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**Environmental Justice
Applications in Transport:
The International
Perspective**

By

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ABSTRACT: This paper focuses on the application of environmental justice principles specifically in the transport context. It begins by giving a background of the environmental justice movement and a definition, and proceeds to describe current legislative mandates in the United States. A holistic approach to transport planning is introduced to highlight the importance of the interrelationships between transport and land use planning. Current practices adopted in terms of environmental justice are illustrated from the Mid-Ohio Regional Planning Commission report as well as a description of the data limitations that result from the models used in current analyses. The paper concludes by providing some recommendations on the areas that need to be developed to address environmental justice principles adequately, and the applicability of these principles internationally.

KEY WORDS: Environmental justice, legislation, transport planning, transport, land use interrelationships.

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1. Introduction

This paper focuses on the application of environmental justice principles specifically in the transport context. It begins by giving a background of the environmental justice movement and a definition, and proceeds to describe current legislative mandates in the United States. A holistic approach to transport planning is introduced to highlight the importance of the interrelationships between transport and land use planning. Current practices adopted in terms of environmental justice are illustrated from the Mid-Ohio Regional Planning Commission report as well as a description of the data limitations that result from the models used in current analyses. The paper concludes by providing some recommendations on the areas that need to be developed to address environmental justice principles adequately, and the applicability of these principles internationally.

The environmental justice movement emerged in 1982 in the United States. It was foreshadowed, however, a number of years earlier when, in 1975, the National Cooperative Highway Research Program identified areas that needed to be incorporated in the transport planning process to address the environmental, social, and economic impacts that stemmed from transport developments and policies: a result of the National Environmental Policy Act, introduced in 1969 (Transportation Research Board, 2002). This led to the development of the Policy and Procedure Memorandum (PPM 20-8), issued by the United States Department of Transport, soon after (Stopher, 2003).

These issues were revisited in 1994 when President Clinton signed Executive Order 12898: *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations* (Blackmon Lane *et al.*, 1998). This in turn led to the order by the United States Department of Transport; *Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, in 1995 (Blackmon Lane, *et al.*, 1998; Chakraborty *et al.*, 1999).

Despite the environmental justice movement originating in the United States, a growing number of countries around the world have begun to investigate the economic, social, and environmental impacts of various developments and policy, on disadvantaged and marginalised groups in society. Environmental justice incited many studies to investigate the relationships between the spatial distribution of environmental disamenities and the socio-demographic attributes of communities affected (Baden and Coursey, 2001). To date, the studies conducted found that discrimination against minority and low income groups occurred in terms of the provision of public services, the location of hazardous industry, and the location of waste sites (Transportation Research Board, 2002). However, it is difficult to determine explicitly whether minority and low income groups reside near environmental hazards due to a lack of housing choice and discriminatory practices in the housing market, or whether discriminatory siting practices have been adopted by policy makers (Transportation Research Board, 2002; Baden and Coursey, 2001; Flippen, 2001; Quillian, 2002). It appears that both cases are true. In some instances, people locate near an environmental externality due to a lack of financial resources. In the United States, this is experienced by African Americans and people of Hispanic origin, in particular (Quillian, 2002; Hite, 2000; Flippen, 2001). In other instances, the externality is housed near certain communities (Bass, 1998). This reinforces the need to address environmental justice and why its principles should be adopted, not just in the United States, but also globally, as

economic forces polarise societies according to their levels of income, if not also according to their racial origin (Checker, 2001; Wessel, 2000).

2. Background

The Environmental Justice Movement originated in the United States, in 1982, as a result of people opposing the location of a Polychlorinated Biphenyl (PCB) factory near an African American community in North Carolina (Baden and Coursey, 2001; Fritz, 1999). In many respects, it may be claimed that the beginnings of the movement towards environmental justice occurred as part of the original environmental movement that arose particularly with highway projects in the United States (Stopher, 2003). Prior to 1969, highway projects in the United States were decided upon with little or no input from the public. This included decisions on the nature of the highway project (e.g., freeway, expressway, principal arterial road), the location of the project, and how the project related to the existing road and land infrastructure. In essence, highway projects were determined in the United States on the basis of a definition of need for the project (generally defined from considerations of congestion and levels of service on existing facilities, or provision of links in the interstate system of highways), and were then sited in locations that were least expensive from a strictly engineering viewpoint. There was (and still is) no requirement in the United States for a formal cost-benefit assessment of highway investments, and externalities of highway construction projects were largely ignored.

One result of the cost focus of highway project decisions was that roads were frequently routed through areas with the lowest property acquisition costs. Indeed, this was not restricted to roads alone, but was also true for many other public and private capital investment projects that required land for construction. In the United States, not only have people of low income generally located in close proximity to one another, but so also have various racial and ethnic groups. Because the United States population has been made up so extensively from immigration, there has been a tendency to create neighbourhoods that are identifiable to specific racial groups. When these groups are also income disadvantaged, they encounter further discrimination in the real estate market. This results in neighbourhoods of concentrated disadvantage, where the real estate is characterised by a dilapidated housing stock: these neighbourhoods become associated with low property values (Flippen, 2001). It is, therefore, hardly surprising that major new highways (and other projects) were frequently located through neighbourhoods that were financially or socially disadvantaged, and often both. Furthermore, there were instances in the 1950s and 1960s in the United States, where road building projects were used as a pretext for slum clearance, or other neighbourhood demolition. An example of this was the building of the Dan Ryan Expressway on the south side of the Chicago Central Business District, where a major area of low income housing was demolished to build this major thoroughfare, and the homes that were taken for this project were subsequently replaced by high-rise apartment blocks. This actually resulted in a new form of urban blight, with the final result being at least no better than the former situation and, in many respects, worse. Consequences stemming from the failure to consider the social and other environmental impacts, and especially failure to look at questions of environmental equity or justice of this project, are clearly evident today.

With the advent of the environmental movement in the 1960s, and the subsequent environmental legislation that was developed, two things changed. First, there was a requirement for public consultation in the construction of major publicly-funded projects, and second, there was a requirement to take into account a wide range of environmental issues. However, these two changes were insufficient of themselves. First, the mandated public hearings were often (and still are, in many cases) ineffective means to engage the public in consultation. Further, these hearings were often seen by low income persons, and those from disadvantaged racial groups as being ineffective or unavailable means for them to express their opinions. These subgroups of the population often see themselves as disenfranchised, or socially excluded, and would assume that the public hearings are for those who are socially included. The perception is often there that these hearings are not for such people and that their opinions, if expressed, would still be ignored or downplayed. Unfortunately, the track record of public hearings in the United States has done little to persuade that the contrary might be true.

Second, while environmental issues now had to be taken into account, there was still no formal cost-benefit procedure required. As a result, simply taking these issues into account did not necessarily involve any consideration of the equity of the impact on different population subgroups. Indeed, on both counts, there have been accusations made quite frequently that both the hearings, and the requirements to take into account environmental impacts are treated as little more than a formality, to which lip service must be paid. There are many who would contend that these are frequently undertaken with little intent to change the process.

One thing that did not change in response to the environmental legislation of the 1960s and 1970s was the nature of the travel forecasting and other models used to inform the planning process. These models were not designed to answer the questions of who benefits and who pays, nor to determine directly the incidence of environmental impacts. As a result, with increasing public awareness of the externalities of various construction projects, especially highways, and the partial failure of the environmental legislation to identify who was impacted by the externalities, the notion of environmental justice was born. Indeed, the models have tended to maintain the separation of the user and the nonuser, and to lead to considering principally the benefits and costs to the users of the facility that is to be constructed. At the same time, the models fail to identify who the users are, in terms of segments of the population by social or income classes. Environmental impacts, on the other hand, are generally not modelled but are rather assessed in various different qualitative ways, and are also assessed at relatively aggregate levels, making it impossible to distinguish who is impacted, and whether certain impacts will fall more frequently on specific population subgroups.

Still, today, race and income are not usually present in travel demand models, and issues of who is impacted by the externalities of projects are relatively poorly modelled or understood. Land use models, which could potentially help the process, also do not contain information on race or income, and are frequently not part of the planning process. Therefore, the means to identify who benefits and who pays are still largely absent from the planning models. It is with this background, then, that we can consider what environmental justice is, and how and where it applies.

2.1 Definition

Environmental justice refers to the fair treatment¹ and meaningful involvement of all people regardless of race, colour, national origin, or income with respect to the development, implementation, and enforcement of environmental laws (Bass, 1998; Quan, 2002). It is also commonly referred to as the equitable distribution of both negative and positive impacts across racial, ethnic and income groups, with the environment defined to incorporate ecological, economic, and social effects (Transportation Research Board, 2002). In the British context, environmental justice problems arise because environmental problems are a component of social exclusion and therefore an issue of social justice (Agyeman, 2001). In the United States, the Environmental Law Institute's (2002) definition of environmental justice is somewhat problematic because it contains ambiguous terms such as "environmentally burdened communities of colour" and refers to environmental impacts as "concerns". It seems to "water down" the significance of the impacts impinged on minority and low income groups in society. Hence, this definition does not emphasise the importance of environmental justice principles: it does not appear to serve its purpose.

Environmental justice appears to comprise fundamental elements of Rawls Theory of Justice, which is based on two principles. The first states that all social primary goods such as liberty, opportunity, income, and wealth are to be distributed equally; the second states that if these goods are not distributed equally, they are to be distributed to favour the disadvantaged (Transportation Research Board, 2002; Khisty, 1996). If environmental justice issues are to be addressed adequately in the United States, and internationally, the definition of environmental justice must be workable and not neutral: it must not divert attention from the adverse impacts on the less powerful in society (Fritz, 1999). This must be acknowledged by governing bodies and agencies internationally.

3. Legislation

Environmental justice issues were revisited in 1994 when President Clinton signed the Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*. This piece of legislation incorporated low income populations in its investigations of programs, policies, and activities, hence, increased the awareness of the need to address social and community impacts (Blackmon Lane *et al.*, 1998). This in turn led to the United States Department of Transport order, proposed by the Federal Highway Administration titled *Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, in 1995 (Chakraborty *et al.*, 1999; Blackmon Lane *et al.*, 1998).

Executive Order 12898, however has proved to be problematic because it requires the analyst to know and define disproportionate impacts as well as acknowledge peoples' values and perspectives: this process requires an objective framework by which data can

¹ Fair treatment is defined in that minority and low income groups do not bear a disproportionate share of the negative environmental impacts of government actions (Bass, 1998).

be collected and analysed (Tonn *et al.*, 2000). To address environmental justice in the United States, and other countries where social-spatial segregation occurs, forces shaping the urban fabric need to be identified: environmental equality will only result when there is social equality (Agyeman, 2001). This is challenging due to the complexity of issues surrounding environmental justice, such as civil rights, and the fundamental need to address social equality (Agyeman, 2001; Purvis, 2001; Blackmon Lane *et al.*, 1998).

In October 1999, the Federal Highway Administration and the Federal Transit Administration issued the memorandum, *Implementing Title VI Requirements in Metropolitan and Statewide Planning*, to clarify how metropolitan planning organisations should ensure the consideration of environmental justice in current and future planning certification reviews (Federal Highway Administration, 1999). This memorandum also emphasised the importance of the applicability of environmental justice orders to the processes and products of planning, in addition to the applications of the legislations during project development (Federal Highway Administration, 1999).

Metropolitan Planning Organisations were asked to address a set of questions to aid in reviewing and verifying compliance with Title VI requirements. These questions were to concentrate on issues surrounding overall strategies and goals, service equity, and public involvement (Federal Highway Administration, 1999). They are presented in Appendix A.

A recognised flaw of this memorandum is that it does not define a specific procedural or analytical approach for demonstrating compliance (Federal Highway Administration, 2000a; Federal Highway Administration, 1999). This allows Metropolitan Planning Organisations across the U.S.A. to develop their own methods to evaluate planning programs, policies, and processes (Federal Highway Administration, 2000a). The Mid-Ohio Regional Planning Commission developed its own methods when evaluating planning programs, policies and processes in relation to compliance with Title VI and related orders. These are described in a later part of this paper.

4. The Need to Address Environmental Justice in Transport Planning

In the 1960s and 1970s, United States Congress was bombarded with community frustration regarding adverse environmental, social, and economic impacts resulting from transport infrastructure developments and policy. This led to the Policy and Procedure Memorandum (PPM 20-8), issued by the United States Department of Transport through the Federal Highway Administration (Stopher, 2003). In 1975, the National Cooperative Highway Research Program conducted a project, in relation to the new legislative mandates, and proposed the following to be considered in the transport planning process:

- Social, economic, and environmental considerations in transport planning are important because inevitable conflicts among competing interests must be resolved;

- Social equity must be explicitly recognised and taken into account in transport decision-making; and
- Different groups of people can be expected to have different interests and different priorities (Transportation Research Board, 2002).

Environmental justice issues were identified in the transport arena 20 years before they were recognised in the political sphere; however, the concept of community impact has widened over the past 30 years. In the 1960s and 1970s, primary focus was on the direct impacts of transport investments on economic and community development, as well as environmental impacts, such as air and noise pollution. The focus today also encapsulates transport investment effects on urban economic growth and decline, job accessibility, community quality and the disruption to the urban social fabric, and the cost of public transport per capita (Transportation Research Board, 2002).

It is understood that the quality of life² in a community is linked to the transport system and hence it must be understood, by transport planners, that transport needs differ across population groups (Transportation Research Board, 2002; Forkenbrock and Schweitzer, 1999). This notion is reinforced by the process involved in the dispersal of employment opportunities towards urban fringe areas, which often leads to areas housing a greater concentration of minority groups, such as Atlanta, Georgia (Strait, 2001). Those without a vehicle cannot adequately access jobs that are now predominantly located in fringe areas hence, these individuals may remain unemployed: a characteristic of the spatial mismatch hypothesis (Sanchez, 1999; Federal Highway Administration, 2000a). It has also been documented that low income households are only one sixth as likely to own a vehicle as middle to high income households and that car accessibility is greater in non-disadvantaged households than disadvantaged households (Agyeman, 2001; Sanchez, 1999; Purvis, 2001). Lack of good public transport systems may lead to “forced car ownership”: a phenomenon that eventuated in urban Sydney, Australia, due to an inadequate public transport system and therefore indigenous Australians were forced to purchase private vehicles. This impacted their lifestyle in a negative manner, because they now had less disposable income due to car running and maintenance costs (Pollack, 2001).

Also, average employment was found to decrease as the distance from a transit stop increased and average employment was found to increase as per capita vehicle ownership increased (Sanchez, 1999). Adequate public transport can increase the participation, by part of the low income group of communities, in employment activities. Hence, today’s travel demand models should give more attention to public transport than travel demand models did in the past (Sanchez, 1999; Transportation Research Board, 2002; Mackett, 1994). This directly relates to environmental justice objectives set out in Title VI of the Civil Rights Act introduced by President William Clinton in 1994 (Quan, 2002). To address the issue described, new models will have to incorporate better the distribution of benefits and costs in relation to income, race and ethnicity (Transportation Research Board, 2002). Regarding all that has been mentioned thus far, a land use-transport model is likely to be the best option, provided that the land-use model also contains information on the location of people by income, race, and any other relevant grouping, a feature that is not present in most current models.

² Quality of Life as defined by Khisty (1996): essence of the collective economic, social, and physical conditions of people in a community.

5. Transport and Land Use Interrelationships

In the global context, problems arise when a region has areas that are politically volatile due to growing ethnic tensions like those witnessed in Belfast, Ireland, Jerusalem, Israel, and Johannesburg, South Africa. Urban and transport planners around the world, can best learn from the South African experience. Planners in Johannesburg have approached entrenched social constructs, founded during the Apartheid regime, in a proactive way, hence the city has now become a “compact city of opportunity” (Bollens, 2002). What needs to be adopted in the United States, and globally, especially in countries that house different immigrant communities, is multicultural planning. This has increased sensitivity towards the use and perception of urban space by all communities in society, in terms of accommodating their different needs, and does not involve their assimilation into mainstream society (Bollens, 2002). Multicultural or progressive planning will address racial segregation and social issues and, therefore, may help quell the rise of environmental injustice as well as promote more democratic institutions (Bollens, 2002; Wessel, 2000).

There is no doubt that the transport planner must frequently consult the urban planner in order to utilise the correct parameters in travel demand models. These must account for population growth or decline, zoning restrictions and changing land uses. However, a better approach would be to adopt a land use-transport model that incorporates the nature of the relationship between land use and transport. Land use changes also reflect the changes in the spatial distribution of activities and this has accessibility implications, particularly for low income and minority groups. Hence, the importance of land use-transport models is that they can be used to address social inequalities (Mackett, 1994). In addition, land use-transport models will help “bridge the gap” between urban planners and transport planners (Dittmar, 1995; Mackett, 1994).

According to Dittmar (1995), the transport system and facilities should be integrated into the community context as well as into both the built and natural environment: the sustainable transport system. He also states that a conservative transport system would be a sustainable transport system, because available financial resources would be used to maintain and rehabilitate the existing urban infrastructure. These improvements may, therefore, enable community groups to revitalise “disintegrating” neighbourhoods, that commonly house low income and minority groups (Flippen, 2001; Quillian, 2002; Dittmar, 1995). This provides an example of how a shift in policy focus may result in addressing environmental justice principles and it also reinforces the importance of land use and transport interrelationships: a more holistic approach to planning (Agyeman, 2001). “Context Sensitive Design”, as defined by the Federal Highway Administration, is the combined interdisciplinary approach that involves all stakeholders in the development of a transport facility whereby the facility preserves the aesthetic, scenic, physical and symbolic resources while maintaining safety and mobility (South, 2002). This new concept also reiterates the importance of a holistic approach to planning.

6. Transport and Environmental Justice: Current Practices

Much of the documentation on environmental justice in transport describes a revolution in terms of public involvement in the planning process: public participation in the

planning process has increased. This has created a new planning image which has replaced the conventional style of planning, whereby public participation in the decision making process is not only to promote the welfare of society, but also to increase the welfare of individuals in society (Khisty, 1996). As a result, community groups now devise their own methods and analyses to address environmental justice principles, due to their dissatisfaction with government procedures and findings (Transportation Research Board, 2002). Environmental justice groups such as CAFE (Community Alliance for the Environment) combine environmentalism and social justice. These groups have also brought factionalised communities together, and created a sense of power and unity to minority groups (Checker, 2001).

Social justice requires a democratisation of the planning process and this was identified by the Mid-Ohio Regional Planning Commission, in its study, *MPO Environmental Justice Report*, conducted in 1999 (Transportation Research Board, 2002; Federal Highway Administration, 2000a). It has been acknowledged that public involvement should begin in the earliest stages of planning (Transportation Research Board, 2002; Blackmon Lane *et al.*, 1998; Federal Highway Administration, 2000a; Federal Highway Administration, 2000b). In its study, the Mid-Ohio Regional Planning Commission incorporated land use and transport interrelationships, and utilised a travel demand forecasting model to assess the positive and negative impacts of existing and planned transport investments and infrastructure, on target populations (Federal Highway Administration 2000a).

The Mid-Ohio Regional Planning Commission identified four key areas of investigation in its report outline. These were:

- (1) Demographic profile whereby the location and size of low income and minority groups was identified,
- (2) Acknowledgement of different transport needs by target populations. This was achieved by requiring members of an Environmental Justice Task Force, set up by the Mid-Ohio Regional Planning Commission, to liaise with members of the communities under investigation and retain information on the priorities, values and needs of these communities in relation to transport. This was used to supplement documentation already available to the Mid-Ohio Regional Planning Commission,
- (3) Evaluate public involvement efforts. This began in 1995 and led to the creation of the Citizen Advisory Committee (CAC) as well as the Mid-Ohio Regional Planning Commission realising the need to publicise its activities in order to attract wider public involvement in the planning process, and
- (4) Assess the benefits and burdens of the transport system (Federal Highway Administration, 2000a).

This last step was regarded as an analytical development in terms of impact assessment. The Mid-Ohio Regional Planning Commission distinguished between types of measures used to compare the impacts on target and non-target populations. These are:

- Population based measures that provide information on members of the target population and also take into consideration small pockets of target populations within non-target populations;
- Geographic based measures that comprise information for a specific geographic area; and
- Visual based measures that are usually presented in map form due to the lack of comparability. The employment of Geographic Information Systems (GIS) to convey the spatial distribution of impacts. GIS has been acknowledged as a very useful tool in the assessment of environmental justice principles. GIS aids the analytical procedures for computing demographic attributes of target populations (Chakraborty, *et al.*, 1999; Blackmon Lane *et al.*, 1998; Federal Highway Administration, 2000a; Transportation Research Board, 2002).

The Mid-Ohio Regional Planning Commission utilised a travel demand model to assess the benefits and costs of transport system investments. However, results revealed limitations of the data incorporated in the model (Federal Highway Administration, 2000a). Results accruing from this analysis showed that target populations had equal access to jobs. This is unlikely. Analysis was not conducted further to determine what kinds of employment opportunities were available and whether these jobs constituted viable employment opportunities for minority and low income workers. It must be noted that the model employed was a travel demand model that integrated land use statistics, not a land use transport model. The Mid-Ohio Regional Planning Commission's report identified the need to include land use statistics to address the spatial mismatch issue: the utilisation of a land use-transport model was implicitly stated.

Also, the Mid-Ohio Regional Planning Commission's report failed to consider frequency of service of public transport because bus services were assumed to offer a uniform service. This, in itself, failed to give accurate results concerning the access of minority and low income groups to public transport services. Mackett (1994), in his assessment of land use-transport models, found that the exclusion of land use effects led to the underestimation of the response to changes in public transport policy. This has direct implications for low income and minority groups. In addition, it stresses the importance of incorporating land use statistics in the modelling stage.

7. Data Issues and Model Estimates

U.S. studies on environmental justice concentrate on distributive, procedural, corrective, and social justice issues. There are two types of models used: income based and race based (Quan, 2002). Table 1 describes data types useful in environmental analyses for both the income and race based models. Short form data come from questions asked of all Americans in the decennial census, and long form data come from questions asked of one in eight Americans in the census. In addition, short form data are available at the census block group level and long form data are available only at coarser levels; the block group and traffic analysis zone level. What has not been addressed here is the need to collect more culturally sensitive data other than the data types in Table 1 (Pollack, 2001). This may be achieved by employing special project officers, or public involvement professionals, who identify areas of need and, therefore, pass this

important information on to the transport planner (Pollack, 2001; South, 2002). This is also a way for communities, unable to voice their needs and concerns for a myriad of reasons, to communicate indirectly with planners and policy makers.

Another problem encountered by the data described in Table 1 revolves around the definition of poverty and how these data are derived. The United States Department of Transport defines a low income person as an individual whose median household income is less than the Department of Health and Community Services poverty level (Forckenbrock and Schweitzer, 1999). Poverty level is estimated from a number of socioeconomic variables such as age, median home value, housing tenure, household income, and household size. The mix of variables used will depend on the target population investigated. Because poverty data are derived, the results will be influenced by the quality and reliability of the original data. This issue has not been sufficiently addressed in the studies conducted thus far; however, what is mentioned is the need for better methods to improve the quality of information available (Forckenbrock and Schweitzer, 1999).

Table 1. Data types useful in environmental analyses

Short form data	Long form data	Data on poverty (derived) from long form data on:
Race, age	Income, disability, vehicle availability and ancestry	Household income, household size, and age of the head of household.

Source: Purvis (2001)

To date, very little research has examined policy implications of observed differences in travel behaviour between different racial and ethnic groups and how income constrains activity and travel choices. This contributes to the lack of understanding of why environmental justice issues constantly arise for certain members of society (Transportation Research Board, 2002). As mentioned earlier, the analyst must be aware of the different travel needs of various members of society: communities do not have identical travel patterns and behaviour. Improvements are also required for cost and benefit analysis tools, because these instruments usually mask the incidence of impacts on the target population (Transportation Research Board, 2002). These issues must be addressed otherwise difficulties and inadequacies associated with the assessment of environmental justice will persist.

It is also known that traditional travel demand models produce aggregate estimates due to simplified computer and mechanical procedures and therefore do not account for differences among the target population, nor capture population dynamics: they treat the population as homogenous. This creates problems for policy makers, because forecasts are not representative of the target population, hence environmental justice principles will not be addressed (Transportation Research Board, 2002; Purvis, 2001).

In addition, it is widely acknowledged that to forecast population growth, information on current and future land uses and past population trends must be obtained. This involves an intensive analytical procedure, usually beyond the scope of the studies investigated. According to Blackmon Lane *et al.* (1998), this renders all analysis that attempts to quantify likely impacts from proposed transport developments and policy as

inaccurate, thus reinforcing the need to adopt a land use-transport model rather than the transport model in isolation.

Land use-transport models are a useful tool that could incorporate social inequality issues in the modelling stage (Mackett, 1994). This is an advance on the current practice whereby social issues are addressed in the decision making or planning stage. The usefulness of the land use-transport model for policy analysis is described in Table 2. This table also depicts the applicability of the land use-transport model to environmental justice principles.

Table 2. Land Use Transportation Model usefulness for policy analysis

Policy Objective	Degree of usefulness
Reduction of congestion	Very useful
Reduction of energy usage	Very useful
Increase safety	Useful
Improve the environment	Useful
Reduce social inequalities	Useful
Improve the quality of life	Moderately useful
Reduce public expenditure	Moderately useful
Move towards a market economy	Of little use

Source: Mackett (1994)

The incorporation of public involvement is also an area that needs to be developed and widely adopted in order to derive community interests, goals, values and priorities and therefore accommodate environmental justice principles (Agyeman, 2001; Blackmon Lane *et al.*, 1998). This is discussed further, below.

7.1 Data Limitations and Recommendations

There are obvious data limitations, especially in relation to sensitive data, such as racial origin and culture, and level of income, required to identify the transport needs of low income and minority groups. In the United States, data of this type are usually only reported at the census tract level – a more aggregate level – to comply with privacy laws (Transportation Research Board, 2002). This creates problems at the data analysis stage, because aggregate estimates mask the transport needs of specific populations and, hence, these are not adequately considered due to a lack of empirical evidence. What is required, therefore, is data collected at a finer geographic resolution to capture the differences in transport needs across the community (Transportation Research Board, 2002; Chakraborty *et al.*, 1999).

This leads to conducting research to quantify the variations in mobility, access and travel behaviour across different economic, social, and demographic groups, because presently, insufficient research has been carried out that examines these areas in relation to changes that may occur over time: cross sectional and longitudinal studies should be employed (Transportation Research Board, 2002). In order to accomplish this, the analyst must be aware of the different transport needs of different populations within the community (Transportation Research Board, 2002; Forkenbrock and Schweitzer, 1999; Blackmon Lane *et al.*, 1998). This may be achieved through greater community consultation, increased community participation in the planning process and through the development of better working definitions and indicators of environmental justice and

social equity (Agyeman, 2001; Pollack, 2001; Transportation Research Board, 2002; Fritz, 1999). It has been previously mentioned that GIS is a useful tool to employ in the evaluation of environmental justice principles (Chakraborty *et al.*, 1999; Blackmon Lane *et al.*, 1998; Federal Highway Administration, 2000a; Transportation Research Board, 2002). Figure 1 provides a conceptual framework for a GIS based evaluation of environmental justice principles.

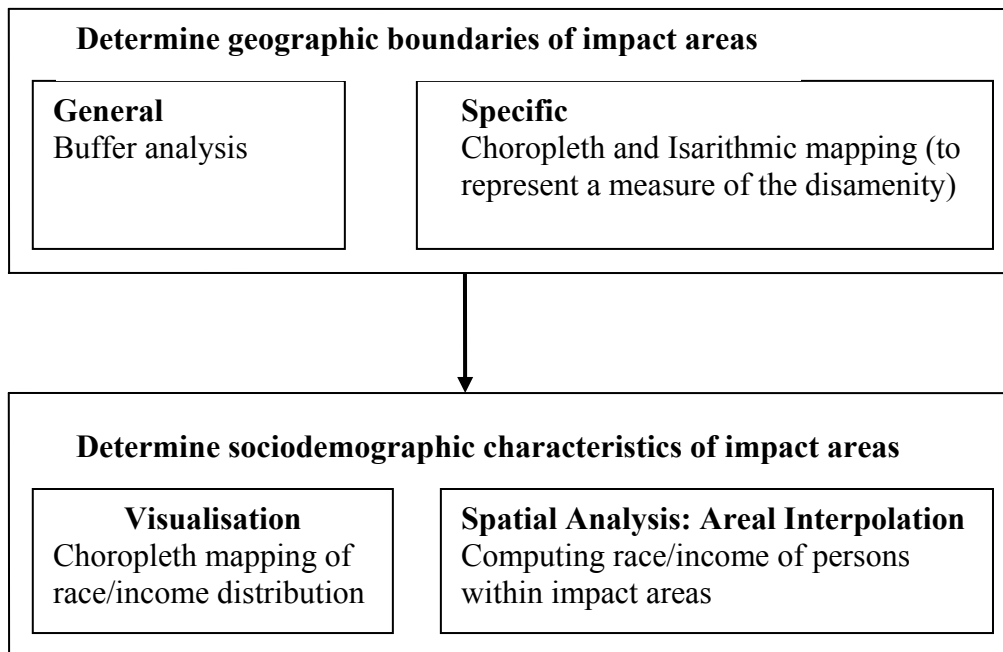


Figure 1. Framework for GIS based evaluation of environmental justice
Source: Chakaraborty, Forkenbrock and Schweitzer, 1999.

However, data limitation problems are encountered with the utilisation of GIS for impact analysis. As already discussed, geo-demographic data are often only available at an aggregate level due to privacy law compliance, while what is required are data at a finer geographic level, because areas likely to be impacted by transport or other projects, do not have boundaries identical with those for which data are available (Chakaraborty *et al.*, 1999). In future, this may remain an issue, because people are reluctant to provide personal information from which they can be identified. Hence, models, such as a predictive regression model, may have to be employed to estimate data at a more disaggregate level (Chakaraborty *et al.*, 1999).

Another problem identified is the requirement of accurate and specific data for GIS based evaluation to produce useful results. This involves expensive and time consuming data gathering, unless synthetic data (derived from synthetic models) are developed. Research is also needed to recognise, as well as document, ways in which investment policies and innovations in transport affect target populations (Transportation Research Board, 2002; Dittmar, 1995). This incorporates analyses of investment policies to highlight the reasons behind the impacts of transport investment on particular communities, and the evaluation of the accessibility levels of low income, minority, aged and disabled populations (Transportation Research Board, 2002).

As mentioned earlier in this paper, studies need to be conducted that embark on comparing costs and benefits of transport developments and policy, focusing on the impacts on socially and economically disadvantaged communities (Transportation Research Board, 2002). This area of research needs to identify land use and transport interrelationships and the dynamics of these relationships.

Overall, more research is required into investigating better methods to analyse environmental, social and economic impacts accruing from transport developments and policy. This may lead to improvement on the current land use-transport models: the models that cater best to addressing environmental justice principles, especially from the urban transport perspective.

8. International Applications for Environmental Justice

Although the environmental justice movement started in the United States and has advanced there far beyond developments in other countries, this relatively new political path has international applications. In China, for example, the formation of new social hierarchies and changes in Chinese society will see the establishment of environmental justice as Chinese citizens become more aware of their environment and their rights (Quan, 2002). However, to assess the environmental justice issues adequately in China, new models will have to be devised other than the income and race based models utilised in the United States. This is because Chinese society is not fragmented due to race or ethnicity the same way that American society is fragmented: U.S society is an immigrant based society with 77 percent of the population white non-minority and 12.6 percent of the population African American (Quan, 2002). In China, the Han people comprise 91.6 percent of the population and ethnic groups do not comprise such high percentages as ethnic groups in the United States (Quan, 2002). In addition, China has had no serious racial conflict. Therefore, to assess environmental justice in China, the proposed models are based on occupation and the peasantry worker (Quan, 2002).

Environmental justice in Canada is viewed as an issue for all members of society: the sustainable environment approach is adopted because communities are not polarised like their U.S counterparts (Draper and Mitchell, 2001). In Britain, the environmental justice movement has began to take more shape through environmental groups; however, it is not yet as influential as in the United States, where the civil rights movement is very powerful (Agyeman, 2001). In Central and Eastern Europe, the collapse of communist regimes has witnessed the development of new legislative frameworks in terms of environmental justice; however, there have not been any practical applications (Costi, 1998). This is a result of economies in transition and priority of governments is given to economic development at the expense of environmental and social justice issues (Costi, 1998). Problems concerning environmental justice will become more evident as these nations exit the transition phase.

There is no doubt that changing economic conditions around the world will inevitably result in greater income disparities between low and high income groups, and possibly lead to socio-spatial segregation (Wessel, 2000). With this in mind, and people becoming more aware of their civil rights, environmental justice issues will become more prominent in Canada, Britain, as well as other countries, especially those that

house spatially clustered immigrant populations. This emphasises the increased importance of understanding and incorporating environmental justice principles globally, in all facets of urban and regional planning.

9. Conclusion

With increasing globalisation of domestic economies and populations, and consequently, the development of disadvantaged minority groups in almost every nation in the world, environmental justice concerns are likely to become increasingly an issue worldwide. Thus, while the environmental justice movement began in the U.S.A., it is likely to become increasingly visible in almost every country. This review has shown that current practices, particularly in transport investments, in handling environmental justice issues are not very sophisticated and often lack key detail that would allow a clear determination of impacts on racial and economic minorities.

Among the research and policy issues facing agencies in the United States and around the world, that need to comply with environmental justice principles, are the following:

- Public involvement³ should increase and, in the case of the United States, it should be enhanced. Public involvement will become more important because immigrant populations usually grow at a faster rate than white populations, while also often being less able to make use of standard procedures for public involvement. This has been the case for the United States (Weeks, 2002).
- Public involvement professionals should be employed. These individuals are able to deal with conflict management, presentation, problem solving, negotiation, facilitation and team building skills (South, 2002). These individuals should initiate the public involvement process.
- The collection of sensitive data, such as racial origin and income should be conducted more frequently. This may become more viable especially if the public involvement process has been successful. If a bond of trust has been established between the community and agency, it is possible that the collection of sensitive data will not be as problematic as in the past where a high percentage of respondents refused to supply this information. Collection of this type of data has been regarded as controversial. However, according to Matley (2002), successful public involvement usually evokes controversy. Such data need to become a standard part of household travel surveys and other data collection efforts in transport.
- Agencies must correctly identify, and understand, the different transport needs of different groups in society. This will be more achievable if the public involvement process has been successful.
- Better land use and transport models are required. The land use models need to incorporate data on income and racial origin and be able to forecast where different groups of the population will locate, and work. The land use models

³ Public involvement is meaningfully engaging the public in the decision making process (Matley, 2002).

need to be fully integrated with travel demand models, so as to show the transport implications and to describe better the incidence of transport service levels on different segments of the population.

Most importantly, agencies must understand the concept of environmental justice. This is where governments may have to formulate a definition, to avoid subjective interpretation, and hence introduce tough penalties for agencies that do not comply with all the requirements of environmental justice legislation.

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Appendix A. Assessing Title VI Capability, Review Questions; An Attachment to the Federal Highway Administration and Federal Transit Administration Memorandum, Implementing Title VI Requirements in Metropolitan and Statewide Planning, October 1999.

Overall strategies and goals:

- What strategies and efforts has the planning process developed for ensuring, demonstrating, and substantiating compliance with Title VI? What measures have been used to verify that the multi-modal system access and mobility performance improvements included in the plan and Transportation Improvement Program (TIP) or STIP, and the underlying planning process, comply with Title VI?
- Has the planning process developed a demographic profile of the metropolitan planning area or State that includes identification of the locations of socio-economic groups, including low-income and minority populations as covered by the Executive Order on Environmental Justice and Title VI provisions?
- Does the planning process seek to identify the needs of low-income and minority populations? Does the planning process seek to utilize demographic information to examine the distributions across these groups of the benefits and burdens of the transportation investments included in the plan and TIP (or STIP)? What methods are used to identify imbalances?

Service Equity:

- Does the planning process have an analytical process in place for assessing the regional benefits and burdens of transportation system investments for different socio-economic groups? Does it have a data collection process to support the analysis effort? Does this analytical process seek to assess the benefit and impact distributions of the investments included in the plan and TIP (or STIP)?
- How does the planning process respond to the analyses produced? Imbalances identified?

Public Involvement:

- Does the public involvement process have an identified strategy for engaging minority and low-income populations in transportation decision making? What strategies, if any, have been implemented to reduce participation barriers for such populations? Has their effectiveness been evaluated? Has public involvement in the planning process been routinely evaluated as required by regulation? Have efforts been undertaken to improve performance, especially with regard to low-income and minority populations? Have organizations representing low-income and minority populations been consulted as part of this evaluation? Have their concerns been considered?

- What efforts have been made to engage low-income and minority populations in the certification review public outreach effort? Does the public outreach effort utilize media (such as print, television, radio, etc.) targeted to low-income or minority populations? What issues were raised, how are their concerns documented, and how do they reflect on the performance of the planning process in relation to Title VI requirements?
- What mechanisms are in place to ensure that issues and concerns raised by low-income and minority populations are appropriately considered in the decision making process? Is there evidence that these concerns have been appropriately considered? Has the metropolitan planning organization (MPO) or State DOT made funds available to local organizations that represent low-income and minority populations to enable their participation in planning processes?