

# Executive Summary

## Transport and Environment in Sub-Saharan Africa

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# The TEST Network

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The TEST Network aims to support Sub-Saharan Africa (SSA) countries in formulating and implementing sustainable transport policies which contribute to poverty reduction and sustainable economic development. TEST Network members in South Africa, Tanzania, Uganda, Zimbabwe and Zambia work in partnership with SEI and EURIST.

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# 1. Introduction

Transport in Sub-Saharan Africa is characterized by the following facts:

- **Transport policies in Sub-Saharan Africa (SSA) are of critical importance to the delivery of sustainable cities, healthy citizens, poverty eradication and achievement of the Millennium Development Goals (MDGs).**
- **Road safety in Africa as a whole is extremely poor** having only 2.8 per cent of the world's motor vehicles yet accounting for 11.1 per cent of global road fatalities.
- **Traffic congestion in SSA cities is on the rise with some cities approaching gridlock.**
- **The urban populations of SSA are growing rapidly, faster than in all other regions of the world,** and this situation is expected to continue over the next two decades.
- **Urban air pollution in African developing countries is rapidly worsening due to vehicle fleet growth, increasing distances travelled, and high rates of emissions from vehicles.**
- Globally, transport accounts for about 25 per cent of energy-related carbon dioxide (CO<sub>2</sub>) emissions and **reducing emissions from the on-road transportation sector can yield rapid and longer-term climate benefits.**
- **Published data on traffic congestion, air pollution, including greenhouse gases (GHGs), and road safety tend to be of poor quality in SSA.**

The aim of this Report is to provide an introduction to the transport and environment issues in SSA countries. It focuses on the key transport-related areas of air pollution, road safety, traffic flow management, equity and climate change. Best practice case studies from SSA and internationally in these areas are also identified and recommendations made for the development of sustainable transport systems in SSA countries.

## 2. Urban Air Pollution

Urban air pollution in cities of SSA is on the rise due to rapid urbanisation, increase in motorization and economic growth. Urban outdoor air pollution is responsible for an estimated 75,500 premature deaths each year in Africa and 49,100 in SSA. One main cause of urban air pollution is the use of fossil fuels in transport. The lack of emission controls on vehicles, and poor monitoring and enforcement systems, further exacerbate pollution problems. These emissions have a wide range of direct and indirect effects on ecosystems, agriculture and materials in addition to human health. **There is a growing need in SSA to determine the state of urban air quality and identify the most effective measures to protect human health and the environment.**

### Air quality management in SSA

*Policies.* Legislation on environmental protection, in the form of Environment Protection Acts, has been developed in the majority of SSA countries. These acts often specify vehicle fuel parameters, emission standards and air quality standards (AQS). Out of 27 SSA countries, 16 have set fuel specifications for gasoline and 14 for diesel. The status for sulphur content in diesel is shown in Figure 2.1, only five countries have promulgated emission standards for vehicles and only eight have set AQS. **A substantial development in SSA is the phasing-out of lead, which started in 2003 and is now completed in all SSA countries.**

*Air quality monitoring.* Only eight SSA countries have operational routine monitoring systems (Botswana, Ethiopia, Ghana, Madagascar, South Africa, Tanzania, Zambia, and Zimbabwe). Air pollutant concentration

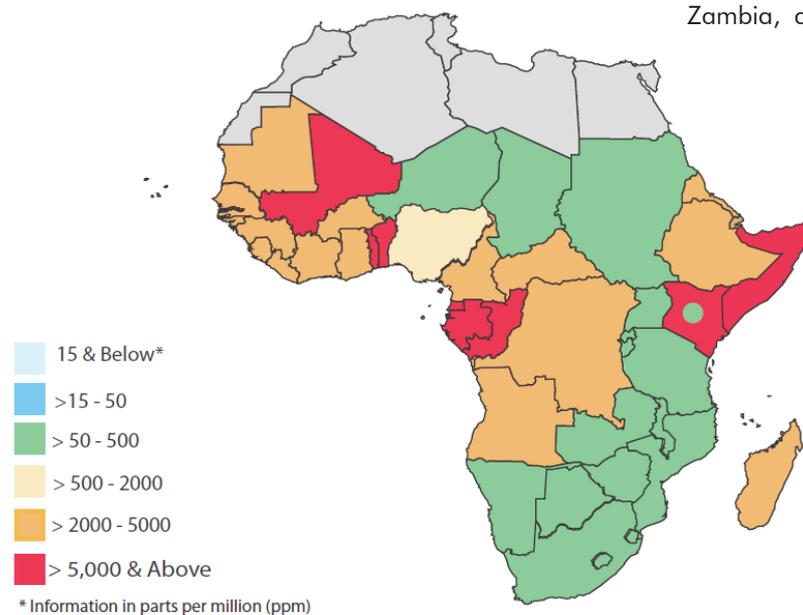


Figure 2.1: Status of diesel sulphur content in Sub-Saharan Africa

Source: PCFV, 2012 Africa, diesel sulphur map. Partnership for Clean Fuels and Vehicles, United Nations Environment Programme, Nairobi. [Available at: <http://www.unep.org/transport/pcfiv/> accessed 30 August 2012]

monitoring is used to test compliance with air quality standards (AQS). AQS have been set or proposed in ten SSA countries – i.e. Botswana, Burkina Faso, Ghana, Kenya, Mauritius, Nigeria, South Africa, Tanzania, Uganda, and Zambia.

*Impacts.* Information on the impacts of air pollution on human health and the environment is rare in SSA countries. A few countries have performed studies on health impacts and in two countries, cost estimates of air pollution have been performed.

*Finances.* As health and a sound environment are basic human rights often laid down in the Constitutions of African countries, decision makers need to be made aware of their responsibilities and of the need to finance air quality management (AQM). The support of international development agencies is crucial to enhance the AQM capacity of these countries. AQM can be considered comprehensive only in South Africa and advancing in Ghana; the AQM capability of being judged to be at an intermediate stage in Botswana, Madagascar, Zambia and Zimbabwe and either at an initial or early stage or entirely absent in other SSA countries.

### Challenges for AQM in SSA

Despite some progress being made in SSA countries, **air pollution continues to pose a threat to human health, environment and quality of life in cities.** Some of the challenges are: old vehicles without emissions control, absence of proper vehicle maintenance, lack of cleaner fuels, inadequate regulatory framework specific to vehicle emissions, and poor enforcement of laws and regulations when they exist.

**Most SSA countries address AQM in an *ad hoc* fashion.** Only South Africa is well on the way to developing a

fully-fledged AQM system although Madagascar and Ghana are making good progress. In almost all SSA countries, there is a lack of monitoring equipment, poor awareness and lack of stakeholder participation. Design and implementation of AQM strategies are often based on poor knowledge, inadequate planning, and a lack of technical and financial capacity. Also, AQM responsibilities are often shared by several ministries.

**In almost all SSA countries, emission inventories do not exist** and there is only **limited or no spatial coverage of SSA cities by outdoor air quality monitoring.** Due to the lack of quality-assured emission data and source apportionment experience, **air quality modeling is hardly applied in SSA countries.**

**There is a lack of studies of health, environmental and economic impacts of air pollution in SSA countries.** This is partly due to the absence of air quality monitoring capability in most SSA countries although insufficient institutional capability and a lack of national health surveillance systems may also be to blame.

### AQM policy measures

Initial building blocks for AQM include monitoring data analysis, identification of sources and their relative contribution, action planning (including economic analysis), and implementation. Rational AQM includes several approaches: command and control, application of economic instruments, co-regulation and stakeholder voluntary initiatives, and self-regulation. Awareness-raising and the provision of information to the public is also an integral part of AQM. The main Report contains summaries of the low cost policy instruments and low cost AQM tools that are now available as well as listing, for each SSA country, those tools likely to be most appropriate for enhancing their AQM capability.

### 3. Road Safety

**The loss of life, injury, disability, suffering and distress associated with road crashes are a major public health and quality of life problem.**<sup>1</sup> Of the 1.2 million road traffic fatalities globally each year, 90 per cent are in low and middle-income countries such as those in SSA. Africa has the joint highest road crash fatality rate of all global regions at 32 per 100,000 population. Fifty per cent of all fatalities are amongst vulnerable groups (e.g. pedestrians, cyclists and public transport users) and death and injury burdens are heavily skewed towards lower income groups. It is estimated that by 2030, road crashes will be the fifth leading cause of death globally (it is currently the ninth leading cause of death) putting road crash deaths ahead of diabetes and HIV AIDS. **The report notes that road traffic crashes are predictable, can be prevented and that fatalities in SSA can be dramatically reduced.**

#### Current Trends in Road Safety in SSA

**The number of citizens killed, injured or disabled as a result of road crashes is often under-recorded in Africa.**

For example in Africa, the total number of fatalities in road crashes recorded by official statistics for the latest year for which data were available was 52,302 whereas the modelled figure is 234,768. Table 3.1 summaries basic road safety data for six selected SSA countries although these numbers are likely to under-state the true situation.

**Road traffic crashes are predictable and preventable and there is no logical cut-off point below which deaths are acceptable and above which they are not acceptable.** Figure 3.1 presents recent trends in road traffic deaths for the five TEST countries.

Table 3.1: Road Safety data for selected SSA countries (mainly 2007 data)

	Population in millions	Reported deaths	Reported non-fatal injuries	% deaths that are pedestrians
<b>Mozambique</b>	21.39	1502	7065	68
<b>South Africa</b>	48.57	14920	219978	39
<b>Tanzania</b>	40.45	2595	16308	37
<b>Uganda</b>	30.88	2838	12058	35
<b>Zambia</b>	13.34	1037	13819	26
<b>Zimbabwe</b>	11.92	1266	9258	50

Source: Country tabulations in WHO (2009)<sup>2</sup>

In SSA, there were 59,000 deaths in 1990 and these are predicted to rise to 144,000 deaths by 2020. In Africa the prediction is that road crash deaths will be the seventh leading cause of death in 2030 and the fourth leading cause of Disability Adjusted Life Years (DALYS) lost in 2030. In May 2011, the Decade of Action for Road Safety 2011-2020 was launched by the United Nations with one goal: to prevent five million road traffic deaths globally by 2020.

<sup>1</sup> Here the word "accident" is not used when discussing road safety as we (as well as WHO) do not regard road crashes, injuries and fatalities as accidental but as being predictable and preventable.

<sup>2</sup> WHO, 2009. Global Status Report on Road safety. Geneva: World Health Organisation. [Available at: [http://www.who.int/violence\\_injury\\_prevention/road\\_safety\\_status/2009/en/index.html](http://www.who.int/violence_injury_prevention/road_safety_status/2009/en/index.html)]

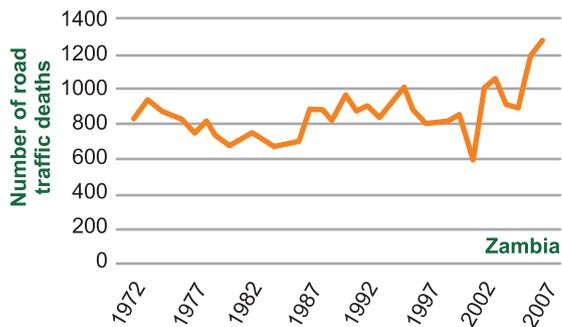
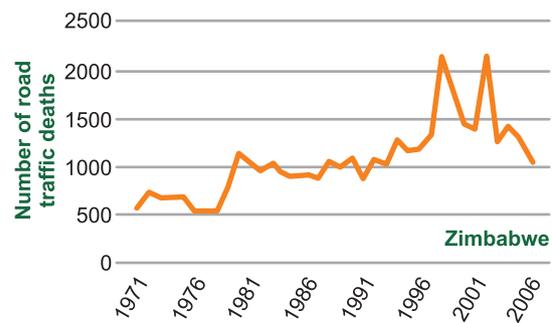
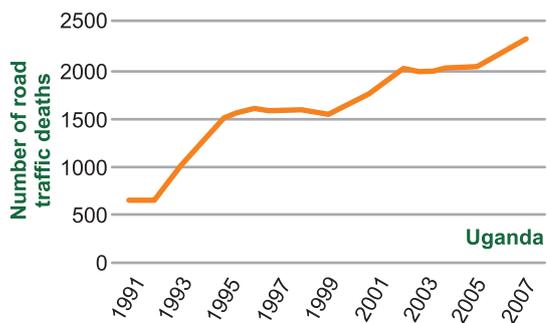
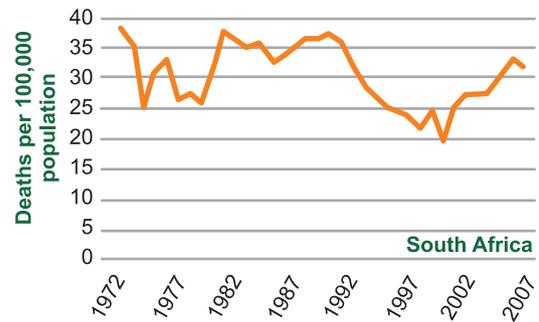
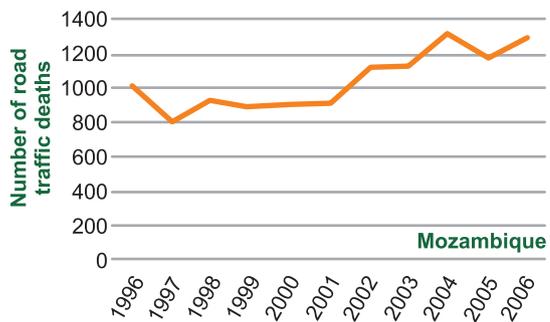


Figure 3.1: Trends in road traffic fatalities in selected SSA countries

Source: (WHO, 2009)

## Challenges for Road Safety Management

Key challenges that require co-ordinated actions to bring about a step change in the quality of life and safety of citizens in SSA include the following:

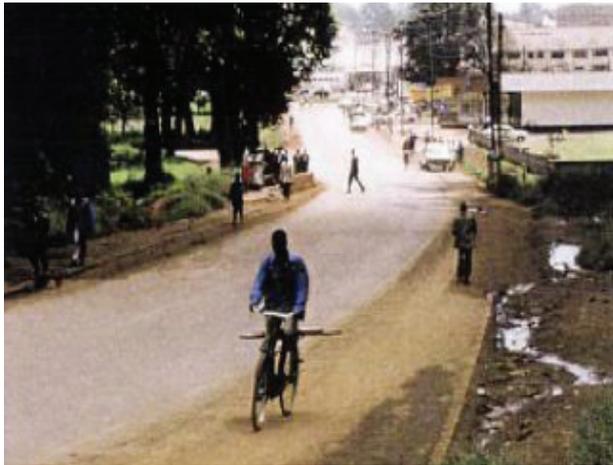
- **Changing mindsets** to recognise the importance of high quality, safe pedestrian space and cycling routes;
- **Adjusting urban planning and the provision of education and health care facilities** to deal with safety and security;
- **The provision of public transport services;**
- **Education and awareness-raising** on the part of all road users about mutual responsibilities;
- Reduction of **road traffic speed;**
- **Inspection and maintenance of vehicles;**
- **Development of institutional capacity** to deal with road safety issues.

## Road safety policy measures

The main categories of road safety policy intervention that can produce dramatic reductions in death and injury have been known for many years. Exposure to road injury risk can be decreased by strategies that include:

- **Reducing the volume of motor vehicle traffic** by means of better land use;
- **Providing efficient networks** where the shortest or quickest routes coincide with the safest routes;
- **Encouraging people to switch** from higher-risk to lower risk modes of transport;
- **Placing restrictions** on motor vehicles users, on vehicles or on the road infrastructure.





Kisumu Road Prior to Intervention



Median on Kisumu Road

Effective road safety interventions in the specific conditions of SSA must embrace:

- **Reducing the exposure to risk** focusing on land use policies and traffic reduction;
- **Attention to detail** in the physical environment in which pedestrians, cyclists and public transport users move around to make safety intrinsic to all aspects of the design process;
- **Speed reductions** (e.g. 30 km/hr limit zones);
- **The elimination of poor quality bus services** with replacement of old vehicles, improved regulation and safety checks and a highly co-ordinated and integrated bus service network that prioritises passenger safety as they walk to and from, and wait at, bus stops.

### Road Safety Case studies

In most SSA African cities, half of the trips are made on foot, and pedestrians and cyclists are those most affected by road crashes. There is a need to increase awareness amongst politicians, planners, engineers and the public of the importance of addressing the needs of these non-motorised transport (NMT) users. The following case studies (presented in detail in the main report) demonstrate that significant improvements can be made through relatively small interventions.

- *Beijing project of improving vulnerable road users (VRU) safety at intersections.*
- *The Eldoret non-motorized safety project (before and after pictures shown above).*

## 4. Traffic Flow Management

Traffic congestion is becoming common in many major urban centres in SSA as the number and use of motor vehicles increases. Traffic congestion impedes economic development and has a number of social and environmental impacts. **Traffic flow management (TFM) is a set of strategic practices utilized by transport authorities to ensure uniform vehicle flow and to avoid delays due to congestion and ultimately to improve safety.**

### Current trends in traffic flow management in SSA

Although affecting many African countries, the extent of the congestion and delays experienced and the resulting economic, social and environmental impacts are rarely quantified or assessed. Little published data on traffic congestion trends for Africa are available. However, besides infrastructure challenges, **it is recognised that poor road discipline is also one of the main causes of urban congestion.**

### Challenges in traffic flow management in SSA

The first challenge is to make city authorities aware of the importance of efficient, affordable mass transit and non-motorised transport as a means of ensuring traffic flow and economic growth. Secondly, it is necessary to provide governments with knowledge of how to implement cost-effective models that result in a maximum of environmental, social and economic benefits. These models will have to be able to address:

- ineffective public transport and its poor network integration;
- the lack of transport demand measures (i.e. parking policies, road pricing);
- the poor quality of cycling and walking infrastructure;
- the lack of integrated land use policies (to reduce travel distances and demand).



An 'Avoid-Shift-Improve' approach could provide the opportunity to "leapfrog" to a transport system that provides efficient, convenient and attractive alternatives to the private car. However, there will be political, technical and financial barriers to overcome in SSA.

### Traffic flow management policy measures

Policy measures taken around the world to improve traffic flows and reduce congestion include:

- the avoid, shift or improve approach;
- Traffic Demand Management (TDM);
- Intelligent Transport Systems (ITS); and
- traffic management.

In the Report, case studies on TDM are presented, together with lessons to be learnt for Africa. **Approaches such as TDM, ITS, and traffic management are transferable to Africa where they can improve transport service delivery and reduce levels of congestion as well as decreasing pollution and contributing to improved overall wellbeing of urban dwellers.**



## 5. Transport and Equity

Transport plays an important role in economic and social development of people. It can be a powerful catalyst to sustainability by providing 'interconnectivity, learning and development', that are essential to the empowerment of socially marginalised and disadvantaged groups.

The poor and marginalised groups living in rural areas often walk, or use cycles, rickshaw vans, animal carts etc. that are environment-friendly and do not account for GHG emissions. **Focusing on the transport behaviour of these groups may hold a key not only to achieving social equity and sustainability in transport, but also to making progress towards the goal of low-carbon development and growth.**

*Equity* in transport relates to the targeting of transport policies to ensure an equitable appropriation of space, from the standpoint of accessibility, safety and environmental protection. It is a situation in which people are granted satisfactory living conditions and opportunities such as access to education and health services irrespective of their individual physical, economic, social, religious or ethnic characteristics.

Ideas of equity and social justice in transport planning tend to support those tools that provide affordable modes, discounts and special services for economically and socially disadvantaged groups. There is often a bias in the current planning practices which tend to value 'mobility' over 'accessibility', and motorized modes over non-motorized modes. Although there may be inherent biases in any trade-off, progress has recently been made in improving the tools for equity, particularly in developed countries.

### **Equitable transport management in SSA**

Currently the monetary costs of roads, the productivity costs of congestion and the health costs of air pollution and climate change are inequitably spread among



motorists and non-motorists alike. **Mechanisms are therefore needed to make transportation pricing fair, equitable and economically efficient. In SSA countries leadership and investment is needed to achieve this paradigm shift.**

### **Tools for equitable transport development**

Transport inequities exist in accessibility, access time, speed, comfort, cost and space appropriation by various categories of people who may experience numerous impacts. There are also a variety of tools for measuring these impacts (see main Report) and a particular decision may seem equitable when evaluated by one particular tool but inequitable when using a different tool. For example, current transport evaluation practices exaggerate the benefits of automobile-oriented improvements and undervalue improvements to alternative modes, because they are based on demand (the amount of transport that people can afford) rather than need (the amount of transport that people need to access basic services and activities).

### Transport and equity case studies in SSA

The main report highlights various initiatives in selected SSA countries that provide emerging insights into how a focus on increased accessibility and mobility can integrate equity and development. Though these developments are still anecdotal and provide only locally specific experience, they do have potential to provide for important lessons in conceptualising equity in comparatively resource-and-accessibility disadvantaged contexts. The case studies include:

- Build a Better Bicycle (BABB) project in Mozambique;
- The Miracle Health Train in South Africa ;
- Donkeys as Pack Animal in Tanzania;
- Use of Peace Bikes to Help Reduce Female Violence in Uganda;
- Recognising the Uses of Indigenous Transport Modes in Zambia;
- Motorbike Ambulance in Remote Areas in Zimbabwe.

**The case studies illustrate the potential benefits of well-designed transport interventions aimed at addressing the needs of the marginalised poor in remote areas.**

### Specific issues: poverty, gender, age, and transport disability

An important factor contributing to poverty in rural areas, in developing countries, is low accessibility. The amount of time spent in collecting water, obtaining fuel, getting to the school, the clinic, or the market may be seen as wholly unproductive or even 'wasted' time. In many countries growth is stunted because of the costs of transportation and the lack of adequate transport; **poor access is the**

### most significant factor restraining agricultural development and limiting poverty alleviation.

The Report addresses equity issues such as:

- *Gender* - how interventions in transport can affect both women and men;
- *Age* - reduced mobility or lack of mobility or lack of access to transport is a serious problem for elderly people in SSA;
- *Transport disability* - a lack of access to independent travel often creates social exclusion for many disabled people and has implications for their access to education, employment, health services, social events and leisure pursuits.

### Understanding transport and equity in SSA

An equitable and sustainable transport system can be developed when all users' needs and expectations are taken into account equally. Key lessons from this chapter are that:

- there is a great need to integrate best practice into existing transport planning;
- transport planning needs to be developed in collaboration with local community institutions and the government;
- systematic gathering of relevant information on land-use change, transport needs of various sections of the population, access to transport, and sharing this information to all concerned is required; and
- equity and sustainability must be recognized as being central issues in transport planning.

## 6. Transport and Climate Change

Climate change is a major threat to sustainable development in Africa and the achievement of MDGs. **Africa is the continent least responsible for climate change and at the same time especially vulnerable to its effects** which include reduced agricultural production, worsening food security, increased incidence of both flooding and drought, spreading of disease and an increased risk of conflict over scarce land and water resources. This overall context calls for clear evidence of effort and success in reducing greenhouse gas (GHG<sup>3</sup>) emissions wherever possible whilst at the same time recognising Africa's development needs. This chapter outlines some

the policies measures and interventions that could be taken by SSA countries to reduce GHG emissions from the transport sector.

### Transport and climate change in Africa

The estimated growth of transport-related CO<sub>2</sub> emissions to 2050 is shown in Figure 6.1. Although Africa's proportional contribution globally is small the steep growth trajectory up to 2050 is a cause for concern and a strong stimulus for the development of transport policies and interventions that can deliver economic and social progress at a much reduced level of CO<sub>2</sub> emissions.

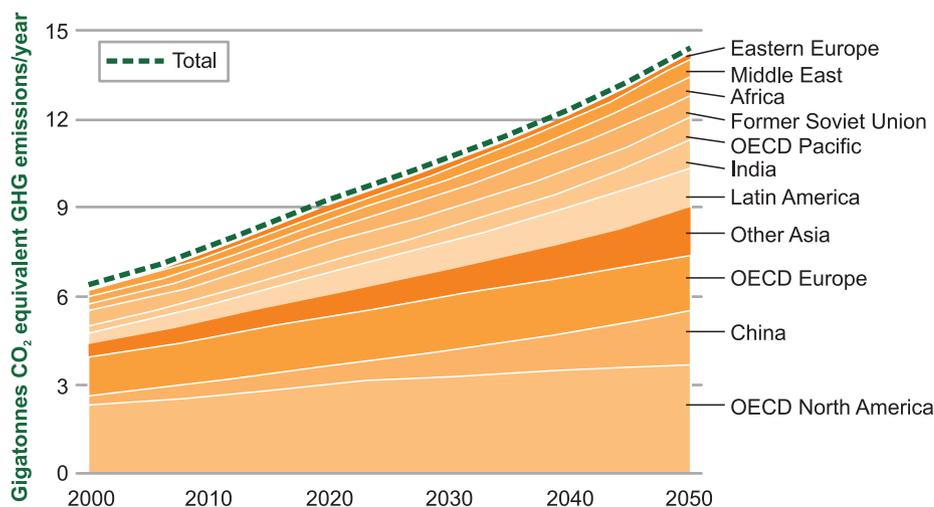


Figure 6.1: Transport related well-to-wheels CO<sub>2</sub> emissions by region

Source: WBSCD (2004)

<sup>3</sup> A greenhouse gas (GHG) is a gas in the atmosphere that absorbs and emits radiation within the thermal infrared range. The accumulation of GHGs is responsible for climate change. The primary GHGs in the Earth's atmosphere are carbon dioxide, methane, nitrous oxide, ozone, and water vapour.



### Challenges for climate change and transport in SSA

The vehicle fleet in SSA is growing with a high proportion consisting of second-hand, imported vehicles. Inspection and maintenance is often absent or insufficient. This means poorly maintained and inefficient vehicles on the roads increasing vehicle exhaust emissions which affect urban air quality and contribute to climate change (see Chapter 2).

Financing is a key challenge for many SSA countries with limited budgets and competing priorities. However current financing frameworks are often skewed towards supporting road construction and motorization which will lead to more car dependent mobility patterns. Climate finance, whose main purpose is to provide resources to support climate mitigation (or adaptation) actions, has grown rapidly over the past decade. Unfortunately, climate finance has so far been limited in its support for sustainable transport.

### Carbon reduction policy measures

A range of policy options can deliver low carbon/low cost transport solutions (see Figure 6.6 in the main Report). They can be categorised within an A-S-I strategy:

**A = Avoid** so that distances between destinations are kept short.

**S = Shift** so that wherever possible, transport demand can be shifted from cars to public transport, walking and cycling and freight can be shifted from truck to rail and water.

**I = Improve** so that vehicles that use fossil fuel can be designed to be more fuel efficient.

The main Report summarises ten principles and associated examples that can bring about sustainable transport and improved quality of life in urban areas with multiple benefits including reduced CO<sub>2</sub> emissions. These ten

principles are all worthy of detailed consideration in SSA cities and all are relatively low cost and much cheaper than huge highway, freeway and car parking projects.

### **Transport and climate change risk management in SSA**

In relation to transport, climate change risk management (CCRM) is a generic term referring to an approach to climate-sensitive decision making in the transport sector. CCRM seeks to promote sustainable transport by reducing GHG emissions from transport and the vulnerability associated with climate change risk. **Integrated transport-related CCRM may reduce adverse climate related impacts in many climate sensitive sectors and promote growth, essential to enabling poor individuals to escape poverty.** Effective CCRM also has the potential for co-benefits as mitigation of GHGs also reduces air pollutant emissions from transport, and adaptation to climate change can help promote growth, essential to enabling poor individuals to escape the poverty trap.

**What is needed in SSA is an integrated and participatory approach that incorporates climate change information into multidisciplinary transport planning and projects.** Improving transport management and reducing climate change risk will increase the resilience of infrastructure systems, and strengthen the capacity to adapt to future climate change phenomena such as extreme weather events. **Climate change risk management through GHG mitigation and climate change adaptation has to be perceived as a core development issue for SSA countries.**

### **Understanding transport and climate change in SSA**

Considerable knowledge exists about those transport interventions, initiatives and infrastructure improvements that can contribute to sustainable human development in developing countries while reducing CO<sub>2</sub> emissions. Finance will be a challenge to many SSA countries that will have to address competing social, economic and environmental priorities. However, it is clear that a number of measures have potential co-benefits that are low carbon but could help improve the quality of life of many African urban dwellers. Measures such as bus regulation and planning, promoting NMT, land use planning and bus rapid transit which assist SSA countries avoid the hyper-motorization phase often associated with development.

## 7. Conclusions and Policy Recommendations

Transport policy decisions have a hugely important impact on the lives of hundreds of millions of people in SSA. **There is a large number of well documented ways in which we can improve the quality of life of Africa's citizens.** We can improve air quality and public health, remove the scourge and distress caused by death, injury and disability as a result of road crashes and increase the likelihood of widely disseminated economic gains to all sections of society.

**A transport policy for SSA must be embedded in a poverty eradication policy** and poverty eradication must deliver real gains in transport as it affects 800 million SSA citizens. This policy synergy, if well integrated, provides a huge opportunity to deliver successful outcomes. Transport policy at every level in SSA countries must focus on five central organising principles:

- **Ensuring that all public health measures deal with the debilitating and costly consequences of air pollution on human health** (Chapter 2).
  - **Freeing up urban road space by improving traffic flow conditions** in a way that stimulates economic activity and job creation and avoids the generation of new traffic (Chapter 4).
  - **Reducing GHG emissions** through the 'avoid, shift, improve' strategy (Chapter 6).
- SSA has some very serious transport problems but these present all decision-takers and policy makers with opportunities to re-shape traditional policies to produce a step-change improvement in quality of life for citizens and to deliver urgently needed poverty alleviation. The main Report shows how those policies and interventions can be re-shaped and the task now is to orchestrate the political and professional support and unwavering commitment to deliver all these virtuous outcomes.

- **Creating the maximum possible accessibility conditions for all social groups and all income level and genders** so that all citizens can access health care, education, training and jobs with minimal effort, costs and expenditure of time on the journey. (Chapter 5).
- **Creating a safe, secure urban environment** with the minimum possible risk of death and injury from road crashes for men, women, children, the elderly, pedestrians, bus users and cyclists (Chapter 3).

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