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Implementation of the Polluter-Pays Principle (PPP) in local transport policy

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ABSTRACT

Previous research has highlighted significant socio-environmental inequalities in the UK and elsewhere. A city's greatest polluters typically reside in affluent suburban communities located along the city's periphery, while those creating the least emissions reside in central locations, and most likely experience the largest associated health burdens. Using the culturally diverse city of Leicester as a study case, and building on Mitchell and Dorling's (2003) localised form of the Polluter Pays Principle, we investigate this environmental injustice. A pattern detection analysis of localised intra-urban interactions was undertaken using a 'Local Indicators of Spatial Association' (LISA) modelling approach of high resolution census data, Driver Vehicle Licensing Agency (DVLA) records, road transport emission maps and geocoded hospital admissions records provided by the NHS Leicester City Primary Care Trust.

Pearson's R statistics identified an inverse correlation between mobile polluters and communities characterised as either socially (−0.78) or environmentally burdened (−0.34), confirming the existence of environmental inequalities. While some inner-city communities moderately contribute towards their environmental burden, these contributions were substantially outweighed by those made by external communities, whom appear to avoid the social, environment and physical cost of their actions. In contrast to their more affluent counterparts, residents of less affluent areas tend to use 'greener' and more active transport options, although any associated health benefits appear largely offset by increased periods of environmental exposure. Strong signs of spatial structuring within the modelling framework, suggest there may be a need to tailor travel schemes to local populaces. For example, in affluent areas where less environmentally friendly transport options tend to be adopted, options based on local carpool schemes may be more amenable than those based on enhanced public services.

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1. Introduction

Road-transport accounts for a substantial proportion of air quality objective pollutants present in the Post-industrial cityscape, attributed to the movement of labour forces and physical merchandise often within close proximity to residential districts. Furthermore, the confined nature of European intra-urban environments often determine spatial variations in traffic pollutant levels, which tend to be associated with a plethora of social disparities. Spatial modelling, object identification and gradient association techniques previously identified underlying structures in the archetypal UK multicultural city of Leicester, whereby persons of minority and lower socioeconomic status habitually reside within intra-urban areas experiencing elevated environmental burdens (Jephcote and Chen, 2012, 2013; Jephcote et al., 2014).

1.1. Just transportation

Transportation is a conduit for opportunities of economic mobility, sustainability and human interaction, which in a 'Just' scenario may serve to address social imbalance. In the real world, costs and benefits associated with transportation developments are not randomly distributed, with the lion's share spent on roads, while urban transit systems serving ethnic and lower social groups are often left in disrepair: In the United States, public transit has received roughly $50 billion since 1964, while roadway projects have received over $205 billion since 1956 (Bullard et al., 2004b). To a lesser extent disparities in transport related public expenditure are observed in Great Britain, with £7.52 billion spent on roads and £3.33 billion was spent on local public transport in 2012 (RAC Foundation, 2014).

Bullard (2003) considers disparate transportation outcomes to fall under three broad categories of inequality:

> "***Procedural Inequity***: *Attention is directed to the process by which transportation decisions may or may not be carried out in a uniform,*

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fair, and consistent manner with involvement of diverse public stakeholders. Do the rules apply equally to everyone?

Geographic Inequity: *Transportation decisions may have distributive impacts (positive and negative) that are geographic and spatial […]. Some communities are physically located on the 'wrong side of the tracks' and often receive substandard transportation services.*

Social Inequity: *Transportation benefits and burdens are not randomly distributed across population groups. Generally, transportation amenities (benefits) accrue to the wealthier and more educated segment of society, while transportation disamenities (burdens) fall disproportionately on people of colour and individuals at the lower end of the socio-economic spectrum.*"

(Bullard 2003, pp.1188)

Across England, 78.0% of households in the highest income group own one or more cars, compared to only 53.0% in the lowest income group (DfT, 2015). Car ownership would appear directly related with mobility, and thus access to opportunity, with 22.0% fewer trips made by the lowest income group (DfT, 2015). Public and active modes of transportation are favoured by lower socio-economic groups, perhaps out of necessity rather than choice. "*In general, most transit systems have taken their low-income and people of colour* "*captive riders*" *for granted and concentrated their fare and service policies on attracting middle-class and affluent riders out of their cars*" (Bullard, 2003, pp.1189). A lack of car ownership, inadequate public services and a high proportion of 'captive' transit dependents are likely to exacerbate issues of social, economic, and racial isolation.

In the Western World, sprawl-fuelled growth has exacerbated the economic, social and racial polarisation of communities, with the suburban flight of jobs and white middle-income families leaving behind: A concentration of urban core poverty, closed opportunity, limited public mobility to non-centric locales, economic disinvestment, social isolation, and urban-suburban disparities (Bullard, 2003; Bullard et al., 2004a). In the UK it is emerging that after decades of suburban flight, young, affluent and educated workers are returning to congregate in regenerated urban neighbourhoods, fuelled by demographic trends and lifestyle preference favouring the close proximity of amenity hubs to attractive 'green' spaces (Moir and Clark, 2014). The redesign and appropriate pricing of city central workspaces have also played a crucial role in this redistribution of the population, with urban locations accounting for 53–70% of the annual office space take-up in the UK over the period 2002–2012 (JLL, 2013).

McLeod et al.'s (2000) incorporation of hierarchical spatial elements, while investigating national trends in UK air pollution and increasingly complex social structures, identified an association between reduced air quality and regional deprivation, the effect of which was locally magnified in ethnic minority communities. Successive modelling accounting for levels of urbanisation and ethnic diversity, found persons of higher social status to be more likely exposed to higher pollutant concentrations. McLeod et al. (2000) concluded that wealthier inhabitants consider a range of property characteristics prior to purchase, however a limited quantity of housing stock display the required environmental and cultural amenities, with the latter characteristic ultimately of preference in the decision making process. Thus, sweeping measures to address mobility, transportation choice and air quality across urban locations, may under certain circumstances increase the equity gap.

Within the transportation literature, the term 'Social exclusion' is often employed to refocus the debate not just based on income-related deprivation, but across the wider political and cultural systems determining social integration (Hodgson and Turner, 2003; Kenyon et al., 2002; Preston and Raje, 2007). Transport plays a crucial role in the discussion of social justice, through its creation and indirect distributions of socio-economic benefits and burdens, that are not exclusively defined by welfare economics (Beyazit, 2011; Martens, 2012; Mullen et al., 2014).

Moving beyond a simplistic monetary debate, Martens (2012) considers the inclusion of the transport sector in Walzer's 'Spheres of Justice'. According to Walzer (1983), dominance and much of the policy debate is typically claimed by 'regular goods' (money and power) distributed through the principle of free exchange, while the creation of 'distributive spheres' for goods with distinct social meaning (education and health services) operate to limit their domination; Injustice occurs when 'distribution spheres' are not autonomous, otherwise a situation of 'complex equality' prevents the accumulation of inequalities across different goods or spheres. Building upon this concept, Martens (2012) views transport as an overarching social good rather than a distribution of individual objects, with the commodity defined not by the perceived freedoms of increased potential mobility (which ignores distributions of choice), but through the accessibility of fulfilling ones underlying social need. From this a 'maximax' distribution criterion is theorised, which seeks to combine an outcome of maximum average accessibility with a limit on the maximal gap allowed between societies worst and best-off. Beneficially the uniformity of the 'equality' principle is not required, allowing for inevitable differences in accessibility created by space, and unlike the 'need' criterion it does not require a paternalistic approach to differentiate trip necessity. Under this approach, policy can increase accessibility levels for some at the expense of those best served, with positive outcomes also obtained from non-mobility related solutions (i.e. land-use intervention).

More equitable implementations often elude existing systems, where distribution focuses on revenue over universal accessibility, demand forecast is based on past travel behaviour reflective of free market distributive mechanisms that ignore latent demand, and when policy success is measured through its performance of parts rather than societal benefit (Martens, 2012). This is highlighted by the spatial mismatch literature, which identifies concentrations of low income groups in central cities, a decentralisation of low wage jobs, and a lack of investment in new public transport facilities leading to a sharp decline in job access among the urban poor (Ihlanfeldt, 1993; Ong and Miller, 2005). Thus, space is divided into centre and periphery, with inequality in accessibility being inevitable, and while policy is unlikely to correct this difference it is capable of redefining it. Another widely defended justice criterion is the 'principle of need', which advocates greater levels of accessibility for certain individuals or groups, to avoid exclusion from social needs or the use of essential public services (Murray and Davis, 2001; Hodgson and Turner, 2003; Geurs and Van Wee, 2004; Apparicio and Seguin, 2006; Currie, 2010). Yet, the challenge in the field of transport is to distinguish needs from wants, and how to translate the basic needs of access to essential services into travel.

The interpretation of such needs is perhaps most viable at the neighbourhood level, for three reasons: (a) optimal integration with the existing transport infrastructure plans which focus on the collective rather than individuals; (b) census based neighbourhood units are considered to provide stable demographic information which best meet the current demand of long-term forecasts; and (c) participant confidentiality is maintained. The following sections seek to evaluate the equity of existing transport infrastructure via Pearce et al.'s (2010) previously unconsidered 'triple jeopardy' of social, environmental and health inequalities at the neighbourhood level for the aforementioned reasons. This approach is considered to comprehensively capture the imposed effect of transportation through an environmental accountability framework. Still, the authors recognised its limitation of considering the 'principle of need' where complex social situations call for greater levels of accessibility. This raises the question, at what cost should one group's accessibility socially, environmentally, impede the social, environmental and well-being of others? On the other hand a penalisation of excessive mobility via polluting modes is perhaps required in order to seriously address socio-environmental inequality, considering that accessibility can and should also be rebalanced by better land use policy. This is not the place to define these open and unresolved questions, with the authors advising policy makers to consider the 'principle of

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