

Institution: University of Warwick		
Unit of Assessment: D33 – Music, Drama, Dance, Performing Arts, Film and Screen Studies		
Title of case study: Yellow Dust: Changing public attitudes to air pollution and inspiring environmental activism		
Period when the underpinning research was undertaken: 2015-2020		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s): Nerea Calvillo	Role(s) (e.g. job title): Associate Professor	Period(s) employed by submitting HEI: September 2015-Present
Period when the claimed impact occurred: 2015-2020		
Is this case study continued from a case study submitted in 2014? N		
<p>1. Summary of the impact (indicative maximum 100 words)</p> <p>We are living in an age of environmental emergencies, but, with remarkable exceptions, there is still much passivity in our society and culture with regard to this fact. Dr Nerea Calvillo's interdisciplinary work combines architectural design and environmental science to generate alternative ways of communicating air pollution using creative, practice-based methods, realizing visual and sensory performance installations in public spaces. Calvillo's research has increased citizen awareness, action and cultural understanding of environmental pollution internationally through her Yellow Dust exhibition at the Seoul Biennale and public workshops conducted in Mexico City, London and Coventry. Her widely publicized installations have influenced city managers in Madrid to deploy creative approaches for citizen awareness and engagement, and impacted environmental debate in architecture through media coverage and exhibitions in prestigious art institutions such as Matadero Madrid and the Royal Academy of Arts in London.</p>		
<p>2. Underpinning research (indicative maximum 500 words)</p> <p>The livelihoods of more and more communities around the globe are being threatened by environmental damage that can be traced back to our economic arrangements and ways of living, and we are not doing enough to mitigate this harm. Calvillo, based in the Centre for Interdisciplinary Methodologies, uses and advances creative methods to present complex technical and scientific data in engaging performance installations capable of involving publics and policy audiences in environmental issues, through the use of aesthetic registers - from the visually to fully embodied, sensorial and to spatial. For the past five years, Calvillo has been developing digital and spatial visualisations, informed by her theoretical research into the relations between environments, science and embodied experience, to develop new ways for citizens to engage with environmental issues.</p> <p>Calvillo's practice-based research, at the intersection of artistic practice, spatial design and social sciences, explores innovative visualisation methods to change public attitudes and actions towards the environment. To do so, she has tested different existing methods of sensing and making air pollution visible in Madrid (3.1), in order to understand how different types of data, devices and interfaces have different communication capacities, and how they mobilise lay people around the issue of air pollution in multiple ways (3.2). The main finding of this research, published in leading interdisciplinary journals across architecture, sociology and cultural studies, is that governmental or institutional air quality data published in official webpages or on digital screens are rarely consulted and have very little impact on how people perceive and react to polluted air (3.3). Instead, Calvillo found that experimental and embodied ways for making environmental data visible, like air pollution-responsive wearables or 'smelling walks' produced much stronger awareness and transformation of people's daily routines (3.4). Therefore, her</p>		

research evidenced that more affective and performative experiences offer more impactful alternatives to the scientific and policymaking assumptions that information alone leads to behavioural change.

To explore this, Calvillo has produced practice-based, artistic research in the form of creative installations and films that engage non-academic audiences with her research, using sensory and spatial experience to overcome the perceived invisibility of air. [Pollen in the Air](#), for instance, was commissioned in 2014 by Laboral Centro de Arte y Creación Industrial, Gijón, Spain (the leading art institution focused on new media in Spain). It visualised pollen in real time on an interactive website, giving participants the ability to travel among clouds of pollen in the air above the city of Gijón, serving both as a tool for public information for people with asthma, and as a way of knowing the city through its different species of vegetation and their rhythms of flowering.

Calvillo further developed this unique immersive approach with *Yellow Dust* (2017) - a temporary urban infrastructure commissioned by the Seoul Biennale of Architecture and Urbanism that monitors air pollution in highly specific places and points in time and translates this data into a visible and sensorial experience. The installation is designed to be built again by citizens, associations or institutions, to generate questions and provocations as part of a wider campaign for environmental awareness and justice. It consists of a three-dimensional water vapour canopy that translates air pollution data into vapour patterns in real-time, and informs audiences about particulate matter formed as a result of burning fuel and chemical reactions in the atmosphere. The fog canopy is reactive to meteorological changes, whilst also functioning as a habitable and media infrastructure, exploring experiential modes of dealing with environmental knowledge and information such as breathing or touching data (3.5).

The colour of the fog also plays a role in shifting the conversation around air pollution issues, from the measurement of air particle concentrations to polluting responsibility. The fog is coloured yellow in reference to the Yellow Dust (Hwangsae in Korean), transboundary fine soil particles carried by the wind from Mongolia and Northern China, mostly during the spring. The yellow fog aims to make visible Seoul's own emissions, to challenge the media and government narrative where Hwangsae is the only source of pollution (3.6).

3. References to the research (indicative maximum of six references)

Calvillo's publications include articles in peer-reviewed journals and chapters in edited collections, in addition to the *Yellow Dust* website which holds the project documentation:

1. **Calvillo, Nerea** (2018) *Political airs: from monitoring to attuned sensing air pollution*. Social Studies of Science, 48 (3). pp. 372-388. doi:10.1177/0306312718784656
2. **Calvillo, Nerea** and Garnett, Emma (2019) *Data intimacies: building infrastructures for intensified embodied encounters with air pollution*. The Sociological Review, 67 (2). pp. 340-356. doi:10.1177/0038026119830575
3. Liboiron, Max, Tironi, Manuel and **Calvillo, Nerea** (2018) *Toxic politics: Acting in a permanently polluted world*. Social Studies of Science, 48 (3). pp. 331-349. doi:10.1177/0306312718783087
4. **Calvillo, Nerea** (2019) *Digital visualizations for thinking with the environment*. In: Vertesi, Janet and Ribes, David, (eds.) *digitalSTS: A Field Guide for Science & Technology Studies*. Princeton: Princeton University Press, pp. 61-75. ISBN: 9780691187075
5. **Calvillo, Nerea** (2018) *Inviting atmospheres to the architecture table*. In: Marres, Noortje and Guggenheim, Michael and Wilkie, Alex, (eds.) *Inventing the social*. Manchester, UK: Mattering Press, pp. 41-64. ISBN: 9780995527751

6. Calvillo, Nerea, (2017) *Yellow Dust: In the Air*. <http://yellowdust.intheair.es/>

Funding: **Calvillo, Nerea** (PI). ESRC Impact Acceleration Account. *Yellow Dust*. REF: ES/M500434/1. 2017. **GBP12,062**

4. Details of the impact (indicative maximum 750 words)

Yellow Dust (2017)

‘Seeing pollution is the first step in changing the habits that generate it’ (Jaime García Cantero in conversation with Calvillo, *El Pais*, 7 Nov 2019, 5.1)

Calvillo’s research has created novel and effective immersive installations that engage members of the public in different parts of the world with issues of environmental pollution. It has resulted in increased citizen awareness and activism, inspired new neighbourhood environmental arts engagement projects and initiated a debate within architecture about how the profession can engage with the issue and contribute solutions.

Increasing citizen awareness, action and cultural understanding of environmental pollution internationally

In 2017, Calvillo was commissioned to produce *Yellow Dust* for the Seoul Biennale of Architecture and Urbanism (3.6). The installation used sensors to monitor real time air pollution data from the site location, emitting a coloured and humid water vapour mist that varied in intensity with the concentrations of fine particulate matter in the air, allowing visitors to both see and feel the air pollution.

The Biennale was the first of its kind in South Korea and the first international architecture biennale that focused on environmental issues. More than 460,000 people visited the Biennale over a period of two months (5.2), with visitors to *Yellow Dust* reporting changes in understanding and perceptions of environmental issues and pollution (5.3). As a result of engaging with the installation, visitors also identified actions they might take to improve air quality, including using public transport, ‘eating vegetables instead of meat’ and using sustainable materials. Visitors identified *Yellow Dust* as a persuasive route towards ‘stronger government regulations’ and policy change. They commented that the installation had enabled them to understand pollution in a new way, by ‘feeling pollution literally, no numbers but touch’, stating that before viewing *Yellow Dust*, they ‘didn’t know about the air pollution of Seoul’. Importantly, visitors identified that the installation provided both an awareness of the problem and a suggestion of the solution; ‘It’s so good that I can see data and [...] having the solution to the dust at the same time’ (5.3).

Cultural mediators and curators have used Calvillo’s work as an example to illustrate and trigger public debates around the environment. In 2017, following the opening of the Biennale, *Yellow Dust* was discussed in the ‘culture focus’ session of KBS World Radio (the national public broadcaster funded by the Government boasting a network of 65.2 million households in 117 countries around the world in 2017). Hosted by Ahn Jae Woo, a very popular South Korean TV cultural critic, he commented ‘may the visualization of Yellow Dust generate the nearest future of green trust’ (5.2). Furthermore, the New York Times Style Magazine Spain selected Calvillo as

one of the 25 influencers of 2017 (next to internationally renowned Elon Musk, Hito Steyerl and Helmut Lang), describing how *Yellow Dust*, through the questions it poses, makes people connect at a personal level with air pollution to realise the impact that their own daily practices have and to hold big polluters accountable. They argue that Calvillo's work, and her innovative approaches more broadly, 'give a solution to urban problems towards sustainability and efficiency' (5.2).

Yellow Dust attracted coverage in high quality Spanish media, including a four-page interview in the *El Pais* (The Guardian equivalent, circulation: 163,759) in 2018 and on national TV; her work was described by presenters on Spanish National television channel LA2 as 'fundamental' in informing citizens about air pollution, enabling them to actively engage with the challenges of pollution (5.2). Press coverage reached wide audiences and changed attitudes towards sustainability. For example, a school teacher in a remote small town in Spain wrote to Calvillo in 2020 to let her know that, inspired by her work, his students started discussing environmental issues and initiated their own research on air pollution (5.4). This active response from the students is a tangible example of how the media coverage of Calvillo's work not only raised awareness of air pollution but also inspired positive action.

Beyond the Seoul Biennale and *Yellow Dust*, cultural mediators have since commissioned Calvillo to create activities that raise awareness and engage wide publics through experiential walks and workshops. In Mexico City (2018), a participant and environmental educator expressed how Calvillo's workshop had given her tools and a new perspective to teach her own young students (5.5). Furthermore, Calvillo has also run events in London at the Barbican Centre (2019), and in Coventry as a co-organised activity selected for the 2019 ESRC Festival of Social Science, where participants learned 'new ways to think about what the environment means in a city like Coventry' and to 'pay more attention to climate change and pollution' (5.5).

Influencing city managers to deploy creative approaches for citizen awareness and engagement

Following *Yellow Dust*, Calvillo was commissioned by city managers to create new projects to engage citizens in environmental issues. For instance, Madrid City Council approached Calvillo to further develop her methodology at Imagina Madrid, an experimental program designed to explore the role of public art in activating abandoned public spaces. Calvillo co-designed with neighbours and a choreographer *The Descents* (2018), an iteration of *Yellow Dust* installed in a large public square in a low socio-economic neighbourhood of Madrid that made droughts and water pollution visible in real time. Feedback from visitors indicated that the installation had enabled them to see the 'environmental actuality of the planet', helping them to visualise environmental changes and water wastage. As a result, visitors committed to 'keep an eye on water consumption at home' and to 'save in every way possible the water that we consume' (5.6).

In a recorded discussion at the installation, a Co-Director from Imagina Madrid commented that, through *The Descents*, 'we [can] start thinking not in huge interventions, but the small ones, really listening to the local situation, ...now we will be more capable to accept and to...sustain and to give more tools to artists that propose things in this way [that collaborate with nature]' (5.6). An official from the Environmental Policy unit of Madrid City Council, also at the installation and pointing to it, commented that 'I think that there is much consciousness but that it still doesn't translate in behaviour, that is to say that in all environmental issues, that step between attitude - the positive attitude right?... We don't change our behaviour just by a read, we need the experiences... I think that art can in fact help us...to gain that consciousness...what art offers is other way of approaching problems that could be much more attractive' (5.6).

Changing the environmental debate in architecture

Architecture has traditionally responded to environmental issues through technological efficiency and sustainable solutions. Calvillo's visualisations have succeeded in shifting the environmental

dialogue across the sector. An architect by training, Calvillo's interdisciplinary research combines architectural design, science data, social sciences and visual art approaches. This unique combination has given the visualisations a status as architecture products, which has facilitated new dialogues about architecture and air pollution, demonstrated by the publication of her work in prominent architectural media which traditionally only focus on buildings. These include Madrid's Architect's Professional Association publication (*Arquitectura*) and the internationally renowned online art magazine *e-flux* (readership: 90,000) (5.1). In the first issue of *Ness*, an Argentinian bilingual magazine launched in 2018, *Yellow Dust* was featured as one of the top 9 activist installations in 2017, as an 'installation that rocketed 2017 by questioning, claiming, resisting or presenting social conflictive issues that reflect contemporary world concerns' (5.2).

Calvillo's visualisations have also been displayed in architecture exhibitions. *Yellow Dust* was selected for the international and itinerant exhibition '*Eco-visionaries: Art for a planet in a state of emergency*', an exhibition exploring humankind's ecological impact on the planet in Matadero Madrid (summer 2019). *Eco-visionaries* toured to the Royal Academy of Arts in London, who then commissioned Calvillo to produce *Madrid In The Air*, a film documenting the skyline of Madrid over a 24-hour period, uncovering the almost invisible veil of pollutants in the air. As part of the exhibition, Calvillo was commissioned to chair a public engagement session on air pollution, with scientists, artists and policy makers. A member of the audience responded in the feedback questionnaire that 'as an architecture student, [I] started to think about how can I design a solution to this problem' (5.7). Following the exhibition, *The Guardian* (print readership: 564,000, circulation: 111,953) commented that the 'In the Air' concept 'offers a useful resource for urban planners and activists, as well as helping residents to understand the complex invisible components in the air they breathe' (5.2). Calvillo's wider research also continues to influence future architects through teaching: since 2017, Calvillo has been a visiting professor on the MS Advanced Architecture Design at the Graduate School of Architecture, Planning and Preservation of Columbia University (New York). As the program director notes, Calvillo's 'interdisciplinary and environmental contributions to Architectural Design have been key to the school and to the field at large' (5.8).

Calvillo's unique position as an expert in material, technological, political and social dimensions of environmental pollution has led to cutting edge immersive provocations resulting in social change. Her work has involved participants from individuals through to city planners and architects and continues to prompt questions around environmental responsibility and action. She continues to drive debate around urban political ecology and raise awareness which stimulates change in future practices, at all levels.

5. Sources to corroborate the impact (indicative maximum of 10 references)

1. Press articles and appearances by Calvillo
2. Press Coverage of Calvillo's work (includes articles in Spanish)
3. *Yellow Dust* questionnaire responses
4. Letter from school teacher (in Spanish)
5. Sensory walk feedback (includes feedback in Spanish)
6. *The Descents* Feedback (questionnaires and interviews)
7. *Eco-visionaries* panel: audience feedback
8. Letter from Graduate School of Architecture, Planning and Preservation of Columbia University