

Forecasting environmental equity: Air quality responses to road user charging in Leeds, UK

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Abstract

Sustainable development requires that the goals of economic development, environmental protection and social justice are considered collectively when formulating development strategies. In the context of planning sustainable transport systems, trade-offs between the economy and the environment, and between the economy and social justice have received considerable attention. In contrast, much less attention has been paid to environmental equity, the trade-off between environmental and social justice goals, a significant omission given the growing attention to environmental justice by policy makers in the EU and elsewhere. In many countries, considerable effort has been made to develop clean transport systems by using, for example, technical, economic and planning instruments. However, little effort has been made to understand the distributive and environmental justice implications of these measures. This paper investigates the relationship between urban air quality (as NO₂) and social deprivation for the city of Leeds, UK. Through application of a series of linked dynamic models of traffic simulation and assignment, vehicle emission, and pollutant dispersion, the environmental equity implications of a series of urban transport strategies, including road user cordon and distance-based charging, road network development, and emission control are assessed. Results indicate a significant degree of environmental inequity exists in Leeds. Analysis of the transport strategies indicates that this inequity will be reduced through natural fleet renewal, and, perhaps contrary to expectations, road user charging is also capable of promoting environmental equity. The environmental equity response is, however, sensitive to road pricing scheme design.

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1. Introduction

1.1. Environmental equity and justice

Sustainable development has three widely agreed meta-goals: sustained economic development (inter-generational equity), environmental protection, and social justice (intra-generational equity) (WCED, 1987). Because there are trade-offs between these goals, all three must be addressed together if development is to be sustainable. Feitelson (2002) observes that, whilst trade-offs between economic development and the environment, and between economic development and social justice have received considerable attention, much less attention has been paid to the trade-off between environmental and social justice goals.

Furthermore, this trade-off, often referred to as environmental justice (EJ), has rarely been coupled with issues related to transport.

As Agyeman and Evans (2004) note, EJ is a contested concept with many possible definitions. A recent definition is that contained in the US Commonwealth of Massachusetts EJ policy, which states that:

“Environmental justice is based on the principle that all people have a right to be protected from environmental pollution and to live in and enjoy a clean and healthful environment. Environmental justice is the equal protection and meaningful involvement of all people with respect to the development, implementation and enforcement of environmental laws, regulations and policies and the equitable distribution of environmental benefits” Commonwealth of Massachusetts (2002)

Agyeman and Evans (2004) note that this definition implies that EJ has “procedural (‘meaningful involvement

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of all people’) and substantive (‘right to live in and enjoy a clean and healthful environment’) aspects” and that “unlike most definitions, it makes the case that environmental justice policy should not only be reactive to environmental ‘bads’, but should also be proactive in the distribution and achievement of environmental ‘goods’ (a higher quality of life, a sustainable community)”. Other definitions of EJ are less explicit with respect to the procedural dimension, and emphasise the distribution of environmental quality. Cutter (1995), for example, defines EJ as “equal access to a clean environment and equal protection from possible environmental harm irrespective of race, income, class or any other differentiating feature of socio-economic status”. No attempt is made here to further define EJ or address EJ directly, but a clear distinction is drawn between EJ and environmental equity, the focus of the paper.

Environmental equity here refers to the social distribution of environmental quality (and specifically the distribution of NO₂ by deprivation status). In contrast, EJ must also consider to what extent the observed distributions are ‘unfair’. One element of this interpretation is a consideration of how a particular distribution has arisen. Whilst such causality issues are poorly addressed in empirical EJ studies to date, numerous mechanisms by which an unequal distribution may arise have been postulated, ranging from deliberate discrimination within the planning system to natural socio-economic processes relating to neighbourhood change (for example, people may choose to locate in an area of low environmental quality to take advantage of local employment opportunities or a better quality house).

A second element in the consideration of fairness is the justice theory subscribed to by those making the EJ assessment, i.e. for a single distribution, different conclusions as to ‘fairness’ may be made depending upon whether the assessors consider a just distribution to be one where people get what they need, what they have a right to, or what they deserve. Thus understanding causality and the justice theory applied are key elements in the interpretation of environmental injustice. Such considerations (see Capek, 1993; Cutter, 1995; Liu, 2001; Walker and Mitchell, 2003 for further discussion), are, however, largely beyond the scope of this paper which addresses a more limited, but essential first step in EJ assessment, the identification of the social distribution of environmental quality, here after referred to as environmental equity assessment.

1.2. The emergence of environmental justice

Environmental justice issues have received significant attention at the global level, most notably with respect to the relationship between developed and developing countries. Research in this field has, for example, addressed differential contributions to, and impacts of, climate change, and the distribution of the costs and benefits of natural resource exploitation, both issues where transport is

important (Bhaskar, 1995). Local scale environmental equity issues, of the kind addressed by this paper, are in comparison much less studied. However, policy developments at the highest level (e.g. a Presidential order in the USA; a UN ECE convention on the environment) mean that in future, greater cognisance of local and regional environmental equity issues is required when evaluating projects, plans and policies that affect the environment.

In the USA, the analysis of EJ is now an important part of environmental and public health policy assessment. The US Environmental Protection Agency, for example, now addresses EJ in their National Environment Policy Act (NEPA) planning and decision-making process, defining ‘fair treatment’, as that where no group of people bear a disproportionate share of the environmental and adverse health impact of development (US EPA, 1995). This action was mandated by President Clinton’s Executive order 12898 that directed “All Federal agencies to make environmental justice part of their mission, and to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low income populations” (President Clinton, 1994). A memorandum accompanying the order also requires that Federal agencies ensure that communities have access to relevant information and are given opportunities to effectively participate in agency actions that affect them.

These EJ responsibilities developed from the concerns expressed by civil rights activists in the 1970s and 1980s, who demonstrated that landfills and polluting industries were disproportionately sited within predominantly black communities or indigenous peoples’ reservations (Bullard, 1990; Lavelle and Coyle, 1992). However, class actions brought against civil authorities on the grounds of unjust planning decisions have proved largely unsuccessful, for two reasons. Firstly, poor empirical foundations of EJ analyses have precluded authoritative statements on inequitable relationships between racial or income groups, and environmental problems and associated health burdens (Bowen, 2002). Secondly, where evidence has clearly pointed to environmental inequity, intentional discrimination on the part of the responsible authority or developer has rarely been proven (Taylor, 1999). Although the Presidential order creates no legal rights, litigation will be an important mechanism in determining how environmental inequities are determined and evaluated within the justice framework created by the order.

In Europe and the UK, EJ issues are also attracting significant attention. Recently, EC directives have been passed on access to environmental information (2003/4/EC) and participation in environmental decision-making (2003/35/EC). These directives were introduced to meet the provisions of the UN Economic Commission for Europe (UN ECE, 1999) ‘Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters’ (the Aarhus convention),

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