Inventive devices and public issues: The *Air Pollution Toile*
Lucy Kimbell

Abstract

This chapter discusses the ways outputs from art and design anticipate futures. It uses a case study of the *Air Pollution Toile* (Kimbell, 2018) which took the form of a concept for wallpaper that reacts to interior air pollution, revealing imagery of diseased human organs. The chapter reviews literatures at the intersection of design and futures, noting how they emphasise design's materialising agency and multiplicity in exploring futures, along with the political and ontological work in so doing. It then turns to air pollution, a public health issue around the world, particularly in lower and middle income countries. The chapter summarises creative projects that address air quality, distinguishing between those that represent the issue, intervene into it or problematise it. Drawing on traditions of toile de Jouy in interior decoration, the chapter then describes the *Air Pollution Toile* wallpaper which includes imagery of everyday activities in urban Europe through which air pollution is produced and encountered. It argues that the wallpaper establishes new relations between domestic settings, scientific research and industrial production in relation to air pollution, while at the same time obscuring the issue.

Chapter Eight.

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Introduction

When my mother moved into sheltered housing, we found ghost frames on each of the walls in her otherwise carefully cleaned London home where the pictures and mirrors had been. Visiting the flat after she had moved out, these marks on the wall remained as traces of my mother's life and tastes and captured physically her memories, and those of friends, family and visitors, to remain until the next residents moved in and repainted. They were also traces of the environment in which she lived for 20 years in this ground-floor London flat. Positioned on the corner of two side roads in a relatively quiet neighbourhood, the ambient pollution in the flat resulted from passing vehicles powered by petrol or diesel, by burning leaves, wood or gas for domestic heating, as well as resulting from the use of everyday cleaning products, smoking, alongside many other factors. The walls starkly revealed the small particles accumulated there over several years. Her brain, heart, lungs and other organs probably contain similar traces. We have no visual record of the particulate matter or damage from polluting gases in my mother's body. But she lives with, what researchers say, are some of its effects: the Alzheimer's disease that meant she could no longer live alone without support, the cardio-vascular disease that slows her down and the cough that never quite seems to go away.[1]

I found these physical traces of air pollution in my mother's flat a year after I created the *Air Pollution Toile* (Kimbell, 2018), a project I was commissioned to make for a group exhibition titled *Future Knowledge* at the Modern Art Oxford gallery (Oxford, UK) in 2018 (see fig 8.1). The *Air Pollution Toile* is a wallpaper concept that gives viewers (in the gallery) and those living with or seeing the wallpaper (installed in buildings such as homes or offices) an opportunity to engage with the issue of air pollution. Briefly, this artwork takes the form of a concept for wallpaper that changes over time, in response to pollutants in its immediate environment, and an accompanying sample book which shows audiences how this pollution-responsive wallpaper changes, using photographs of interiors.

The wallpaper's imagery operates at two levels: it combines scenes from everyday life in the UK, showing some of the activities through which air pollution is produced and how people are exposed to it; and it includes images of three diseased organs (a lung, a heart, a brain) particularly affected by such pollution, made visible through three different medical imaging technologies. Using inks and adhesives, the proposed wallpaper would monitor specific air pollutants in its immediate environment and change in response, with imagery of organs, gradually becoming more visible over time.

<insert fig. 8.1 about here>

At the time of writing this chapter, the wallpaper is 'just' a concept or, more specifically, using the language associated with design practice, a non-functional exploratory prototype. This is because it was not feasible to research, develop, resource and manufacture 'working' responsive wallpaper, given the few months available to me to create a project in response to

an invitation from the gallery in early 2018. Indeed, at present, as I discovered, chemistry researchers do not know how to bring the concept to life.[2] Instead, for the exhibition I combined a display of the wallpaper installed on three gallery walls and the wallpaper sample book on a shelf. The discussion that follows, therefore, emphasises the potentiality of the concept, rather than its actuality, embedded within broader discussions about the capacity of creative outputs such as this wallpaper to represent public and social issues and anticipate futures.

As with other creative projects responding to or dealing with the environment – in terms of, for example, the climate emergency, species and habitat loss, or migration resulting from disaster and displacement – the potential here is to go beyond current awareness and understanding of an issue, to open up possibilities and intervene into the issue. While avoiding assumptions that there is any linear pathway through these responses, research in psychology has shown that emotional reactions to environmental issues can produce a tendency to act (Roosen *et al*., 2018). A review of the ways that the visual arts can engage audiences through experiencing art works in the topic of climate change, summarised these capacities as follows:

> Artworks can increase the viewer's involvement by: making use of narrative or metaphor, prompting awareness, attention, and reflection, enhancing group identity development and encouraging or strengthening a shift in social norms, providing a way to visualize climate change and giving the audience a personal experience of the issue, provoking change and transformation and, finally, inducing a (positive) emotional response, especially when this includes inspiration. (Roosen *et al*., 2018, p. 98)

Psychological perspectives emphasise individual experience and choice. In this chapter, I want to explore the potential of creative outputs to connect people viewing or experiencing them with social or public issues and the anticipation of courses of action to change things. To do this, I will briefly examine literatures in Design Studies (Fry, 2009; Mazé, 2019), Design Anthropology (Gunn *et al.*, 2013; Kjaersgaard *et al.*, 2016) and Science and Technology Studies (Barry, 2001; Calvillo, 2018; Marres *et al.*, 2018), to make connections between concepts of ontological design and inventive research, and use these to discuss the particular kind of wallpaper I created. Making the wallpaper itself preceded this account. What follows might also be read as a tracing between creative practice and the work of contextualisation and theorisation of such a practice. In so doing I explore the limits of design to be considered as an anticipatory practice that brings futures into view.

Design's changing relation to futures

Practice within contemporary design – at least in the western European/North American versions institutionalised within organisations developing products and services, the consultancies that serve them, and the universities that educate the people who design them – has long been tied up with futures.[3] Such relations can be understood within a broader context, resulting from the ways in which design production, consumption and everyday life are constituted within neo-liberal economies characterised by globalisation, deregulation, financialisation and ownership of intellectual property (Brassett, 2015; Julier, 2017). Understandings of design typically rely on the idea that design results in change. However, there are often unacknowledged assumptions about the scale, scope or direction of such changes, and limited recognition of resulting inequalities, nor extensive analysis of the nature

of the relations between design practice and futures. Within discussions in research on these topics, there are several traditions which offer different perspectives on the relationship between design and futures (Hill and Candy, 2019). A brief review of these highlights key contributions and ongoing areas of debate.

The increasing intersections between the domains of practice and research known as 'design' and 'futures'[4] are evidenced by a number of publications, initiatives and events (for example: Selin *et al*., 2015; Brassett and O'Reilly, 2015; Candy and Potter, 2019; Mazé, 2019). Emphasising the ways that the practices and outputs of design bring experiences into view, Stuart Candy and Jake Dunagan (2016) point to how they materialise aspects of the future in the present. Traditions of making and exhibiting artefacts in design and the arts (for example: Mazé, 2007; Dunne and Raby, 2013) and the material turn in anthropology (for example: Drazin and Küchler, 2015), emphasise creative and material practices in the exploration of futures. Such capacities in design practice position this expertise as an important resource for developing 'futures literacy', understood as 'conscious human anticipatory activities, either explicit or implicit, [for] generating the imaginary futures needed to understand and act in the present' (Miller *et al*., 2018, p. 5). Within the various studies of futures, there is growing interest in the creative, visual and material practices of the arts, including design (for example: Selin, 2015; Candy and Potter, 2019). Creating stories (for example: Miller, 2007), fictions (for example: Bleecker, 2009; Hales, 2013), performance and installation (for example: Kuzmanovic and Gaffney, 2017) and creative forms of fieldwork (for example: Morrison and Chisin, 2017). serve in different ways to engage people and non-human actors and open up participation in the work of anticipation. Involving participants of different kinds in making, producing, experiencing, disseminating and interpreting creative and

performance-based artefacts associated with art and design can broaden anticipatory capacities for exploring futures and acting in relation to them.

Researchers connecting design (and the arts more broadly) and the social sciences have opened up the complex relations between these fields, with implications for the work of 'futuring' (for example: Gunn *et al*, 2013; Yelavich and Adams, 2014; Smith *et al*, 2016). In the social sciences, Arjun Appadurai (2013) argues for a shift in anthropology's project to make stronger contributions to human flourishing, by drawing together perspectives from planning, sustainability and design. A review of the emerging dialogues between design and anthropology proposes 'Design Anthropology' as a transdisciplinary field of research and practice that addresses differing temporalities, materialities and politics of future-making and their inherent relations to pasts and presents (Kjaersgaard *et al*., 2016). Also linking design and anthropology, Yoko Akama, Sarah Pink and Shanti Sumartojo (2018) argue that combining perspectives from anthropology and design enabled making uncertainty and possibility present, available to and productive for participants coming together to explore and address complex issues. In sociology, an account of 'inventive' social research proposed by Noortje Marres, Michael Guggenheim and Alex Wilkie (2018) reworks the long-established distinctions in social research between representation and intervention. Drawing on readings of the mathematician, physicist and philosopher Alfred North Whitehead, Marres *et al*. (2018) foreground the generative dialogues between sociology and other domains of practice and knowledge, such as design, the arts and architecture. Located at the intersections between anthropology and the arts, Adolfo Estallela and Tomás Criado (2018) highlight sites for fieldwork that foreground the aesthetics of collaboration and problematise the production of social science knowledge. In different ways these contributions emphasise productive

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relations between design and social research, that open up established distinctions between representation and action, often through combining different forms of knowledge and insight.

Several of these discussions acknowledge the work implicated in designing and anticipating futures. For example, a critical perspective found in discussions of 'ontological' design (for example: Willis, 2007; Fry, 2009; Brassett, 2018) raises questions about the constitutive relations between design practices and how futures are imagined in designing and designs, situated as they are within globalised modern industrial ecosystems and within neo-liberalism. Tony Fry (2009), for example, points to the grounding of (industrial or product) design in capitalism which has resulted in, and continues to drive, the ongoing climate emergency, resulting in defuturing. Ramia Mazé (2019) shows how designing futures in the present is always political. For example, she notes the hegemonic tripartite structure of time – modern and Western paradigms of clock time, linear progression and positivist predictability – implicated in dominant traditions of Western/Northern design practice and research (Mazé, 2019). Arguing that designers should recognise the affective character of their practice, Jamie Brassett (2018) notes that the work of designing reinforces or disavows the various agential possibilities of the types of existence that emerge. Drawing on different traditions, these discussions of design emphasise its materialising agency and multiplicity in exploring futures, along with the political and ontological work in so doing.

In short, the occasions for, modes of and means for exploring futures in the present are multiplying; resulting from fruitful connections between design and related fields, in particular futures studies, sociology and anthropology. This brief review has highlighted the constitutive role of materiality in design's anticipatory agency. However, the context of neo-liberalism and its unequal and racialised consequences – such as the climate emergency and

effects of COVID-19 – serve to emphasize the need to be reflexive about the direction of future-making through design and the need for awareness of the politics materialised within designs and designing. Furthermore, perspectives from Science and Technology Studies point to the potential for the outputs of social research and of designing to be devices that offer both more and less than representation (Barry, 2001; Marres *et al*, 2018). Bridging representation of a social world, and intervention in it, an inventive device can be understood as opening up possibilities that enable an anticipatory form of representation. By having such a capacity, devices such as the wallpaper 'produce' and materialise data in novel ways to open up relations between publics, audiences and participants, anticipating future ways of living and being in response to public issues such as air pollution.

Against this background I now develop a case study of my creative output, the *Air Pollution Toile,* and discuss it using the concepts introduced here. While there are other ways to discuss this artefact, analysing it in this manner enables critical reflection and reflexivity about the extent to which design – in the traditions in which I am situated as privileged person working in a university in western Europe – serves to anticipate futures.

Air quality: A public health emergency

In late 2018, the World Health Organization (WHO), the international organization developing global and regional research and policy and regulation for health, declared air pollution a global public health emergency. According to them (WHO, 2018a), 91% of the world's population live in areas with air pollution above WHO's recommended limits. Such pollution can cause, complicate or exacerbate many adverse health conditions: with 4.2 million people a year dying from ambient pollution and another 3.8 million a year dying from

exposure to air pollution in the home and billions more harmed in one way or another (WHO, 2018a). Two years later, researchers began to find links between air pollution and experience of the COVID-19 virus. Not only do researchers suspect links between locations with levels of air pollution and increased severity of COVID-19-related illness, it is also linked to increased deaths and possibly to the spread of the disease itself (Carrington, 2020).

The WHO announcement built on decades of work by activists, researchers, clinicians, policy makers, planners and public servants assembling growing evidence about the reductions in air quality and the negative implications that result for human and animal health and for plants (WHO, 2018a, 2018b). Impacting on people of all ages, in all regions and across all social groups, air pollution causes more harm to some people than others (National Institute of Clinical Excellence, 2020), with children and older people disproportionately affected (Committee on the Medical Effects of Air Pollution, 2004). Air pollution impacts on every organ and every cell (Schraufnagel *et al.*, 2019). In particular, in addition to the lungs, it damages the heart and brain; impacting and exacerbating diseases such as asthma, pneumonia, heart attacks, dementia, strokes and cancer (Schraufnagel *et al.*, 2019). In addition to the effects on human health, air pollution damages biodiversity, animals and crops (WHO, 2018a).

The term 'air pollution' includes several distinct forms. One main form is gases, such as nitrogen dioxide or sulphur dioxide, often produced by burning fossil fuels, or resulting from industrial processes, but also chemicals that are routinely found in the home or workplaces such as volatile organic compounds. Another main form is particulate matter: tiny, invisible particles, which can make their way into human or animal bodies. This matter can have industrial origins (resulting from manufacturing, driving or burning fuels, for example) or

biological origins (such as spores or mould). Particulate matter is categorised by diameter: PM10 denotes particles which are less than 10 micrometres in diameter; particles of this size can enter membranes and the upper airways, causing coughs or tearing. Finer particles, PM2.5 – smaller than 2.5 micrometres – make their way into the lungs. The tiniest, ultrafine particles, can move through the membranes separating the lungs and the blood system, enter cells and then are moved round the body via the bloodstream with the potential to reach nearly all of the cells in the body, including brain cells (Peters *et al*, 2006). Because these particles can carry elements or compounds which are toxic, they therefore cause damage to human and animal bodies.

In the past decade, air pollution has become increasingly visible as a contemporary international public health and social justice issue. In his discussion of air quality monitoring in a London borough in relation to a European-funded project, scientific research and broader policy debates, Andrew Barry (2001) argues that there are different kinds of air quality object, each assembled from different kinds of discursive, technological, scientific and other resources. External sources of pollution include manufacturing, agriculture, construction and transport. But dangers lurk indoors too. Indoor air quality is becoming understood as a hidden and important determinant of health. The quality of indoor air varies with sources of pollutants, air temperature, humidity and ventilation (Parliamentary Office of Science and Technology, 2010). Sources of indoor air pollution include cleaning products, household appliances and goods, and activities such as cooking, heating and smoking. Proximity to external sources of pollutants such as roads also changes interior air quality. Researchers modelling interior air pollution consider and adjust for factors such as opening windows, human activity such as vacuuming, as well as the physical fabric of buildings and spatial arrangement of dwellings (Garnett, 2020). Indoor air pollution is disproportionately higher in

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developing countries, particularly due to the use of solid fuels, including biomass, for cooking and heating inside homes (WHO, 2010).

In Europe, much of the policy and public health focus to date has focussed upon defining air quality standards (European Environment Agency, 2019), building frameworks and capacities for data-gathering, monitoring and reporting in local and regional government: the UK's local air quality management guidelines (Defra, 2019b), for example. Policy responses to reduce air quality in the hands of local government, include measures such as encouraging or supporting car sharing, making changes to the built environment, traffic planning and creating low emission zones within which high-polluting vehicles are prohibited or disincentivised from travelling (Defra, 2019c). In terms of regulations, these do not apply equally to all forms of air pollution. According to the Alzheimer's Society (2019a), a research and advocacy charity based in the UK, there is less monitoring of (and therefore less information about) the effects of ultrafine particles than of the larger PM2.5, PM10 and gases such as ozone. Other developments have included citizens becoming more visible in discussing air pollution and its consequences for example through citizen science (Gabrys *et al*, 2016) and forming publics to provoke change when government authorities act illegally or irresponsibly (Calvillo, 2018).

These policy and regulation activities have often focussed on outdoor – or 'ambient' – air pollution. In the UK, for example, news media routinely report the daily or even current levels of ambient air quality based on data gathered and reported by national and local government bodies. But there is growing awareness of the need to understand and address indoor (or household) air pollution. Risks and impacts associated with interior air pollution, even in high-income countries, are less visible than for ambient pollution. For example, a

report on the UK highlighted how domestic fires in 1.9 million UK households, burning

wood, coal and other solid fuels, generate 40% of the total of dangerous, very fine, PM2.5

particles (Emden and Murphy, 2018). This figure is more than double the emissions from UK

industrial combustion (16%) and more than three times as much as from road transport (12%)

(Emden and Murphy, 2018). Table 8.1 gives a summary of some of the key pollutants, their

sources and effects on health, associated with domestic or indoor air pollution in the UK. It

shows how ordinary consumer products and appliances – typically found in UK homes and

associated with everyday practices – result in pollutants which are dangerous to health. In

short, indoor air pollution is prevalent as well as mundane.

<insert table 8.1 about here>

Making air pollution public

As with other environmental issues (Cape Farewell, 2020), air pollution has seen interest

from artists, designers and other creatives. Space does not allow a fuller analysis of the

different ways that creative practice treats air pollution but, in this summary of some recent

projects, I make a distinction between work that represents it, intervenes into it or

problematises the issue (Marres *et al*., 2018). Many creative projects do more than one of

these, of course, but to clarify the argument I highlight distinctions between the three.

As an example of a creative project that represents air pollution, UK-based artist Michael

Pinsky's installation *Pollution Pods* (2017) takes the form of five geodesic domes, emulating

polluted environments in five cities. The air inside each dome is modified to simulate air

quality in five places, based on levels of particulate matter, nitrogen dioxide, sulphur dioxide

and carbon monoxide. The audience moving through the sequence of five domes experiences the differences in air quality between Tautra in Norway, London, New Delhi, Beijing and São Paulo. Commissioned in the context of a cross-disciplinary research project, this installation aims to use art to connect climate science, climate psychology and the general public (Climart.info, 2019b). According to the project's website, the aim of the artwork is to offer the audience an experience which will change people's behaviour:

> The experience of walking through the pollution pods demonstrates that these worlds are interconnected and interdependent. Our need for ever cheaper goods is reflected in the ill-health of many people in world and in the ill-health of our planet as a whole. In this installation we can feel, taste and smell the environments that are the norm for a huge swathe of the world's population. Perhaps the visceral memory of these toxic places will make us think again before we buy something else we don't really need. (Climart.info, 2019)

The *Pollution Pods* use data from the cities whose current levels of five pollutants they simulate in the location of the exhibition. The artwork can be considered a form of representation that requires translation, shifting data produced in five places to the site of the installation and bringing the experience of air pollution there, here; but in so doing, this piece positions the issue of air pollution as being about air and experience. Visitors are invited into the pods to breathe simulations of the air somewhere else, without revealing anything about the infrastructures, policies and practices which result in these differences. Visitors from a European city where air pollution levels are lower than in much of urban Asia may briefly breathe air similar in quality to that of New Delhi, for example. But the varying experiences of people in that city and the long-term consequences for their health, as a result of persistent health inequalities, cannot easily be translated.

As an example of a creative practice that aims at intervention, UK-based office EcoLogicStudio (2018) created a living curtain to be installed in buildings, *Photo.Synth.Etica*, which uses photosynthesis in algae to remove carbon dioxide and produce oxygen. In this design, unfiltered urban air is introduced at the bottom of the module. Air bubbles rise through the liquid and in the course of this, carbon dioxide molecules and air pollutants are captured and stored by the algae, to grow into reusable biomass. Photosynthesized oxygen is then released from the top of each module. Similarly, Netherlands-based Studio Roosegaarde (2019) created a large-scale urban tower (2015) and bicycle (2018) that are intended to produce 'Smog Free Air'. Installed in the Netherlands, China and Poland, the seven-meter high aluminium tower designed for public spaces such as parks uses patented ionisation technology to remove pollutants from the air. At a different scale to that adopted by architects, product designers are also developing responses. New products such as the Airbubbl (2019) air purifier produced by London-based start-up Air Labs are shifting the burden of improving air quality from governments towards individuals, by giving them a consumer product to improve their immediate environment. The Airbubbl enables people to remove PM2.5 and PM10 particles, nitrogen dioxide and other pollutants in the confined and heavily polluted environment of a car. All three examples are interventions into air pollution using technology to improve the air quality in the immediate vicinity. But they do not raise questions about the infrastructures, policies and practices that make such devices necessary.

A third approach is to problematize air pollution. For example, UK-based designer and sociologist Jennifer Gabrys's *CitizenSense* project (2013–18) explores the relationships between the technologies and practices of environmental sensing and citizen engagement (Gabrys *et al*, 2016). The project studied and also set up small-scale projects in which people

directly engaged with sites of contamination or pollution including noise, air, soil and water pollution: hence, 'citizen sensing'. One output from the project was a toolkit for 'citizens' to analyse and download citizen-generated air-quality data points collected in Pennsylvania, which has an extensive natural gas industry and infrastructure. The tool is designed to open-up the work of identifying sites of concern to local residents and to enable them to participate in making air pollution into a public issue. Along with other practical experiments sharing digital tools for people to use, *CitizenSense* contextualized, questioned and developed new understandings about the possibilities and limitations of democratized environmental action through 'citizen sensing' practices. These projects make air pollution visible; but more than simply representing air quality, they change the relations between participants and air quality data, raising questions about infrastructures, policies and practices associated with air pollution, its causes and effects.

These projects exist within different traditions and in relation to different publics. Whereas for some, data can be translated to communicate with publics, for others, the construction and articulation of the air quality issue itself, and the data this rests on, are open to question. Some projects aim to intervene directly to reduce pollution in the immediate environment, but without changing the relations between individuals experiencing the project and the air pollution issue. For some, the scale of the issue and response is individualistic, whereas other projects emphasise collective agency. For some, the infrastructures, policies and practices that result in different levels of air quality are bracketed; for others, the tracing and reconfiguring of relations between various actors is central to the creative work. It is this latter set of practices that can be described as producing an inventive device is 'both more and less than a realistic representation of the world' (Barry, 2001, p. 155). On the one hand, a visualisation can bring into view previously hidden aspects of air quality; on the other, it can

also intervene, not just into local air quality, but into public understanding of and engagement with the issue. Doing so involves reassembling the relations including data, visualisations, practices, policies, infrastructures and publics associated with the issue.

<insert fig. 8.2 about here>

Anticipating indoor air pollution

In a context in which household air pollution is a growing concern, the *Air Pollution Toile* (see figs. 8.1, 8.2, 8.3 and 8.4) is a concept for a wallpaper to represent but also problematise air quality, its causes and future consequences, for those who are exposed to it.[5] The wallpaper is intended to gradually change visually over time in response to three interior air pollutants in its immediate vicinity. In so doing, it proposes a new way for audiences who come into contact with the wallpaper in a gallery (and following further development, when installed in homes and offices), to understand, track and assess the cumulative amount of air pollution in the immediate environment where it is installed, visually and materially linking causes, conditions and effects. In response to the presence and concentration of particular pollutants, the wallpaper's inks, combined with adhesives that capture particulate matter, will change the imagery over time.

In the gallery, alongside the wallpaper is a sample book, of the kind commonly produced by wallpaper manufacturers and found in shops where you buy wallpaper. This heavy, canvas-bound, large-format book includes several samples of the *Air Pollution Toile*, with the wallpaper in various stages of change. The first page shows a version of the wallpaper with its scenes from everyday UK life. The accompanying in-situ image suggests the wallpaper is recently installed, and the wallpaper has not yet reacted to local pollutants (see fig. 8.3).

Subsequent pages show pairings of a sample of the wallpaper and an in-situ image, text declaring how long the wallpaper has been installed and a simple summary of the levels of nitrogen oxides, particulate matter and carbon monoxide in the vicinity.

<insert fig. 8.3 about here>

The final section of the sample book includes a sample of wallpaper for urban India, in which the line drawings of everyday life are based on photographs of people in India. The inclusion of one sample from India acknowledges the reality that the highest levels of air pollution are found in low and middle-income countries. Around three billion people live in households that predominately burn fuel such as wood or coal for cooking, typically in low-income or middle-income countries, exposing them to pollutants as part of everyday life (Science Daily, 2018). In a list of the world's most polluted cities for PM2.5 – just one pollutant, often used as a stand-in to communicate the issue – seven Indian, two Pakistani cities and one Chinese city are in the top ten (Air Visual, 2018). My main focus when creating this wallpaper was indoor air pollution in UK; the images accompanying this chapter are more specifically named the *Air Pollution Toile (Urban Europe).* But air pollution is not the same everywhere; different ways of living and working and associated technologies, forms of organisation and regulation result in different levels of pollutant and different consequences. Listing future variants in the sample book – and including within it a sample from a planned *Air Pollution Toile (Urban India)* wallpaper with India-based imagery – acknowledges the specific and contingent variations in air pollution that exist around the world, with their differing and racialised consequences.

As well as adding detail to scenes of everyday activity through which air pollution is produced and how people are exposed to it, the inks and adhesives in the wallpaper gradually reveal imagery from the main organs in the body damaged by air pollution: a lung, a heart and a brain (Royal College of Physicians, 2016) (see fig. 8.4). These design decisions resulted from desk research to understand more about the effects on the human body and selected these three organs. The wallpaper gathers and materialises hyperlocal data and produces a visual account of interior air pollution over time. As with the body, these changes are irreversible.

Deceptive wallpapers, everyday toiles

As a wallpaper, this inventive device draws on historical associations between this form of interior decoration and the shaping of cultural and social behaviours. Historians of interiors have shown the ways that Chinese traditions of wallpaper intersected with developments in European furnishing and decoration, resulting in rolls of paper being used in interiors around the end of the seventeenth century (Hoskins, 2005). Some note a long association between wallpaper and deception (Stewart, 2016). By bringing into European rooms illustrations of life that are 'other' (for example, Chinoiserie in eighteenth and nineteenth century Europe), visualising fake architectural details (for example, dado rails) or combining simple repeated motifs into *trompe-l'oeil* panoramas, wallpaper was understood to deceive and trick. Contemporary criticism of late eighteenth century wallpaper objected to the fact that it relied on imitation, appearing to be large-scale drapery in rooms where cloth previously had hung (Jacqué, 2009). Historians have also shown how dangerous wallpaper could be to the people who lived in the rooms where it was installed. Use of arsenic as a colouring additive in

manufacturing in the nineteenth century was widespread, resulting in green wallpapers that made people extremely unwell, sometimes terminally so (Whorton, 2010).

The graphical language known in shorthand as 'toile' has long been associated with contemporary events. 'Toile de Jouy' is the name for a graphical style associated with furnishings and interiors since the mid-eighteenth century. With the global trade in manufactured cotton goods between Europe and the places Europeans occupied and extracted resources from, there was a growth in interior decoration using this material for furnishings and upholstery in European homes (Russell, 2012). One early innovator in printing onto cotton was a Swiss German engraver and entrepreneur called Christophe-Philippe Oberkampf, who set up a printing press in Jouy-en-Josas, south of Paris in 1760. Designs produced in this early factory included engravings of details of everyday life, printed on cotton in monochrome with wooden blocks (Gril-Mariotte, 2009).

The highly detailed designs proved popular, the factory grew fast and its style became widely adopted, copied and adapted in many other contexts. Common details include animals, people and scenes from pastoral life. Often designers used current events as material for the detail in a print (Gril-Mariotte, 2009). With closely observed details from everyday life and from current events, toile de Jouy brought images of social and technological change into people's homes (Russell, 2012). Toile became a kind of visual journalism tracking and also recording interest in current events (Gril-Mariotte, 2009). For example, Oberkampf commissioned three designs of air balloons for upholstery in 1783–4, around the time there was growing interest in early flying machines then being developed and tested in France (Gril-Mariotte, 2009). There are links, too, between political events and toile designs. As political changes happened across Europe and the Americas in the late eighteenth century, engravings about

these events also became inspiration for toiles. One example is Oberkampf's design from 1780–81 demonstrating French support for American resistance to British rule in what became the War of Independence (Gril-Mariotte, 2009). In that design, France is represented as a mature woman, providing help to the emerging America in its struggle against the British, in the form of 6000 French troops sent to fight. US revolutionaries also used toile designs to highlight their politics in the fight against the British.[6] Later still, in the 1930s, designers in the US used toile designs to demonstrate patriotism (Russell, 2012): a mid-twentieth century design attributed to Elisabeth Draper[7] based on the life of President Eisenhower brought together symbols of his presidency, background and institutions he was associated with such as Columbia University, West Point and NATO (Cook, 1998). Contemporary toile designs have reinvigorated this tradition of bringing public issues into view (Hemmings, 2005). Additionally, however, some designers raise questions and disrupt expectations, as is evident in the work of UK-based textile design studio Timorous Beasties and US-based interior designer Sheila Bridges. These designers are not simply representing the world they see around them; they want to intervene into it and pose questions.

The Scottish design duo known as Timorous Beasties, Paul Simmons and Alistair MacAuley, who met as students of textile design at Glasgow School of Art, have created several toile designs. First was the *Glasgow Toile* in 2004, which updated the toile format for 21st century urban contexts, realised as wallpaper and fabric. Available in blue, pink and green, this visually dense design shows grim scenes from the city's life including drug addicts, prostitutes, modern buildings and dirt. Describing their later *Edinburgh Toile*, the website notes:

When commissioned by the Edinburgh International Festival [EIF] in 2009,

Scotland's capital became a cornerstone in Timorous Beasties' urban toile collection.

Featured on the cover of the EIF events magazine, projected on the Edinburgh Omni

Centre, framed in Jenners department store display window, and broadcast on taxis

and billboards across the city, our Edinburgh toile was part of the very fabric of the

city. Controversial images of revellers urinating at the Greyfriar's Bobby fountain,

homelessness, begging, and a traffic cone crowning the statue of the eminent

Enlightenment philosopher, David Hume, provoked some reaction in conservative

circles. (Timorous Beasties, 2019)

This description highlights the varied distribution of this graphical output, beyond domestic

settings, as well as the importance of provocation for these designers. Timorous Beasties aim

to use their wallpapers and textiles to translate between domains that are usually kept apart:

the luxury hotels, high profile events and wealthy homes for which their work is

commissioned and where it is installed; and the impoverished streets of the city; as well as

making links between tourism, heritage and poverty in the urban environment. As with the

Glasgow and Edinburgh variants, familiar landmarks locate their *London Toile* (2006, in the

collection of the Smithsonian Cooper Hewitt National Design Museum) in space and time,

but can trick the viewer who looks only at the whole and not the detail:

If a traditional toile was replaced by the Timorous Beasties' design in an interior

design magazine spread, the switch would likely go unnoticed. However, if one takes

the time to examine the images presented, it is only then that the, perhaps too realistic,

scenes of urban life can be recognized. This quality – from afar giving off the feel and

look of traditional toile and up-close unsettling the viewer with the unexpected – is

what makes *London Toile* a clever reimagining of a traditional textile that also serves as commentary on present-day culture. (Elevado, 2013)

In contrast to the tradition of architectural deception in early European wallpapers, this approach draws people in to disrupt expectations about social realities and heritage sites. The repetition of scenes of everyday life is familiar, as a toile, but the social realities they capture provoke, rather than mask, the social inequalities associated with 'heritage'.

Similarly, US-based interior designer Sheila Bridges developed a toile to challenge assumptions about how African Americans are represented. Her design, realised in wallpaper, fabrics and homewares, called *Harlem Toile de Jouy* (2005)*,* is also in the permanent collections of the Smithsonian National Museum of African American History and Culture and the Smithsonian Cooper Hewitt National Design Museum. Bridges' website (2019) explains:

> As an African American living in Harlem, I have always been intrigued and inspired by the historical narrative of the decorative arts, especially traditional French toile with its pastoral motifs from the late 1700s. I'm entertained by the stories these patterns tell and the questions they sometimes raise. But after searching for many years for the perfect toile for my own home, I decided that it quite simply didn't exist. I created Harlem Toile de Jouy initially as a wallcovering then expanded the collection to include fabrics, bedding, plates, glassware, umbrellas and clothing. This design [. . .] lampoons some of the stereotypes deeply woven into the African American experience.

Bridges' design shows everyday scenes of African American people in eighteenth century European and North American dress: women doing their hair, a man and a woman dancing,

young men playing basketball with a basket hung from a tree (Herringshaw, 2014). These scenes and the rich background colours – deep purple, pistachio, Icelandic blue – on which the black and white drawings lie, insert common ways that contemporary African American lives are represented into colonising European interior design traditions. By combining modern elements, such as a large radio cassette player, with the dress of wealthy people from the eighteenth century, Bridges invites the viewer to consider which people were able to benefit from political, social and economic changes in the eighteenth century and which were excluded. The toile includes two people dancing in front of a triumphal arch similar to the one in Washington Square Park built to celebrate the 100th anniversary of George Washington's inauguration as president, itself modelled on Paris's Arc de Triomphe. These figures, enjoying themselves dancing, contrast with stiffness and formality of the arch they decorate, associated with a War of Independence that resulted in only white, property-owning men becoming recognised as citizens of the new United States of America. Rather than proposing an 'authentic' African American experience, the *Harlem Toile de Jouy* asks the viewer to consider to what extent African Americans are understood to be equal citizens of the nation they live in. Bridges' toiles extend beyond being representations of everyday life and events updated for the contemporary era: highlighting the urban rather than the pastoral; basketball and drugs rather than woodlands, animals and birds. They are designed to be dissonant, bringing tightly curated, politically powerful visualisations of day-to-day African American life into the world of high end, small batch, luxury wallpaper production.

Inspired by developments in interior and textiles design such as the ones described above, the *Air Pollution Toile* aims to go beyond representations of air pollution and to problematise how people relate to data about air quality. A common aim of those working in the public management of air pollution is to make data visible so people can understand it. News media

and government websites routinely use images of people wearing face masks as well as information graphics to communicate levels of pollutants and changes over time. However, as Bruno Latour has argued, 'making things public' goes beyond making representations of 'matters of fact' (Latour, 2008, p. 2). Negotiating the historic association between wallpapers, deception and provocation, the *Air Pollution Toile* wallpaper does not aim to reproduce scientific data about air pollution. Instead as an inventive device, it offers a different kind of truth via data-gathering and monitoring of air pollution in its immediate environment, gradually and partially bringing into view the material bodily consequences for three human organs (fig. 8.4).

The *Air Pollution Toile* includes line drawings of everyday scenes from British life through which pollutants are created or people are exposed to them, or their consequences such as ill-health: a parent taking the kids to school in the car; a child on a bicycle; people in an open plan office; cows being milked within an industrialised agricultural system; electricity pylons; scientists in a lab; people in an National Health Service waiting room; a family at home preparing a meal in the kitchen including imported fruit. The consequences of air pollution are shown through detailed imagery of three organs, produced by three medical imaging technologies: an MRI scan of a brain with Alzheimer's; a cardiogram of a diseased heart; and pathology photograph of a lung affected by anthracosis.[8] The style of toile de Jouy distributes agency across these different settings and objects, including its very materials including inks, adhesives and pollutants, allowing the public issue of air pollution to emerge from the wallpaper (Brassett and O'Reilly, 2015).

<insert fig. 8.4 about here>

Drawing from insights that sociologist Annemarie Mol (2002) develops in *The Body Multiple: Ontology in Medical Practice* – that technologies and clinical practices produce different kinds of illness – the choice of this imagery acknowledges that air pollution and the resulting illnesses are multiple. In this context, the *Air Pollution Toile* offers a socio-material account of air pollution which makes links between the social practices through which pollution is produced and encountered resulting from particular infrastructures, policies and practices, and the effects on the human body. The piece uses vernacular forms – toile wallpaper and a sample book – in accentuating air pollution as a domestic matter. When installed in a home or office, the resulting imagery would be situated and emergent through an unfolding process that changes over days, months and years. Rather than seeking to represent data, the wallpaper brings together different aspects of air pollution, linking data gathering and representation, production of and exposure to pollutants, public health and everyday life as well as science and interior design. Its graphical language uses traditions associated with toile de Jouy to bring into view contemporary realities and political issues in a domestic setting.

Rather like our bodies – including even placentas in pregnant women, which carry the traces of pollutants women have been exposed to (Randall, 2019) – the *Air Pollution Toile* is transformed through the accumulation of pollution to which it has been exposed, going beyond representation of data, to become materially affective. This *Toile* resists current concerns with making visible monitoring of levels of key pollutants in the public sphere, as currently managed by local authorities or national governments, or the new generation of personal sensors, wearable smart designs or representative artworks. Instead the *Air Pollution Toile* slows down or even resists the act of interpretation, avoiding producing an easy-to-read graphical association between levels of pollution in the room where the wallpaper is installed,

and its visual display. A viewer looking at this wallpaper will not easily be able to answer the question: 'What level is pollution at right now, here?' Rather, the design emphasises the accumulation of air pollution through its visual design that response to levels of three pollutants, but not through a direct translation. Further, it directly connects causes, conditions and possible effects, by combining imagery associated with how air pollution is produced and the institutions, policies and practices resulting in people being exposed to it in ordinary domestic and work settings, and the resulting effects on three organs in the body.

In this way, the *Air Pollution Toile* wallpaper makes a double move. On one hand, adopting the public recording history of toile de Jouy, it establishes new relations between domestic settings, scientific research and industrial production, resulting in a novel kind of air pollution object being brought into view. One the other, it obscures air pollution. Enacting the deceptive associations of wallpaper, it is not easy to read. It does not convert pollutants to scales that citizens can take in: with, for example, red representing high levels of pollutants and therefore very bad for health, amber medium/acceptable and green low levels/good. Indeed, the version of the wallpaper shown here would probably never exist like this. This is because the wallpaper, if realised, would be contingent on local levels of pollutants over time, resulting, in part, from the day to day practices of the people using that room, as well as any environmental pollutants that may seep in, for example, through windows or doors. The wallpaper renders air pollution multiple.

Anticipating my futures

Researchers do not yet agree on the causes of Alzheimer's disease; studies are ongoing to understand its causes and to develop treatments. However, publicly available guidance notes

that there are several risk factors from the individual – such as, genetics and behaviour such as diet, consumption of alcohol and levels of exercise – to the environmental; including air pollution (Alzheimer's Society, 2019c). I have lived in London for over 25 years, moving through this polluted city on foot as well as a cyclist, runner, mother pushing a buggy and occasional driver, as well as on public transport. I have often travelled at rush hour in the mornings and evenings when there are many more vehicles on the roads and have used standard products such as gas boilers to heat my home. It is therefore reasonable to assume I have been exposed to pollutants including particulate matter and toxic gases, sometimes intensively so. There is no easy way for me, or for any researcher or clinician, to determine the degree of this exposure or its impacts. While I could avail myself of the opportunity to undergo genetic testing which might reveal markers for Alzheimer's[9] (the likely explanation for my mother's condition) or heart disease (the cause of my father's sudden death aged 54), it might well be that it's the air pollution, intersecting with genetic risks, that kills me.

Billions of people are implicated in such a future of illness and early death as a result of air pollution. But unlike me, the vast majority of them live in low or middle-income countries. The causes of air pollution, its consequences and future impacts, are now identified as a significant global environmental and health issue, linked too with COVID-19. The effects spill over into the lives of many individuals and communities, unequally. The spread of these invisible toxic pollutants harms everyday living, being, caring, doing and knowing. Anticipating my own end of life leads me to imagine my daughter reflecting on a future we might one day share:

When my mother moved into sheltered housing, we found ghost frames made of tiny particles on each of the walls in her otherwise carefully cleaned London home where the pictures and mirrors had been . . .

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Notes

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[1] See WHO (2018a, 2018b) for more detail on air pollution and its health effects.

2 During the development of the Air Pollution Toile I spoke with analytical chemist Professor Nicole Pamme (University of Hull, UK), who visited the exhibition in Oxford. We have since continued our dialogue and have applied for research funding to enable researchers and PhD students to develop the wallpaper further.

3 Escobar (2018) makes an important intervention into contemporary design research and practice in the global North by linking critical design studies with traditions of thinking and activism in Latin America rooted in non-linear, non-Eurocentric relations between community, land and time.

4 There are close relations between the terms: 'foresight' and 'futures', including journals by these names and decades of research and practice. Here I use the term 'futures' to emphasise the multiplicity of approaches, formats and practices which explicitly imagine futures.

5 I am indebted to artist Suky Best who was employed as an assistant on this project. She first suggested I consider toile as the graphical language for the wallpaper (I knew the graphical style, but I did not know its name). She developed the wallpaper's graphical language in dialogue with me in response to my brief and my early sketches and collaged mock-ups, and she produced the digital files which were manufactured.

6 Eds. It is interesting to remember that with the 1712 introduction into Britain of a Wallpaper Tax – 1D per yard, raised by 1/4D in 1714 in order to finance the costs of war, as design historian Martin King (2007, pp. 65–66) notes of his investigations into his own home at 53 Cross Street, Islington, London – wallpaper became a site of consumer-level political activism akin to contemporary boycotts. He continues, that at the end of the century, after the tax raised to 1 3/4D per yard to fund the lost war in the American colonies, its avoidance was one of many acts of civil disobedience that included the Gordon Riots of 1788. Wallpaper-related activism was an everyday, domestic form of tax avoidance, alongside smuggling.

7 Cook (1998) argues there was what she calls a 'ghost' designer, textile artist Katherine Sturges Knight, who was paid to produce the design, but who is not accredited as the designer of the Eisenhower toile. There's an echo of this in my working with Suky Best, who provided substantial input into the realisation of the wallpaper concept and its graphical expression and who has assigned her copyright of the Air Pollution Toile to me. While I acknowledge her contribution, what also requires acknowledgement is the power relations through which I have resources as an employed academic design researcher, while Suky relies on freelance work, art commissions and sales as an independent artist.

8 In the few months I had available to develop and produce the wallpaper for exhibition, I decided not to pursue involving participants, including possibly my mother, to access images of their organs. Instead I licenced the photographs from a commercial image bank.

9 The Alzheimer's Society (2019b) says predictive genetic testing is only possible for inherited Alzheimer's disease, in which rare mutations in three genes are implicated, and fronto-temporal dementia, which has known mutations in at least six genes. According to the charity, the most common form of Alzheimer's disease affects about 520,000 people in the UK, mostly over the age of 65 but there are no approved predictive genetic tests for this form of the condition.