ClairCity: Citizen-led air pollution reduction in cities

D3.2 Academic paper on the application of social science to air quality and carbon management

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Description	The following is a short academic style paper that outlines, in very simple and clear terms, the core concept of the ClairCity project by exploring the application of social science to air quality and carbon management. It is intended that this paper adopted and adapted to be used as the basis for other ClairCity publications.

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Paper Purpose and Background

The following is a short academic style paper that outlines, in very simple and clear layperson terms, the core concept and arguments underpinning the ClairCity project. Focussing on air quality management, but with transferrable lessons from and to carbon management, the paper brings together the latest thinking on social practices, behaviour and socio-technical transitions to re-frame the city and national level air quality and carbon management debate in a new context. The paper content can be used as the basis for other academic and practice publications by the ClairCity project team.

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The need to develop a social perspective on air quality management

Abstract

Air pollution has now been recognised by the World Health Organisation (WHO) as a class one carcinogen and the fourth highest risk factor for premature deaths worldwide (World Health Organisation, 2013). However, despite many years of efforts to reduce air pollution to safe ambient concentrations, levels of several pollutants still contravene guidelines across Europe, indicating a risk to health of EU citizens (European Environment Agency, 2017). Air quality management is a concern in many European cities where a high density of people and high pollution levels lead to greater risks of exposure. However, poor air quality can also be experienced in smaller towns and villages. This represents a failure of European and national policy with many Member States not meeting legal obligations. So what has gone wrong and how might the problems be addressed? This paper argues that the failure of air quality management to date has been due to its major focus on implementing technological solutions. This paper addresses the need for a broader approach, one that places a greater emphasis on the social factors that contribute to emissions as it is the activities of people, not just technologies, that produce pollution.

Introduction

The 1996 European Framework Directive on Ambient Air Quality marked a sea change in how policy approached the widespread problem of air pollution. The change, described in detail at the time by Longhurst et al. (1996, 2006 & 2009) and Beattie et al. (2001) principally consisted of a move away from controlling specific (generally industrial) emissions sources through 'end-of-pipe' solutions, process changes or 'dilute and disperse' policies, and instead sought to keep ambient concentrations of pollutants below specified health-based thresholds. This change of focus reflected the development of what is now commonly termed 'air quality management'.

It is now over two decades since the Framework Directive was introduced (1996), fourteen years since the PM_{10} limit values came into force (2004) and eight years since the nitrogen dioxide limit values came into force (2010). However, despite the long-run up to these achievement dates, and the significant time that has subsequently passed, 23 out of 28 European Member States still exceed the limit values, with 16 Member States facing legal action for exceeding PM_{10} limit values, and 12 Member States for NO_2 limit value exceedances (European Commission, 2017) from sources such as road transport and domestic solid fuel burning.

Given the observed failure of EU Member States to comply with legislation, it is time to consider why this policy process has failed and how more effective approaches to air quality management might be implemented. In doing so this paper argues that approaches to air quality management to date have been too focussed on implementing technological solutions along the pollutant pathway from emission to receptor.

Given the failure of national governments to implement effective actions and for ambient concentrations of pollutants to respond sufficiently to current policy signals, a new vision is needed to address the causes of air pollutant emissions. To do this, it will be necessary to integrate a social perspective into air quality management that puts people and their activities at the heart of both analysis and policy development alongside current technological controls.

Learning from other disciplines

Despite transport and energy use being major sources of air pollution, there has been little effort to date to link air quality management with the wide range of social research and literature in these fields. This has led to air quality management being dominated by what, in the energy domain, is referred to as a Physical-Technical-Economic-Model (PTEM) (Lutzenhiser, 1993). The PTEM takes an engineering view of the world, i.e. focussing on the buildings, objects and devices that use energy, or create emissions. The objects are paramount, with the actions of people reduced to average usage factors or technology adoption rates. "*It is a world of machines and objects envisioned from afar, in which the technological outcomes of aggregate choices are as close as we can come to actual households and behaviours.*" (Lutzenhiser et al., 2009, p.12). Although this perspective is still dominant in the realms of transport and energy, policy in both these areas, and subsequently in carbon management, has increasingly begun to broaden its theoretical viewpoints.

Considering how most air quality management work is undertaken, it is not difficult to see a parallel of this energy systems view. Current air quality management processes and principles were developed in the 1990s, at a time when road building as a means to end congestion had been largely discredited and countries such as the UK were passing legislation such as the "Road Traffic Reduction Act" (HM Government, 1997). However, despite this wider context governments still argued that rather than reducing traffic, attention should be principally given to reducing the impacts of traffic (Butcher, 2010). This policy preference is linked to the pervasiveness in policy circles of the benefits of transport growth for economic growth (Craft, 2009). Hence in this context of managing air quality the conventional emissions equation:

Emissions = Emission Factor x Activity

will prioritise the emission factor, rather than the activity side of the equation and air quality problem. This focus is symptomatic of the traditional pollution pathway approach to air pollution, which seeks technological solutions. The imbalance is illustrated by the fact that in 2007, three years after the UK failed to meet its own domestic NO_2 objectives, the revised Air Quality Strategy for England, Scotland, Wales and Northern Ireland only proposed three new measures. Each of these measures focussed on emission factors rather than activity:

- Incentivising the early uptake of new tighter European vehicle emissions standards (Euro-standards);
- Increasing uptake of low emission vehicles;
- Reducing emissions from shipping).

This, in theory, is little different to the historical approaches of air pollution control, with the vehicle exhaust pipe substituting for the industrial chimney. However, one of the key

reasons for the need to develop a new approach to managing air pollution was specifically to control pollution from numerous, small diffuse sources especially traffic (Beattie et al., 2001). With these sources, it wasn't the case that any particular source was a gross polluter, but instead it was their cumulative impacts that caused the problem. There is a need therefore to find better ways to control the number of sources *as well as* their individual emissions.

Moving from 'Where' and 'What' to include 'Who' and 'Why'

The current approaches to air quality management, described above as following a PTEM model, can be described as focusing on the 'Where' and 'What'. That is, 'Where' are pollutant concentrations exceeding legislative limit and target values, and 'What' objects or technologies are causing the pollution. We contend that the emphasis on 'What' and 'Where' has led to the formulation of poorly implemented and ineffective control strategies that are typically technology orientated.

With respect to 'Where', air quality management, has tended to focus on hotspots of pollution where limit values are exceeded. However, this has two key problems. Firstly, in the case of transport, it only considers traffic as a problem at the location where the exceedences are occurring, (i.e. in hotspots). This means that any action to deal with traffic often results in micro-scale shuffling and relocating of vehicles, seeing them as problematic only on a particular section of road rather than recognising this as a local manifestation of symptoms (the high air pollution concentrations) as the result of the entire set of journeys that are being made. Secondly, this focus on specific areas where acute symptoms are manifested, fails to allow air quality management to align itself with other policy areas concerned with overall vehicle flows such as greenhouse gas reduction (Tiwary et al., 2014) or public space/quality of life (Hart and Parkhurst, 2011) in order to manage the problem systemically. Furthermore, this 'hotspot' approach can also create situations in which attention becomes focussed only in larger urban areas where air quality is monitored or modelled in detail, while pollution exceedences may also be experienced in smaller towns and villages through solid fuel burning, or due to traffic on narrow streets.

In terms of the 'What', source apportionment work tends to be carried out by differentiating pollution based on its material characteristics (marine salt, crustal material, road dust etc.), or the physical processes and objects that create it (vehicle exhaust, power plants, industrial emissions, biomass burning) (Belis et al., 2014). The PTEM perspective views roads as a stream of vehicles, with the only interests being their engines, their fuels and their speeds. This perspective prevents us from developing a broader systemic view of the problems that are causing poor air quality.

In order to broaden out from the PTEM perspective this paper argues that more attention should be paid to the drivers of the vehicles ('Who') and the reasons for their journeys, in those vehicles, at those time ('Why')? Similarly, with respect to domestic sources, attention should be given to the occupants of houses who heat their homes with solid fuels or even with waste. To do this will require a broader view of the causes of air pollution, one that incorporates people, and social and spatial structuring into how we understand, communicate and address air pollution problems. The good news though is that there is significant research around this in both the transport and energy domains and efforts have been made to link this to governance contexts (for example Chatterton et al., 2015). This

extends previous work (Barnes and Chatterton, 2017; Chatterton and Barnes, 2016) examining differences between emitters and receivers of pollutants as well as exploring the social and spatial patterns that appear to determine not just whether cars are owned, but what sort of car and how far they are driven. However, as has often been noted (Olowoporuku et al., 2012) there have been problems with the integration of air quality management with other policy areas (including, but not limited to some of the reasons mentioned above). It is not just sectors such as transport and energy that relate to sources of pollution that have been poorly connected to air quality management practices. Despite the obvious links to health agendas, it is only recently that air pollution has started to become widely seen as a public health issue rather than just an environmental one (Greer et al., 2017).

The interaction of air pollution with other social determinants of health can create a disproportionate and strengthened disease risk and burden between and across populations. Adopting a broader social perspective allows for air pollution problems and solutions to be considered in the broadest possible public health context and therefore help to define the role and expected contributions of public health bodies in air quality management. There is considerable merit in implementing measures to reduce air pollution risks at a population level (not just a hotspot level) and in targeting areas where the health need is highest as much greater health gains can be achieved (Brunt et al., 2018). In line with work on the social determinants of health (Marmot et al., 2008), it is necessary to recognise that much work has indicated that the actions that lead to pollution (for example driving or solid fuel burning) are often not considered to be free choices by those who participate in them (Chatterton et al., 2009). Therefore proposals to incorporate 'people' more clearly within air quality management need to go beyond simple considerations of individual choice, or willingness to pay, and instead look at the social context of actions (Chatterton, 2017).

The ClairCity project

The European Commission Horizon 2020 funded ClairCity project is developing an approach to air quality management that puts 'the citizen at the centre'. This does not involve discarding conventional approaches to air quality management, instead, it seeks to supplement conventional air pollution modelling, with modelling of the behaviours, activities and practices of citizens. This approach allows source apportionment not only on the basis of different types of vehicles but also by the types of journeys being made, giving an ability to examine the cause of problems such as people going to work, or shopping, or taking children to school.

This approach will strengthen the role that civil society can play in generating and implementing solutions to air quality problems. To date, the technical nature of much air pollution work has tended to exclude interaction with citizens and civil society organisations such as Non-Governmental Organisations and community groups. The development of air pollution models which describe air pollution in relation to people's activities will support better communication about how air pollution relates to citizens' everyday lives. Through a range of strategies, citizens are engaged in policymaking, aiming not simply to gain their acceptance of policy but to support development of policies that take better account of that patterns of modern life that have led to our pollution problems. This involves consultation methods already used in developing city level low-carbon strategies (Bailey et al., 2012) as

well as a game to enable players to explore and support particular policy options for reducing air pollution. Another approach is the creation of an app designed to both provide information about air pollution for informing individual choices as well as collecting information in order to help organisations to collectively understand and manage the impacts from employee travel.

The project will support air quality policy and management by incorporating a broader social science approach. It will show how new thinking about the role of people in relation to air pollution can change the options for action for cities and policy makers, leading to more acceptable and effective policies. The project will demonstrate the practical applicability of this holistic approach by putting citizens at the centre of air quality management in six pilot cities and regions.

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