

CAN THE CONCEPT OF  
ENVIRONMENTAL  
JUSTICE IN  
TRANSPORT BE  
TRANSFERRED TO  
CITIES OF THE  
SOUTH? A CASE STUDY  
OF NAIROBI

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**Conference CODATU XV**

The role of urban mobility in (re)shaping cities  
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## **Can the concept of environmental justice in transport be transferred to cities of the south? A case study of Nairobi**

**Thilo Becker**

Technische Universität Dresden - Research School DIKE - True Cost in Transport- Dresden, Germany

### **Abstract**

Environmental justice (EJ) describes the equal access to environmental resources as well as equal protection from adverse effects and environmental hazards, independent from the socio-economic background of the individual like age, gender, income or ethnic group.

This paper merges aspects of environmental justice with current transportation planning activities in Nairobi, Kenya. Based on a literature analysis, the paper introduces studies and project plans on urban transport in Nairobi as well as the concept of EJ. In the second part, results from in-depth interviews with stakeholders from government agencies, NGO, international donor agencies, consultants and researchers are presented and evaluated.

The qualitative and quantitative results show that a large majority of the population is far from being able to afford motorized transport. Even indirect positive benefits to those disadvantaged people were not pointed out during the interviews. Instead, the disadvantaged people have to carry a burden of an unacceptable infrastructure for NMT-users, danger of life due to accidents and long-term health effects from air pollution and noise. In comparison to developed countries, the magnitude of environmental injustice differs greatly in absolute terms. In contrast, the perception for EJ turned out to be very low during most of the interviews.

### **1. Introduction**

Justice is becoming higher attention in policy discussion. On the global level, discussions emerge on the responsibility for climate change and end in negotiations on carbon emission reduction targets. Despite the seriousness of the issue, observers already follow the yearly UN-Summits with a degree of hopelessness [Heinrich-Böll-Stiftung, 2009]. However, there is a question behind climate change negotiations. Does every country in the world need continued economic growth? How can the Millennium Goals of the UN be achieved? Does the ideal of a green economy [UNEP, 2011] formulated by UNEP work?

All questions are closer related to urban transport and environmental justice than expected at

the first glance. Up to today, economic growth has always been linked to an increase of car use and thus creating further demand for road infrastructure. Nairobi with its large-scale investments in highways is seen as a representative example for this development. There are clearly positive and many negative effects associated with road construction, but a question little discussed is the relationship to the Millennium Goals which aim at improving the living conditions for all. Do the existing transport system and the planned measures support the goals like reducing poverty by means of economic growth? Is it a system which truly deserves the adjective “sustainable” or “green”?

Even in Europe or the origin of Environmental Justice (EJ), the United States, a purely quantitative answer of those questions is difficult because of limited data availability. This limitation is even more relevant in a developing country like Kenya.

Therefore, the qualitative approach of expert interviews has been chosen to detect the perception and attitudes of stakeholders towards this topic. The interviews lead to the identification of groups which benefit from the current situation and the investments finished in the near future. In addition, the groups in society which have to bare the negative effects mostly caused locally by cars are discovered. Due to the authors perspective as a foreign researcher being a limited time in Nairobi it is clearly a perspective from the outside, trying to raise awareness for topics seldom addressed.

## **2. Literature review**

### 2.1 Structure and pattern of Nairobi

#### 2.1.1 General structure

Nairobi is the capital and economic center of the East-African country Kenya and the settlement area of the metropolitan area is about 30 km from east to west and 20 km from north to south. Nairobi is the economic and administrative center of the country. Modern office buildings host regional headquarters of international companies, embassies coordinate activities for neighboring countries and the headquarters of UNEP and UN-Habitat are located there. About 43 % of the national GDP is generated in Nairobi [UN-HABITAT, 2006, S. 9]. In contrast to the fairly good development of the city, Kenya is rated as a country with a ‘Low Human Development’ (Human Development Index Rank 2010: 128) and has a GDP per capita (2008) of 1,622 US-\$ [UNDP, 2011].

3,300,000 of the 38,600,000 inhabitants of Kenya (2009) live in the city of Nairobi [KNBS, 2010, S. 16] with a steady increase in population. Although literature sources differ, a considerable number of the inhabitants live below the poverty level. For example, the number of people living in informal settlements varies between 60 % of Nairobi’s population [UN-HABITAT, 2006, S. 10] to around 15 % individuals [Karanja, 2010]. At the same time, the increasing upper and middle class can afford a living standard comparable to industrialized countries.

## 2.1.2 Transport structure

Many parts of the urban structure and the general design of the transport system still dates back to the British colonial time, which ended in 1963. Examples are the land use designation, the railroad system, the routes of some arterial roads and the strict segregation of residential areas between social groups. Although the Growth Metropolitan Study from 1973 proposed many road investment projects, most of them have not been realized yet. However, some of the current road constructions are based on this old plan.

The railway, the original reason for the foundation of Nairobi, does not play an important role nowadays. The central station at one edge of downtown is serviced by four local trains per peak hour in/from two main directions. The railway carriages are generally heavily overloaded.

The public transport (PT) system is unregulated and uncontrolled to a large extent today. Several large bus companies operate in parts of the town on certain routes with 25-seaters. The main market share have mini buses, locally called Matatus, which operate on routes with 14-seaters and are owned by small businesses. According to estimates, 15,000 matatus operate within town [Graeff, 2009, S. 3]. Frequency and fares vary by route, distance, direction of travel, time and weather.

The most noticeable problem of the road system is congestion. Trips with a free-flow travel time of 20 minutes often take more than two hours during long periods of the day. The congestion also affects PT as there is no separated infrastructure available. A less noticed, but even more severe problem, are road traffic accidents. 2,893 road fatalities were reported in 2007 for the whole country, which means 2.88 casualties per 1,000 registered vehicles [Organisation, 2009, S. 125]. To give a comparison, this factor is 32 times higher than in Germany [BMVBS Bundesministerium für Verkehr, 2009, S. 134, 158].

Non-motorized transport (NMT) includes mostly walking, cycling and goods transport with different types of handcarts. No official statistic is available, but the modal share of cycling is around 1 % and the remaining 48 % of the NMT modal share are pedestrians [Aligula et al., 2005, p 84]. In terms of available infrastructure, many roads in the inner city are equipped with sidewalks. A large proportion of the roads in outer districts are built as rural roads without any NMT-features and pedestrians have to improvise. Pedestrians are often prevented from crossing the road by guard rails and fences. A few pedestrian bridges exist, but their poor design generally discourages their usage. Bicycles

are not considered in infrastructure design. Only one section of bike path (one way!) exists in the city of Nairobi, but the intensive use and the surprising acceptance of car drivers underlines the need. Handcarts for goods transport, which are often organized as a micro-business, were banned lately from large parts of the city.

## 2.2 Environmental Justice

### 2.2.1 Definitions and aspects of environmental justice

Different definitions for EJ exist, but the most widely used is applied by the Environmental Protection Agency of the United States: “Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Fair treatment means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies” [EPA, b].

The topic “Environmental Justice” originates from the United States and it started there with the struggles of Civil Rights Movement in the 1960’. In the early 1990, the topic was addressed by politics and multiple bills were passed by the US-Congress. The intention was to focus attention “on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities”. [EPA, a] Today it is one of the seven priorities of the US Environmental Protection Agency. In Europe, the topic is still evolving and European research has a different focus: racial differences and the siting of waste facilities are less important topics. Instead, the focus is put on public health. [Fairburn, 2009, p. 72]

Three dimensions of EJ can be identified, which are often discussed separately in literature [Forkenbrock and Sheeley, 2004, p. 6]:

- Transport disadvantaged people “have more difficulty accessing education, employment and affordable goods”, often because they are “unable to afford the most convenient travel modes or locations” [Litman, 2012, p. 6]. This includes accessibility, which describes “the extent to which land-use and transport systems enable individuals to reach activities or destinations by means of a combination of transport modes” [van Wee and Geurs, 2012, p. 352]
- Environment disadvantaged people are in a way impaired that they can not live in “a safe, healthy, productive, and sustainable environment” [Forkenbrock and Sheeley, 2004, p. 3]. They can be affected by most environmental effects like air quality, noise or the risks of accidents.
- Participation disadvantaged people are excluded from the planning process. This includes minorities, lower-income people, children or disabled people. [Litman, 2012, p. 39]

The introduction and perspective so far were mostly from the United States and Western Europe. Even there, the relevancy of the topic EJ differs from one country or

level of development to another. For example, countries in the developed world have a higher Human Development Index (life expectancy, education, income) meaning that they have a good standard of living [UNDP, 2011]. This does not mean the countries are just. To measure general income distribution among the people of a country, the Gini index is often used. Countries like Sweden or Germany have a rather equal income distribution in comparison to Kenya, but even some developing countries in East-Africa like Ethiopia is rated to be less equal than the average of the European Union. Especially the United States are considerable more unequal than many East-African countries like Kenya or Uganda [CIA, 2012].

This example indicates that in the developing world, the majority of the inhabitants experience income poverty and level of human development which makes the distribution relatively equal. In contrast, a minority in the developed world experiences income poverty. This minority is so disadvantaged that the equality measured by the Gini index is on a comparable level like countries in the developing world.

The small example shows that it is important to compare the right parameters and shows that every analysis of EJ has to be adapted to the local conditions, issues and needs.

### 2.2.2 Environmental justice and access

Transport is often seen as a factor to facilitate economic growth, both in the developed and developing world. Based on this belief, donor countries and organizations continue to encourage and support road building measures in the developing world. Today, this perspective is more and more criticized and the interaction of mobility and accessibility is emphasized instead. “The starting point should be the decision-making parameters of the mobile agent who needs or intends to move from point A to point B rather than the road network per se. The mobile agent’s immediate considerations are: 1) time versus money expenditure, 2) road utility contingent on modal availability, and 3) accessibility versus mobility.” [Bryceson, 2009, p. 15]

For disadvantaged people, who already face “considerable financial and physical hardships, [...] travel costs eat into their already meager incomes and add to the worries and financial burden of these households, often making it extremely difficult or impossible for them to look for employment, attend education, seek medical attention and/or maintain their social networks” [Lucas, 2011, p. 1332]. To be able to fully participate in society, specific solutions in terms of land-use and transportation planning have to be provided to all people in order to reach the Millennium Goals.

### 2.2.3 Environmental justice and road accidents

Road accidents are an issue addressed globally by the World Health Organization (WHO). According to WHO-estimations, about 1.3 million people die per year on the roads world-wide, while 20 to 50 million are injured. The need for reductions is not debatable, but one issue is often not mentioned: “Road crashes disproportionately affect vulnerable groups of road users, with more than half of those killed being young adults, pedestrians

or public transport users aged between 15 and 44 years. Most of the victims of road crashes come from lower socioeconomic groups. These underprivileged individuals often ride risky means of transport and/or live in unsafe neighborhoods. Material deprivation and social exclusion prevent them from ensuring safety.” [Azetsop, 2010, p. 115] At the same time, the accident perpetrator belong to advantaged groups in society.

#### 2.2.4 Environmental justice and pollution

In the developed world, air quality policies have been implemented for several decades. Some pollutants from transport have already been reduced below threshold values, but others still remain a challenge. There has also been progress in developing countries (e.g unleaded fuel), but in urban settings air pollution remains high.

Air quality data is generally limited in developing countries and no specific linkage of pollution level and social background of individuals has been made so far. However, Kinney et al. [2011, p. 370] provides a good overview on air quality in Kenya and points out that many disadvantaged people regularly spent time at locations with high exposition.

### **3. Methodology**

The whole analysis is based on a three month research visit in Nairobi between October and December 2010. It was followed by a six-week visit at the University of Nairobi in October and November 2011. Both stays were independent from other projects and were purely funded by academic scholarships.

Before the start of the analysis and the precise definition of the research question, a general overview of accessible literature sources was undertaken to identify key issues. This step was accompanied by observations at different locations in Nairobi from the users’ perspective.

After identifying problems in the area of NMT and social justice, a questionnaire for experts covering the following fields was designed: current transport development, role of stakeholders, obstacles and opportunities of NMT, social aspects and education and marketing. The formulation and phrasing of the questions was done in collaboration with the government funded research institute Kenya Institute for Public Policy Research and Analysis (KIPPRA), which provides objective public policy advice to the government and other stakeholders.

In total, 16 oral expert interviews were conducted with individuals working in different hierarchy levels in the field of transport- and NMT-planning. Four of the interviewees were female. The interviews were spread among different institutions and all interviewees were involved in urban transportation. Not all stakeholders and institutions could be included and the individuals were chosen by recommendation or official inquiry at the institutions. Therefore the exploratory design of the analysis cannot provide a full picture of the situation, but gives an overview on the current state. [Wessel, 1996]

The in-depth interviews lasted up to two hours and took place at varying locations. Instead of recording the interviews, detailed notes were taken during and after all meetings. This way, many interview partners, especially the individuals working in a political environment, were able to speak out their personal opinion freely.

**Table 1: Interview partner per type of institution**

Type of institution	Number of interviewees
Ministries	1
Road administration	2
Nairobi City Council	1
Universities and research institutions	3
International organizations	3
Planning consultancies	3
NGO and special interest groups	3

Parallel to the interviews, a literature analysis was undertaken. It focused on academic literature as well as gray literature like strategic plans, public relation documents, news- papers and design plans for road construction. Especially the gray literature turned out to be hard to access because some of the documents were described as “not accessible to the public” or the barriers to get them were high. However, new sources were regularly pointed out by the interviewees.

During the second visit in Nairobi in 2011 I was involved in teaching activities at the University of Nairobi. By sharing experience with post-graduate students and some staff members, some additional information was obtained.

In this paper, results from the literature analysis on Nairobi and the subjective inter- views are combined. The recommendations in the conclusion are independently derived from the survey.

#### **4. Results from Interviews and discussion**

##### 4.1 General mode choice

When asked about social disparity in transport, 100 % of the interviewees mentioned upper social classes as the main car users and lower social classes as NMT-oriented. Results from travel surveys confirm this perception: In upper class districts, around 20 % of the modal share is NMT and up to 50 % of the trips are done by private car. In districts with informal settlements, the NMT-share goes up to 75 % and the car use is below 2 % [Aligula et al., 2005, p. 86].

A conclusion of a travel survey in informal settlement areas goes even further: ”First, it is clear that most people living in the slums of Nairobi do not have travel ’choices’-they cannot afford motorized transport, so they walk. Second, it is also clear that women and children are disproportionately affected.” [Salon and Gulyani, 2010, p. 655].

In the interviews, cycling was often mentioned as a solution which would help to extend the activity range to 10 to 15 kilometers. This range would allow most of the people

to reach their daily destination. The savings for public transport fares would quickly outbalance the costs for the investment into a bicycle and its maintenance. However, other reasons inhibits them from using this transport mode (see [Becker, 2011]).

#### 4.2 Land-use planning

An issue mentioned by two stakeholders was the transport situation in informal settlements (“slums”). About 39 % of the households in Nairobi can be associated with informal housing conditions by using the wall material (iron sheets or mud/cement) as a proxy variable. 28 % have no electric lighting. [Census]. Although many land-use projects and charity organizations try to improve the situation for the inhabitants, the transport problems within the communities with all their micro-businesses and mini-infrastructure were not addressed in the interviews at all. However, two international interviewees remarked the dense distribution of local merchants in residential and business areas as a positive example of current land-use. Stalls along the roadside or merchants on simple rags on the sidewalk ensure very short and walkable distances to fulfill shopping needs and create business opportunities. The author is reasoning that (under the assumption of existence of long-term time savings created by road infrastructure) those benefits outbalance any “savings in Road User Costs” [of Roads Republic of Kenya, 2010, p. 45] often calculated for time savings. The applied methods for cost-benefit-analysis do not take all those effects into consideration.

One problem is often mentioned as a conflict between residents and infrastructure planners: the road authorities are in a complex legal situation when they need space for road expansions. During the last decades, land, which was designated as a road reserve, has been sold to private investors. From today’s point of view, those transactions are classified as illegal actions, but investments have been made on that land and the current land owners do not accept the cancellation of the original deals. Extra costs to relocate the current land users increase the infrastructure project costs. Different groups of society are affected by the dispossession, but a large share seems to be borne by poor residents [Nation].

#### 4.3 Participation of stakeholders

Public consultations exist only on a minimum level. Certain public hearings are required by Kenyan laws (e.g. Environmental Impacts Studies), but they are organized by private consultancies. The number of participants, the methods of getting response from all affected individuals and the overall quality and impact of the reports are rated quite low by three interviewees. In addition to the Kenyan studies, international donors often require special reports covering specific issues or fulfilling their guidelines. The different processes increase the inhibition to take part in public participation even further for every affected individuals.

After the consultation phase, the planning entity is responsible to draw conclusions and set environmental standards. Environmental project plans take issues like health and safety of workers, water pollution, waste management or regeneration of material sites

after the end of construction into consideration (e.g. Thika Rd. Plan) Unfortunately an interviewee involved in these processes stated that the plans do not have a quality control system, the engaged personnel often have lack of capacity for the covered topics (“high school students”) and the supervision at the construction sites is done with low due diligence. In general, the environmental protection processes for the construction phase seem to be in place, but there is still a lack of implementation.

Social fairness is closely related to economical aspects. The need to expand the road infrastructure is communicated by politicians as a prerequisite to achieve economic growth to successfully gain support for the investments. While questioning this correlation in general, interviewees pointed out that the beneficiary of the current projects are effectively only the upper and partly the middle class. The ‘silent majority’ is using mostly NMT and does not have any benefits, but partly has to pay for the investments with taxes. In addition, the increasing traffic volumes impose a higher accident risk. Surprise was stated by three interviewees that the vast majority of society believes in the political explanation of the current actions of the government. A sentence in the Environmental Impact Study of the radial road Thika Road project about the public participation displays it best: “Close to 100 % of the participants appreciated the road project as an important undertaking by the Government. A sample comment from the participants went like this: “This is such a wonderful public investment [...]. If I had land, I would donate it to the project”” [of Roads and of Kenya, 2007].

The actual construction of Thika Road from 2010 to 2012 was accompanied by focus group discussions with residents and road users. The evaluation was initiated by a Kenyan NGO and by academic institutions. The construction project is the first “Super Highway” in the country and is seen as an example for future road projects. Among others, the following problems were addressed which are in sharp contrast to the statements in the Environmental Impact Study:

- No easy or no access at all to information regarding the implementation of the project.
- Absent communication to residents and users during construction phase.
- Public consultation took place, but the mobilization (e.g. newspaper advertisement) was very poor and the process was not successful. [KARA, 2012, p. 13]

The demand for such information regarding the project can already be seen by the existence of a private blog which collects and shares information <http://www.thikaroadblog.net>.

The participation of the public in the planning processes cannot be substituted by local NGOs because they are almost absent. Besides representatives of business groups, no organization speaks for the interests of the transport users (all modes!). There are only few exceptions with specific interests (KARA: holistic planning; UVUMBUZI: cycling), but according to the interviewees there are no procedures in place to formally include them in the planning and consultation process.

#### 4.4 Current strategic plans

There are four relevant strategy papers and plans that were identified to be relevant for current activities. All of them deal with the transport system and have impacts on environmental justice. The mere existence of plans like this is a good progress which has to be pointed out.

- A Report on Integrated National Transport Policy: Moving a Working Nation: The national transport strategy defines the policy and covers many fields beyond infrastructure. All person and cargo modes are included and environmental effects, road safety, education and health issues are dealt with in separate chapters. [of Transport Republic of Kenya, 2009]

To call the plan “integrated” is fully justified. The policy openly addresses problems, emphasizes the role of all modes, proposes modern economic measures like the user-pays-principle and values the economic benefits and potential of NMT. Many proposed measures result in benefits for all groups in society. Due to the diverse conditions in rural and urban areas of Kenya, its use for Nairobi is limited. However, it demands a separate urban transport policy for Nairobi and other Kenyan towns which “should aim at developing an integrated, balanced and environmentally sound urban transport system” [of Transport Republic of Kenya, 2009, p. 29]. The author considers the national plan as a good model for any local plan.

- Road Sector Investment Programme & Strategy 2010 - 2024: This is the newest document and it lists precisely the future road investments on a nationwide basis. The traffic growth forecast for 2030 does not include NMT at all as an urban mode and reserves barely any financial resources. [of Roads Republic of Kenya, 2010, p. 32]. It has to be judged very positively that a 15-page chapter addresses “cross cutting issues”, where the topics gender, social governance and environment are well discussed. However, this chapter differs in terms of content and language style significantly from the rest of the document. It raises the question whether the chapter is a simple ‘whitewash’ towards donors.
- Nairobi Metro 2030: The policy document, published by the Ministry of Nairobi Metropolitan Development, is a general strategy for different types of politics and planning. Transport is addressed on six pages, making general statements about road infrastructure, mass rapid transit, logistics and land use.

NMT barely plays a role in this general plan. In the transport section, it just says “a critical concern is to ensure adequate provision for metropolitan wide non-motorized transport, [sic] mobility network”. The report recommends to reduce poverty by enhancing economic growth. No relationship between transport and social considerations is pointed out.

- The Study on Master Plan for Urban Transport in the Nairobi Metropolitan Area in the Republic of Kenya: According to interviewees, the majority of all current

investments in the road infrastructure are based on a comprehensive study on transport planning that was funded by Japanese development assistance. Even international interviewees consider the report with 753 pages, from the methodological perspective to be a state-of-the-art transport plan. [Agency, 2006]

Several investments in public transport are recommended in different chapters in the documents. A feasibility study for improvements of the bus/matatu transport system describes several ideas. Unfortunately the sub-chapter “social considerations” states only impacts like “kiosk [...] would flock around”, “attract car owners” or “the behavior of waiting passengers to occupy portion of the road will be avoided” [Agency, 2006, p. 30-72 to 30-74]. Topics like affordability of fares, which are very relevant for poor inhabitants, are not addressed.

The modes cycling and walking with very low costs are mentioned in the report, the dependency of the poor on NMT is pointed out and the large role in terms of modal split is emphasized. However, the appraisal of NMT in the plan does not correspond to its importance. It is stated as a component of many measures, but it is always among other aspects to consider. Neither the different needs of cycling and walking are taken into consideration. Nor are quality standards besides the width of NMT-lanes defined. When quantifying the text elements dealing with NMT for more than ten lines, only a chapter of five pages of text remains. With those general conditions, it is surprising that the modal share of NMT is forecasted to just decrease from 49 % to 44 % by 2025.

Overall, the plan can be rated as a supply-oriented approach, which is at least three decades behind modern planning principles like the “Sustainable Urban Mobility Plans” [Bürrmann et al., 2011] in the European Union.

#### 4.5 Road safety

Road accidents are a key issue in Nairobi. Disaggregated police data with reported fatalities and injuries are not accessible for Nairobi, but the total number of 2,893 fatalities and 12,470 injuries (2007) for Kenya as a whole already underline the magnitude of the problem [Organisation, 2009, p. 125]. The number of road fatalities per one million inhabitant and year (2007) is 75 (Germany: 61), the number of fatalities per registered vehicle and year is 2.88 (Germany: 0.09). More than one half (56 %) of the road fatalities nationwide are pedestrians and cyclists, the rest divided up into different motorized vehicles [Organisation, 2009, p. 125]. A (presumeable incomplete) accident statistic is available for 2011 and it even indicates that more than 70 % of the road fatalities in Nairobi are either pedestrians or cyclists [OpenData]. As a comparison, the share of fatalities of NMT-users is 22 % in Germany [BMVBS Bundesministerium für Verkehr, 2009, p. 134, 158].

There are no statistical details about the social background of the victims available, but the dependency of mode choice on social background is an indicator that a large proportion of the casualties relate to poor social groups. One interviewee stated that any

accident with long-term health effects on an income earner in this social group implies serious problems for the subsistence of the whole family.

Road safety is a widely recognized problem. All interviewees mentioned the topic, although it was not emphasized during the interviews. About 75 % of the interviewees addressed fatalities very neutrally and they did not mention which modes of transport were affected most. The perception for the risk of NMT-users seems to be low.

Specific topics with rather easy solutions are discussed here:

- An issue for cyclists is the bicycle condition. Low-price imports from Asia have poor quality and a high risk of material failure. In addition, very few bikes are equipped with lights and just a low percentage of cyclists “substitute” the light with a reflector vest. The few interviewees familiar with the topic recommended to implement adequate safety standards for the product import.
- Substance use (e.g alcohol) is mentioned by all foreign interviewees as an unrecognized problem in Kenya. Strong legislation in industrialized countries sensitized drivers through strict laws, consistent controls and education very effectively [Schade and Schlag, 2003]. In contrast, the Kenyan police is currently not conducting large scale preventive alcohol tests and the risk attribution of the drivers to alcohol can be rated as very low. It can be assumed that the combination of alcohol and driving is mostly a problem caused by groups in society which can afford (the use of) a vehicle and that disadvantaged groups are affected by the accidents.
- Another topic mentioned is speed. A speed limit of 50 km/h exists on urban roads, but actual speeds often reach up to 90 km/h as long as congestion does not cause lower levels. Foreigners and two Kenyans recognized a holistic approach to reduce speeds to 30/50/80 km/h (residential, trunk roads and fully segregated highways, respectively) as an essential approach to reduce the risk of all road user and especially NMT-users. If modern roads are designed for high speed, more effort is needed to keep the driven speed at a safe level.

#### 4.6 Environmental pollution

Environmental and ecological issues play a minor role in the perception of the interviewees. Seven mention air pollution as a problem, but none turned out to be familiar with detailed effects of different pollutants. Four interviewees personally notice the difference between air quality in Nairobi and in rural areas. Other problems seem to exceed environmental issues in the perception by far.

The misinterpretation of the interviewees of the environmental situation in Nairobi is proved in Kinney et al. [2011]: Exploratory measurements of fine particulate matter (PM<sub>2.5</sub>) show very high daytime concentrations (50.7 to 128.7 µg/m<sup>3</sup>) at sites adjacent to roadways. Those values clearly exceed the WHO’ 24h-average guidelines of 25 µg/m<sup>3</sup>. [Kinney et al., 2011, p. 373] Taking the large number of individuals who walk, work or

trade in informal businesses directly along the roadside, many are exposed to high long-term risks of respiratory diseases. Traders, sitting at booths are likely to be exposed on an even higher level because of higher concentration levels on ground level.

The data above reveals a rather high urban background level ( $10.7 \mu\text{g}/\text{m}^3$ ). If this is seen as a city-wide minimum level, the exposure for residents in informal settlements is likely to exceed the WHO-guidelines as well. In addition to the urban background, they are affected by local transport emissions as well as smoke from charcoal cooking and other fires.

The magnitude of results from air pollution measurements for a single pollutant type should be seen as a warning call. Based on fuel quality [UNEP] and vehicle condition, other pollutants like Carbon Monoxide (CO), Hydrocarbons (HC) and especially Sulfur Dioxide can be expected to be above health guideline values, too. Having no data available shall not lead to the conclusion that there is no problem. Therefore, implementing a year-round air quality monitoring, the compilation of an air pollution inventory and an effective action plan to reduce emissions are the first steps for improvements.

## **5. Conclusions and outlook**

All interviewees considered transport as a key issue in the development of the city of Nairobi in the next decade. Users of all modes of transportation are highly unsatisfied with the current situation, but the proposed solutions by the interviewees vary widely. The fact that transport strategies exist is already noteworthy. One half of the interviewees see the current infrastructure programs as a big step for further development, but the remaining half consider a well designed combination of improved public transport and NMT as the only long-term solution.

The current investments in road infrastructure only benefit the upper class and - to a limited degree - the upper middle class. The large majority of the population is far from being able to afford motorized transport. Even indirect positive benefits to those disadvantaged people were not pointed out during the interviews. Instead, the disadvantaged people have to carry a burden of an unacceptable infrastructure for NMT-users, danger of life due to accidents and long-term health effects from air pollution and noise. The magnitude of environmental injustice differs greatly in absolute terms compared to developed countries. In contrast, the perception for EJ turned out to be very low during most of the interviews. A possible explanation may be the exceedance of EJ in transport by other social issues like poverty, housing, food or health care. However, EJ in transport is a key for participation of the already disadvantaged majorities in daily life and for fulfilling their needs. The basic idea of EJ can easily be transferred to Kenya.

Today, the Kenyan government is still moving into a different direction. Besides the mentioned Thika Highway, more roads are newly built or considerably expanded. The created space for cars will quickly generate more cars ('induced traffic') which results again in 'parking lots' on the newly built roads. A vicious cycle starts as experienced in many other metropolitan areas of the world. For stepping out of this cycle, the implementation of usable alternatives is needed. Special attention has to be put on

providing accessibility to all groups of society. Projects like the Bus Rapid Transit system being currently prepared by the Sustran-consortium aims at solutions for middle class. The project can only be one small component of an integrated strategy. Further elements of public transport fitting to the local habits and especially NMT-measures are needed.

Industrialized and best-practice developing countries should provide knowledge transfer to combine international experience with local circumstances. Donor countries should not support industrial development for their own national industries, but instead provide help to ensure a sustainable development in urban transport. That way they could prevent Nairobi from repeating their own unsustainable development they did themselves in their own countries. However, a declared intention to take this social and sustainable path by Kenya is a prerequisite.

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