduced sounds on other inhabitants of the environment. For example, Arbel used headphones to avoid noise pollution from their sound installations in the wild [1]; Gupfinger and Kaltenbrunner intentionally deployed their installations far from residents [27]; and Beilharz and Martin limited the sound levels of their installations due to local regulations [4]. The only example of using empirical methods to understand how to balance the sound of the installation with ambient sounds comes from Birchfield et al.'s case study, in which they tested the ambient sound levels at the deployment site [7]. As a result, the sound level of the device is limited within the upper limit of the ambient sound levels.
- The authors of a few works stated in their ethical statements that they were aware of the ecological footprint of the outdoor intervention they implemented [1, 62, 63].

Therefore, based on the above insights, it is not difficult to reach the conclusion: The need for socio-ecological awareness of site-related practices has been present within the context of NIME. However, the various ethical, environmental, and social dimensions of sustainability considerations are currently intertwined and have not yet been systematically sorted.

3.4 5 Reflexive Considerations for Outdoor Site-Related NIME Practice

This section proposes five illuminating dimensions to consider when planning and implementing site-related NIME work. They are written as simple prompts and high-level suggestions: the aim is to make impact visible early, so that alternative blueprints remain possible. A mapping that clarifies the derivation process is provided below.

[8]It should be noted that the importance of logistics issues in event sustainability research is well recognized and has been systematically addressed. Much of the literature on events has specifically explored this topic. The broad definition of logistics proposed by Bowdin et al. includes "on-site logistics", which involves the deployment, operation, and removal of personnel and artifacts - the aspects central to this paper [9]. However, logistics in the narrow sense refers to relocation processes outside the event site, such as transportation and warehousing. To focus this paper on a single deployment site, we consider transportation, warehousing, and similar activities as part of a larger event ecology that connects to other sites.

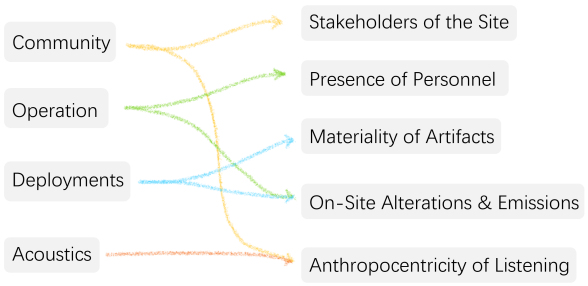

Figure 2: Derivation of Reflexive Considerations from Prior Synthesis

3.4.1 Stakeholders of the Site. Event sustainability research emphasizes that impacts and acceptable trade-offs depend on the specific circumstances of stakeholders, making it necessary to assess this throughout the entire workflow. For site-related NIME practices, site caretakers or managers (and, where relevant, the ecologist or ranger) need to be considered: as agents of the site itself, they are aware of quiet periods, nesting areas, access routes, and acceptable materials of a site. It is also necessary to consider human neighbors: their complaints about noise, light, and privacy are common friction points during practice, and even small activities can become "site permit" issues. Beyond considering human stakeholders, incorporating non-human residents as stakeholders within the workflow is essentially necessary, as this ensures that their interests are not overlooked throughout the entire ideation - design - deployment - implementation - recycling process.

3.4.2 Presence of Personnel. In the context of site-related NIME, artifacts need to be deployed and operated by their builders in person; as an artistic practice, there are often audiences on site. The temporal-spatial scale of the audience's presence matters, particularly for large-scale site-related NIME works. Crowding, noise, and even informal paths can be made if people gather in one place to view or listen to the work, especially when the interactions are excessively long. Furthermore, NIME practices often involve collaboration among multiple individuals (e.g., performers, designers, researchers, developers, etc.) - it is suggested to keep essential groups who are present on site deliberately small.

3.4.3 Materiality of Artifacts. The artifacts of NIME practice rarely consist of a single object - the constituent elements often include sensors, speakers, brackets, housings, batteries, and even laptops that need to be connected externally. Many elements are not designed in response to the environmental particularities of the site. A typical case in point is NIME hardware deployed in wet natural environments, where batteries and electronics in housings that are not robust or effectively sealed risk corroding or even generating waste. Therefore, it is necessary to consider the material sustainability and longevity of artifacts. The long-lasting discourses on longevity within much of the NIME community have a unique significance in the context of site-related practice, such as modular design, standard fasteners, and recyclable cases, which could mitigate the risk of complete disposal [47].

3.4.4 On-Site Alterations & Emissions. In addition to visible and perceptible impacts, subtle changes can occur on-site while installing and operating NIME works, such as alterations to the terrain, temporary markers, and traces left after equipment is uninstalled (e.g., tape backs, cable ties, etc). Attention to these

site changes and possible remediation aligns with the broader philosophy of LNT. In this context, documentation [12], especially documentation of all site-alterations and deployed artifacts, has the unique potential to improve the completeness of removal and recovery. Furthermore, sustainability research often focuses on ecological burdens such as energy consumption, water use, logistics, and waste generation. For site-related NIME practices, although hardware power consumption is generally low, utilizing renewable energy (as opposed to batteries) can further reduce emissions and potential battery waste. Therefore, we recommend conducting inspections of alterations and emissions, while taking further measures to minimize them.

3.4.5 Anthropocentricity of Listening. [9] Last but not the least (and perhaps the most), site-related NIME practice involves a lot of sound-making, which needs extra care. Although NIME practitioners and other stakeholders can collaborate to test, evaluate, and optimize the receptive experience, this is not solely an issue that can be fully resolved through anthropocentric evaluation. A key risk in many sonic artistic practices is the assumption that sound is 'only for human listeners', when in fact it is also the primary means of sense-making and communication for many species. Sustainable event studies provide specific warnings on artificial sound-making and their impact [3]. It is therefore necessary to consider listening experience as ecological design in the site-related NIME practice, attending to how the formal and physical dimensions of sound could impact local non-humans. Existing soundscape thinking implies practical mitigation, such as setting level caps and avoiding wildlife playback except under tightly justified and ethically guided conditions.

4 Implications and Conclusion

Our work has potential implications for how site-related NIME can be articulated within the community's ethical expectations as formalized in the NIME Principles & Code of Practice on Ethical Research [48]. Most obviously, our discourse could reverberate with a point that is currently easy to overlook in outdoor work: in NIME's Code of Practice, there is a subtle difference between the wording "Involving Animals" and "With Human Participants". This already implies that the relevance of non-human beings who dwell around the site has ethical significance, even if they do not become formally engaged with the practice.

Given the cultural-natural inseparability of the new materialist discourse, we might consider the "site," including those outdoor sites described in the previous section, as a kind of "contact zone" that embodies this inseparability [10]. In such contact zones, culture and nature, humans and non-humans, coexist. However, both within and beyond the scope of NIME, there remains limited understanding of how deploying (even temporarily) culturally charged sonic interfaces in contact zones can ensure low and predictable impact on the ecology [11].

Thus, we believe that studying non-intrusive sonic interfaces in relation to sites, or even reciprocal sonic interfaces, has unique aesthetic, epistemic, and socio-ecological values. Not only would this be beneficial to human practitioners and listeners, but it could also bring a pragmatist-based ethical commitment to the new-materialist-influenced practice of relationality [29], which would ensure that celebratory narratives of co-becoming do not inadvertently mask persistent power asymmetries and intrusiveness.

This paper identifies and interprets a set of outdoor, site-related NIME practices, and argues that their on-site particularities warrant sustainability thinking that is not exhausted by longevity and making alone. By bridging site-related NIME with transferable insights from sustainability research on events, we propose five reflexive considerations. This shifts "environmental awareness" from a post-hoc statement to a lens that could benefit practitioners during ideation. Future work can refine these considerations into community-tested checklists, reporting templates, evaluation methods (such as collaboration with rangers, ecologists, and local communities), as well as NIME-specific guidance (on reciprocal listening and restoration/inspection practices) that better align outdoor sonic experimentation with the community's evolving ethical code.

5 Ethical Standards

This paper is aligned with the ethical standard on NIME. No participants were involved, nor any animal or vegetal specimens. This work also aims to contribute to the discussion on sustainable NIME, a point mentioned in the conference 's code of ethics. Since none of the first three authors are native speakers, we used GPT-based AI to improve our writing.

[9] Although this consideration can be covered by "considering stakeholders of the site", we decide to individualize it as it's deemed to be of exceptional relevance in the context of site-related NIME, and requires further investigation on how to achieve a mutually reciprocal listening experience

[10] Even in urban sites, nonhumans are inevitable and should be present

[11] Relatively more specific and varied research exists on the ecological impacts of non-artistic/musical sounds, e.g., technological artifacts that emit ultrasound in urban areas [26], and playback of bird songs used in wilderness birdwatching activities [65]. These can shed some light on the context of our concerns. However, the high diversity of sites, sounds, nonhumans, and mediating technologies overlaid on top of each other means that each combination can be highly conditioned and different

References

[1] Lior Arbel. 2021. Aeolis: A Virtual Instrument Producing Pitched Tones With Soundscape Timbres. In *Proceedings of the International Conference on New Interfaces for Musical Expression*. Shanghai, China, Article 2. https://doi.org/10.21428/92fbeb44.64f66047

[2] Shomit Barua. 2025. Hyperwilding: Sonic Perplexity as Urban Acupuncture to Promote Environmental Kinship. In *Proceedings of the International Conference on New Interfaces for Musical Expression*, Doga Cavdir and Florent Berthaut (Eds.). Canberra, Australia, Article 89, 5 pages. https://doi.org/10.5281/zenodo.15698978

[3] Corrado Battisti. 2024. Changes in bird assemblages following an outdoor music festival: A BACI (before-after-control-impact) monitoring from central Italy. *Environmental Pollution* 344 (2024), 123384. https://doi.org/10.1016/j.envpol.2024.123384

[4] Kirsty Beilharz and Aengus Martin. 2012. The 'Interface' in Site-Specific Sound Installation. In *Proceedings of the International Conference on New Interfaces for Musical Expression*. University of Michigan, Ann Arbor, Michigan. https://doi.org/10.5281/zenodo.1178211

[5] Birgitta Berglund, Thomas Lindvall, Dietrich H Schwela, and World Health Organization. 1999. *Guidelines for community noise*. World Health Organization, Geneva. https://iris.who.int/items/812b31c0-6bec-4976-ab52-b4c48600454c

[6] Kirandeep Bhumber, Nancy Lee, and Brian Topp. 2016. Pendula: An Interactive Swing Installation and Performance Environment. In *Proceedings of the International Conference on New Interfaces for Musical Expression*. Queensland Conservatorium Griffith University, Brisbane, Australia, 277–285. https://doi.org/10.5281/zenodo.1175992

[7] David Birchfield, Kelly Phillips, Assegid Kidané, and David Lorig. 2006. Interactive Public Sound Art: a case study. In *Proceedings of the International Conference on New Interfaces for Musical Expression*. Paris, France, 43–48. https://doi.org/10.5281/zenodo.1176873

[8] Brennon Bortz, Aki Ishida, Ivica Ico Bukvic, and R. Benjamin Knapp. 2013. Lantern Field: Exploring Participatory Design of a Communal, Spatially Responsive Installation. In *Proceedings of the International Conference on New Interfaces for Musical Expression*. Graduate School of Culture Technology, KAIST, Daejeon, Republic of Korea, 73–78. https://doi.org/10.5281/zenodo.1178484

[9] Glenn A. J. Bowdin, Johnny Allen, William O'Toole, Robert Harris, and Ian McDonnell. 2011. Logistics. In *Events Management* (3rd ed.). Routledge, Chapter 18. https://doi.org/10.4324/9780080964317

[10] Maria Bromley, Jeff Marion, and Troy Hall. 2013. Training to Teach Leave No Trace: Efficacy of Master Educator Courses. *Journal of Park and Recreation*

Administration 31, 4 (2013), 62–78. https://www.js.sagamorepub.com/index.php/jpra/article/view/2778

[11] Andrew R. Brown. 2022. On Board Call: A Gestural Wildlife Imitation Machine. In *Proceedings of the International Conference on New Interfaces for Musical Expression*, Andrew McPherson and Emma Frid (Eds.). Auckland, New Zealand, Article 13. https://doi.org/10.21428/92fbeb44.71a5a0ba

[12] Filipe Calegario, João Tragtenberg, Christian Frisson, Eduardo Meneses, Joseph Malloch, Vincent Cusson, and Marcelo M. Wanderley. 2021. Documentation and Replicability in the NIME Community. In *Proceedings of the International Conference on New Interfaces for Musical Expression*. Shanghai, China, Article 4. https://doi.org/10.21428/92fbeb44.dc50e34d

[13] Xinran Chen, Iurii Kuzmin, Mela Bettega, and Raul Masu. 2025. Embodying Sustainability: Paving Opportunities for NIME Research. In *Proceedings of the International Conference on New Interfaces for Musical Expression*, Doga Cavdir and Florent Berthaut (Eds.). Canberra, Australia, Article 34, 12 pages. https://doi.org/10.5281/zenodo.15698845

[14] Collins English Dictionary. 2026. *Site — Definition and Meaning*. https://www.collinsdictionary.com/dictionary/english/site Accessed 2026-02-12.

[15] Enrico Dorigatti and Raul Masu. 2022. Circuit Bending and Environmental Sustainability: Current Situation and Steps Forward. In *Proceedings of the International Conference on New Interfaces for Musical Expression*, Andrew McPherson and Emma Frid (Eds.). Auckland, New Zealand, Article 5. https://doi.org/10.21428/92fbeb44.18502d1d

[16] Gershon Dublon and Xin Liu. 2021. Living Sounds: Live Nature Sound as Online Performance Space. In *Proceedings of the International Conference on New Interfaces for Musical Expression*. Shanghai, China, Article 42. https://doi.org/10.21428/92fbeb44.b90e0fcb

[17] L. Dávid. 2009. Environmental impacts of events. CABI, 66–75. https://doi.org/10.1079/9781845935245.0066

[18] Ecological Society of America. 2021. Code of Ethics for the Ecological Society of America. https://esa.org/about/code-of-ethics. Amended May 2021.

[19] Álvaro Enríquez-de-Salamanca and Rubén Díaz-Sierra. 2023. Impact assessment of temporary activities and events. *Integrated Environmental Assessment and Management* 19, 5 (01 2023), 1320–1332. https://doi.org/10.1002/ieam.4733 arXiv:https://academic.oup.com/ieam/article-pdf/19/5/1320/59563155/ieam4733.pdf

[20] European Parliament and Council of the European Union. 2002. Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise. *Official Journal of the European Communities* L 189 (2002), 12–25. https://eur-lex.europa.eu/eli/dir/2002/49/oj/eng

[21] Sam Ferguson, Anthony Rowe, Oliver Bown, Liam Birtles, and Chris Bennewith. 2017. Sound Design for a System of 1000 Distributed Independent Audio-Visual Devices. In *Proceedings of the International Conference on New Interfaces for Musical Expression*. Aalborg University Copenhagen, Copenhagen, Denmark, 245–250. https://doi.org/10.5281/zenodo.1176236

[22] Clinton D. Francis, Peter Newman, B. Derrick Taff, Crow White, Christopher A. Monz, Mitchell Levenhagen, Alissa R. Petrelli, Lauren C. Abbott, Jennifer Newton, Shan Burson, Caren B. Cooper, Kurt M. Fristrup, Christopher J.W. McClure, Daniel Mennitt, Michael Giamellaro, and Jesse R. Barber. 2017. Acoustic environments matter: Synergistic benefits to humans and ecological communities. *Journal of Environmental Management* 203 (2017), 245–254. https://doi.org/10.1016/j.jenvman.2017.07.041

[23] Karmen Franinovic and Yon Visell. 2007. New Musical Interfaces in Context : Sonic Interaction Design in the Urban Setting. In *Proceedings of the International Conference on New Interfaces for Musical Expression*. New York City, NY, United States, 191–196. https://doi.org/10.5281/zenodo.1177093

[24] Kate Galloway. 2022. On the Ethics of Extraction in Environmental Sound Art. *MUSICultures* 49 (2022), 111–134. https://journals.lib.unb.ca/index.php/MC/article/view/33221 Published 2 December 2022.

[25] Lalya Gaye and Lars E. Holmquist. 2004. In Duet with Everyday Urban Settings: A User Study of Sonic City. In *Proceedings of the International Conference on New Interfaces for Musical Expression*. Hamamatsu, Japan, 161–164. https://doi.org/10.5281/zenodo.1176601

[26] Mark Grimshaw-Aagaard and Brian Bemman. 2024. Ultrasonics and urban greening: an exploratory study on ultrasound presence in urban spaces. *Personal Ubiquitous Comput.* 28, 5 (April 2024), 677–692. https://doi.org/10.1007/s00779-024-01798-5

[27] Reinhard Gupfinger and Martin Kaltenbrunner. 2014. SOUND TOSSING Audio Devices in the Context of Street Art. In *Proceedings of the International Conference on New Interfaces for Musical Expression*. Goldsmiths, University of London, London, United Kingdom, 577–580. https://doi.org/10.5281/zenodo.1178778

[28] Esther Hammelburg. 2020. Live event-spaces: Place and space in the mediatized experience of events. In *Locating Imagination in Popular Culture* (1 ed.). Routledge, Chapter 17, 215–229. https://doi.org/10.4324/9781003045359-17

[29] Donna J. Haraway. 2016. *Staying with the Trouble: Making Kin in the Chthulucene*. Duke University Press. http://www.jstor.org/stable/j.ctv11cw25q

[30] Adrian Hazzard, Steve Benford, and Gary Burnett. 2014. You'll Never Walk Alone: Composing Location-Based Soundtracks. In *Proceedings of the International Conference on New Interfaces for Musical Expression*. Goldsmiths, University of London, London, United Kingdom, 411–414. https://doi.org/10.5281/zenodo.1178794

[31] Jocelyn Ho, Margaret Schedel, and Bryan Jacobs. 2024. Housework Commons: Rheostat Rotary Rack. In *Proceedings of the International Conference on New Interfaces for Musical Expression*, S M Astrid Bin and Courtney N. Reed (Eds.). Utrecht, Netherlands, Article 4, 5 pages. https://doi.org/10.5281/zenodo.13904770

[32] Kirsten Holmes, Michael Hughes, Judith Mair, and Jack Carlsen. 2015. Environmental impacts of events. In *Events and Sustainability* (1st ed.), Kirsten Holmes, Michael Hughes, Judith Mair, and Jack Carlsen (Eds.). Routledge, Chapter 8, 79–99. https://doi.org/10.9774/gleaf.9781315813011

[33] Ira Brunchilda Hubner, Myrza Rahmanita, and Surya Fadjar Boediman. 2025. From Rhetoric to Practice: Stakeholder Engagement as a Driver of Green Event Success: A Systematic Literature Review. *KnE Social Sciences* 10, 29 (2025), 373–383. https://doi.org/10.18502/kss.v10i29.20280

[34] Marie Højlund, Morten Riis, Daniel Rothmann, and Jonas Kirkegaard. 2017. Applying the EBU R128 Loudness Standard in live-streaming sound sculptures. In *Proceedings of the International Conference on New Interfaces for Musical Expression*. Aalborg University Copenhagen, Copenhagen, Denmark, 420–425. https://doi.org/10.5281/zenodo.1176354

[35] International Organization for Standardization. 2024. *ISO 20121:2024 Event sustainability management systems — Requirements with guidance for use*. Standard. International Organization for Standardization, Geneva, CH. https://www.iso.org/standard/86389.html

[36] ISO 1996-1:2016 2016. *Acoustics – Description, measurement and assessment of environmental noise – Part 1: Basic quantities and assessment procedures*. Standard. International Organization for Standardization, Geneva, CH.

[37] ISO 1996-2:2017 2017. *Acoustics – Description, measurement and assessment of environmental noise – Part 2: Determination of sound pressure levels*. Standard. International Organization for Standardization, Geneva, CH.

[38] Tazim Jamal and Amanda Stronza. 2009. Collaboration theory and tourism practice in protected areas: stakeholders, structuring and sustainability. *Journal of Sustainable Tourism* 17, 2 (2009), 169–189. https://doi.org/10.1080/09669580802495741 arXiv:https://doi.org/10.1080/09669580802495741

[39] Meegan Jones. 2017. *Sustainable Event Management: A Practical Guide* (3 ed.). Routledge, London. https://doi.org/10.4324/9781315439723

[40] Aurore Julien and Clare Mackay. 2019. Environmentally sustainable event design. In *The Fundamentals of Event Design* (1 ed.). Routledge, Chapter 12, 177–194. https://doi.org/10.4324/9781351142083-12

[41] Anindya Kenyo Larasti. 2019. Environmental Impacts Management of the Coachella Valley Music and Arts Festival. *Gadjah Mada Journal of Tourism Studies* 2, 2 (2019), 56–72. https://doi.org/10.22146/gamajts.v2i2.56851

[42] Ben Lawhon, B. Derrick Taff, Peter Newman, Wade M. Vagias, and Jennifer Newton. 2017. Understanding and Influencing State Park Visitors' Leave No Trace Behavioral Intent. *Journal of Interpretation Research* 22, 1 (2017), 53–71. https://doi.org/10.1177/109258721702200104 arXiv:https://doi.org/10.1177/109258721702200104

[43] Jeffrey L Marion and Scott E Reid. 2001. Development of the US Leave No Trace program: an historical perspective. *Enjoyment and understanding of the national heritage* (2001), 81–92.

[44] Adnan Marquez-Borbon. 2015. But Does it Float? Reflections on a Sound Art Ecological Intervention. In *Proceedings of the International Conference on New Interfaces for Musical Expression*, Edgar Berdahl and Jesse Allison (Eds.). Louisiana State University, Baton Rouge, Louisiana, USA, 335–338. https://doi.org/10.5281/zenodo.1179126

[45] Raul Masu, Fabio Morreale, and Alexander Refsum Jensenius. 2023. The O in NIME: Reflecting on the Importance of Reusing and Repurposing Old Musical Instruments. In *Proceedings of the International Conference on New Interfaces for Musical Expression*, Miguel Ortiz and Adnan Marquez-Borbon (Eds.). Mexico City, Mexico, Article 14, 10 pages. https://doi.org/10.5281/zenodo.11189120

[46] Brennan Matt. 2021. The Infrastructure and Environmental Consequences of Live Music. In *Audible Infrastructures: Music, Sound, Media*. Oxford University Press. https://doi.org/10.1093/oso/9780190932633.003.0006 arXiv:https://academic.oup.com/book/0/chapter/287756457/chapter-pdf/39813576/oso-9780190932633-chapter-6.pdf

[47] Nicolo Merendino, Mela Bettega, Adam Pultz Melbye, John D. Sullivan, Antonio Rodà, and Raul Masu. 2024. Sustainable digital fabrication in NIME: Nine sustainability strategies for DMI production. In *Proceedings of the International Conference on New Interfaces for Musical Expression*, S M Astrid Bin and Courtney N. Reed (Eds.). Utrecht, Netherlands, Article 40, 9 pages. https://doi.org/10.5281/zenodo.13904850

[48] Fabio Morreale, Nicolas Gold, Cécile Chevalier, Raul Masu, Kerem Ergener, Doga Cavdir, and Natalia Fuchs. 2025. NIME Principles & Code of Practice on Ethical Research. https://doi.org/10.5281/zenodo.17811082

[49] Bryan C. Pijanowski, Luis J. Villanueva-Rivera, Sarah L. Dumyahn, Almo Farina, Bernie L. Krause, Brian M. Napoletano, Stuart H. Gage, and Nadia Pieretti. 2011. Soundscape Ecology: The Science of Sound in the Landscape. *BioScience* 61, 3 (03 2011), 203–216. https://doi.org/10.1525/bio.2011.61.3.6 arXiv:https://academic.oup.com/bioscience/article-pdf/61/3/203/19404645/61-3-203.pdf

[50] Cambridge University Press. 2026. *Site — English Meaning*. https://dictionary.cambridge.org/dictionary/english/site Accessed 2026-02-12.

[51] Veronica Relano, Sierra Christodoulou, Mirta Carbajal, and Maite Narvarte. 2025. Community cohesion in the absence of MPA co-design: transforming a paper park in the San Antonio Bay, Argentina. *Frontiers in Ocean Sustainability* 3 (2025). https://doi.org/10.3389/focsu.2025.1638573

[52] Giuseppe Resta and Samuel Gonçalves. 2024. Design for disassembly and cultural sites. The use of modular architecture and prefabrication in exhibition venues. *VITRUVIO - International Journal of Architectural Technology and Sustainability* 9, 1 (Jun. 2024), 78–95. https://doi.org/10.4995/vitruvio-ijats.2024.21442

[53] Riki Saito, Fushi Sano, Rikuto Shinmi, Minna Hosaka, Haruru Muramatsu, Kenta Tanaka, Ryoho Kobayashi, Yuta Uozumi, and Shinya Fujii. 2024. Yadorigi. In *Proceedings of the International Conference on New Interfaces for Musical Expression*, Laurel Smith Pardue and Palle Dahlstedt (Eds.). Utrecht, Netherlands, Article 11, 6 pages. https://doi.org/10.5281/zenodo.15027175

[54] Paul Sanden. 2013. Introduction. In *Liveness in Modern Music*. Routledge, 1–17. https://doi.org/10.4324/9780203078518

[55] Jan C. Schacher. 2008. Davos Soundscape, a Location Based Interactive Composition. In *Proceedings of the International Conference on New Interfaces for Musical Expression*. Genoa, Italy, 168–171. https://doi.org/10.5281/zenodo.1179623

[56] Scott Smallwood. 2016. Coronium 3500: A Solarsonic Installation for Caramoor. In *Proceedings of the International Conference on New Interfaces for Musical Expression*. Queensland Conservatorium Griffith University, Brisbane, Australia, 32–35. https://doi.org/10.5281/zenodo.1176127

[57] Gabriela Spears-Rico. 2015. *Consuming the native other: Mestiza/o Melancholia and the performance of indigeneity in Michoacán*. Ph. D. Dissertation. UC Berkeley.

[58] Alamuri Suryanarayana. 2025. Green Technology and Sustainable Infrastructure for Festivals and Events: Reasoning and Research Evidence. *Festival and Event Tourism and Hospitality Series* (2025), 189–200. https://doi.org/10.1079/9781836990185.0015

[59] Bastian Thomsen, Jennifer Thomsen, Kellen Copeland, Sarah Coose, Emily Arnold, Haydn Bryan, Karl Prokop, Kaela Cullen, Caitlyn Vaughn, Brenda Rodriguez, Rachel Muha, Natalie Arnold, Hannah Winger, and Gabrielle Chalich. 2023. Multispecies livelihoods: a posthumanist approach to wildlife ecotourism that promotes animal ethics. *Journal of Sustainable Tourism* 31, 5 (2023), 1195–1213. https://doi.org/10.1080/09669582.2021.1942893 arXiv:https://doi.org/10.1080/09669582.2021.1942893

[60] Antonio Cavallin Toscani, Luca Vendraminelli, and Andrea Vinelli. 2024. Environmental sustainability in the event industry: a systematic review and a research agenda. *Journal of Sustainable Tourism* 32, 12 (2024), 2663–2697. https://doi.org/10.1080/09669582.2024.2309544 arXiv:https://doi.org/10.1080/09669582.2024.2309544

[61] Lynn Van Der Wagen and Brenda R. Carlos. 2005. *Event Management for Tourism, Cultural, Business, and Sporting Events*. Pearson Prentice Hall, Upper Saddle River, New Jersey.

[62] Nathan D Villicana-Shaw, Dale Carnegie, Jim Murphy, and Mo Zareei. 2023. Explorator Genus: Designing Transportable Mechatronic Sound Objects for Outdoor Installation Art. In *Proceedings of the International Conference on New Interfaces for Musical Expression*, Miguel Ortiz and Adnan Marquez-Borbon (Eds.). Mexico City, Mexico, Article 3, 9 pages. https://doi.org/10.5281/zenodo.11189092

[63] Nathan D Villicana-Shaw, Dale Carnegie, Jim Murphy, and Mo Zareei. 2023. Legatus: Design and Exhibition of Loudspeaker-Based, Environmentally-Reactive, Soundscape Augmentation Artifacts in Outdoor Natural Environments. In *Proceedings of the International Conference on New Interfaces for Musical Expression*, Miguel Ortiz and Adnan Marquez-Borbon (Eds.). Mexico City, Mexico, Article 5, 8 pages. https://doi.org/10.5281/zenodo.11189096

[64] Nathan Villicaña-Shaw, Dale A. Carnegie, Jim Murphy, and Mo Zareei. 2021. Speculātor: visual soundscape augmentation of natural environments. In *Proceedings of the International Conference on New Interfaces for Musical Expression*. Shanghai, China, Article 43. https://doi.org/10.21428/92fbeb44.e521c5a4

[65] Andrew Whitehouse. 2024. Inquisitory Birds: Thinking through the Ethics and Assumptions of Playback Responses in Birds. *Schweizer Jahrbuch für Musikwissenschaft* 41 (Dec. 2024), 39–51. https://doi.org/10.36950/sjm.41.3