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Air Walk: Monitoring Pollution and Experimenting with Speculative Forms of Participation

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'Life is in the transitions as much as in the terms connected;
often, indeed, it seems to be there more emphatically...'
William James, *Radical Empiricism*, 87

Introduction

The sites and sources of air pollution in London include automobile exhaust and building heating, construction debris and factory emissions, as well as pollution drifting in from neighboring European countries and fine particles from sandstorms in the Sahara. Settling and mixing in the lived atmospheres of this conurbation are the debris of local, distant, present and inherited material processes as they are worked through and form the city's heady exhaust. While on one level a tale of urban activity could be extracted from the circulations of these chemical residues, on another level the very practices by which the composition of the air and its pollutants come to be identified are also of relevance, for they extend toward bodily and environmental effects, institutional mechanisms for measurement and regulation, as well as infrastructures of instrumentation that settle into a set of standards for assessing air pollution over time.

Air pollution has emerged as an environmental problem with considerable negative impacts. The EU designated 2013 as the 'Year of Air,' and the World Health Organisation (WHO 2006) has issued recent reports indicating that urban air pollutants give rise to extensive health concerns. Yet unlike the smoky skies that plagued London in the 1950s, the air pollution of today tends to be odorless and colorless, as it forms not through sulfur dioxide (SO_2) from burning coal, but rather from nitrogen oxide (NO) and nitrogen dioxide (NO_2) and particulate matter ($PM_{2.5}$ and PM_{10}), primarily emitted from combustion engines. These pollutants are known to impair pulmonary, cardiac and respiratory health, so much so that air pollution has become one of the leading causes of death worldwide (Lim 2013). Distinct social formations concretize through the distributed and lived experiences of air pollution, and through public health attempts to mitigate and address it. However, air pollution and its effects have not (until recently) registered as an environmental problem since these pollutants tend to be less evident.

The monitoring of air pollution also unfolds within the not-quite-evident spaces of registering emissions levels. In multiple locations across London, official monitoring infrastructures keep track of concentrations of recognized air pollutants in order to meet national and international air quality objectives. At the same time, practices for monitoring air quality are migrating from primarily 'official' modes of detection and regulation to a number of 'citizen' initiatives for assessing air pollution emissions and exposure. Since air quality is now typically assessed through numerous instruments that measure and monitor particular pollutants, any discussion of what is in the air becomes entangled with the technologies used to monitor air quality.

These technologies are not just making air pollution legible and evident, but also could be said to *experiencing* the air by processing and transforming particles of

air into measurements that become legible within wider institutional networks (Gabrys 2016). The sites, practices and objects of measurement within air monitoring are continually shifting arrangements of pollutants, bodies, environments and monitoring technologies. This chapter asks: What are the ways in which experiences of air and air pollution are generated through different and speculative modes of monitoring and detection? What new and possibly collective environmental and participatory practices concretize along with sensing devices, and in what ways might these sensors also delimit environmental practice within specific ways? And how might walking give rise to particular encounters and experiences of air pollution, particularly as an experimental and speculative form of participation that is distributed across multiple sites and subject?

In order to address these questions, I discuss an 'Air Walk' held in the South London neighborhoods of New Cross Gate and Deptford as part of the International Visual Sociology Association conference hosted at Goldsmiths in July 2013. The walk was held as part of the Citizen Sense research project, which studies citizen-based practices and technologies of environmental monitoring. The 'Air Walk' was undertaken as a pilot study examining how environmental sensing is practiced through multiple modalities, and how DIY citizen-sensing devices inform environmental practice. The walk was also developed as a process for testing how it might be possible to experiment with the experiences of air and air pollution by setting in motion the sites, participant encounters, monitoring kit, infrastructures, urban situations, and speculative practices as they come together in this context. In part, the 'social' worlds that the 'Air Walk' traversed then came into being through lived and live encounters with air pollution (cf. Back and Puwar 2012), and were not entirely pre-constituted. In another sense, as a form of 'collective experimentation'

(Gabrys and Yusoff 2012), the walk set speculative encounters into play so that new social formations were also concretizing through this event. The walk was then a mode of experimentally composing different experiences of urban air.

Analysis of walking: forms of participation

This investigation of the walk as an experimental form of participation draws on and responds to literature and research that investigates the broad range of public participation to consider how it might variously be more constructive, open-ended and experimental, and potentially less normative and scripted (Bogner 2012; Delgado, Lein Kjølberg and Wickson 2011; Lengwiler 2008). In dialogue with these investigations, I consider what an experimental approach to the *speculative forms* of participation might offer. As a pilot, the 'Air Walk' was not a fully-fledged unfolding of 'publics'. Instead, it was an experiment with the forms and processes of engagement, and a specific consideration of Felt and Fochler's (2010) suggestion that *more experimentation* is exactly what is needed when investigating public engagement.

In this sense, this chapter is also not making grand claims for citizen science, but rather is suggesting that as a form of participation walking--and citizen monitoring--might be approached as generative and speculative rather than prescribed processes. Citizen science and citizen sensing are practices that could--or could not--'empower' participants, and which potentially could lead to forms of political intervention and realignment. But these capacities are largely dependent upon the communities, contexts and environmental problems to be addressed, and are not a *de facto* attribute of citizen science or citizen sensing. Just as many citizen science projects could be characterized as rote tasks contributing to distant scientific problems,

or as public-relations exercises in obtaining citizen 'consent' for technoscientific developments (cf. Felt and Fochler 2010). My focus here is to consider how citizen sensing as a practice *could* activate environments and environmental concerns, and thereby give rise to new possibilities for experimental forms of participation and public engagement through inventive experiences.

But by experience I do not mean simply human bodies sensing air, since this would suggest a mediatory way of how subjects feel the object of air. Instead, I am interested to think through how air is experienced and encountered on this walk across and by a distributed range of entities, from institutional monitoring networks to air apps to pamphlets and organisms, busy streets and active incinerators, auto exhaust and lorries, mobile kits and DIY practices, as well as human and more-than-human bodies. All of these entities, I suggest, sense and experience air in actual occasions (Whitehead 1929), of which this walk might serve as one instance.

By experimenting with ways of experiencing air pollution, the walk becomes a process for testing speculative forms of participation, not just with human participants, but also with the multiple distributed entities that are involved in experiencing the air. On this walk, we attended to the infrastructural monitoring networks in place in this one area of London, together with the more mobile technologies increasingly available for assessing air quality, and the DIY sensing kits assembled for the event that were tuned to NO_2, $PM_{2.5}$, and 'other gases.' The ways in which the walk experimented with sensing and monitoring the air then included the use of DIY sensors, GPS devices, black carbon meters, pamphlets and maps, existing air monitoring infrastructure, roadsides and industrial sites, as well as human and nonhuman bodies that were variously incorporating the effects of urban air.

The walk attempted to *tune in* to these experiences and entities (James 1912, 126; Stengers 2008; Gabrys 2012b), as actual and speculative encounters with air pollution. Walking can be seen as a speculative form of participation since it is not possible to know how the experience will unfold—in other words, it is an always-experimental form of encounter (O'Rourke 2013). The walk was then an attempt to work through--in practice--the contours of *experiencing* air quality, and through experience consider what forms of participation are generated in this actual occasion. In thinking of the air walk in this way, I am influenced by the work of James (1912), Whitehead (1929) and Stengers (2002), who variously suggest that experience serves as the critical modality for considering how speculative encounters might give rise to engagements--or relational articulations--that recast not just what counts for participation, but also what counts as the subjects, objects and sites for experiencing air quality. Air and air pollution are not fixed entities, but rather are concrescences that are drawn together and inflected across multiple experiences. 'The Air' is not an absolute point of reference, but rather forms through drifting and atmospheric experiences in and through which distinct moments and materialities of air register. This is not to say that everything is constructed in the old sense of the social construction of technology, but rather that particular constructions of air *matter*, since these are distinct ways in which the feeling for air is expressed--across instruments, geographies, bodies, policies, more-than-human organisms--and sedimented into future a/effects of air (cf. Suchman 2007).

Further to this, walking could be seen as a *transition* in experience that, following James in the epigraph to this chapter, puts emphasis on the connections and disconnections made through processes of relating. This emphasis on transition makes 'the distinction between knowing as verified and completed, and the same knowing as

in transit and on its way' (1912, 67-68). As a transitional experience, walking unfolds as an experiment with knowing in passage, and with connections made through processes as they unfold. Such transitions are, as James notes of experience, 'speculative investments' that draw together the actual with the more-to-come (ibid., 88). Even if mapped in advance, a walk does not allow one to know what will be encountered during the walk itself, what relations will emerge or what exchanges will occur. Walking draws together some entities, milieus and experiences, while excluding others. It develops as a speculative grammar of movement and pause, of attention and inattention.

This chapter is organized as a series of five transitions made across the trajectories and stopping points, as well as subjects and milieus, encountered along the walk. These transitions provide the radical empirical material under discussion, and are points at which the walk is considered as potentially generative of distinct forms of participation and experience that provide different entry points to the problem of urban air pollution. Through recounting the process of the walk as a series of transitions, this chapter further considers how it might be possible to switch the emphasis on monitoring technology as the usual site of invention to consider how the relations and practices that are put in motion are sites of invention as well. Walking decenters the apparent thingness of an object of technical invention. In this radical empirical approach, rather than focus attention on a fixed thing or location, emphasis is instead brought to bear on the animating relations and things that concretize *across* speculative forms of participation. In the text that follows, I explore how walking as an experimental form of participation unfolded through these different experiences of urban air in South London.

Transition 1: walking and multiplying forms of monitoring

Reflecting the interdisciplinary character of this conference event, our walk was made up of architects and artists, sociologists and policymakers, as well as public health researchers and practitioners. We began the 'Air Walk' in the campus green at Goldsmiths, a space removed from busy streets of New Cross yet full of activity from the conference. New Cross as a whole is an area that regularly exceeds NO_2 levels set in place by the EU, and has recurring high levels of $PM_{2.5}$ as well. The walk was situated within this set of concerns about air quality, and considered how to experiment with environmental engagement in air quality.

Walking can be articulated through multiple modalities, from protests and parades to flâneurie and botanizing on the asphalt, as well as moving experiments with locative media, art and geography, which have variously tested and worked with walking as a form of engagement (Gabrys 2012a). This particular walk could on one level be characterized as a sort of 'walking seminar,' following Annemarie Mol (n.d.), which undertook a walk as a way to bring together experiences of and discussions about air pollution along with the instruments and environments in which these technical alignments might be put to work.

As a pilot walk for eventual engagement with citizen-sensing communities, the walk tested the coming together of kits and practices in situ, and to understand the types of encounters that might unfold through real-time monitoring. The route was planned in advance in order to make visits to official air-quality monitoring infrastructure, and to visit key sites of industrial activity and urban development in the area. Prior discussions had taken place in order to plan for the walk, including interviews with local borough air quality officers, meetings with urban planning and design firms, and collaborating with the King's Environment Research Group that

runs the official London Air Quality Network. We were also accompanied by researchers working on public engagement at the NHS, who brought a micro-aethalometer and GPS--devices loaned to us by the King's ERG--to monitor and locate black carbon levels, which is emitted from combustion activities but is most common in diesel exhaust.

Even though the route was planned in advance, at the same time it was not possible to know what would occur along the route as we walked, testing monitoring equipment in the heat of the day, traversing crowds and traffic, bringing together questions and encounters: specific experiencing entities would inevitably still form and erupt in this actual occasion. In the process of beginning and introducing the walk to participants (many of whom were not familiar with South London), there was an inevitable gathering and assembling of cameras and pamphlets, maps and monitoring equipment, notebooks and backpacks, as well as sunscreen and water bottles, which made this a heterogeneous research undertaking that was neither too orderly nor too contained. At the same time, researchers on the research project were a part of this experiment, not standing outside observing from a singularly authorized position (cf. Haraway 1997), but moving along with this rolling kit of parts, and attempting to make sense of air pollution along this particular trajectory.

After a brief introduction to the walk and to each other, we then made our way from Goldsmiths down New Cross Road. Our first stop took place at the New Cross Road monitoring station, located adjacent to the Rose Pub and directly across from the New Cross Gate train station. This monitoring station is one of four in the Borough of Lewisham, and one of nearly 100 stations in the London Air Quality Network (LAQN), which includes council-owned stations and Automatic Urban and Rural Network (AURN) national stations (cf. Barry 1998). There are a wide array of

instruments and methods for measuring air quality, from hand-held personal air monitors to diffusion tubes and badges, as well as spot-checking devices and mobile laboratories, but when it comes to monitoring air in response to and to influence environmental policy in a widespread and systematic way, fixed monitoring stations within government networks tend to be the most common technology and infrastructure used for regulation and enforcement.

Air monitoring stations are part of the urban infrastructure that typically recedes into the background. Yet as part of this walk we made a more deliberate encounter with this infrastructure, while standing on a busy roadside in the heat and thick air of numerous automobiles rushing by. We asked how the station is managed, how the data is processed, and the responses that arise to exceedances of air pollution levels. These questions about the governance and logistics of monitoring cannot always be answered in situ, but as part of this encounter we discuss how stations are typically owned by councils, which also decide where to locate stations.

We consider the particular pollutants captured at this station. NO and NO_2, as well as SO_2, and PM_{10} and $PM_{2.5}$ are monitored here. The pollutants monitored within the LAQN are set in relation to EU-led policy that is developed in response to health research on the damaging effects of air pollution (European Commission 2008). The measurements obtained from this station and the many others across the network are compared and managed (or ignored) against European standards for acceptable emissions of certain pollutants. Yet as we investigated this grey box, we had little sense of the measurements or modes of governance that converge into this and the multiple other stations across London. Different modalities of measurement might even be said to generate different experiences of pollution, which take hold in distinct environments of relevance (Gabrys 2016; Stengers 2002).

To give a somewhat more immediate sense of air pollution, King's ERG has set up the London Air app, which we looked at on several smartphones brought along on the walk. This app allows the general public to look at maps and specific locations in London to receive a relatively near-time reading of air pollution levels. The bandings on the app indicate whether air pollution is low, moderate or high according to the daily air quality index. This app also sends air pollution alerts for specific locations, and includes a record of air pollution episodes. Yet the 'low' or the 'high' readings of the app do not always seem to correspond to the microclimate in which we are standing, and the readings within any given hour may not reflect the longer-term air pollution exceedances that occur.

At the same time that we are considering the measurements taken or expressed by the air quality station, the diffusion tubes at this site, and the London Air app, we are taking measurements with the micro-aethalometer, which measures black carbon but does not have a real-time display (and so the comparative data will have to be gathered after the walk has taken place), and we are also carrying DIY environmental sensors measuring NO_2, PM, and 'other gases.' Traversing and transitioning past one air quality station, we encounter multiple forms of monitoring that parse the experience of air pollution differently. Participation does not settle into a singular engagement with a device, in this sense, but rather opens up into a series of questions about how air pollution is captured, measured, communicated, and experienced across a range of sensing instruments.

Transition 2: exposure and embodiment along Mercury Way

As we make our way from the New Cross Road monitoring station to a less busy residential street, we stop to consider the ways in which embodied experiences might

enable distinct experiences of air quality, while potentially not capturing others, by testing our sense of the smell of the air just beyond the busy road and just before approaching the nearby incinerator and waste yard. Even though the 'official' readings suggest we are experiencing low levels of air pollution, and the low-cost devices flickered in and out of zones of safety and toxicity, on our walk we were pointedly experiencing the effects of air that felt quite burdensome, as scratchy throats and watering eyes indicated. Our experience in this moment was then intersecting with this range of technologies that differently articulated air and pollution--across bodies, technologies and environments.

As Debaise (2014) has suggested, bodies-subjects are not the 'ground' of experience, but rather are a node within a process of experience, a node that 'polarizes' the datum in particular ways. Bodies, in this sense, are diffractive vectors, capturing and transforming air while also being made and remade by these same hazy currents. The process of accessing the distributed and polarized experiences of what is in the air becomes a project that is contingent and imperfectly constituted, traveling across DIY devices, monitors without displays, tubes without immediate analysis, and monitoring stations that are more or less opaque, save for the data linking up through a one-hour delay to an air quality app that gives notional qualitative bandings of how high or low air pollution for select pollutants was at any given time.

On one level, it is evident that these multiple monitoring practices are productive of different engagements with air quality and pollution. But beyond the multiplicity of these practices, what also stands in relief are the ways in which these encounters give rise to different relations. We could say that the New Cross Road monitoring station is *experiencing* the multiple forces that inform the type of air quality assessment that actually goes on here, in a way that differently compares with

the attempt to smell the air or register air pollution through different sensors. The monitoring station is an active distribution of experience that works through, processes and prehends the 'datum' that is air quality, and which contributes to the potential for further experiences to arise, since social environments are comprised of 'mutual prehensions' (Whitehead 1929, p. 230).

The different ways in which these technologies *experience* air by monitoring and measuring pollutants begin to inform the types of work that can be done with them, and what our experience might be as citizen scientists and citizen sensors, attempting to understanding and potentially intervene in the space of urban air quality. As should be clear by now, moreover, this is not a phenomenological rendering of experience, since a human decoding subject is not at the center of these experiences. Rather, experience is distributed across and expressed by entities that form societies of actual occasions. Our attempt to monitor, experience and understand pollution emissions and exposure at this moment of the walk inevitably intersected with multiple other 'bodies' that were processing, distributing, remaking and analyzing air quality on this afternoon and across longer durations.

Bodies also become sites where the experience of air pollution is taken up as a sort of constructive and constitutive function (cf. Shaviro 2014). These bodies are not just of the human sensing type, rather, they form as experiencing entities sloughed off from multiple pollution processes. Combustion and suspension of pollutants forms across the burning of fossil fuels, the circuiting of motor vehicles, the friction of urban spaces, the scattering and gathering of crowds, the channeling of buildings as street canyons, the flowing of pedestrians and passersby, and the absorbing by lungs and hearts, soils and trees, an assortment of dusts and gases that drift in and out of a

zone of reactivity, bonding, lighting up, amplification, local weather, multiplying and transforming in and through urban air.

An incinerator and the absence of monitoring

In the heat and grit of this rather hot 27º Celsius July day in London, we then walk to the Mercury Way monitoring station at the intersection with Cold Blow Lane, which is adjacent to a waste transfer site, and nearby the Southeast London Combined Heat and Power (SELCHP) incinerator. The Mercury Way monitoring station, which has only been in operation since 2010, is one of the four stations operated by Lewisham Council and managed within the LAQN by King's ERG. This site is classed as an industrial monitoring station, which only monitors for PM_{10} and weather data, and does not have NOx or other sensors. As an industrial monitoring station, data from this site is also not included in the Department for Environment, Food and Rural Affairs (DEFRA) air quality reports to the EU as constituting relevant exposure. Although housing surrounds this site, the *industrial* classification of the monitoring station (one of only seven in the LAQN) designates the data from this site as less relevant in comparison to hotspots such as New Cross Road.

While at this site, we noted that the street on which we stand, 'Mercury Road,' seems to be a monument to this and any number of toxic chemicals. We considered what types of dust the PM_{10} instrumentation is monitoring, and whether it would also be relevant to monitor $PM_{2.5}$ and NOx in this site of intensive heavy vehicle traffic and industrial activity. We examined how the monitoring station is situated and if it was downwind or upwind of SELCHP, and as we inspected the monitor more closely, we saw that the anemometer at the top of the station was jammed and was catching on the protective grating over the weather sensors. Since part of what would make the

monitoring data from this site relevant is whether and how emissions might be travelling from the industrial sites to residences, this jamming of the anemometer interrupts this understanding of emissions and their trajectories.

As we move from the Mercury Way monitoring station around the waste transfer yard to the SELCHP incinerator, we consider the long-standing environmental justice issues related to where industrial infrastructures such as incinerators are sited. This particular structure was located in an immigrant community that at the time of its construction was seen to pose less resistance to this development (Parau and Wittmeier Bains 2008). Incinerators were at one time considered a useful form of infrastructural investment, and these developments at times receive subsidies for generating 'renewable energy' and for diverting waste from landfills.

We considered the uncertain relationship between monitoring and emissions, and the ways in which incinerators were perhaps less frequently addressed as environmental matters of concern (cf. Corburn 2005). At one time, the looming chimneys of incinerators and factories were icons of environmental harm, but attention has increasingly shifted to automobiles and individual consumption. The environmental impacts of these more collective infrastructures can still be felt, however, and the absence of certain regulatory types of monitoring and attention to sites such as incinerators are often what spur interest in citizen-led monitoring.

Transition 3: 'instruments for a speculative cartography' at Deptford Park

What's in the air? What is monitored? How is it monitored? How is this information acted upon or otherwise influences environmental politics and practice? As we walk and visit different monitors and different sites of pollution, we are repeatedly testing

these questions about what monitoring makes evident, and how monitoring is located and operationalized. We next walk past Sir Francis Drake Primary School at Grinstead Road and Trundley's Road, as well as Deptford Park Primary School at northeast corner of park at Evelyn Street to Deptford Park, a large green field surrounded by plane trees and offering welcome relief from the full blaze of the sun. Here, in the shadow of the SELCHP incinerator, we consider in more detail how the rise of citizen science and citizen sensing activities attempt to democratize environmental monitoring and data collection, while addressing the specificities of individual exposure as distinct from the fixed sites of emissions monitoring. These citizen sensing practices are often what might be referred to as 'instruments for a speculative cartography,' following Guattari (1989, 5), which test out new technical arrangements without having any guaranteed outcome. There is no guarantee that the data gathered by citizens will make sense, that the instruments will work or that evidence will concretize in such a way as to generate political change. Yet these speculative practices still create a lure toward expanded ways of understanding the experience of environments and environmental pollution.

While the LAQN captures air quality data at points throughout London for generating legally admissible data, and DEFRA and EA monitors capture data at points of distinct land use, and models and emissions inventories various project and forecast pollutants across London and the UK, now more monitoring projects are emerging that are related to community engagement with air quality. The King's ERG that runs the LAQN has also been involved with the Southeast NHS public engagement group to study how air pollution data might be used to improve health. With us on our walk are several researchers from the Southeast NHS group, who are carrying a micro-aethalometer, which has also previously been used in a study of

personal air monitoring of journeys (Brannon 2012). The point with many of these mobile and individual monitors is that individual exposure may vary widely from the emissions captured at fixed monitoring stations, and so exposure studies can provide a much different picture of what's in the air.

The micro-aethalometer is far from a low-cost or DIY device, however, and we have along with us a set of Grove Seeedstudio sensors alerting us to the relative 'freshness' of the air, and at one point recording NO_2 levels as high as 76 $\mu m/m^{3.}$ From backpacks and balloons to wearable sensors and sensors on drones, from handheld sensor prototypes to smartphone apps, and even from lichens to strawberries, a number of air monitoring kits are currently under development, in use, and being tested in the field in order to give indicative assessments of air quality in finer-grain spatial and temporal detail.

The data that these devices generate, however, are typically less relevant for the absolute number produced and more relevant in relation to indications of activity or changes in pollution patterns over time (cf. Gabrys and Pritchard 2015). Tuning citizens into exposure patterns, filling in the spaces between monitoring sites, generating a sense of shifts in urban activity over time: these are different types of insights that might emerge from the use of DIY sensors. Sensors are often presented as participatory technologies, yet there is a considerable amount of expertise needed to code and assemble this kit for monitoring. And different sensors can provide distinct experiences air, given that some sensors used in DIY electronics are manufactured for monitoring Boeing jets or lavatory air freshening, rather than urban air quality.

On this walk, we then explore the rise of personal and DIY environmental monitoring as a way in which air-quality data is made intimate and immediate to lived

urban experiences. The assumed immediacy and directness of what is being sensed inevitably influences the experience of environments. The monitoring that generates air pollution data is meant to provide a direct route to action, even though it is somewhat unclear how forms of participation that make pollution visible facilitate action. Indeed, strategies of visibility through data might potentially elide other influences within the problematic of urban air pollution. As experiments with forms of participation, these monitoring practices arguably unsettle some (regulatory) engagements while solidifying others. In this sense, monitoring is not just an epistemic consideration, but also an ontological one, where distinct relations are put in place in order to identify, monitor and potentially even act upon that which is detected.

Transition 4: anticipating pollution at Sayes Court and Convoys Wharf

Moving northeast from Deptford Park, we then crossed Evelyn Street to Oxestalls Road, taking a right on Grove Street past the Deptford Park Primary school located next to a petrol station and the Veolia Environmental Services yard to our next stop, Sayes Court. Standing here in the ward of Evelyn, in the district of Deptford in the Borough of Lewisham, we encounter a park and relic of sorts of John Evelyn, who was author of *Fumifugium* (1661). This text is often referred to as one of the first treatises on air quality, which considered the relationship between urban industry and air.

Why refer to this text besides the fact that it seems to be a curious accident that Evelyn, the author of what is arguably the first text on air pollution in London, once lived on a site that is now immediately downwind from the SELCHP incinerator? Not only was *Fumifugium* one of the first texts on air quality, it was

continuously recycled and reprinted in the context of air quality discussions, including by the National Smoke Abatement Society in 1933 and 1961, and by the National Society for Clean Air in 1944. The basic gist of the text was an appeal to Charles II to control the 'smokes' in London. Because people were unable to adapt to the extreme London air pollution, there was a high incidence of death due to London air, and people who had the means often repaired to the countryside. Evelyn argued that breathing was an indispensible process, and that poor air quality had a harmful affect on the body.

Evelyn argument not only addressed the 'aesthetic' appeal of better air quality--that air has a spiritual quality, but also that London did not have air befitting a world capital city. He made a series of proposals for remedying air pollution, including moving industry and the 'vile' working cottages out of London, or at the very least beyond the 'mountain' of Greenwich; planting sweet-smelling flowering trees and shrubs, including lavender, rosemary, hops, bay, woodbind, musk and roses. Merchant has suggested in the *Death of Nature* (1980) that Evelyn's approach to the environment was fundamentally flawed as it was organicist and managerial (and classist), yet his proposals continue to provoke considerations about how urban air and urban development swirl together in the same smoky broth.

With Evelyn's text in mind, and the murky commons that are made in urban air, we move toward the final stopping point on the walk, Convoys Wharf in Deptford. This 46-acre site on the Thames was currently in the planning stages for a major urban development by Hutchison Whampoa. The site had previously been owned by News of the World, and had become a site primed for redevelopment, including high-density housing of approximately 3,500 new units along with commercial and cultural units. Inevitably, such a development would produce air pollution, both in the

construction of the site (anticipated to last 15-20 years), and in the increased traffic and building use that would generate common urban pollutants.

Planning regulations typically require strategies to be in place for mitigating or abating anticipated pollution from new developments. Planning proposals are also required to submit air quality assessments and models as part of the planning package outlining the current state of the air, along with anticipated forecasts of air quality in 4-5 years if no development were to occur, and anticipated forecasts of air quality in 4-5 years if development were to occur. These planning documents form the basis for mitigation and reduction measures that Lewisham Council would then work with the developer to put in place. Yet as often as not, development unfolds without such oversight, and the city absorbs the new sources of pollutants, with or without an air quality strategy.

As we stand at the Convoys Wharf site discussing the imminent development, momentary readings of NOx spike and then fall. We speculate whether this is due to the wind from the river, passing ships, or some other airborne event. And we wonder how accurate this momentary reading is, since this site is currently far less overloaded with traffic and industrial activity than many of the other sites we have passed through. We also conjecture how this site will look in 10 years time when, planning permission having been granted, 40-story residential towers with boilers, and buses and lorries ferrying people and goods amplify the pollutants here.

Inevitably, new development projects generate additional environmental impacts that require assessment, as well as monitoring and mitigation. New densities and transport configurations, as well as construction and heating, change the environmental conditions of sites and bring new requirements for ensuring air quality. Citizen sensing that focuses on real-time environmental pollutants could respond to

and anticipate these future pollution events. But at the same time, these citizen-sensing practices could also occlude other types of urban political engagement, such as addressing gentrification or housing crises.

Transition 5: alternative exposures along Douglas Way

Nearing the end of the walk, we finally made our way back to Goldsmiths along Douglas Way, an alternative walking route along a greenway that Lewisham Council had promoted as a way to minimize individual exposure to air pollution that one might otherwise experience if walking along New Cross Road. Emissions and exposure are two aspects of air quality management. While practices can be developed for abating air pollution and so controlling emissions, the reduction of emissions remains a politically complex project, and so managing one's individual exposure is often seen to be a more expedient approach to the problem of air pollution. The practice of taking alternative walking routes is then frequently suggested and adopted as a way to minimize individual exposure to air pollution.

By this point of the walk, we had engaged with official LAQN monitoring stations located to comply with EU air quality objectives, apps designed to give publics some sense of the quality of air, and apps designed to make explicit the connections between air quality and health, as well as bodily engagements with air pollution and DIY sensing devices. Across this array of kit, infrastructure, bodies, organisms, places and digital platforms, the ways in which we experienced and monitored air pollution became not only multiply constituted, but also provided ample space for considering how we develop practices in and around these sites of engagement.

Fast-forwarding several months from the end of this walk, we received a map of the GPS-located micro-aethalometer data from King's ERG (Figure 1). Here was another dataset that mapped exposure during the two-hour walk on a hot day in July. As if the intersecting experiences of monitoring infrastructures, bodies, DIY devices, health research and EU policy, as well as diffusion tubes and anecdotal tales were not enough to trouble the contours of environmental monitoring, this map provided us with minute-by-minute data at each site along the walk that at times corresponded with our DIY readings, at other times wildly contrasted, and in most cases provided a much different picture than the hourly averages communicated through the qualitative bandings of the London Air app. Different experiences of one itinerary showed up in different data sets and across different technologies.

While we were standing at the New Cross Road monitoring station, this app indicated emissions of NOx and PM_{10} and $PM_{2.5}$ to be low, while here black carbon readings indicated emissions were high. This minute-based reading of air quality was a further point of contrast, since health research and policy objectives indicate that hourly readings are sufficient for understanding and responding to air quality. On the other end of the spectrum, diffusion tubes provide averages that are typically monthly, depending on how long they have been placed in the field. The temporality of monitoring and exposure, of regulation and experience, then wavered in and out of focus, where official measurements might contrast with citizen data, and where individual exposure might not readily align with the averages provided through public health guidance and air quality objectives.

Conclusion

How does the experience of emissions and exposure unfold across kits, infrastructures and bodies? How do we differently participate in environmental monitoring through these diverse and distributed ways of experiencing air quality, and what consequences does this have for the human, more-than-human and environmental health? Part of the objective of the 'Air Walk' was to consider how air is experienced, whether through visual, embodied or informational registers. The walk further experimented with speculative forms of participation that concretize through encountering air pollution in process. Through experimenting with air pollution sensing kit, we tested how environmental sensing enables certain types of monitoring, and yet at the same time generates questions about the limits and possibilities of these monitoring practices.

Low-cost sensor devices not only relocate the sites of monitoring from scientific and governmental to everyday spaces, but also raise multiple questions about what is being monitored, and how environmental harm may be identified. Delineations of low or high air pollution imperfectly correspond to on-the-ground measurements, bodily experiences, and accumulated effects. Environmental sensors appear to measure and record the 'facts' of air pollution, but actually give rise to new questions and matters of concern about how air pollution is monitored.

This is an extended way of saying that sensing kit is just one small part of the provocation for working through how the experience of air quality is distributed, and what the practices of reworking air might consist of. Monitoring and citizen sensing are emerging as new modes of environmental participation. We sought to investigate the ways in which these practices enable new ways to engage with and address air pollution, and to address and change environmental politics.

The walk raised many questions about how DIY sensors travel through environments, multiplying the experiences and data points gathered in monitoring

activities, while also creating a new set of issues with which to grapple in order to have the kit work and be legible as a site of environmental practice and politics. But a key concluding point is that this walk mobilized speculative and experimental forms of participation that reorient research engagements. Rather than undertake an ethnographic and descriptive-based account of the walk, I have instead sought to emphasize the multiple vectors of experience that were animated and brought together in this event.

And rather than collapse this discussion into creating a typology of participation or outlining how walking might become a method, I have sought to articulate how the singularity of walking might be a way to rethink and rework forms of participation mobilized for environmental and public engagement. It is the very liveness and relationality of these encounters that might potentially contribute to new ways of unfolding engagements with air pollution. Distributions of experience actively inform the entities that are made and sustained in order for particular practices--here of environmental citizenship--to occur. From the events encountered on the route of the walk, to the air, the weather, the traffic, pedestrians, participants, and monitoring kits, the 'outcomes' of the walk-as-research might prove to be somewhat unpredictable. Yet the trajectory of the walk can animate these speculative encounters, and create radical forms of pedagogy that might be contribute to more generative—and collective—forms of environmental politics.

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