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Editorial: The Scales of Environmental Justice

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Since the 1980s, environmental justice researchers have struggled to make sites and histories of environment injustices visible. Some, such as Phil Brown, Barbara Allen, and Jennifer Gabrys help with citizen science efforts to monitor, report, and campaign about environmental exposures in communities. Others, including Gwen Ottinger, Anna Lora-Wainwright, and Joan Martínez-Alier have brought them into the open through their writings.

Protestor, credit: H Christoph Steinhardt & Fengshi Wu free from http://www.istockphoto.com/gb

Clearly, environmental justice scholars should continue their important work in tackling issues of visibility, evidence, and recognition. However, this work and the campaigns it supports, do not always lead to justice. The successful grassroots movement to prevent a petrochemical company from locating in Convent in Cancer Alley, Louisiana (1996) resulted in the re-location of the company in another, less well-organized community, a scenario that has been replicated in struggles around the world. The 2007 mass protests in Xiamen, China against a proposed paraxylene (PX) chemical plant, for instance, led to the location of the plant in Zhangzhou instead.

There can also be unintended consequences of increased public awareness of toxic problems. Rachel Carson's book *Silent Spring* (1962) helped lead to the ban of DDT (dichlorodiphenyltrichloroethane) in the United States in 1972. But public attention on banning DDT caused a regulatory blind eye to be turned to the second main class of chemicals identified within Carson's book, the even-more-toxic organophosphates, which are still widely used as pesticides (see Davis 2014).

This all suggests another challenge remains to be addressed: to make people think more deeply and more globally about environmental justice in all of its complexity.

My collaborative research for the ERC-funded research project on Toxic Expertise: Environmental Justice and the Global Petrochemical Industry aims to traverse different (and seemingly incommensurable) **scales of justice**, both in terms of *geography* (from local struggles to regional, national, and global transnational movements) and in terms of *values* (competing interests and values of economy, environment, and health).

As we continue with our research, we are beginning to grapple with the challenge that we have set ourselves: of drawing insights and connections across multiple sites and divergent people; from environmental activists, community residents, and NGOs, to corporate and government representatives.

Just over a year and a half into this 5-year project, we (the Toxic Expertise research team) have made our first journeys into exploring this complex terrain. At one point, in March 2016, we were engaged in conversations "from the field" across three petrochemical landscapes: a global petrochemical industry conference in Amsterdam; a grassroots community meeting about a planned new Chinese petrochemical plant in St James Parish, Louisiana; and an official petrochemical complex visit in Nanjing. As we continue with our research, we are beginning to grapple with the challenge that we have set ourselves: of drawing insights and connections across multiple sites and divergent people; from environmental activists, community residents, and NGOs, to corporate and government representatives.

It is well known that problems of environmental injustice have patterns and similarities around the globe, with uneven social-spatial patterns of environmental benefits and risks. Initiatives such as the EJOLT Mapping Environmental Justice have already embarked on linking up different struggles (and other languages and discourses related to environmental justice) through online mapping of multiple case studies.

Screen shot of the Ejolt website landing page (16/05/2017)

Yet the challenge of making links between diverse local struggles is really quite profound for a number of reasons. First, it is a question of capacity. Local struggles are focused on urgent issues that affect people's everyday lives and wellbeing, and extra resources are required to reach beyond local networks.

'Nimby' graphic, credit: http://savehistoricjacksonhole.org/ (15/05/2017)

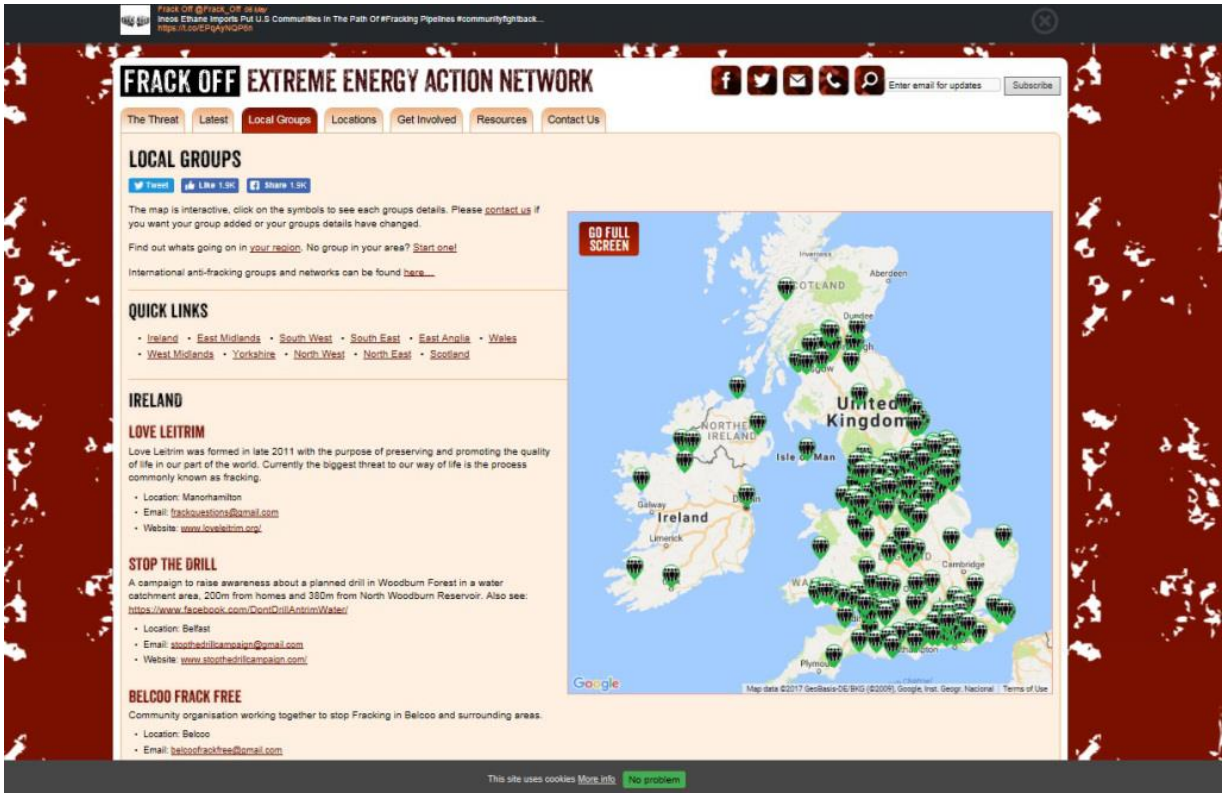
Second, it is a question of NIMBYism, as we have seen in environmental justice struggles that end in the relocation of toxic sites to other communities. In locations facing environmental injustice, ordinary people who have never been politically active before can become motivated to become activists, particularly when their lives are personally affected. But once local battles have been fought, people are less motivated – or less able, going back to the question of capacity – to extend concern and activism beyond particular local issues. Of course, there are exceptions, such as Lois Gibbs, who led the battle for community relocation following the US 1978 Love Canal disaster and continues to campaign for environmental justice around the world. But such activists remain the exception rather than the rule.

Third, it is a question of knowledge and expertise, knowing what is going on in other places and how to draw out common lessons and strategies for action.

There seems to be a need to make stories personal, to have "a hook" in order to resonate. Thus, fracking is an explosive issue in the UK, especially in affected communities, and in the aftermath of all the bad publicity of fracking in the US

Communicating the relevance and complexity of such struggles to different kinds of "publics": NGOs, governments, corporations, the general public – presents further challenges particularly on a global scale. Many public issues are tightly bounded within national and

local priorities. There seems to be a need to make stories personal, to have "a hook" in order to resonate. Thus, fracking is an explosive issue in the UK, especially in affected communities, and in the aftermath of all the bad publicity of fracking in the US. The debate about nuclear energy is also alive again, with the controversies around the proposed Hinkley nuclear facility. Global environmental issues like climate change and toxic dumping require more of a nudge to capture public attention. Often, this requires invoking a sense of moral outrage, as in the case of the floundering marine wildlife covered in oil or entangled in plastic. Or a sense of urgency inspired by media spectacle following a disaster: the immediate fallout of Hurricane Katrina (2005) or the Fukushima disaster (2011).



Screen shot from the 'Frack Off' website which details UK based anti-fracking community groups http://frack-off.org.uk/local-group-specific-pages/ (16/05/2017)

In an uneven landscape of environmental benefits and hazards, there are winners and losers. Hazardous waste; dirty extractive industries; and the majority of the world's top toxic threats are all concentrated in poor, marginalized places, primarily in the Global South. The rest of the world benefits from the fact that environmental injustices are displaced elsewhere.

To draw public attention to the global nature of local environmental struggles, particularly around issues of injustice, we need to confront uncomfortable realities underpinning modern consumer lifestyles. This requires a deep *sociological imagination*, "a way of looking at the world that can see links between the apparently private problems of the individual and important social issues" (C. Wright Mills 1959).

....Gwen Ottinger explores four important lessons from her experiment in creating web-based tools that would help people living in fenceline refinery communities.

In this issue, we bring together articles that address different scales of environmental justice. In the opening feature article, Gwen Ottinger explores four important lessons from her experiment in creating web-based tools that would help people living in fenceline refinery communities make sense and use of large volumes of publicly available ambient air quality data.

Next, we turn our attention to under-explored issues of environmental justice in the Global South. In an ethnographic study of a village in the Sundarban Tiger Reserve in India, Amrita Sen provides striking yet sensitive account of the tensions between statist methods of conservation and forest worker livelihoods. In the "endless concrete jungle" of her native city of São Paulo in Brazil, Marina da Silva examines the politicized issue of visual pollution and its relationship to environmental justice. Both of these articles show how poor and marginalized people face disproportionate burdens of environmental risk, hazard, and stigmatization, beyond the traditional focus on "toxics" within environmental justice research.

We conclude with a report from Thom Davies about the May Toxic Expertise workshop on Pollution, Environmental Justice, and Citizen Science at the University of Warwick, UK. This workshop drew together an impressive range of international speakers and greatly inspired us to embrace the collective challenge of addressing the scales of environmental justice.

A version of this editorial was originally published with Lacuna Magazine.

Lessons Learned from an Experiment in Infrastructuring

'Shell Refinery in Martinez, California', credit: Gwen Ottinger

Gwen Ottinger, Drexel University

Almost two years ago, colleagues and I began an experiment in infrastructuring. Our working group of social scientists, programmers, environmental justice activists, and residents of "frontline" communities set out to create web-based tools that would help people make sense of, and make use of, large volumes of publicly available ambient air quality data. In our work together, I've learned first hand four lessons about information technologies and their use in everyday life that confirm the findings of social science researchers–and yet bear repeating for those striving not only to create new information technologies, but also to ensure that the technology actually functions to make facts matter in environmental justice campaigns.

The Meaning from Monitoring project was inspired by the work of activists in towns next to oil refineries in the San Francisco Bay area. In 1995, residents of Crockett and Rodeo, California, pressured their refinery neighbor (then Unocal, now Phillips 66) to install a state-of-the-art ambient air monitoring system for toxic gases. It was the first of its kind, developed with significant technical input from community members, and served as a model for nearby Benicia (next to a Valero refinery) and Richmond (home to a Chevron refinery). Both towns subsequently won their own fenceline monitoring programs–Benicia from 2008 to 2012, and Richmond in 2013, a system that Chevron, like Phillips 66, continues to operate today. These communities' collective efforts also led the Bay Area Air Quality Management District (BAAQMD) to adopt a rule in 2016 requiring all 5 refineries in its jurisdiction to set up fenceline monitoring programs.

"Our infrastructuring project responded to what we saw as untapped potential in the data generated by these monitors. The data are publicly available, yet little used."

Our infrastructuring project responded to what we saw as untapped potential in the data generated by these monitors. The data are publicly available, yet little used. While residents may look to the monitors' website when they see a flare or smell something unusual, they haven't folded the data into their campaigns against refinery permits and for new regulatory

requirements. Nor have researchers used the data to learn more about regional air quality or environmental health.

There were clear infrastructural reasons for the relative neglect of fenceline monitoring data: data wasn't easily downloadable, and the website emphasized the immediate situation without presenting a longer term view. The goal of Meaning from Monitoring, then, was to create an infrastructure that would make the data more usable and more strategically useful for communities concerned about their exposures to toxins.

Since our initial participatory design workshop in April 2016, we have created a new website that enables users to explore current and historical data, set up a mailing list for daily reports on unusually high levels of pollution, and deployed an app through which residents can report noxious odors to be presented on the website, alongside monitoring data. (Credit for this act of creation goes first and foremost to Amy Gottsegen, an undergraduate studying computer science at Drexel University, who did all the programming necessary for these tools under the supervision of Randy Sargent, Senior Systems Scientists at Carnegie Mellon University's CREATE Lab.)

Now that we have a working set of tools, however, their limitations are becoming obvious. Potential users are confused by the relationship between the website and the app, for example. What's more, we find that our website is *also* not being used–and the potential of the data remains untapped.

Our tools are admittedly still new, and as yet advertised only among people active in refinery-related environmental activism. Yet the limited uptake among some of our most likely users suggests that usage will almost certainly be our key challenge in the months ahead. As we struggle to account for low rates of use and develop strategies for expanding our user base, my first temptation is to scrutinize our design decisions and participatory processes, looking for where we went wrong, where we failed to hear or give appropriate weight to community input, where we missed the opportunity to create a site that would be relevant, intuitive, and useful.

"What deserves scrutiny is my initial expectation that we could create a suite of tools that was capable, in itself, of meeting the complex needs of potential users of air monitoring data."

But in fact, I think what deserves scrutiny is less our process and more my initial expectation that we would–that we even *could*–create a website or app or even a suite of tools that was capable, in itself, of meeting the complex needs of potential users of air monitoring data. My expectations stemmed from a naive view of how technology–information infrastructure in particular–is made, and how it becomes part of social practice.

Lesson #1: Infrastructures are not created from scratch.

Before we began, I had imagined that we would be building a website from the ground up. That's not how it worked, for two big reasons. First, code is easier and quicker to create when it's adapted from other code, and on my budget–which, as part of an National Science Foundation-funded grant, was substantial but not unlimited–a developer would have to rely heavily on pre-existing site designs and information architectures.

Second, existing sites were an important resource for participants in the design process trying to envision what a more useful website could look like. Out of the various mock-ups and potential designs that the project team assembled for the design workshop, community participants strongly preferred the one fully implemented example, The Shenango Channel, in large part for the powerful visual statement made by the site, which integrates monitoring data, map, and time-lapse photography of the (now-shuttered) Shenango Coke Works. The Shenango Channel, developed by the CREATE Lab in collaboration with Allegheny County Clean Air Now (ACCAN), thus became a model for our own site.

Lesson #2: New infrastructures inherit the strengths and limitations of old ones.

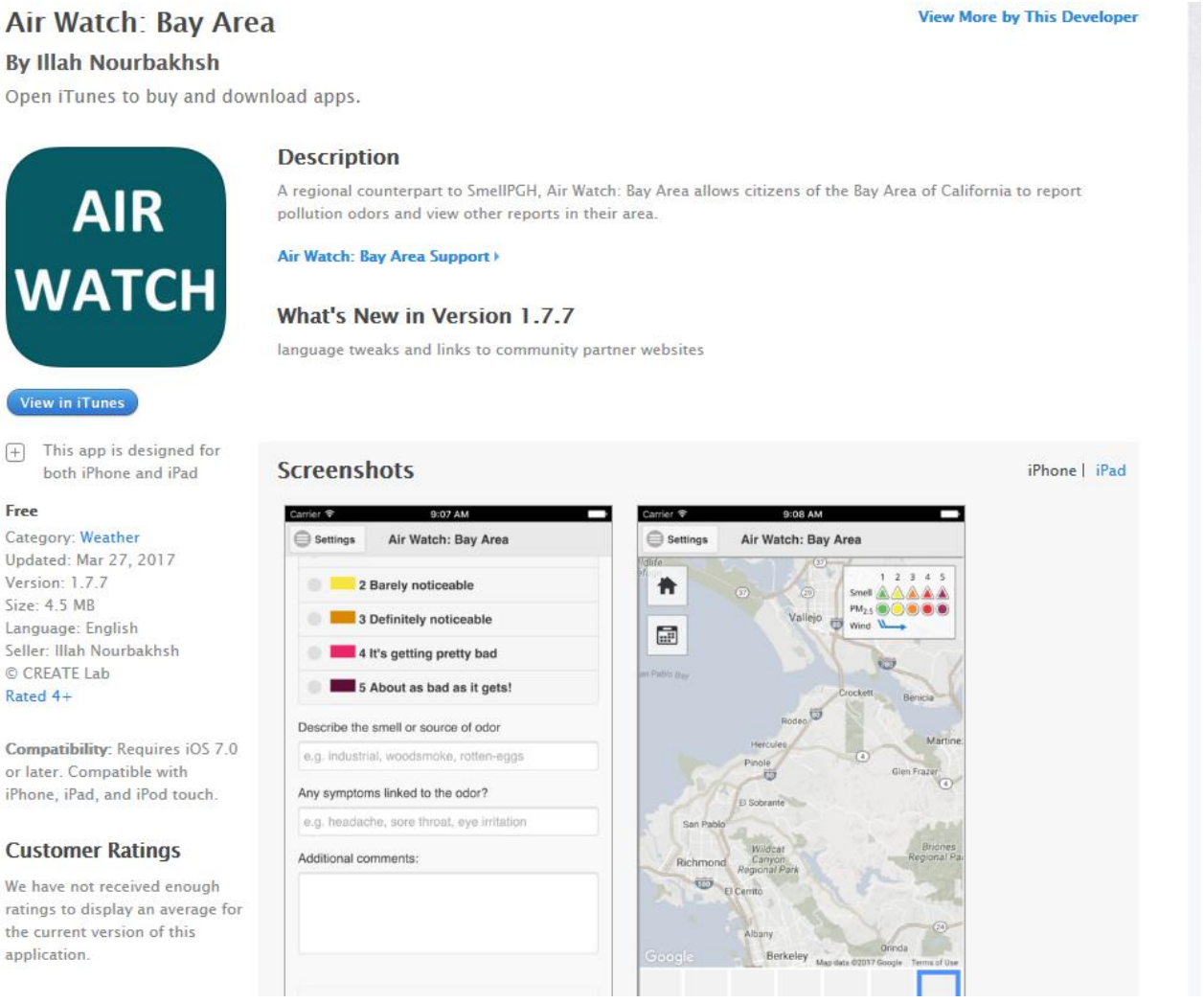
In the months leading up to the design workshop, Drexel University undergraduate Nicholas Brooks worked with me and Intel Labs colleagues Dawn Nafus and Richard Beckwith to characterize the current state of web infrastructures for collecting and displaying data about conditions in fenceline communities. What Nick found, in short, was that one category of existing sites presented quantitative information (e.g. air monitoring data) to the public without offering means for the public to contribute their own observations. The website on which Rodeo and Richmond fenceline monitoring data originally appeared, Fenceline.org, falls into this category, as do sites maintained by the United States Environmental Protection Agency, such as AirNow. A second category of website, including the Louisiana Bucket Brigade's iWitness Map and the sites in the California-based IVAN reporting network, allow people to report their observations and experiences of pollution, but are not integrated with quantitative data. Sites that did integrate quantitative and qualitative data or, to think of it another way, that allowed for two-way communication from monitor operator to affected resident, **and** affected resident to responsible authority, were both unusual and not fully realized in one dimension or the other, in the two cases we did find: The Shenango Channel and LACEEN. (At the time, the Shenango Channel's reporting function still required a bit of manual labor to integrate community reports into the website; LACEEN's monitoring data was yet to be integrated with its better-developed reporting.)

Having noted the disconnect, our site aspired to better integrate these functions from the start. But, drawing as we were on existing infrastructures for which that integration was an unresolved challenge, we foundered on exactly the same point. After creating a Shenango Channel-like interface for viewing real-time fenceline monitoring data, we faced the

challenge of incorporating some sort of reporting function. Borrowing from the iWitness Map or a comparable Ushahidi-based platform was one possibility; creating a Bay area version of the SmellPGH app, a successor to the Shenango Channel also developed by the CREATE Lab, was another. Neither would fold into our site in a way that would be seamless for users, and neither solved a central problem: how to not only collect residents' reports about local impacts of pollution, but also relay them to BAAQMD and other local authorities?

Lesson #3: Deploying open source software requires tacit knowledge.

We chose to adapt the SmellPGH app for our project because it was the fastest route to reporting capacity for residents of our partner communities. This expediency stemmed in no small part from our access to the original app's designers: because Amy was working on the Meaning from Monitoring project from the CREATE Lab, she was able to tap into the expertise of programmers there to understand what modifications needed to be made, and how to make them, in order to make the app work in another region. We also benefitted (and continue to benefit) from the CREATE Lab's back-end infrastructure for storing the reports collected by the app(s).



Although the iWitness Map and the platform on which it is built is also open source, we did not have similar access to people who had hands-on experience with it and could advise us on the finer points of deployment. Choosing that route would have been analogous to trying to learn to bake bread by reading a recipe alone, in contrast to having a master baker standing beside you to point out when your dough had become "smooth and elastic" and how to tell the difference between risen and over-risen. We ended up with better bread, so to speak–a fully functional app that relays reports to the website, deployed in only about a month–at the expense of frustrating residents with multiple platforms (a website and an app) to navigate.

Lesson #4: Uptake of new technology depends on links with on-going, everyday practice.

When we began our work, all of the community groups and activist organizations that might have been making use of data from the real-time monitors were doing without and working around, precisely because the data were so inaccessible. Our aim was to make the data more accessible, and combine it with other streams of data, so that they wouldn't have to continue to do without. Yet their success in working around also means there's little pre-existing demand for the information our tools now offer. As a result, I see the biggest remaining challenge for the Meaning from Monitoring project not as creating the perfect design (though we will still be working out the obvious kinks in our current design). Rather, I think our big challenge is to work with the individuals and groups engaged in the on-going work of protecting communities from petrochemical pollution, to envision how fenceline monitoring data–and our suite of tools more generally–can help them accomplish their goals. Thinking through potential use cases with members of our working group, including Constance Beutel, Janet Callaghan, Kathy Kerridge, and Nancy Rieser, has already prompted us to create daily summaries that are easy to print, anticipating that they might become handouts at public meetings. More such conversations with a wide range of environmental, health, and social justice organizations in the Bay area will, I hope, not just create a user base for our website and app, but guide our future development decisions, as well.

"To participate in designing and implementing the website, I had to set aside my analyst hat and accept an optimistic way of thinking about building resources and infrastructure for environmental health and justice campaigns."

As important as these four lessons are to my understanding of how to move the Meaning from Monitoring Project forward, they will hardly be news to anyone with a background in Science and Technology Studies (STS). As a an STS scholar, these are all things I should have known–and, in fact, at some level did know–in advance. Lessons #1 and 2 paraphrase Leigh Star and Karen Ruhleder's influential work on infrastructure; Lesson #4 not only resonates with Star and Ruhleder's findings but could also be seen as a restatement of the "quandary of the fact-builder" that Bruno Latour describes in *Science in Action*. And Lesson #3 is but a short extension of a long tradition in STS, showing the importance of tacit knowledge, especially in laboratory practice, as an essential element of knowledge-making–and surely I'm not the first to apply the concept to open source software.

Why, then, do these feel like such revelations in the context of the Meaning from Monitoring project? To participate in designing and implementing the website and other tools, I had to set aside my analyst hat for a while and accept, relatively uncritically, an optimistic way of

thinking about building resources and infrastructure for environmental health and justice campaigns. In this way of thinking, new technology is good for communities living on the frontlines of petrochemical pollution. They are, without question, underserved by technology: monitors are scarcer there, most websites are not designed with their residents in mind, and more affordable smartphones with more limited storage and RAM may hamper the use of additional apps. Fighting for access to appropriate technology is part and parcel of environmental justice struggle, and finding funding to create new monitors, for example, or to even attempt a participatory design project is a victory in itself.

Now that there is a prototype, though, insights from STS can re-emerge. They help make sense of where the project is, and why, and they bring into focus the subtler points of how to ensure the technologies we have created are really effective in community contexts. As we move forward, the challenge will be to turn the heightened awareness that new technology is always constrained by old into strategic design modifications and, working from the knowledge that how a technology is used depends on how properties of its design are given meaning in practice, to collaborate with potential users on new visions for how their practices can be enriched by monitoring data.

(Images are screen shots of the Air Watch website taken on 16/05/2017)

A promenade of human spaces in the 'land of the tigers': experiences from the Indian Sundarban

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The Sundarban in India epitomises one of the largest remaining trails of riverine mangrove forests, situated at the mouth of the *Ganges*, before the river disperses into the Bay of Bengal. The forests are territorially shared between the two countries of India and Bangladesh, with Bangladesh occupying the larger faction.

Sundarban is the largest remaining tract of the Royal Bengal Tiger, a predator who necessarily occupies an integral core of the terrestrial food-chain and is known for its valour in man-eating trait. The eminence of the tiger coupled with a range of exotic mangrove and aquatic resources have acquired the region a status of the 'reserved forest' in 1878, along with other landmark provisions of conservation which followed in the aftermath: Tiger Reserve, National Park, Critical Tiger Habitat and Biosphere Reserve. Sundarban Biosphere Reserve (SBR) occupies the entire stretch of the inhabited and forested islands of Sundarban in India with an area of 9630km². The forest cover constitutes 4263 km² while the human inhabited area measures 5367km². The settled area of the biosphere reserve lies outside the forest area, being divided into 19 community development blocks under the districts of North and South 24 Parganas in the state of West Bengal.

Sundarban Tiger Reserve (STR), which was notified in the year 1973 under Project Tiger scheme of the government of India[i], falls within SBR and has an area of about 2584.89 km² out of which 1699.62 km² is being designated as a Core area or the Critical Tiger Habitat (CTH). Sundarban National Park has been declared as a World Heritage Site (presently known as World Heritage Property) in 1987 by the UNESCO and falls within this CTH covering an area of 1330.12 km². The Core area of the STR overlaps with the core area of the SBR and is considered as the CTH.

However, the immense ecological importance of the region and the ensuing efforts ascribed towards conservation of the forests and its wildlife are relatively new, following the independence of the country from British imperialism in 1947

However, the immense ecological importance of the region and the ensuing efforts ascribed towards conservation of the forests and its wildlife are relatively new, following the independence of the country from British imperialism in 1947. The idea of forests as useful, and as something that merits conservation did not strike the imperialists in the 18th and the early 19th century when Sundarban, as in the writings of Hunter (1875), was depicted as a 'drowned island', 'impenetrable forests' and 'thick brushwood', without any restrictions on subsistence based activities like fishing, honey collection, fuel-wood collection etc.

The instinct of revenue generation from the vast forested tracts of Sundarban through rapid reclamation was first espoused by Claude Russell, the collector general of the district of 24 Parganas, who divided Sundarban into respective plots and leased them out to the landlords for timber extraction and collection of revenue (Ghosh, Schmidt, Fickert and Nusser 2015). The clearing operation started in 1781 under the magistrate of Jessore district in Bangladesh known as Tillman Henkel, who brought migrants from Midnapore (Medinipore) and other parts of central Bengal, primarily tribals, to clear the vast tracts of forest lands. Landless indentured labourers migrated from places like Chotonagpur plateau, Balasore and Arakan coast in Myanmar many of whom settled there after reclaiming the lands.

Tigers were treated to be a major threat for land reclamation, since it was estimated by the second half of the 19th century that tigers killed about 1600 people every year (Chakrabarty 2009: 81). It was only during the 1870s, that the government, out of a sense of extensive forest depletion, had a realization that such uncontrolled felling need to be checked. The passing of the Forest Act of 1878 reconfirmed the fact that the forest is a property of the government, but however included the category of 'reserved' or 'protected' forests within the forest conservation laws. This was followed by stringent methods of conservation and rapid curtailment of bonafide livelihood rights.

From the period of 1951-2001, the population in Sundarban recorded a growth of 2.36 per cent per annum, most of which was rural and the acceleration escalated in the aftermath of the independence period (Chacraverti 2014). Presently, the fishermen population provides an integral part of the occupational structure in the lower delta.[ii]

This article draws from my observations of a village in the lower delta, where a bulk of the population depends upon the forests for their livelihood. The village known as Patharpara, is situated at the extreme south of the Gosaba block in the district of South 24 Parganas and shares closest boundaries with the STR, being separated from the forests only by a narrow river. Parts of the village have been eroded a number of times due to tidal inflow and the river has gradually intruded more into the habitable land, destroying agricultural fields and crops due to the salinity of the water. An economically impoverished and marginal village coupled with an extremely difficult topography, people mainly subsist on the resources of the river and forests like by fishing crab and prawn seeds and collecting wild honey and wax. Agriculture is erratic and unpredictable due to the brackish quality of the soil, leading to the conversion of many agriculturalist families into forest workers.[iii]

The land of river and forests. Traditional wooden boats used for forest work (source: fieldvisit).

The cultural norms of the region are embedded in a range of religious mores and social practices, noted among which is the worship of *Bonbibi*, a forest goddess who is believed to protect the forest workers from the potential risks of tiger attack. According to the Islamic religious text *Bonbibi Johuranama*, Bonbibi saved a poor boy called *Dukhe* from the wrath of *Dakshin Ray*, who was a clairvoyant and through his mythical powers, was able to assume different forms, primarily that of a tiger. While the fear of Dakshin Ray loomed large within the poor and landless forest workers, Bonbibi and her brother *Shah Janguli* turned out to be their rescuers, by fighting against the tiger demon and finally winning the battle. A mutual agreement was made thereby that Dakshin Ray would never feed on the forest workers who enter the forests for meagre livelihood needs. However if someone tries to be voracious and exploits the forest resources beyond need, then he/she would suffer the fate of his/her actions by falling prey to Dakshin Ray.

…the customary practices of the communities have been severely curtailed by the Forest Department by closing off bulk of the forests as core areas, where entry is considered to be illegal, dealt with verbal and physical abuse…

Reverence towards the forest through such traditional beliefs and practices are practically translated into a set of rules and sustainable norms of extraction, while entering the realm of the forest and using the resources. However, the customary practices of the communities have been severely curtailed by the Forest Department by closing off bulk of the forests as core areas, where entry is considered to be illegal, dealt with verbal and physical abuse and are frowned upon by the department functionaries. The buffer area of the STR, which measures

only 522.85km² is severely stressed by anthropogenic pressures and constrained of resources due to unabated exploitation, making the population fall back upon the restricted forests.

The traditional techniques of subsistence based livelihoods as practiced by the forest workers are not always incompatible with the scientific techniques of conservation, as is often assumed. The population relies on a set of traditional ecological methods which combines reverence with sustainable extraction. The Forest Department, however, averts the cultural norms as well as the possibility of a dialogue between the customary and the statist methods of conservation.

The picture represents forest goddess Bonbibi (left) and her brother Shah Janguli (right), who are widely worshipped in Sundarban by the forest workers, as supernatural deities, protecting them from the tiger demon Dakshin Ray (the tiger).[iv] (Source: field visit).

Whether one enters the core area out of greed or out of resource scarcity in the buffer is disputed, considering the disproportionate number of licensed as well as unlicensed boats which venture the forests of STR. The Forest Department runs only 923 Boat Licence Certificates as of now, out of which only 650 are operational, grossly underlying the actual need of licenses by the present number of fishers. Most of the forest fishers thus venture without licences which cordons eligibility for compensation to their families in cases of casualty by tiger attack.

The large number of deaths which occur every year in the core areas are not only unrecognized, but are also refused by the officials of the Forest Department in most cases. Whether deaths happen in the core or in the buffer, compensation is an implausible reality for the forest worker, since very few speaks of getting one. A fisherwoman notes that in

February, his husband was killed and taken away by a tiger near an area known as Gopalkhali, which is in the buffer area. While his fellow fishermen reported the incident to the Forest Department as well as to Choto Mollakhali Police Station, police refused to believe the accident. They did not even record the 'missing diary' of her husband. Forest workers say that the police station does not report incidences of accidents without the approval of the Forest Department. Thus she did not receive any compensation, in spite of the accident taking place in the buffer.

The tribal hamlet at Tipligheri village in Lahiripur houses around 200 tribal households, most of who are landless and are forest workers. People say that the number of casualties of tiger, crocodile and river shark attacks are so many that the villagers themselves have stopped keeping any records of deaths. None of the tiger widows[v] receive any widow pension, as is entitled to them by the state. According to another forest worker, the compensation amount of Rs 25000 to be given to his family on account of his father's death by a tiger was appropriated mostly by the local political party which included the political patrons of the Forest Department. At the end, he received only Rs 7000.

People say that the number of casualties of tiger, crocodile and river shark attacks are so many that the villagers themselves have stopped keeping any records of deaths

The forest workers collectively believe that the deaths occurring in the core areas are not reported in many cases, fearing severe fines and abuse. Such deaths cannot even be bewailed in the villages and the victims are thought to be better abandoned to the tiger without any effort to fight it back, in the fear of the abuse by patrolling forest guards. These guards, in case of spotting a fishing boat in a core area, are exceptionally abusive and if they come to know about an *accident*[vi] in those areas, the abuse comes down heavily on the other members of the team, regardless of whether the victim has survived or not. Even in the village where the victim resided, mourning has to be very reticent, not to let know any outside members about the incident. Claiming compensation in such cases is even unthinkable.

In a reserve which has assumed increasing eminence due to its exotic range of flora and wildlife and has been extensively invested by national and international donors, the little promenades of human spaces seem to be invisible! The range of literary activities which prescribe the imminence of the nature-culture relationship have once again been rendered derelict through the fervent exploitation of forest based livelihoods and the denial of cultural associations with the forests. Traditional ecological reverence like the worship of Bonbibi might not have transcended local barriers of the lower islands in Sundarban to reach the domains of the popular cultural and religious practices in the cities, but it is still idiosyncratic and preaches virtues of conserving the nature in a just way. The repertoire of discourses which pre-empt human intrusion in the forests inhabited by the 'tigers', need to look back into the regional history of shared experiences in Sundarban, where people once lived and evoked understandings of practical settlements alongside the forest.

The dense mangrove forests of Sundarban interspersed with rivers.

Source: http://www.banglaview24.com/tourist-places/sundarbans-the-largest-mangrove-forest-of-the-world.html

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[i] The Project Tiger was implemented in the year 1973 under National Tiger Conservation Authority (NCTA), by the Ministry of Environment, Forests and Climate Change, to implement state level conservation emphasis on the preservation of tigers. Under this scheme, the Government of West Bengal on 18.12.2007, constituted Sundarban as a CTH, listing the area to be 1699.62 km² which was previously 1330.12 km². Under this notification, a large

area of the STR, which was previously buffer, was also included within the core, increasing the area of the inviolate zone.

[ii] Lower delta signifies those settled areas of SBR, which shares close proximity with the forest. In the lower delta, tidal action makes and remakes the physical topography, since these settlements are prone to river erosion and flooding. These areas are away from the cities, in contrast to the upper delta, which has a stable land surface and are less prone to the threats of erosion and submergence.

[iii] The term 'forest workers' is used to denote the collectivity of people who 'work' in the forests to sustain their livelihood. Working in the forest implies fishing, honey collection, crab fishing, prawn seed collection etc; occupations which are integrally dependent on the forests and the river creeks. These people spend multiple days in the forest areas which are interspersed by the innumerable river creeks. Their mode of communication is simple wooden boats, driven by oars and radars.

[iv] Refer to https://ruralindiaonline.org/articles/ma-bonbibi-mother-to-humans-and-tigers/ for more details. Also *Forest of Tigers: People, Politics and Environment in the Sundarbans* (2010) by Annu Jalais give an anthropological account of Bonbibi and her worship in Sundarban.

[v] Tiger widows are women whose husbands were killed by the tigers. A forest fringe village like Patharpara usually has several tiger widows.

[vi] Instances of death by tiger attacks are locally known as accidents in the village.

Translations of São Paulo's Visual Pollution

Marina Da Silva, Sociology, Goldsmiths, University of London

Pollution in São Paulo

Being native from São Paulo, the best description I can give about the city is that it is an endless concrete jungle. São Paulo is also a global city, with the world's 12th largest population and Brazil's wealthiest capital – it is known for its fast pace and dynamism; Paulistanos (as São Paulo's residents are known) never stop working. However, what I remember is being sedentary in a traffic jam by Tietê River. Traffic congestions contribute directly to the city's air pollution, which in 2013 was declared by the Institute of Health and Sustainability responsible for more deaths than car accidents in São Paulo.

It is not only São Paulo's air that is polluted, but also the water from its main rivers Pinheiros and Tietê. The water pollution has not only added to the city's foul smell but also aggravated the 2015 water drought, which was reported in the New York Times as an 'unprecedented water crisis'.

Clean City banned billboards, regulated the size of commercial signage and removed the graffiti from the city's urban space, yet without defining visual pollution or its effects on society.

São Paulo's air and water pollution are not surprising in a large industrial city. My interest in São Paulo's pollution started back in 2007, when the 'Clean City' Law (Lei Cidade Limpa) was created to fight a less known type of pollution — visual pollution. Clean City banned billboards, regulated the size of commercial signage and removed the graffiti from the city's urban space, yet without defining visual pollution or its effects on society. In contrast with other types of pollution, the impact of visual pollution has not been analysed, and there are no tools in place to measure it in the city of São Paulo.

Visual Pollution and the Clean City Law

São Paulo's radical legislation generated international attention. The ban on billboards in not unique to the city (Vermont, Hawaii and Maine in the US have banned advertising since the 70s), but São Paulo's law was the first to classify advertisement as pollution.

The term 'visual pollution' has been increasingly used in the Americas and India. But what is understood as visual pollution? Adriana Portella writes that visual pollution is 'an established expression commonly used to describe the degradation of the visual quality of places by signage' (Portella, 2014 p.1). Portella's explanation presupposes a normative idea of the concept of visual pollution, and, just as Clean City, it does not address the effect of this degradation and the politics behind the judgments of 'visual quality'.

Adriana Portella writes that visual pollution is 'an established expression commonly used to describe the degradation of the visual quality of places by signage'

São Paulo's law is creating a new urban identity, a 'clean' urban space free from commercial communication, signage, and graffiti. However, what are the consequences of classifying these visual communications as pollution? My current research is looking into ideas of commercialisation of the public space, the aesthetic judgments of visual quality, usage of public space and its relation to freedom of speech and environmental justice.

Public Space Translations

In 2014, I conducted field research on the Clean City Law to understand how it came into being and how citizens, politicians and experts responded to it. The research also explored how São Paulo's public space is being shaped by the removal of 'visual pollution' and the political nature of such classifications.

I used mobile interviews (city walks) as the main method of research, which allowed São Paulo's citizens to discuss their understanding of visual pollution, the possible effects and how it is affecting the city, while immersed in that urban space.

Below are some examples of the visual ethnography of São Paulo's public space created by the participants during the city walks. The action of photographing the elements helped the participants to discuss visually what they considered to be visual pollution.

My project borrows techniques from visual arts and assembles the visual ethnography into a research installation, allowing the audience to experience a *translation* of São Paulo's public space. The installation incorporates the sensorial make-up of the city and provokes questions on visual pollution in order to understand the specificities of this classification by disturbing/interfering with the new space where it now happens (either a gallery or an urban intervention).

The installation is composed of three screens (featuring the main elements classified as visual pollution by Clean City) forming a layered cityscape. They are modified by a film projection that addresses the questions raised by the research and evoke the temporary/ephemeral nature of visual communication on public space. The visual piece changes with the project.

The current projection discusses the controversy of the different views on visual pollution that were raised during the city walks. The initial research showed that São Paulo's residents approved the billboard ban, not on the grounds of being against the commercialisation of public space or visual stimulation; they were mostly against vernacular advertising such as billposters but not against 'flashy' billboards. However, they pointed out that the removal showed the state in which the buildings of São Paulo were. The restorations of these buildings is private responsibility now, so they remain destroyed and are a fighting canvas for Street Art vs. Graffiti vs. Pixo.

On one side there is São Paulo's street art (allowed in determined areas by the city hall — but not in the legislation), which is internationally known, and on the other side, there is Pixo, a particular (to São Paulo) type of graffiti that is present in most of the city's urban space. Street art is understood as original artwork created for the public space, often considered aesthetically pleasing, sometimes even reproduced for interior use and currently sponsored in São Paulo by big brands such as Nike, while Pixo is seen as a social movement against the wealth gap in the city. Pixo is supposed to be aggressive and ugly. Pixadores (as the creators of Pixo are called) aim to destroy the public space as a way to be seen by society and to protest against São Paulo's inequality.

Pixadores (as the creators of Pixo are called) aim to destroy the public space as a way to be seen by society and to protest against São Paulo's inequality.

The blurred line between these visualities is the cause of discordance amongst the city residents. Grafitti is only considered street art when the 'artist' has had some recognition in the art/design world or when it has been commissioned to appear in someone's (inside) wall. Pixo, present in most buildings found in deprived areas of São Paulo, was considered to be a major form of visual pollution by the participants: "visual pollution is a visual intervention that shouldn't be there…like pixo, graffiti not so much, but pixo I think it is horrible, I get that it's a social movement…I guess it is something ugly on the top of something that is already awful, the city is ugly."

This variance is not innocent. The residents' and the authorities aesthetic judgments are embedded within a political judgment of class; this notion of visual pollution not only inflicts on ideas of environmental justice but also reinforces the social gap and class distinction present in São Paulo's society.

"You can see tension on Sao Paulo's public space, but what you see is not as strong as the one you feel…These visual interferences are reminders of the city's dissatisfactions."

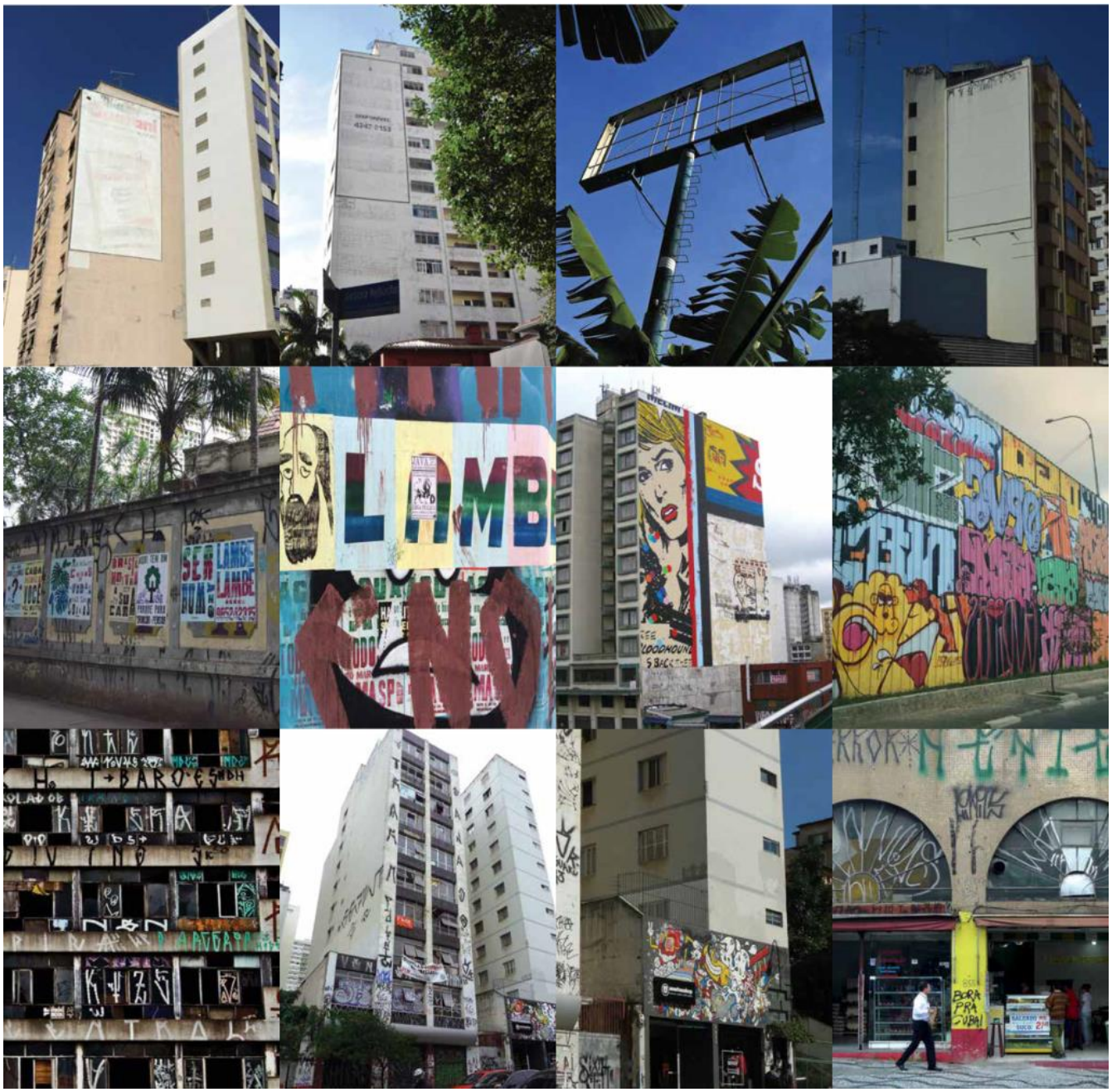
What does São Paulo's new space tell us about its country and society? My current research continues to use São Paulo's urban space by considering the idea of pollution more generally to understand the specificity of 'visual pollution' and how it is made to exist and subsequently experienced as pollution. I believe that the core of this urban controversy is the political character of the judgment of what is visual pollution.

Ingold, T. and Vergunst, J. (2008). *Ways of walking*. Aldershot, England: Ashgate.

Pink, S. (2001). *Doing visual ethnography.* London: Sage.

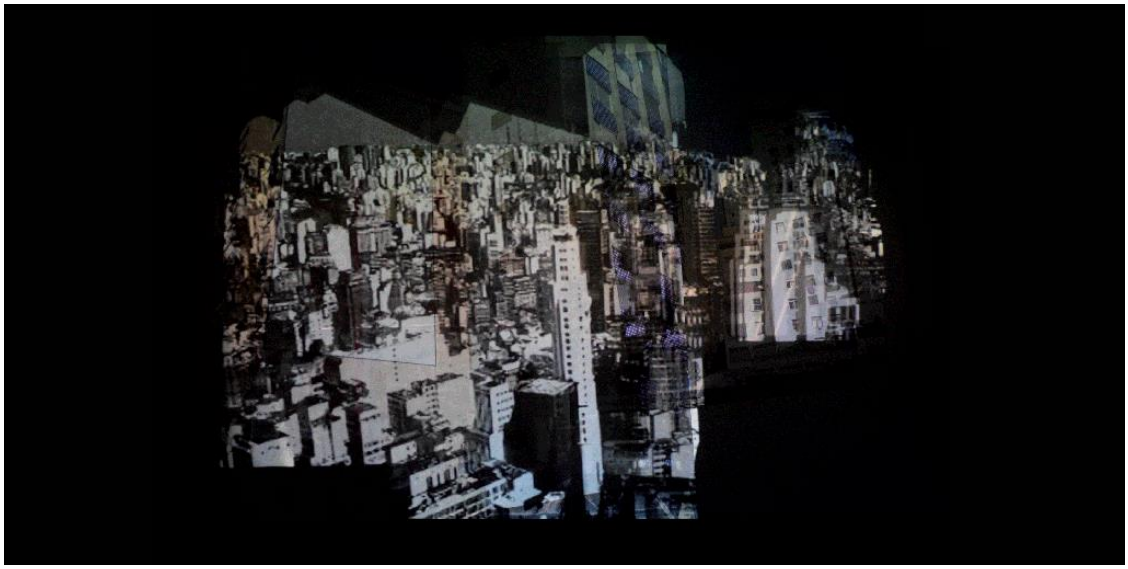
Portella, A. (2014). *Visual pollution*. Farnham: Ashgate Publishing Ltd.

Participant taking pictures of visual pollution during a city walk.



Visual ethnography of visual pollution in São Paulo.

Side view of the installation featuring the visual ethnography from 2014.



Montage of the projection 2014.

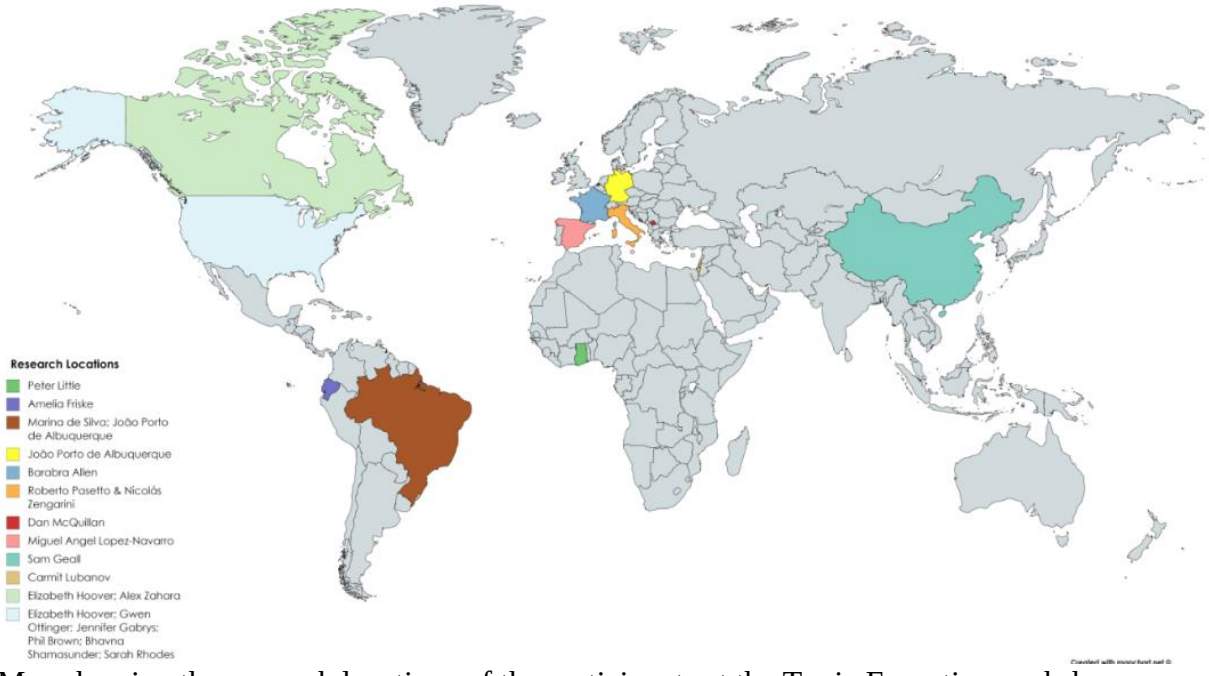
'Citizen Science, Pollution and Environmental Justice': the 2017 Toxic Expertise annual workshop

Dr Thom Davies, Research Fellow, Department of Sociology, University of Warwick: @ThomDavies

This month Toxic Expertise held our second annual workshop at the University of Warwick. The two-day event involved over thirty scholars and members of the public who shared their experiences of environmental justice, pollution and citizen science from a variety of perspectives. Environmental justice experts Phil Brown (Northeastern University) and Gwen Ottinger (Drexel University) gave keynote addresses, and fourteen other academics from a range of disciplines presented fascinating research papers that highlighted cutting edge scholarship at the nexus of citizen science and environmental justice.

Participants showcased recent research from twelve different countries in the Global North and South.

One of the things I found most exciting about the workshop was the breadth of geographic case studies brought into the conversation. As shown in the map below, participants showcased recent research from twelve different countries in the Global North and South, including Kosovo, China, Spain, Ghana, France, Ecuador and Brazil. A key point of reflection was the transferability of environmental justice across different scales and geographies. Throughout the case studies, environmental *in*justice appeared as a seemingly universal consequence of uneven power relations impacting the lives of diverse groups across the world. More optimistically however, several of the papers also highlighted citizen science projects that are utilising alternative perspectives about pollution, and politicising environmental concerns.



Map showing the research locations of the participants at the Toxic Expertise workshop.

[Created using mapchart.net] It was fascinating to hear about Citizen Science projects from a diverse range of places; from Dan McQuillan's account of youth-led air monitoring initiatives in post-truth Kosovo, to Barbara Allen's case study of 'strongly participatory science' in France, and Jennifer Gabrys' research on pollution sensing near fracking sites in Northeastern Pennsylvania, USA.

The kite physically connects itself to the communities using it, making it a much more effective and compelling tool for citizen science.

We were lucky with the weather during the workshop, and fortunate to be joined by Cindy Regalado from Public Lab and UCL, who gave a fantastic 'Kite Mapping' demonstration. She showed us how to set up a kite photography kit, and how kite flying can be used to monitor environmental injustice from a 'bird's eye' perspective. With increasing restrictions on the use of drone technology, this simple yet effective technology for witnessing changes to the landscape seemed particularly apt. As she explained, the way the kite physically connects itself to the communities using it, makes it a much more effective and compelling tool for citizen science monitoring:

Cindy Regalado

Elizabeth Hoover holds the camera while Phil Brown takes a picture.

The workshop participants being shown how to assemble the kite.

Alex Zahara and Peter C. Little hold onto the kite string while Cindy Regalado attaches the camera.

After a brief introduction from Alice Mah (University of Warwick) who runs the Toxic Expertise project, Phil Brown opened the two-day event with a keynote address that introduced the history of environmental justice and popular epidemiology, linking contemporary work with pioneering justice campaigns such as Love Canal (1978). He discussed the notion of 'toxic trespass', before asking us to consider the role of 'worry' within research; how environmental justice campaigns often involve worrying local communities about a toxic threat, which is sometimes necessary to galvanize political action. He also discussed the importance of sharing research with local communities, and their right to know. For example, he explained that if 'you take that data from there, you give it back'. This echoed the approach of many of the participants' papers throughout the workshop. He also stressed the importance of communicating research findings in an understandable way, such as using terms like 'weed killer' instead of 'pesticide' when communicating with local communities.

…if 'you take that data from there, you give it back'. This echoed the approach of many of the participants.

Jennifer Gabrys' (Goldsmiths University) and Joao Porto de Alburquerque (University of Warwick) gave talks themed around the theme of 'Citizen Sensing'. Jennifer, who leads an ERC project 'Citizen Sense', drew upon her recent research with communities living near fracking sites in rural Pennsylvania. She discussed the installation and use of air quality

monitoring kits, describing how citizen sensing practices have given rise to new forms of evidence, and how using data that is 'just good enough' has the potential to significantly impact environmental politics. Joao Porto de Alburquerque then discussed how citizens are engaged in sensing, curating and making sense of geographic data in the context of disaster and urban resilience. He questioned the "citizen as sensor" metaphor, giving examples from his research of how citizen science has been contrastingly used in urban settings of both Germany and Brazil. Joao also questioned the implicit idea that citizen science leads to empowerment, emphasising how 'sensing can be detached from sense making'.

Figure 6 – Barbara Allen discusses her 'strongly participatory' environmental justice research in France

The next talk by Barbara Allen (Virginia Tech University) introduced her in-depth research with communities in southern France who live near petrochemical facilities. She continued the theme set by Joao on the importance of 'sense making', emphasising how researchers must ensure they focus on 'sensing the things people *want* to know'. Through her extremely comprehensive and inclusive participatory research design, Barbara has not only been producing detailed citizen science data with communities, but has striven to fully include local communities in the analysis and use of the data. She described the intensive community workshops that have helped to collaboratively analyse the research findings, in an area of France so polluted that 'if you're there for a day your eyes burn'. It was fascinating to hear about her environmental justice project, which takes the notion of 'participation' extremely seriously.

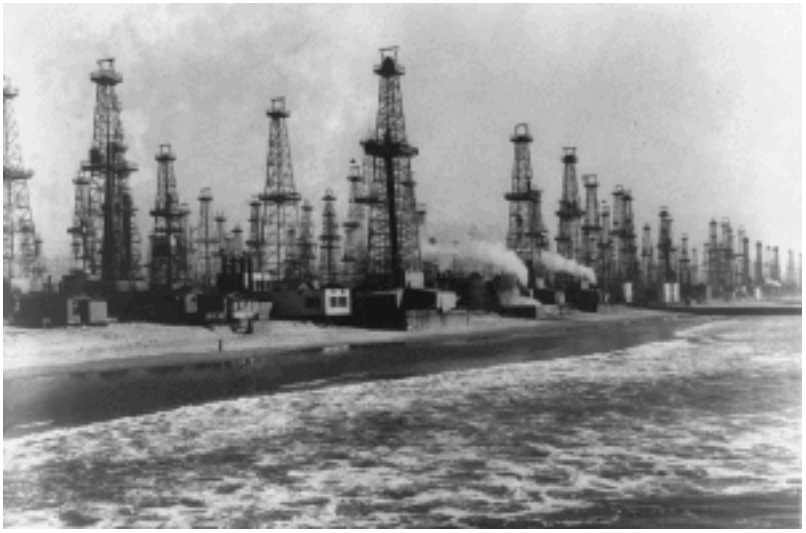


Figure 7 Oil wells along Venice Beach in 1952, which is now a prominent tourist destination in LA (Source: Library of Congress)

Continuing the petrochemical theme, Bhavna Shamasunder (Occidental Collage) gave a paper on neighbourhood oil drilling in California. She showed striking photographs of 'nodding donkey' oil pumps abutting suburban housing in the 'urban oil fields' of LA, as well as interesting historical images of the intensive petroleum landscape of California in the early 20th century. Incredibly, there is currently no law in California to ensure there is a buffer between oil sites and where people live, which exposes local residents to increased health risks. Like with countless other cases of environmental injustice in the USA, Bhavna explained how there was a clear racial dimension to the distribution of

environmental disadvantage in LA: she showed how oil rigs are better enclosed and hidden in white neighbourhoods than in places of colour. Also focusing on the USA, Sarah Rhodes (University of North Carolina) gave a paper on antibiotic-resistant bacteria in North Carolina's intensive hog production regions. Sarah's PhD is utilising community-based participatory research to examine potential environmental issues caused by the density of industrial agriculture, in a place synonymous with pig farming.

"We revolt simply because, for many reasons, we can no longer breathe"- Frantz Fanon

During a panel themed around '*Citizens and Air Pollution around the World'*, Miguel Ángel López-Navarro (Universitat Jaume I, Castelló) presented his research based in two petrochemical sites in Spain. He discussed how petrochemical companies, as well as civil society organizations and public authorities in Tarragona, are all faced with the challenge of legitimating discourses about how to manage environmental risks. Connecting to Phil Brown's discussion of the political use of 'worry' within environmental justice campaigns, Miguel also discussed the role that confrontation plays within environmental controversies. Taking us from Spain to Kosovo, Dan McQuillan (Goldsmiths) then discussed his participatory research with young people in Pristina who are monitoring air pollution as a means of political activism. He discussed the notion of 'bio-solidarity', which I thought was an interesting counterpoint to the idea of 'citizen science', and detailed his Making Sense Kosovo 'mannequin' campaign which campaigns against urban smog. He ended his talk with a very apt Frantz Fanon quote that summed up the politicisation of polluted air: 'We revolt simply because, for many reasons, we can no longer breathe". It was very interesting finding out about the role of environmental monitoring and political activism in Kosovo, which Dan described as a place that has already experienced the 'post truth politics' that we are now witnessing in the USA and UK.

Figure 8 – Sam Geall talks about climate change journalism in China

Carmit Lubanov (Association of Environmental Justice in Israel) discussed her detailed research into environmental injustice in Israel, where she has focussed on inequality in sewage, water, public transportation, air pollution and open spaces. As with countless other examples of environmental injustice, economically vulnerable communities in Isreal – predominantly Arab towns and villages – are most subject to environmental risks. Roberto Pasetto (Istituto Superiore di Sanità) followed Carmit with a paper about heath profiles of communities living near contaminated sites in Italy. As with Carmit's paper, Roberto's epidemiological research found evidence of an uneven distribution of hazards and risks due to the combined impact of contamination and socioeconomic disadvantage. For example, health impacts near National Priority Contaminated Sites in southern Italy, which is predominantly more economically marginalised, were much worse than those in the north. Moving the discussion to China, Sam Geall (University of Sussex) gave a presentation about Chinese climate-change journalism. He detailed how the environment has been officially framed by the Chinese government

throughout its modern history, and pointed to how today, climate change represents a destabilizing phenomenon with non-linear and uncertain dynamics.

Gwen Ottinger (Drexel University) kick-started the second day of the workshop, giving a key note address that focussed on her real-time ambient air monitoring research in California. She described her participatory design project 'Meaning from Monitoring' which works with residents of 'frontline' refinery communities in the San Francisco Bay area who live in places where toxic gasses are a potential health threat. Despite the existence of vast quantities of real time data, Gwen described how air quality data alone does not necessarily advance the cause of environmental justice. She questioned the usefulness of accurate data on environmental issues, if it was not being used by the communities involved. She also talked about the tension between advocacy and academic rigour, and whether there was anything inherently 'special' about citizen science. You can read more about her ongoing research and the four lessons she learnt from this project in this Toxic News article.

Following Gwen, Alex Zahara (Memorial University) gave a talk about communities' right *not* to know about environmental controversies, and the role of 'refusal' within citizen science. This was an interesting counterpoint to Phil Brown's invocation of 'worry' the day before, and Alex drew upon feminist geography scholarship, talking reflexively about ethnical concerns and challenges he has faced in his own research. He described his ultimate decision not to focus on indigenous communities, but instead turn the lens on his own community. Elizabeth Hoover's (Brown University) presentation about environmental injustice within an indigenous Mohawk community of Akwesane problematized the normalised sovereign category of 'citizenship' implicit in 'citizen science' through her focus on the experience. The word "Citizen", for example, may have different meanings in tribal communities. She described how the Akwesane territory transects Canadian and US sovereign space, and how the binaries between citizen and scientist, between subject and researcher were blurred through a participatory health research process. She detailed how scientific health advice was amended to meet the needs of Mohawk community, such as the need to fish, but only after community consultation.

The word "Citizen" may have different meanings in tribal communities.

Starting the last session of the day which was themed around '*Witnessing and Visualising*', Peter C. Little (Rhode Island College) discussed his on-going research with toxic E-waste sites in Ghana. He explored the use of participatory photography as a tool to reflexively challenge insider/outsider perspectives on environmental injustice. He detailed the physical and highly visual health impacts of living amongst the remnants of discarded technology and his talk questioned the use of visual methods to capture the structural violence that the E-waste workers are subjected to. With photography often being blinkered to anything but the most dramatic symptoms of wider structural forces, participatory photography can often conceal as much as it illuminates. He discussed how his participants have stayed in contact with him by sending photographs of their everyday lives in the E-waste site, which reminded me of work by Katz (1994) and Koyabashi (1994) on extending 'the field' beyond the traditional field research setting. Marina Da Silva (Goldsmiths) carried on the visual theme to talk about visual pollution in São Paulo. As an academic and artist, Marina is exploring how the city's 'Cidade Limpa' (Clean City) law is attempting to fight 'visual pollution' without actually defining what counts as 'visual pollution'. With reference to a video of the research installation, she discussed how the malleable definition of visual pollution relates to the

ownership of public space and the urban environment in Brazil. You can read more about Marina's visual sociology research in this recent Toxic News article.

Participatory photography can often conceal as much as it illuminates.

Amelia Fiske (Christian-Albrechts- Universität zu Kiel) concluded the presentations at the workshop, with a discussion of her research on 'Toxic Tours' and bearing witness to petrochemical pollution in the Oriente region of Ecuador. She described how rapid environmental and social change resulting from colonization, palm tree cultivation and oil production, has created a number of environmental issues that are not experienced equally. Amelia described how the juxtaposition of toxic tours with the hidden reality of this environmental injustice reveals the profoundly unequal toxic burdens suffered by some bodies and not others. She also argued for greater emphasis on bodily knowledge and bodily experience in constructing alternative expertise about environmental issues.

Over the two-day Toxic Expertise annual workshop it was fascinating to hear about such a broad range of approaches and engagements with citizen science, pollution and environmental justice. During the question and answer sessions we grappled and discussed complex themes: from problematizing the categories of 'citizen' in 'citizen science', to pondering what counts as 'justice' in 'environmental justice', to what we mean by 'success' during citizen science campaigns. As Jennifer Gabrys remarked, how do we know when we have enough data? Gwen Ottinger raised the question of what – if anything – makes citizen science 'better' than other forms of knowledge production, and asked us to consider what is *gained* and *lost* by framing this form of data gathering in this way. Another reoccurring question was how well environmental injustice themes could travel across different spaces and scales, given that each case study is inherently imbued with local perspectives, place-based specificities, and details that would be harder to universalise. The geographies of environmental injustice are undoubtedly uneven, yet the breadth of case studies discussed at this workshop, as well as the multiple ways the environment is being explored and politicised in participatory ways, gives me confidence that researchers and communities alike are taking environmental justice seriously.

Figure 9 – Some of the workshop participants at Kenilworth Castle (from left to right: Thom Davies, Alice Mah, Jennifer Gabrys, Gwen Ottinger, Phil Brown, Peter C Little, and Barbara Allen. (Photograph by Cynthia Wang)