

# ***A GUIDE TO LOW-CARBON TRANSPORT***

***Transportation, climate change and the UN  
Framework Convention on Climate Change  
17th Conference of the Parties (COP17) in Durban, 2011***



**transport**

Department:  
Transport  
REPUBLIC OF SOUTH AFRICA



# A GUIDE TO LOW-CARBON TRANSPORT

SOUTH AFRICA'S ROLE AS HOST for the UN Framework Convention on Climate Change Seventeenth Conference of the Parties (COP17) places the country in the spotlight, not just in terms of hosting the event, but also with regard to the role South Africa plays in both producing and mitigating carbon emissions.

This guide to low-carbon transport is intended to inform debate within the South African transport sector on the impact of transport on climate change and the potential for low-carbon and sustainable transport to mitigate climate change effects. The contents are by no means exhaustive, but should be seen as indicative of a number of the potential approaches that can be applied in urban areas to reduce consumption of fossil fuels, decrease emissions of greenhouse gases and contribute to more livable cities.

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# THE ROLE OF TRANSPORTATION IN CLIMATE CHANGE

*Fossil fuels are changing our climate, and so that's what we've got to change. It's high time for a rapid mobilisation to a 100% safe, just, renewable energy future. - Bill McKibben, founder, 350.org*

**T**he transport sector accounts for 13% of all greenhouse gas (GHG) emissions and 23% of energy related ones on a global level.

The OECD (Organisation for Economic Co-operation and Development) predicts a 120% growth of global transport emissions on year 2000 levels by 2050. Transport-related CO<sub>2</sub> emissions are expected to increase 57% worldwide in the period 2005 to 2030.

While the largest share of GHG emissions from the transport sector is emitted from developed countries, much of the growth will come from the developing countries (approximately 80% of the predicted increase). With these figures in mind, it is obvious that the world cannot address the climate change

challenge and limit temperature increases to less than 2 °C without tackling transport. The transport sector, and land transport in particular, has the potential to play a significant role in reversing the current trend towards permanent changes in the world's climate.

However, as Gary Kendall, author of WWF publication 'Plugged In: The End of the Oil Age' puts it, mobility enables economic development. 'Everything that is burning petroleum greatly enhances levels of mobility and therefore economic activity. That is why we move. Mobility provides access to goods, employment, commercial and social services, access >

*'Transport is the economy' – Dr Gary Kendall*



- Road transport is responsible for 74% of all transport emissions globally. Private cars account for a large portion.
- Aviation accounts for 12%. Short haul flights are the worst emitters, as the most fuel is consumed in take-off and landing.
- Shipping accounts for 10%. The industry, in addition, is very polluting of the sea and river waterways.
- Rail accounts for 2% of global transport emissions. However, many rail systems operate off electricity generated by fossil fuels, and these emissions are not included in the figure. In addition, the rail systems of many countries still operate partly or fully on diesel.

***MtCO<sub>2</sub>e means megatonnes of carbon dioxide equivalent.***

***In 2009 there were more than eight million motorised vehicles on South Africa's roads***

Private cars	5 411 093
LDVs – bakkies	1 946 292
Trucks	321 604
	(compared to 229 000 in 2000)
Motorcycles	362 400
Minibuses	282 941
Buses	45 217 (about 25 000 in public transport)
Other and unknown	230 484

to friends, relatives, communities and leisure; it also provides access to raw materials, employees, suppliers, customers and consumers and so on – another way of looking at it is to say, transport is the economy.'

It is disappointing to see that the transport sector has not benefited significantly from the existing financial mechanisms under the United Nations Framework Convention on Climate Change (UNFCCC) process and its Kyoto Protocol, the current international governing structure in place to address climate change worldwide. For example, only 36 of the 3 329 projects within the Clean Development Mechanism pipeline and six of the 3 395 projects that had been registered by September 2011 are transport sector projects. This calls for a much larger role of the transport sector in any possible future agreement that may come after the first commitment period of the Kyoto Protocol in 2012 or any bilateral and regional initiatives to combat climate change.

An important way in which transport contributes to GHGs is through fossil fuel combustion. Fossil fuels contain a substantial amount of carbon, and when these fuels are burned in the presence of oxygen they form carbon dioxide. Emissions generated during the production of electricity, and those produced during the manufacture of liquid fuels, also contribute to the production of GHGs.

### ***Transport emissions in South Africa***

South Africa requires more transport relative to its GDP size than any other economy. This is because the economy is 'spatially challenged' ie unlike most countries with a coastline, South Africa's industrial centre is far inland. In addition, the distances between cities are vast. South Africa accounts for 0.4% of the world's total GDP, but 0.7% of the world's transport costs and 2.2% of the world's surface freight tonne kilometres (road and rail combined).

### ***A breakdown of the three primary greenhouse gases emitted from transport in 2000***

<b><i>GHG</i></b>	<b><i>EMISSIONS (MtCO<sub>2</sub>e)</i></b>	<b><i>% OF TOTAL</i></b>
Carbon dioxide (CO <sub>2</sub> )	38.624	97.8%
Methane (CH <sub>4</sub> )	0.258	0.7%
Nitrous oxide (N <sub>2</sub> O)	0.629	1.6%
<b><i>Total</i></b>	<b><i>39.5</i></b>	

Road-based transport (diesel and petrol) contributes 93.1% of these greenhouse gases.



***'The transport sector has not benefited significantly from the existing financial mechanisms under the UNFCCC process and its Kyoto Protocol.'***

In South Africa, 2008 data suggest that the energy used in transportation contributes about 46.3 MtCO<sub>2</sub>e, or 13% of total local GHG emissions. (This figure only includes emissions from diesel and petrol consumption, however, and does not include emissions from electricity generated to run electric trains or bunker fuels.)

South Africa has an additional source of CO<sub>2</sub> emissions resulting from the production of petrol and diesel fuel through the Coal to Liquid process. Production of these synfuels, which provide approximately 20% of South Africa's petrol

and diesel needs, added a further 47.2 Mt of CO<sub>2</sub> to the atmosphere in 2010, making this one of the most significant sources of CO<sub>2</sub> emissions in the country. 

SOURCES: BRIDGING THE GAP (RAMON J CRUZ); SATAWU (JANE BARRETT); SOUTHERN AFRICAN TRANSPORT CONFERENCE (SATC 2011); SASOL SYNFUEL ANNUAL REVIEW 2010.

***South Africa has 700 000 km of road and only 18 000 km of rail track.***

# COP16

## IMPLICATIONS FOR THE TRANSPORT SECTOR

**T**he United Nations Framework Convention on Climate Change (UNFCCC) is an international environmental treaty which was produced in 1992 at the Earth Summit held in Rio de Janeiro. The objective of the treaty 'is to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.' The Kyoto Protocol is an international agreement under the UNFCCC, which is used by the UNFCCC to effect the reduction of global emissions by 5.2% between 2008 and 2012 based on 1990 levels.

After the Parties to the UNFCCC were not able to

reach consensus on a legally binding agreement to curb GHG emissions after 2012, some of the confidence in the process was eroded.

A large focus of last year's COP16 in Cancun, Mexico, was to restore confidence in the process and push forward a series of agreements that are more realistic for today's world. Contrary to the expectations of many, considerable progress was made by Parties at the conference, particularly in relation to Nationally Appropriate Mitigation Actions (NAMAs), the verification of developing country mitigation actions through International Comparative Analysis (ICA), financing, technology transfer and capacity building.



***Below are some of the outcomes that could be beneficial to the transport sector:***

### **NAMAs**

The concept of NAMAs is still not concretely defined but it is understood to refer to voluntary emission reduction measures reported by national governments to the UNFCCC. These actions can have the form of policies, programmes or projects on the national, regional or local level. This presents a favourable scheme to develop mitigation activities in the land transport sector. From the 44 Parties that have submitted NAMAs (as of September 2011), 28 have made explicit reference to the land transport sector.

### **Finance**

At COP16, developed country Parties were invited to submit information on resources provided to fulfill the commitment for fast-start finance (US\$30 billion between 2010 and 2012) and to scale-up 'long-term finance' to developing countries (US\$100 billion a year by 2020). This represents an opportunity for transport stakeholders to ensure that criteria for funding can support activities in the land transport sector. In addition, it was decided to establish a Green Climate Fund (GCF) to operate as the UNFCCC's financial mechanism and to be operated by an independent secretariat and operated by the World Bank.

It went on to say that it would support projects using 'thematic funding windows', though it did not provide details of these windows.

### **Technology**

The COP established a 'Technology Mechanism' in order to support the diffusion and deployment of environmentally sound technologies and knowledge, increase investment in technology, review technological needs, provide guidance and facilitate collaboration. It would operate under the guidance of the COP and guided by a Technology Executive Committee and a Climate Technology Centre and Network.

### **Capacity building**


The outcome of the COP concluded that capacity building support to developing country Parties should be enhanced and developed countries should provide financial resources to support this. This represents opportunities for transport stakeholders to strengthen institutions, networks for sharing knowledge, climate change education and training, capacity to evaluate GHG impacts of spending and policies, and public awareness among other initiatives.

# EXPECTATIONS FOR COP17 IN DURBAN



**W**hile it is unlikely that the world will see a legally binding agreement to reduce GHGs at COP17, the conference in Durban might result in the most exciting set of accomplishments by the COP in recent years. There is a solid foundation for action laid out in the Cancun agreements of COP16. The meeting in Durban will consolidate recent advancements in the important areas of building the institutions to deliver finance and technology to developing countries.

On the Technology Mechanism, there has been progress towards the creation of the Climate Technology Centre and Network, which should be finalised in Durban. In a similar way, the Transition Committee to design the Green Climate Fund has outlined the path towards completing its work in Durban. These two developments are extremely positive for transport stakeholders and an incentive to work hard to include transport projects as part of NAMAs, since most likely both mechanisms will rely on the NAMAs registry for implementation.

There are areas nonetheless where it is uncertain if Durban will deliver successful outcomes. One is that the total sum of official emission reduction pledges until today adds up to only 60% of what is agreed is needed to keep the temperature increase to 2 °C. It is unclear if more countries will pledge more aggressive GHG emission reductions while at Durban. Another key issue that remains unsolved and will need to be answered in Durban is the future of the Kyoto Protocol. Many countries want the treaty to continue beyond the first commitment period that finishes in 2012, but some are not willing to continue into a second period in its current form. 



*At the heart of Durban's new bicycle network is the Durban International Convention Centre, from which COP17 delegates will be able to depart on a fleet of bicycles specially commandeered for the event.*

# FINANCING A LOW-CARBON ECONOMY - FROM CDM TO NAMAs

**T**he Kyoto Protocol effectively committed developed countries to emission reduction targets, which means they needed to take action to reduce emissions internally and as well as buy some carbon credits from developing countries. A carbon credit is a generic term for any tradable certificate or permit representing the right to emit one tonne of carbon dioxide or the mass of another greenhouse gas such as methane (CH<sub>4</sub>) with a carbon dioxide equivalent (tCO<sub>2</sub>e) to one tonne of carbon dioxide.

The carbon market has grown significantly since its inception, doubling in volume every year for three years since 2005. It peaked at \$144bn in 2009 and stalled to \$142bn in 2010, dropping for the first time since its inception. Most market commentators and participants are of the view that this is a result of the uncertainty about the carbon market post-2012.

## **Clean Development Mechanism (CDM)**

The Kyoto Protocol introduced three flexible mechanisms by which to reduce emissions, one of which is the Clean Development Mechanism (CDM).

The CDM makes it possible for developing countries such as South Africa, India, China and Brazil to participate in emission reduction efforts while positively contributing to sustainable development. The CDM is a project-based mechanism, which is governed by the CDM Executive Board, appointed by the UNFCCC (United Nations Framework Convention on Climate Change).

How it works is that a company in South Africa can initiate an emission reduction project, register it under the CDM, and generate carbon credits. These carbon credits could be sold to developed countries to assist them in meeting their targets under the Kyoto Protocol, while providing the much-needed cash injection in emission reduction projects in South Africa. The CDM was designed to enable technology transfer, build capacity and also encourage sustainable development. The specific definition and criteria for sustainable development based on economic, social,

and environmental elements is left to the individual host countries to define. In addition, if a project results in a reduction of greenhouse gases, uses an existing approved methodology, and is additional, then it could be developed as a CDM project. A project is regarded additional if the emissions from the project activity are reduced below those that would have occurred in the absence of the CDM project activity.

CDM projects go through a lengthy, highly technical and usually costly process to get to registration. With more than 3 300 registered projects, some believe the CDM to be a success; China and India account for about two thirds of these projects, with Brazil in third place. As at the end of August 2011, Africa had only 66 registered projects, with South Africa accounting for 19 of these (and none of these are transport projects).

The current under-representation of the transport sector could be explained by a number of barriers, such as:

- the difficulty in explaining the baseline scenario, due to the fact that transport projects contribute to a multitude of goals
- lack of positive lists of technologies that are common practice for easier demonstration of additionality
- data- and resource intensity of transport projects, making monitoring difficult and costly
- extensive linkages to other economic activities (makes it difficult to give boundaries to a project)
- transport's strong relationship with human behaviour, which can make evaluation difficult
- high CDM project related costs (including the cost of devices) versus benefits from CDM.

## **Nationally Appropriate Mitigation Actions (NAMAs)**

NAMAs were conceived in December 2009 at the International Climate Change Conference held in Bali (COP14). The Bali Action Plan, a document produced as an outcome from the conference, speaks of 'Nationally Appropriate Mitigation Actions by developing

countries in the context of sustainable development, supported and enabled by technology, financing and capacity building, in a measurable, reportable and verifiable manner.'

The Copenhagen Accord, an outcome document from COP15, speaks of two kinds of NAMAs. Those undertaken by developing countries themselves which 'will be subject to their domestic measurements, reporting and verification' and those that are 'seeking international support', which 'will be recorded in a registry along with relevant technology, finance and capacity building support'. These NAMAs 'will be subject to international measurements, reporting and verification in accordance with guidance adopted by the Conference of the Parties'.

The Cancun Agreement from COP16 invited developing countries to inform the Secretariat of the NAMAs for which 'they are seeking support, along with estimated costs and emission reductions, and the anticipated time frame for implementation'.

The general understanding so far is that the NAMAs are not restricted to actions that directly reduce GHG emissions, but that they can also include actions that will facilitate or enable the reduction of GHG emissions such as policy development. Thus NAMAs could also be implemented at provincial or city level.

At the end of August 2011, only 47 countries had registered their NAMAs with the Secretariat.

NAMAs are generally categorised as follows:

### **Unilateral NAMAs**

The developing country takes autonomous actions to reduce emissions using domestic financing. These actions can be used to meet international pledges.

### **Supported NAMAs**

These actions will enjoy support from the international community in the form of financing, technology or capacity building. These NAMAs could be supported by bilateral or multilateral agreements and even the Green Climate Fund. This fund was established in Copenhagen and was established to 'be an operating entity of the financial mechanism of the Convention to support projects, programmes, policies and other activities in developing countries related to mitigation including REDD-plus, adaptation, capacity-building, technology development and transfer'. These NAMAs could also receive up-front financing from developed countries. Support could include grants, loans, and policy development support. They would need to be registered in a registry.




- **Will MRV (Measurement, Reporting and Verification) measures be less restrictive than in the case of CDM?**
- **Can NAMAs be sector-specific, and at provincial and city level?**
- **Does your project qualify as a NAMA?**
- **How do you apply for financing?**
- **What is the progress on the NAMA registry?**

### **Credited NAMAs**

Developing countries would earn carbon credits from their mitigation efforts and sell these in the international carbon market provided they meet certain requirements. They would also need to be registered in a registry. How this market-based mechanism would work was deferred to COP17 which is taking place in Durban at the end of the year.

It is encouraging to see the principle of sustainable development being carried forward into the NAMAs definition, along with financing, technology transfer, and capacity building. Also encouraging is the fact that unlike CDM, NAMAs are not project based and could potentially be sector specific and include policy development.

However, some developing nations are of the view that all NAMAs must be supported and financed (as defined) by developed countries. They feel that their development must not be impeded by developed countries. On the other hand, some developed countries are saying that developing countries must take independent action to reduce global emissions.

Another complication is that NAMAs are supposed to be nationally appropriate, which means different things to different countries, including that each country has autonomy in defining appropriateness, while at the same time needing to comply with 'measurement, reporting and verification' requirements. Moreover, the registry still needs to be developed and approved; more clarification is required on measurement, reporting and verification issues, and developing countries need to provide proposals of their NAMAs. Ultimately, developed countries must provide finance for the Green Climate Fund. In Copenhagen, developed countries agreed to provide \$30 billion in a fast-track financing and a further \$100 billion per year by 2020. With the recent Global financial crisis, it remains to be seen whether the financial support will materialise. 

*SIZWE KUZWAYO – DELOITTE (SUSTAINABILITY & CLIMATE CHANGE), WITH ADDITIONAL SOURCES CORNIE HUIZENGA AND STEFAN BAKKER (PARTNERSHIP FOR SUSTAINABLE LOW-CARBON TRANSPORT).*

# CDM AND NAMAS

## OVERVIEW AND DIFFERENCES

	<b>CDM</b> <i>Clean Development Mechanism</i>	<b>NAMA</b> <i>Nationally Appropriate Mitigation Actions</i>
<i>Definition</i>	<b>Mechanism of the Kyoto Protocol (Art. 12)</b> <i>The CDM allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol (Annex B Party) to implement an emission-reduction project in developing countries.</i>	<b>Commitment under the Convention</b> <i>All Parties [...] shall formulate, implement, publish and regularly update national [...] programmes containing measures to mitigate climate change [...].(UNFCCC Art. 4.1b) Internationally supported NAMAs will be measured, reported and verified (MRVed) domestically and will be subject to international measurement, reporting and verification (para 61 of decision 1/CP.16).</i>
<i>Type of actions</i>	<b>Projects</b> (eg BRT) and programmes of activities (PoA)	<b>Policies</b> , programmes and projects (eg sustainable transport policy).
<i>Initiator of activity</i>	<b>Private sector</b> <i>Companies identify and implement projects.</i>	<b>Government</b> <i>National government, possibly in collaboration with regional or local authorities, initiate activities.</i>
<i>Return on investment</i>	<b>Certificates (CERs)</b> <i>Certified Emission Reductions (CERs) are issued by the CDM Executive Board based on verification reports. CERs can be traded on carbon markets.</i>	<b>Financial and technical support:</b> Developed country Parties shall provide enhanced financial, technological and capacity building support for the preparation and implementation of NAMAs of developing country Parties and for enhanced reporting by these Parties (para 52 of decision 1/CP.16).
<i>Preconditions</i>	<i>Reductions in emissions must be <b>additional</b> to any that would occur in the absence of the certified project activity (KP Art. 12.5 c) CDM to assist developing country Parties in achieving <b>sustainable development</b> (KP Art. 12.2)</i>	<i>NAMA in the context of <b>sustainable development</b>, aimed at achieving a <b>deviation in emissions</b> relative to 'business as usual' emissions in 2020 (para 48 of decision 1/CP.16)</i>
<i>Requirement</i>	<i>Project supports <b>sustainable development</b> (proven by <b>governmental Letter of Approval</b>)</i>	<i>Action is nationally appropriate (proven by <b>governmental registration</b> under the UNFCCC)</i>
<i>Financing</i>	<i>Upfront financing through <b>private sector</b>. Certificates are issued ex-post based on regular verification reports. CERs can be sold on a carbon market.</i>	<b>Domestic resources and/or international support</b> (e.g. through bi-lateral agreements, development banks or multilateral funds, incl. Green Climate Fund) for the preparation and implementation of NAMAs.
<i>Administrative requirements</i>	<b>Strong rulebook</b> (Marrakech Accords)	<b>General guidelines</b> yet to be developed under the UNFCCC (paras 61 and 62 of decision 1/CP.16)
<i>GHG reduction potential</i>	2005–2011: <b>500 MtCO<sub>2</sub>e</b>	2012–2020 (15–30% against BAU): <b>more than 40 000 MtCO<sub>2</sub>e</b>

SOURCE: HARALD.DIAZ-BONE@GIZ.DE

# WHAT IS SUSTAINABLE, LOW-CARBON TRANSPORTATION?

**C**ities throughout the world face a mobility challenge of increasing traffic, chronic congestion, air and noise pollution and increased traffic accidents – against a background of climate change and the need to reduce our carbon consumption.

The challenge for cities is to alter the balance of priorities from motorised vehicles to more sustainable and active modes.

The traditional approach to dealing with increased transport demand has been to provide additional road space by means of new and expansive road infrastructure. This approach has not delivered the expected benefits, however, and a new approach to tackling current transport problems is required.

Inspired by the principles of sustainability, an alternative, low-carbon approach focuses on the demand side. One new approach, known as A-S-I (from Avoid/Reduce, Shift/Maintain, Improve), seeks to achieve significant GHG emission reductions, reduced energy consumption and less congestion, with the final objective to create more liveable cities.

## Why low-carbon transport?

A low-carbon transportation infrastructure that follows the principles of equitable, sustainable development not only mitigates climate change but also realises the following co-benefits:

- increases energy security as less oil needs to be imported. Resource conflicts can be avoided and transport users won't have to suffer fuel price shocks
- reduces traffic congestion, and consequently air pollution and noise are reduced, having a positive impact on the environment and human health
- reduces land demand by preventing urban sprawl and preferring semi-dense mixed-use neighbourhoods
- provides visibility and acknowledgement of cities that demonstrate leadership: sustainable and modern low-carbon transportation systems >

- *Avoid/reduce travel demand*
- *Shift to more economic and environmentally friendly, high-occupancy modes of transport*
- *Improve efficiency with technological measures*

'Sustainability is a condition in which economic, social and environmental factors are optimised, taking into account indirect and long-term impacts. It balances economic, social and environmental objectives. Sustainability emphasises the integrated nature of human activities and therefore the need for coordinated planning among different sectors, groups and jurisdictions. This expands the objectives, impacts and options considered in a planning process. It helps insure that individual, short-term decisions are consistent with strategic, long-term goals.

'Sustainable transport planning recognises that transport decisions affect people in many ways, so a variety of objectives and impacts should be considered in the planning process.

'True sustainability is not just environmental sustainability. For example, a transportation system would not be truly sustainable if it could not be maintained over the long run, if it did not adequately support economic activity, or if it were unfair and harmful to disadvantaged people.'

Todd Litman – Victoria Transport Policy Institute ([www.vtpi.org](http://www.vtpi.org))

**‘There’s a problem with saying we need a bit more walking, a bit more cycling, and bit more rail, if at the end of the day we have a broadly unsustainable system. High levels of cycling, for example, will not solve all these environmental problems if other things stay the same.**


**‘In Europe, the problem is not that people are driving where once they would have been using public transport. The problem is that we are travelling so much more, and most of this is by motorised transport, by burning petrol. It’s a systemic issue, and built into everyday lives, so there is no easy consumerist solution, unfortunately.’**

***Rachel Aldred – Sustainable Mobilities Research Group, University of East London (UK)***

- increases the competitiveness and attractiveness of cities and attracts top companies, highly qualified workers and employees into the country
- depending on future climate change agreements, – cities and countries that achieve mitigation beyond baseline scenarios gain access to emission certificates and carbon related funding schemes
- convenient and high-quality public transport and non-motorised transport infrastructure save money and time.

## **What is low-carbon transport?**

Elements of a low carbon transport system include:

- dense but green and mixed use cities that allow jobs, shopping and leisure facilities close to where people live
- modern, high-quality links between the centres and good integration of long-distance hubs with local transport
- high-quality alternatives to individual car use, especially efficient public transport and good non-motorised transport infrastructure and its proper integration
- efficient, inter-modal freight transport and smart urban logistics that also include clean vehicles
- advanced technologies such as electric/gasoline hybrid engines, alternative fuels or even electric motorbikes and cars. 

*SOURCES: DEUTSCHE GESELLSCHAFT FÜR TECHNISCHE ZUSAMMENARBEIT (GTZ), WATER ENERGY, TRANSPORT SECTOR PROJECT TRANSPORT POLICY ADVISORY SERVICES*

The European Council of Ministers of Transport (ECMT) defines a sustainable transport system as one that:

- allows the basic access and development needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations
- is affordable, operates fairly and efficiently, offers a choice of transport mode and supports a competitive economy, as well as balanced regional development
- limits emissions and waste within the planet’s ability to absorb them, uses renewable resources at or below their rates of generation, and uses non-renewable resources at or

below the rates of development of renewable substitutes, while minimizing the impact on the use of land and the generation of noise.

In the South African context, we have a lack of transport and therefore sustainable transport should also:

- provide a means for citizens to access social and economic opportunities in a manner that is cognizant of limited resources, including energy, finance and space
- use the appropriate mode for each situation
- be seen as an ultimate goal to which we need to move, ‘greening’ transport along the way, but simultaneously our lack of public transport can allow us to ‘leapfrog’ to new and better technologies and systems.

*SUSTAINABLE TRANSPORT WORKSHOP, GREENING THE SOUTH AFRICAN ECONOMY, NOVEMBER 2010*

# **GROWING PUBLIC TRANSPORT IS A JOB CREATION PRIORITY**

**I**n South Africa, increased use of public transport would not only mitigate climate change but would also grow the economy and provide a significant number of jobs, according to South African Transport and Allied Workers Union's (SATAWU)'s Transport and Climate Jobs research programme.

'At the moment in South Africa, one third of people travel to work go by private car,' says Jane Barrett, Satawu's policy research officer. 'If public transport provision were to be radically increased, large numbers of jobs could be created in manufacturing (vehicles), construction (infrastructure), and in operations. If improved public transport could result in attracting only 10% of car commuters onto public transport, an

additional 1.5 million people would become public transport users.'

## ***Attract commuters to public transport and create jobs***

If 200 000 more people caught taxis, this would mean an increase of 1.8% on current passenger numbers. This would require an additional 4 500 more taxi workers.

If 500 000 more people caught buses to work and education, this would mean an increase of 14% on current passenger numbers. This in turn would translate into the need for an additional 3 500 buses and 7 000 more workers in bus operations.

If 800 000 more people caught Metrorail trains, this would mean a 28% increase in the current 2.8 million >



people who catch trains. An additional 113 train sets would be required over and above the current 403 train sets in service. (This does not take into account the additional train sets that are required to ease current overcrowding.) The current Metrorail staff of 8 500 would have to increase by 2 380.

In sum, if 10% of car commuters (1.5 million people) could be attracted to public transport, and those numbers were distributed between taxis, buses and trains in such a way that progressively favours the mass modes, then 13 880 direct transport operational jobs would be created.

The ratio of direct to indirect jobs in the bus industry is said to be 1:58. An increase of 500 000 bus passengers could therefore translate into an additional 35 000 indirect jobs. These indirect jobs are in vehicle maintenance and part supply, as well as in bus building.


'If I make a conservative estimate of a ratio of 1:3 for the taxi and rail industries, then the taxi industry would produce 13 500 additional indirect jobs and rail would produce 7 140 additional indirect jobs,' says Barrett.

'That is 69 420 new jobs if we increase public

transport usage by 1,5 million people – excluding additional jobs that would be created in expanding and improving the public transport infrastructure to accommodate expanded public transport.'

### ***Cycling out of climate change***

If the current cycling population could be increased by just 10%, that would mean 40 000 additional bicycles on South Africa's roads. This, too, would create additional employment. The building of cycling lanes for all communities as part of road infrastructure is therefore a significant job creator.

A massive increase in bicycle use could also facilitate a myriad of other economic activities, including informal cycle rentals, bicycle maintenance enterprises, bicycle taxis (three wheelers, or the bicycle towing a small cart), and even ambulances. 

*TRANSPORT AND CLIMATE JOBS; SATAWU RESEARCH PAPER, AS A CONTRIBUTION TO THE MILLION CLIMATE JOBS CAMPAIGN; JANE BARRETT, POLICY RESEARCH OFFICER, SATAWU*



# SOUTH AFRICA IN THE SPOTLIGHT


**S**outh Africa as the host country to COP17 has a unique opportunity to trigger movement in the climate policy arena. The South African Ministry of Transport and transport advocacy groups should be able to use the momentum created by the meeting to promote sustainable transport policies as mitigation and adaptation to climate change and leverage funds for low carbon projects. South Africa also has opportunities to showcase model low-carbon transport infrastructure projects that have developed during the last few years.

For example, the Rea Vaya Bus Rapid Transit System, the first full-BRT system in the African continent (see page 22), with its dedicated lanes and modern stations, has changed the landscape of the City of Johannesburg. This new transport system not only provides better public transport, but also reduces traffic congestion, improves the environment, creates jobs, and reduces GHG emissions. Projects like Rea Vaya, originated by city government, are ideal candidates for NAMAs. This system is already serving as a model for other cities within South Africa and the rest of the continent. Similar BRT projects in Latin America and Asia are popping up, and two have even received modest CDM funding. There is no reason why governments should not include such systems as part of every NAMA, especially since well designed BRT systems can deliver mobility benefits equal to rail systems in a fraction of the time and cost.

Other South African transport projects with positive climate impact that will be highlighted at COP17 are Gautrain (see page 14), a state of the art rapid rail network in Gauteng that links Pretoria, Johannesburg, Sandton and the Oliver Tambo International Airport, extending for approximately 80 km.

Also, during the Durban COP17, there will be a system of public bicycles that could become the basis for bike share programs in cities around the continent. Bike share programs in many developed world cities and China are cost-effective solutions that should be part of any climate mitigation plan.

More details about these, and other local low-carbon projects, programmes and replicable possibilities, can be found on the following pages.

South Africa and national governments of the region should use COP17 as an opportunity to devise low carbon transport projects and put their cities on the path to economic growth and sustainable development. 



# GAUTRAIN RAPID RAIL LINK

<b>What</b>	Gautrain has 24 train units (96 rail cars), 125 feeder buses, 10 000 parking bays
<b>Where</b>	80 km route between Pretoria (Tshwane) and Sandton (Johannesburg), with nine stations OR Tambo International Airport; Pretoria; Rosebank; Sandton; Marlboro; Midrand; Centurion; Hatfield; and Rhodesfield (Kempton Park)
<b>Why</b>	To ease congestion on Gauteng highways, stimulate economic growth and job creation in Gauteng, promote public transport, tourism and public-private partnerships, change the culture of public transport use in South Africa
<b>When</b>	Announced in February 2000, launched June 2010 (ORT to Sandton), and the remaining routes July 011
<b>Who</b>	Public-Private Partnership between Bombela Consortium and Gauteng Provincial Government
<b>Cost</b>	R25.2 billion

*Our prediction was that we would pull in 100 000 passenger trips a day, and that would have meant a reduction of 15 000 tonnes of CO<sub>2</sub> emissions a year. – Gautrain CEO, Jack van der Merwe*

**G**auteng Province makes up only 1.4% of South Africa's land area, but produces of 40% of the country's GDP; 65% of the money generated in South Africa is generated here. In an economic hub such as this, mobility and access have always been – and perhaps always will be – a challenge, says Gautrain CEO Jack van der Merwe. In Gauteng today, there are 6 million passenger trips a day, with vehicle occupancies a mere 1.1.

The Rapid Rail project was conceptualised in 1999, and announced in 2000; construction began in 2006. In the first five months since its launch, in June 2010, 1.2-million people have travelled on the high-speed train – of which more-or-less half were airport commuters.

Within its first month, during the FIFA World Cup, the number of passengers was almost three times that of the projected figure: that's about 80 000 commuters each week.

The 80 km route, from Sandton to Hatfield in Pretoria, began operating in mid-2011. The train runs every 12 minutes during peak, and every 20 minutes off-peak. Over the weekends it runs every 30 minutes.

'Our prediction was that we would pull in 100 000 passenger trips a day, and that would have meant a reduction of 15 000 tonnes of CO<sub>2</sub> emissions a year, says van der Merwe. 'Today we have only 40 000 passenger



***Before Gautrain, the only ‘public transport’ anyone aspired to was air travel. – Peter Lukey, Deputy DG, Climate Change, Department of Environmental Affairs***

trips, but the current service has only been running for 6 weeks [at the time of interview, September 2011], so it is early days to say.’ The link to Park Station, in central Johannesburg, is also not yet operational.


‘Public transport is a carrot and a stick,’ he says. ‘The stick is congestion. But some of the “stick” has been taken away, with the South African Roads Agency’s Gauteng Freeway Improvement that has gone and created eight more years of road capacity,’ says van der Merwe.

‘But the stick will come back, once the technical challenges with the tolling system are resolved,’ he notes. And the date for the implementing of road tolling has been set, with perhaps a hint of irony, for 1 April 2012.

Gautrain is re-thinking its feeder bus system, which has attracted fewer riders than anticipated. The system had been based on the system so effective in Zurich. ‘There is no map, and you’ll never walk more than 1 km

without seeing public transport,’ says van der Merwe. ‘There are also no timetables, the simple point that every ten minutes there will be a bus. So you could end up with a grid of empty buses.’

‘We decided to do the same, to have a grid system, but have subsequently taken the off-peak buses out of service.’ More than 9 000 passengers use the buses at present.

Next on the cards is an integrated ticketing and fare system, with synchronised timetables and schedules, among other public transport services in Gauteng. 

***Gautrain’s Park & Ride facilities, with 10 000 bays, have proved to be extraordinarily successful.***



# BRIDGING THE GAP BETWEEN TRANSPORT AND CLIMATE POLICY

**In order to better integrate land transport into the international climate negotiation process, the Bridging the Gap initiative (BtG) was formed in 2008 by a group of organisations that now includes the German Agency for International Cooperation (GIZ), the International Association for Public Transport (UITP), the Transport Research Laboratory (TRL), Veolia/Transdev and the Institute for Transportation and Development Policy (ITDP).**

This international initiative has raised the profile of mobility and urban and land transport within the UNFCCC negotiations, and has advocated an increase in finance for low carbon transport, particularly within the developing world. The BtG initiative conducts a number of complementary activities around the different UNFCCC meetings, offering workshops, side events and exhibit stands. It also publishes a number of reports and policy papers to inform country delegations at the meetings and through its website [www.transport2012.org](http://www.transport2012.org).

In its quest for better integration of land transport initiatives into the negotiation process, BtG's agenda focuses on the acknowledgment of the sector's role in relation to key areas of the climate negotiations.

## Mitigation

Recognise the transport sector's importance in mitigation efforts, with a current focus on the potential for transport NAMAs. Countries should consider strategies to promote low-carbon land transport, and these should include policies such as fuel/vehicle efficiency standards, public transport improvements, parking management and regulations, vehicle registration programs and congestion charging. They should also develop transport specific data

collection processes and methodologies to support the Measurement, Reporting and Verification (MRV) requirements for NAMAs and other sources of climate finance.

## Adaptation


Integrate the land transport sector in adaptation planning efforts, such as improving the capacity of developing countries to assess risk and vulnerability of transport infrastructure. Climate resilient transport networks are as important in the developed world as in the developing one.

## Finance

Consider the various options for financing mitigation actions in land transport through the funds provided under the UNFCCC. BtG has also developed a proposal for a sectoral approach that could be financed through a transport funding window under the Green Climate Fund (GCF). The proposal REST (Reducing Emissions through Sustainable Transport) suggests a way in which the large mitigation potential of the land transport sector could be realised through earmarked support for sustainable transport.

## Technology

Promote recognition of the wide potential for the transfer of technologies in the land transport sector. The available technologies are wide-ranging and include mass rapid transit systems (ie Bus Rapid Transit – BRT) and non-motorised transport solutions (ie bike share programmes), as well as energy efficiency vehicle technologies.

Equally important will be the ongoing work with country delegations, local and regional governments, and national transport advocacy groups to formulate and support comprehensive national mobility plans that could be part of transport sector NAMAs and opportunities for bilateral finance mitigation agreements. We hope that COP17 will be a turning point for inclusion of the transport sector in the UNFCCC GHG reduction and finance mechanisms. 



**The BtG Initiative plans to be active in Durban, as it has been in the last three COPs. Look out for its side event highlighting its work on transport NAMAs.**

# PARTNERSHIP ON SUSTAINABLE LOW CARBON TRANSPORT

**B**etter transport systems in the developing countries are needed to provide better access to jobs, markets, schools and health care. But an increase in motor vehicles will not only cause an increase in GHG emissions transport in developing countries, but also cause congestion and contribute to air pollution, road crashes and a general decrease in the quality of life in many of the cities in developing countries.

‘Yet when it comes sustainability, it appears that transport is still involved in a catching up game with the energy sector,’ says Cornie Huizenga, a convenor of the Partnership on Sustainable, Low Carbon Transport (SLoCaT). ‘This catching up appears to be a wider problem and one not limited to the development banks.’

‘Why is it a problem that the energy sector is in the limelight and transport in the shadows,’ he asks? ‘Perhaps because developing countries feel that they need to focus their attention (staff and budget) on the energy sector, rather than the transport sector, because of the possibilities to link up with the international initiatives on sustainable energy. And also because of its perceived leadership role, the energy sector finds it more easy to attract external financial resources, including from the private sector, for co-financing of energy programs and projects.’

SLoCaT is a membership-based organisation that aims to mobilise global support to reduce the growth of GHG emissions generated by land transport in developing countries by promoting more sustainable, low carbon transport. It works to improve the knowledge on sustainable low carbon transport, helps develop better policies and catalyse their implementation, in Asia, Latin America and Africa.

‘We can see that good gains have been made in catching up with the energy sector through bringing together stakeholders on transport and sustainability,’ says Huizenga.




‘Internationally agreed goals for sustainable transport could greatly facilitate the policy dialogue with developing countries on sustainable transport and subsequent prioritisation of sustainable transport in policy development and budget allocations’

***Support the strengthening of global action on sustainable transport.***

‘But when I read the recent announcement that readers from global corporations, financial institutions, and foundations will join with UN agencies and member states to produce a comprehensive and concrete sustainable energy action agenda leading up to the Rio+20 conference next year, I feel that the energy sector is pulling away again from the transport sector.’

‘If we would have something similar for the transport sector then it would help in getting a better seat at the table when it comes to defining the role of transport in a post-2012 climate regime and associated new climate change financing modalities. Having a similar internationally agreed upon set of goals for sustainable transport could also greatly facilitate the policy dialogue with developing countries on sustainable transport and subsequent prioritisation of sustainable transport in policy development, capacity building and budget allocation.’

‘Transport is in many countries the most important, or second important, economic sector, but lacks both a formal global coordination mechanism and agreed upon global strategy for sustainable transport.’ 

***The transport sector needs to overtake the energy sector in becoming a leader in sustainability – Cornie Huizenga, convenor, SLoCaT***

# PARK & RIDE

<b>What</b>	Rail-based Park & Ride facilities
<b>Where</b>	26 railway stations in Cape Town
<b>Why</b>	Attract a higher proportion of the car-driving market to rail, largely through improving the safety, security and general attractiveness of station parking, through landscaping, urban design features, security staff, and lighting
<b>Who</b>	City of Cape Town, with partial funding from the GEF for the design of the facilities
<b>Cost</b>	R47 million for the extension and upgrade of stations
<b>Impact</b>	Between a 5–14% increase at all stations, with the largest increase at Kuils River and Kraaifontein stations

*The goal of TDM is getting people out of their cars and into public transport. It's an ambitious goal for one project, but the smaller projects all add up. – Gerhard Hitge, City of Cape Town*

The City of Cape Town implemented Park & Ride facilities in Cape Town after a detailed investigation into Travel Demand Management (TDM) in the city. The project initially meant extension and upgrade of stations with a focus on improving the 2010 World Cup, but also as important legacy facilities after the event. Due to the limited budget, 26 stations were identified throughout the metropolitan area.

In Cape Town, the main daily commute is towards the central city, which is why the Park & Ride strategy encouraged a modal shift for this destination in particular. A shortlist of stations was selected by taking into account the following:

- distance from central city – as the advantages of using more remote Park & Ride sites is greater
- area coverage – to ensure a broad spatial impact across the city
- densification corridors – to support the objectives of this initiative
- NMT (Non-Motorised Transport) network – to maximise the mutual benefit between these initiatives
- IRT (Integrated Rapid Transit) network – to maximise the benefit to the public transport system.

This project was only able to influence the perception of unsafe and unattractive stations, where cars are vandalised, by addressing the actual safety and attractiveness of stations. Since the potential market for Park & Ride users are typically not averse to parking at shopping centres, station parking aimed to emulate these facilities, characterised by:

- high quality surfacing
- good lighting
- good road marking guidance



- adequate road signs
- short walk to sheltered destination
- safety while walking to station
- security of car while parked
- cost-effective (mostly free).

‘Our follow-up research showed that there was a slight increase in the use of parking at all the upgraded stations, but a more significant increase where there were big aesthetic improvements’, says Hitge. ‘Typically, an engineering solution is about function, so it was interesting to discover that urban design could have a significant impact, too. For example, at Kraaifontein station, we fixed the tarmac (it was falling to pieces), and we created a square with trees and other landscaping, and added a defined pedestrian route, so users no longer had to weave between parked vehicles.’

‘These impacts cost less than we expected, so we were able to effect minor upgrades at additional stations, too.’

### **Stations with Park & Ride facilities**

Athlone, Belhar, Bellville, Brackenfell, Century City, Claremont, De Grendel, Eerste River, Fish Hoek, Heathfield, Kraaifontein, Kuils River, Lansdowne, Mitchell’s Plain, Monte Vista, Muizenberg, Nonqubela, Oosterzee, Ottery, Pentech, Retreat, Simon’s Town, Somerset West, Steenberg, Steurhof, Strand.



***Out of the whole public transport trip, we could only influence the safety and aesthetics of access to the station, only a minor part of the trip chain. We do not control quality of the rail. Yet even an improvement to these two small components seems to have made a significant impact. – Gerhard Hitge, City of Cape Town***

**The City of Cape Town’s Travel Demand Management (TDM) strategy includes:**

- promoting higher private vehicle occupancies
- implementing Park & Ride facilities
- travel planning for large employers
- marketing TDM and public transport
- developing supporting policies and tax incentives
- exploring a congestion pricing scheme.



# CALCULATING THE CARBON VALUE OF CYCLING

**What  
Who  
Why**

Development of a methodology to allow the attribution of a climate value to cycling

Developed by Interface for Cycling Expertise (I-CE), Netherlands

The challenge with assessing the carbon impact of cycling is that cycling has an intrinsic zero-emission value, making it difficult to attribute (direct) carbon benefits. This limits opportunities for low-carbon financing

**Climate  
impact**

Application of the methodology to the case of Bogotá, Colombia — a city with a current bicycle modal share of 3.3% on a total of 10 million daily trips — results in a climate value of cycling of 55 115 tonnes of CO<sub>2</sub> per year, corresponding to an economic value of between 1 and 7 million US dollars when traded on the carbon market

**P**articularly in developing countries, economic resources often limit opportunities for implementing high-cost vehicle improvement technologies, which suggests that investments in programmes avoiding CO<sub>2</sub> emissions, such as NMT projects, may be more suitable and feasible.

Besides directly reducing emissions through modal shift, these projects may also have substantial co-benefits, such as public health and traffic safety benefits. Non-motorised transportation, particularly cycling, has great potential because it is a cheap mode of transportation and can be used by even the poorest; the investment costs for infrastructure are much lower than for private motorised traffic infrastructure,

in dense and congested urban areas the bicycle is as time-effective as motorised traffic, and, of course, it is a zero-emission transportation mode.

In the context of the climate change debate, the 'opportunity costs' of a bicycle trip are the additional CO<sub>2</sub> emissions that are generated when the traveller selects an alternative, motorised transportation mode for his or her bicycle trip. In terms of avoided CO<sub>2</sub> emissions, therefore, cycling provides significant 'opportunity benefits'.

The problem with assessing the carbon impact of cycling, however, is that cycling has an intrinsic zero-emission value, making it difficult to attribute (direct) carbon benefits.

In economics, the concept of opportunity costs is commonly used to value goods or services which are difficult to value. For the evaluation of the external effects of CO<sub>2</sub> emissions of transportation, opportunity costs are often referred to as avoidance costs. Consider the climate effects of a person who can make his daily trip to the market by bicycle or car. Suppose the person chooses to go by bicycle. Based on the principle of opportunity costs, the avoidance costs of using the bicycle for this trip are: the avoidance costs of the bicycle trip itself, minus the avoidance costs in case of the alternative action, ie using his alternative mode, the car.

***The bicycle has always been positioned and used as the icon for sustainable climate policies but until very recently not as contributor to emission reduction targets. – Cornie Huizenga, SLoCat***

The avoidance cost of the bicycle trip is zero but the avoidance cost of the car trip is the volume of CO<sub>2</sub> emitted during the trip, leading to a negative net environmental cost. The use of the bicycle for the trip thus has an 'opportunity benefit'.

The climate value of cycling represents the total amount of avoided CO<sub>2</sub> emissions by all bicycle trips, which is the summation of opportunity costs of each bicycle trip in the study area. The climate value of cycling is calculated based on a prediction of the most likely alternative (substitution) mode for each bicycle trip and the calculation of the additional CO<sub>2</sub> emissions for that trip by the alternative mode.

The fact that the climate value of cycling is higher in places with large motorisation rates indicates the importance of cycling mobility as a CO<sub>2</sub> emission mitigation strategy in developed cities. However, even though developing cities have smaller marginal climate values of cycling, it is expected that many of the developing cities of today will be the developed cities of tomorrow. For example, in Beijing the cycling modal share has decreased from 38.5% in 2000 to 23% in 2007, while the car modal split has increased from 26.5% to 32.6% in the same years.

When citizens from lower socio-economic strata improve their economic status they will also change their mobility preferences. In the absence of decent bicycle facilities, it is more likely that private motorised transportation will be used. Guidance in the form of investment in bicycle facilities is therefore of vital importance in creating a sustainable transport future. The climate value of a cycling model can assist in estimating the benefits of cycling and thus, appraise the carbon impacts of cycling.



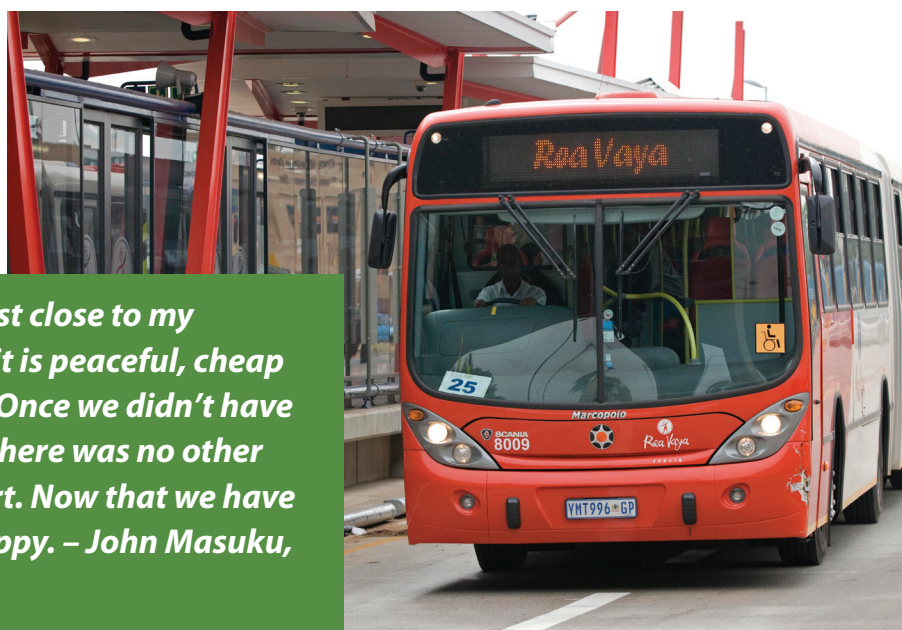
THE FULL PAPER CAN BE FOUND AT: ROEL MASSINK, MARK ZUIDGEEST, JAAP RIJNSBURGER, OLGA L. SARMIENTO AND MARTIN VAN MAARSEVEEN (2011) THE CLIMATE VALUE OF CYCLING, NATURAL RESOURCES FORUM (UNITED NATIONS) PHOTOGRAPHS BY BICYCLE PORTRAITS, WWW.DAYONEPUBLICATIONS.COM



# REA VAYA 'WE ARE GOING'

<b>What</b>	Phase 1A (complete) launched in September 2009. It includes 143 Euro IV buses, 25.5 km of trunk route, three complementary and five feeder routes using 13 m buses, 27 stations with average of 40 000 passengers per day. Phase 1B is under construction with 134 Euro IV buses, 18 km of trunk route, 2 trunk routes, 3 complementary and 7 new feeder routes and 16 new stations
<b>Where</b>	The trunk route runs between Soweto and Johannesburg CBD
<b>Why</b>	Reduce poor air quality in Johannesburg; alleviate traffic congestion; reduce number of trips and travel time and therefore reduce vehicle emissions; restructure spatial form of the city
<b>Overall goal</b>	Place people within 500 m of trunk or feeder route, and provide a quality, affordable public transport system for Johannesburg
<b>Who</b>	A current 1.1 million passengers a month; Rea Vaya is a partnership between the City of Johannesburg and members of affected public transport operators (through bus operating company Piotrans Pty Ltd)
<b>Cost</b>	Phase 1A, R1.9-billion; Phase 1B, estimated R1.8-billion. GEF funding was used for legal services, marketing and communications, assistance to the minibus taxi industry and evaluation of the system
<b>Economic impact</b>	6 840 short-term positions and 830 permanent jobs; as station ambassadors, station marshals and cashiers; security and cleaning of Phase 1A stations; and as drivers, dispatchers, controllers, bus washers and administration assistants.
<b>Carbon impact</b>	Estimation of overall emission reductions is 398 292 tCO <sub>2</sub> e for Phase 1A and 1B (not full Phase 1) over the 10 year period up to 2021, through mode switching; and improved fuel-use efficiency through new and larger Euro IV buses

*I grab Rea Vaya just close to my house and I think it is peaceful, cheap and comfortable. Once we didn't have a choice because there was no other means of transport. Now that we have Rea Vaya, I am happy. – John Masuku, street trader*



**R**ea Vaya launched its Clean Development Mechanism (CDM) Project Idea Note (see page 6) in October 2008; its Project Document is complete and has been validated by UNFCCC panel validators. However, due to 'prior consideration requirements' not being met for Phase 1A and 1B, the project will be registered on the voluntary market (see right) instead. Prior consideration requirements were not met because when the first construction contracts for Rea Vaya were signed in 2007, the project had not formally indicated to UNFCCC that it would be relying on carbon funding for the project.

In order to calculate the carbon impact of the project, total baseline emissions were determined based on the mode of transport BRT passengers would have chosen in the absence of the project, and their respective emission factors. These included public transport buses, minibus-taxis (capacity of 16 passengers), passenger cars, suburban rail, and walking or cycling. Motorcycles and metered taxis were not included as the expected mode shift from these modes of transit was considered to be marginal.

Relevant fuel types for each vehicle category were also established. GHG emissions per kilometre were calculated and fixed for the project crediting period. Other relevant data included occupation rate and trip distances.

Project emissions are based on the fuel consumed by the buses of the project (trunk, feeder and complementary buses).

Rea Vaya also reduces the number of remaining buses – and, potentially, other vehicles – on the road formerly used for mixed traffic, thereby also reducing congestion. Congestion change occurs on the road where the new trunk lane operates and which was formerly used by mixed traffic.

Reduced congestion has the following impacts relevant for GHG emissions:

- 'rebound effect' leading to additional trips and thus higher emissions
- higher average speeds and less stop-and-go traffic leading to lower emissions.



There are two markets for carbon offsets. In the larger, compliance market, companies, governments, or other entities buy carbon offsets in order to comply with caps on the total amount of carbon dioxide they are allowed to emit. This market exists in order to achieve compliance with obligations of Annex 1 Parties under the Kyoto Protocol, and of liable entities under the EU Emissions Trading Scheme. In 2006, about \$5.5 billion of carbon offsets were purchased in the compliance market, representing about 1.6 billion metric tonnes of CO<sub>2</sub>e reductions.

In the much smaller, voluntary market, individuals, companies or governments buy carbon offsets to mitigate their own greenhouse gas emissions from transport, electricity use, and other sources. For example, someone might buy carbon offsets to compensate for the greenhouse gas emissions caused by personal air travel.



***I work in Joburg CBD and I really thank the government for this Rea Vaya thing. From my personal experience, it truly made a difference in my life. – Selinah Ndlovu, shop assistant in Soweto***

# WORKING WITHIN A CARBON BUDGET

**What**

A framework around which to approach transport decision-making

**Why**

A Low Carbon Action Plan offers a way in which to unpack the what, when and how of low-carbon economy planning and implementation

**Who**

WWF South Africa

**Goal**

Develop a package of transport NAMAs

**S**outh Africa is extremely vulnerable to the impacts of climate change, with water shortages, diseases, food security and other challenges. The most vulnerable people are also those who are most at risk to the impacts of climate change.

Which is why WWF South Africa has begun to design a Low Carbon Action Plan (LCAP), which looks specifically at the way in which we make decisions around carbon mitigation and adaptation.

'At WWF we talk about a just transition to a low-carbon future,' says Louise Naudé, National Climate Change Officer, WWF South Africa. 'The low-carbon part is easy – obviously we have to cut out greenhouse gases (GHG), and defend and repair our ecosystems. The "just" part is that all of this is about poverty – in whose interests are the choices about low-carbon development?'

'In South Africa we don't necessarily need the sexy vehicles; we need to produce mobility services for the majority of people who are hampered by the lack of access. And making people more mobile is climate mitigation in itself,' she notes, as mobility enables greater resilience.

In order to achieve the level of GHG cuts required by science, and make efficient decisions around low-carbon development, WWF South Africa proposes a national low-carbon budget – the overall quantity of

***Within our limited resources, for example, and to balance our carbon budget, do we spend on freeways, or do we spend on public transport? – Louise Naudé, WWF South Africa***

carbon emissions that South Africa can emit between now and 2050 to develop its low-carbon infrastructure, and transition to an infinitely smaller ongoing annual carbon budget post-2050.

A tonne of CO<sub>2</sub> emitted by one sector at any point in time implies one less tonne of CO<sub>2</sub> available to be emitted by that or any other sector now or in the future – so it's about looking at what activities produce the most value per unit of emissions space occupied.'

'It's a trade-off,' says Naudé. 'Who do we put at the centre of the transition to a low carbon economy? Within our limited resources, and to balance our carbon budget, do we spend on freeways, or do we spend on public transport, for example? In whose interests are we spending the money? And what is the best "bang" for our "carbon buck"?''

WWF South Africa has therefore begun the collaborative and participative process of collecting and collating transport information, and would eventually like to develop a package of exemplar transport NAMAs. In early 2012 the organisation will work to model different transport intervention possibilities, and through stakeholder meetings will formulate the questions and share the solutions. 'Our goal is to use the carbon budget framework and facilitate key stakeholders collectively scoping iconic, game-changing transport projects.'



**The WWF's Living Planet Unit will be at COP17, so ask their representatives how you can become involved in their participative planning process. What is the best deployment of the limited emissions space left in which to achieve South Africa's development needs?**

# ELECTRIC VEHICLES

**S**outh Africa started investigating electric vehicles (EVs) in the early 1970s (during the first oil crisis) at the CSIR, where researchers developed the current Li-Ion and ZEBRA battery technology (now sold throughout the world). But when the fuel crisis faded, so did the interest in EVs. Interest was renewed in the 1980s, first through the National Energy Council, then Eskom and again in 2008 through SANERI (South Africa's National Energy Research Institute). In 2010, Blue IQ, through the Innovation Fund (a Gauteng Province instrument), provided some seed funding to a private company – GridCars, for the development of a small EV commuter.

The Eskom programme delivered a number of electric vehicles of all sizes – from e-bikes to a 20-seater game-viewing vehicle. The Innovation Fund more recently invested in the design and concept model of a five-seater, five-door passenger car named the Joule (right).

There are no current EV pilot projects in South Africa, though, largely due to lack of funding and government backing for technology development.

Users have been slow to adopt EVs – although the vehicles are growing in popularity internationally (below right) – due to anxiety about range, and concerns about battery technology cost (which makes the vehicle expensive).

Yet EVs offer significant carbon mitigation opportunities, says Carel Snyman, who has worked on most of the above programmes.

'A petrol car in city traffic, with a fuel consumption of 10 litres per 100 km, adds 25 kg of CO<sub>2</sub> per 100 km', says Snyman. 'A diesel vehicle is only slightly more efficient. An electric vehicle would produce none of these emissions.'

When you include the carbon cost of the fuel-producing industry in South Africa, this increases the CO<sub>2</sub> impact: the refinery produces an additional 7 kg of CO<sub>2</sub> per 100 km, and SASOL (which produces 20% of all fuels sold in South Africa) produces 50 kg per 100 km.

Calculating an average (SASOL and other fuels), this means that a South African city car produces approximately 45 kg of CO<sub>2</sub> per 100 km travelled.

An electric vehicle of the same size – given the contribution of coal-fired Eskom electricity – would produce 39 kg per 100 km, although there are no emissions produced in the city where the car is used;


## What Why

100 % electric vehicles  
Possibility of almost zero emissions

***A South African city car produces 45 kg of CO<sub>2</sub> per 100 km traveled; a small EV has the potential to produce zero emissions.***  
– Carel Snyman, GridCars

these emissions occur at source, at the power station, where emissions are easier to control.

But a small electric commuter (such as a shared-car or three-wheeler) would produce only 13 kg per 100 km. And due to its size and small battery requirements, such a car could easily be powered by the sun.

'And, of course, if you use solar energy, you'll have zero emissions,' says Snyman. 



# COMPRESSED NATURAL GAS

## What

The conversion of petrol or diesel engines to operate on Compressed Natural Gas (CNG) as well as petrol




## THE CARBON IMPACT OF FOSSIL-SOURCED CNG

	CNG	Petrol		
Energy	38		MJ	1 sqm
Energy	8	32	MJ	1 litre
Energy	43	45	MJ	1 kg
Carbon content	750	900	g/kg	
CO <sub>2</sub> emissions	56	72	g/MJ	

**A**lthough the required regulatory framework for the use of biogas and bio-fuels is not yet in place in South Africa, these fuels are receiving more and more attention, and already a number of buses, panel vans and mini-bus taxis are participating in pilot CNG projects.

South Africa's industrial Development Corporation (IDC) is currently driving a process with various government departments to facilitate the required framework, and has indicated its interest in supporting the implementation of gas-fuelled busses in particular.

Biogas is a methane-rich gas emitted from bio-matter (such as plant and food waste); CNG (compressed natural gas) is gas sourced from natural reserves such as gas wells (South Africa currently imports CNG from Mozambique). The same vehicle engines could run on either of, or a blend of, CNG and biogas.

Non-fossil fuel gas can be obtained from landfill sites (municipal waste), sewage sludge, animal manure, food waste and biocrops – and the IDC already has a PPP with the City of Joburg to explore its waste sites in order to deliver landfill gas. 

**DHL EXPRESS SOUTH AFRICA** has begun converting its fleet to run on gas. The first four vehicles are already included in the company's fleet and will be extended to all operations in the rest of South Africa over time. On average, gas-driven vehicles reduce carbon emissions by between 20% and 35% compared to petrol and diesel. These vehicles have during the testing period also shown a decrease of 20% in operating cost. The expansion of their CNG fleet is set to follow in both Cape Town and Durban.



# 'GREEN TRAILER' REDUCES DRAG

**What**  
**Who**  
**Fuel savings**  
**impact**  
**Carbon**  
**impact**

An interlink, taut-liner 'green trailer'

Barloworld Logistics

Up to 35% reduction in drag, up to 10,6% fuel savings

Reduction of 13.77 tonnes of CO<sub>2</sub> emissions during six-month test period

In South Africa, the challenges and costs of road freight transport and road maintenance continue to escalate. The country's secondary road system also continues to deteriorate for lack of maintenance and because it, too, is overburdened with heavy freight traffic. The required funding required to maintain and upgrade these roads will be more profound and the cost impact significant.

And while it's clear that a greater proportion of freight needs to move to rail, the current carbon impact of road freight needs to be considered.

Truck manufacturers are constantly working on reducing the amount of CO<sub>2</sub> emissions produced by their products, and South Africa is starting to see the benefits of this with truck manufacturers introducing Euro 3,4,5 engines into the local market.

In an attempt to reduce the carbon impact of its transportation, South Africa Barloworld Logistics recently decided to look at aerodynamics as a possible avenue in reducing the amount of diesel used. The company commissioned the CSIR to conduct research on the influence of drag on a truck tractor and taut-liner link.

The result was a 'green trailer', an interlink taut liner trailer combination that achieves significant reductions in the amount of fuel it uses. The trial rig has been running on a dedicated route for a specially selected customer for six months in order to confirm the quantifiable benefits of the trailer.

'All the changes that we made to the green trailer are within the bounds of current legislation,' says Francois van Rensburg, Divisional Director at Barloworld Logistics, 'and are practical in normal operating conditions.'

The research for the green trailer was conducted on the N3 between Johannesburg and Durban. The



vehicles on this route do a round trip of 1 160 km on a dedicated route every 24 hours and 98% of the route is on the N3 and N2. This meant that the vehicles maintained a much more constant speed compared to vehicles operating on secondary roads or in urban areas. This also meant that the effects of wind resistance were higher than on any other route. The initial simulations based on the green trailer research indicated a 35% reduction in the total drag when travelling at a constant speed between 70 and 80 km/h.

The rig travelled 100 000 km in the six-month period, and saved 10.6% in fuel when compared to the rest of the fleet running the same route, under the same weather conditions and with the same payload. This equates to an actual cost saving of R8 500 per month just on fuel, and just on one rig! The total wind drag reduction came in up to 43%.

The 10.6% fuel saving amounted to a reduction of 13.77 tonnes of CO<sub>2</sub> emissions during the test period.

Says van Rensburg, 'The payback period on investment in the conversion is around 17 months. Following this successful trial, we are in the process of converting the rest of the fleet on the same route running the same contract.'



# RUSTENBURG

## RAPID TRANSIT

<b>What</b>	Integrated Rapid Public Transport Network including a BRT, direct and feeder routes. A 40 km BRT route with two main trunk corridors between Phoekeeng and central Rustenburg and Kanana and central Rustenburg; 37 stations proposed, with more than 500 other stops along direct and feeder routes.
<b>Where</b>	Rustenburg, North West Province
<b>Why</b>	To ease congestion on Rustenburg roads, stimulate economic growth and job creation in Rustenburg, reduce carbon emissions, encourage more effective settlement patterns, CBD regeneration and development along the RRT corridors; to create a better, more mobile city that is universally accessible.
<b>When</b>	Planning & Design 2011-12; Construction 2012-14; System operational in 2015
<b>Who</b>	For an estimated 200 000 residents
<b>Cost</b>	Currently estimated at R3 billion

**W**hen feasibility planning started in 2010 on the Rustenburg Integrated Rapid Public Transport Network, the technical team considered the environment as a fundamental building block for the kind of public transport system to be created. This was triggered by two main factors – the first being the more obvious need to contribute to ensuring South Africa achieves its stated emissions reduction target by 2020, and the second being the rural setting of this Magaliesberg town.

The future Rustenburg Rapid Transport (RRT) system will deliver a considerable carbon emissions reduction by replacing an aging taxi fleet with a modern fleet of buses – which comply not only with emissions standards, but also look at alternative fuel sources.

In addition, the RRT project will develop not only a public transport system, but also a Transport and

Climate Change Action Plan for Rustenburg. While increasing the share of public transport and non-motorised modes, such as walking and cycling, are core elements in any emission reduction strategies, they need to be supplemented by smart land use, better traffic management, a more balanced parking policy, better information on travel choices, and increased public awareness. The RRT project also intends investigating alternative funding mechanisms, such as Nationally Appropriate Mitigation Actions (NAMAs).

But apart from the system requirements, the RRT project planning has gone one step further in ensuring that in all aspects of the project planning, design and implementation, the outlook is green.

Notes RRT Project Manager Pauline Froschauer: 'We ensure that as far as possible all our printing is on recycled paper, our IT solution is cloud based, our architects and engineers have been briefed to seek out environmentally friendly products and processes and we even carbon-offset our main stakeholder events (such as with tree-planting) within the municipality.'

'The focus on local suppliers and materials adds to containing our carbon emissions, and as a team we are always considering ways to work together remotely and online. Obviously there are also the required environmental impact studies which are being carried out along the transport corridors where needed.' 

*Carbon mitigation: Cllr Shimane Seriteng and Executive Mayor Mpho Khunou dig in to do the hard work of tree planting at Boikagong Secondary School.*



# IMPROVED PEDESTRIAN FACILITIES

**What**

Development of non-motorised transport infrastructure in three small to medium sized South African cities

**Where**

Local Municipalities of Mangaung, Polokwane and Rustenburg

**Who**

Partial funding from the GEF for design of the facilities and provision of implementation assistance

In Mangaung a Global Environment Facility (GEF) grant was used assist with implementation of a pedestrian route through the design of a pedestrian bridge crossing the busy Markgraaf Street to safely link the pedestrian and cycle route to the sporting, shopping and employment areas.

This project of approximately 1.2 km links the Free State Stadium and Loch Logan Waterfront Shopping Mall with the bus and taxi rank adjacent to the Central Railway Station. The project involved the creation of one-way roads and the removal of on-street parking. This roadspace, previously used by cars, was replaced with pedestrian and cycle paths between 6 m and 3 m wide. *(Photo above right)*

Polokwane Local Municipality has a high proportion of captive public transport users, reliant on buses, minibus taxis and walking as the main mode of transport. With assistance from the GEF grant the Municipality implemented 3.2 km of pedestrian and bicycle paths with a 3.0 m lane width within the CBD. These facilities also constituted the Fan Walk for 2010 FIFA World Cup linking the City Centre to the Peter Mokaba Stadium. *(Photo below right)*

The Rustenburg NMT project included the construction of 14.5 km of sidewalks, completed and operational in time for the 2010 FIFA World Cup. In addition to improving accessibility to the Royal Bafokeng Stadium, these routes also directly serve the main activity centres in Phokeng: the central minibus taxi rank, the Phokeng Shopping Mall, the Phokeng Civic Centre, two primary schools and one middle school.



*This roadspace, previously used by cars, was replaced with 6 m-wide pedestrian and cycle paths.*



***The sidewalks, the pavements, are the most important element in city infrastructure – this is how to make a city better for human beings.  
– Enrique Penalosa, former mayor of Bogotá and pioneer of BRT***

# A GUIDE TO **LOW-CARBON TRANSPORT**

*Sustainable low-carbon transport provides economically viable infrastructure and operations that offers safe and secure access for people and goods while reducing short and long-term negative impacts on the local and global environments.*  
– Global Environment Facility (GEF)

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