Programme for Sustainable Urban Mobility South Africa

Tsamaya NAMA:
Mitigation action seeking for support for the implementation

Published by

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of:

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

of the Federal Republic of Germany

transport
Department:
Transport
REPUBLIC OF SOUTH AFRICA

As a federally owned enterprise, GIZ supports the German Government in achieving its objectives in the field of international cooperation for sustainable development.

Published by:
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH
Registered offices
Bonn and Eschborn

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH
Postbox 5018
65760 Eschborn
Germany

T + 49 6196 79-0
E info@giz.de
I www.giz.de

T +49 61 96 79-0
F +49 61 96 79-11 15
E info@giz.de
I www.giz.de

Project:
TRANSfer Project – Towards Climate-Friendly Transport Technologies and Measures

Authors:
Andrea Henkel (GIZ, Eschborn)
Hanna Hüging (Wuppertal Institute, Wuppertal)

Supervision:
André Eckermann (GIZ, Eschborn)

Photo credits:
Cover: Durban, South Africa (Manfred Breithaupt)
Back: Pretoria South Africa (Andrea Henkel, GIZ)

Location and year of publication: Eschborn, 2017

DOT, GIZ (2017): Programme for Sustainable Urban Mobility South Africa (Tsamaya NAMA), www.transport-namas.org/

Contact details of the DOT representative
Themba Tenza
Chief Director: Research & Innovation
Department of Transport
TenzaT@dot.gov.za

Department of Transport
P Bag X193,
Pretoria, 0001, South Africa

Disclaimer:
The South African Department of Transport (DOT) and the Department for Environmental Affairs (DEA) thank the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (German Development Cooperation) for collaboration and technical assistance in the preparation of this document. The collaboration with GIZ was conducted in the framework of the International Climate Change Initiative within the project TRANSfer (Towards Climate Friendly Transport Technologies and Measures), which has been commissioned to GIZ by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). The opinions expressed in this document do not necessarily reflect the views of GIZ and/or BMUB.

Acknowledgements:
We would especially like to express our sincere gratitude to the following government officials and experts for their active collaboration during the joint design phase of Tsamaya NAMA and their contributions to this document: Thema Tenza, Pulane Manale and Bopang Khutsoa, Neels Basson (National Department of Transport), Reitumetse Molotsoane and Mashudu Mundalamo (National Department of Environmental Affairs), Alex Bhiman (City of Johannesburg, Transport Authority), Louis Naudé (WWF), Carel Snyman (SANEDI), Sebulefe Dyodo (SALGA) and Mathetha Mokonyama (CSIR).
Furthermore, we would like to thank Linda Phalatse and Christian Mettke (GIZ) for their valuable support to the concept design, Kirsten Biemann and Christoph Heidt (Ifeu - Institut für Energie- und Umweltforschung) for their expertise in emission calculation and Robin Kaenzig (Integrated Transport Planning Ltd) for his assistance in estimating financing needs.

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List of acronyms and abbreviations

AfD	African Development Bank
AFOLU	Agriculture, Forestry and Other Land-use
BAU	Business-As-Usual
BCR	Benefit to Cost Ratio
BMUB	Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety of Germany)
BRT	Bus-Rapid-Transit
CBA	Cost-Benefit-Analysis
CDM	Clean Development Mechanism
CNG	Compressed Natural Gas
CoGTA	South African Ministry of Cooperative Governance and Traditional Affaires
CSIR	Council for Scientific and Industrial Research
CTL	Carbon-To-Liquid
DBSA	Development Bank of South Africa
DEA	Department of Environmental Affaires
DOE	Department of Energy
DOT	Department of Transport
DTI	Department of Trade and Industry
EVs	Electric Vehicles
GEF	Global Environmental Facility
GHG	Greenhouse gas
GIZ	Gesellschaft für Internationale Zusammenarbeit GmbH
GTL	Gas-to-Liquid
GTS	Green Transport Strategy
HCV	Heavy Commercial Vehicles
IIPSA	Infrastructure Investment Programme
IPTN	Integrated Public Transport Network
ITP	Integrated Transport Plan
KfW	Kreditanstalt für Wiederaufbau (German development bank)
LCV	Light Commercial Vehicles
LULUCF	Land-Use, Land-Use Change and Forestry
MBT	Mini-Bus Taxi
MCV	Medium Commercial Vehicles

MoU	Memorandum of Understanding
MRV	Measuring, Reporting and Verification
NAMA	Nationally Appropriate Mitigation Action
NATAWO	National Transport and Allied Workers Union
NCCRP	National Climate Change Response Policy
NCOP	National Council of Provinces
NCSD	Committee on Sustainable Development
NDC	Nationally Determined Contribution
NERSA	National Energy Regulator SA
NFSD	National Framework for Sustainable Development
NLTA	National Land Transport Act
NMT	Non-Motorised Transport
NSSD	National Strategy for Sustainable Development
NTA	National Taxi Alliance
pkm	Passenger kilometres
PRASA	Passenger Rail Agency of South Africa
PT	Public Transport
PTNG	Public Transport Network Grant
SA	South Africa
SABS	South African Bureau for Standards
SACN	South African Cities Network
SALGA	South Africa Local Government Association
SANEDI	South African National Energy Development Institute
SANRAL	South African National Roads Agency limited
SANTACO	South African National Taxi Association
SATAWU	South African Transport and Allied Workers Union
SUM	Sustainable Urban Mobility
SUV	Sport Utility Vehicle
TIA	Technology Innovation Agency
ToD	Transit oriented Development
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organisation
USD	US-Dollar
vkm	Vehicle kilometres
ZAR	South African Rand

Exchange rates

Original Currency	EUR	USD	Date
1 ZAR	0.05765 EUR	0.06501 USD	16.06.2016

Executive Summary

Motivation

The South African government aims to reduce the country's Greenhouse Gas Emissions by 34% below the Business-As-Usual (BAU) emission level until 2020 and by 42% until 2025. In its nationally determined contribution (NDC) South Africa takes a peak, plateau and decline GHG emission trajectory range. Between 2025 and 2035 emissions are projected to plateau followed by a decline till 2050.

The transport sector is responsible for about 8.75 % of the country's total GHG emissions (2010) and has a share of 28% in the total energy consumption (2014) in South Africa. Emissions from the transport sector rose continuously since 2000 and are projected to increase significantly till 2050 without additional GHG mitigation measures. Consequently, the National Department of Environmental Affairs (DEA) identified the transport sector as key sector for a transition to a low carbon economy in the 2014 Greenhouse Gas Mitigation Potential Analysis.

Urban mobility plays a particular role to achieve these targets as about 65% of the population lives in urban areas. Emissions from urban transport are growing significantly due to strong motorization growth and a modal shift from public transport towards private cars. Main drivers for this development are increasing household income on the one hand and worsening infrastructure quality and public transport services on the other. Inhabitants suffer from increasing congestion as a consequence of rapidly rising motorisation rates in cities. At the same time, road safety is worsening and currently, South Africa has the worldwide second highest traffic fatality rate per person (negative impacts).

The South African government has already introduced several strategies and initiatives towards sustainable urban mobility, partly with international assistance. With the Public Transport Network Grant (PTNG), for example, the national government supports the implementation of integrated rapid transit systems in 13 larger cities. However, many local governments are facing serious challenges such as limited capacity and finance to identify and develop sustainable mobility solutions, a lack of strategic guidance on fuel and technology options which are urgently needed for public transport investments as well as social barriers towards modernising and reforming the mini-bus taxi industry, (see as well barriers in figure below).

The current quantity and quality of sustainable transport projects and measures in cities and at national is insufficient to achieve a transformation towards low-carbon mobility in South African cities (Core Problem).

Objective

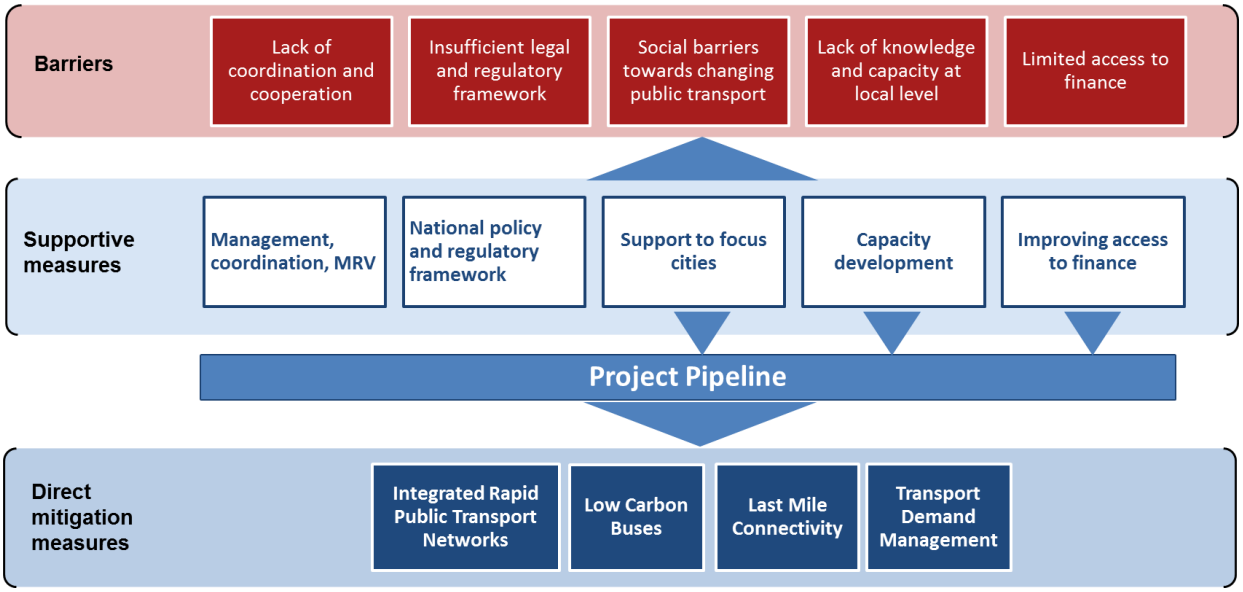
In 2015, the government has decided to develop a Nationally Appropriate Mitigation Action (NAMA) to coordinate and unlock the potential of the different initiatives for sustainable urban mobility. This will be done through a programmatic approach covering supportive measures at national level and for municipalities as well as direct mitigation measures in 10 focus cities. Tsamaya is the title of the National Urban Mobility Programme and means "go!" in the local language Setwana and can be understood as "go for sustainable urban mobility".

Tsamaya NAMA aims to reduce GHG emissions from urban transport through a national programme approach which acts an incubator for projects and mitigation measures on sustainable mobility in South African cities (Outcome).

NAMA approach

Tsamaya NAMA will systematically address the current barriers, which are considered to prevent a transformational change towards sustainable urban mobility. The following graph illustrates key barriers and the corresponding supportive measures of the programme. The national programme will create a pipeline of well-prepared high-quality measures ready-for-implementation combined with a solid financing concept. This will be achieved through technical assistance to selected metropolitan cities, improved access to finance and capacity development. At the same time the programme addresses challenges with regard to the national policy and regulatory framework and to coordination and cooperation. In this way, Tsamaya NAMA will systematically improve the conditions and create instruments to promote sustainable urban mobility.

Figure 1. NAMA Approach of Tsamaya NAMA



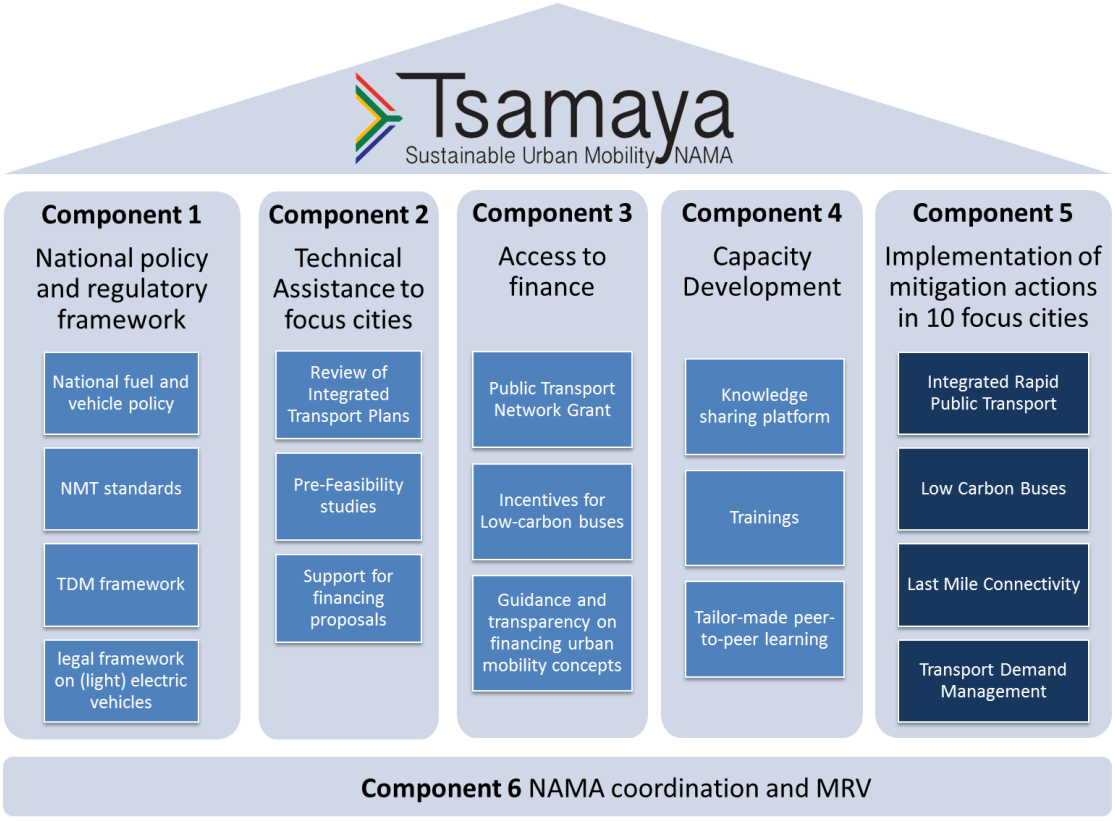
Tsamaya NAMA is building up on current initiatives and aims to increase their impact through providing enabling conditions at national level and providing technical assistance to municipalities. At the same time the programme will support municipalities in accessing different means of finance associated with the cost of sustainable mobility measures.

The supporting and mitigation measures of the national programme cover the following aspects:

- **Component 1 – National policy and regulatory framework:** National fuel and vehicle policy and guidance (incl. light electric mobility), non-motorised-transport standards, transport demand management;

- **Component 2 – Technical Assistance to pilot cities**: Review of Integrated Transport Plans, Pre-feasibility studies, Support in developing financing proposals;
- **Component 3 – Capacity development**: Knowledge sharing platform, Tailor-made peer-to-peer learning (trainings, on-the-job technical assistance, study tours);
- **Component 4 – Access to finance**: Procurement benefit negotiations with the industry, Low-carbon bus fund to promote clean technology, Upscaling of existing support programmes (e.g. Cities Support Programme), guidance and transparency on financing options.
- **Component 5 – Implementation of Mitigation Actions in 10 Focus Cities:** Integrated Rapid Public Transport, low carbon buses, last-mile-connectivity, transport demand, management
- **Component 6 – Coordination and MRV:** Political Steering Committee, inter-ministerial coordination and "Tsamaya Dialogues" to foster stakeholder exchange, impact monitoring;

Figure 2: Components and Measures of the Tsamaya NAMA



Alignment with national policies

The added value of the Tsamaya NAMA includes improved coordination with different government spheres, the creation of synergies of already existing initiatives and additional elements to create a supportive environment for cities to promote sustainable mobility. Tsayama NAMA helps to

streamline ongoing efforts and to increase their visibility nationally and internationally. It brings together the individual elements of a national urban mobility programme, which contribute to reducing greenhouse gas emissions and achieving the Nationally Determined Contributions. In this way, Tsamaya NAMA may help to increase outreach and to attract further support from international donors. The key elements of already existing programmes and institutions in the framework of Tsamaya NAMA are as follows:

1. The Public Transport Network Grant is a conditional grant of the National Department of Transport which provides infrastructure funding to 13 municipalities. The estimated budget expenses for the financial years 2015/16 to 2018/19 sum up to about 24.7 bn ZAR[1] (USD 1.6 bn). The purpose of the PTNG is to provide funding for accelerated construction, improvement of public and Non-Motorised Transport (NMT) infrastructure that form part of a municipal integrated public transport network and to support the planning, regulation, control, management and operations of financially sustainable municipal public transport network services.
2. The City Support Programme (CSP) is an initiative of the National Treasury aimed at providing implementation support to South African cities, specifically around human settlements, public transport, economic development, and climate resilience and sustainability. As of now the Worldbank, GIZ and SECO are providing technical assistance to the programme in order to upscale the impact of the programme. CSP is considered as an effective instrument to improve planning and to develop projects from a technical and financial perspective.
3. The South Africa Local Government Association (SALGA) and the South African Cities Network (SACN) are active in advocating the needs and demands of local governments towards the national governments and in sharing knowledge and best practices among their members. So far the outreach is limited in terms of topics due to capacity and budget constraints. The organisations however have a strong connection and well established communication channels to their members.

Figure 3 shows the main institutions, policies and programmes of the national government, para-state organisations and international partners, which have a key role in supporting cities to develop urban mobility. The illustration shows that there are already today several building blocks of a sustainable urban mobility programme. The Tsamaya NAMA will help to unlock the potential of the different efforts and create synergies that will lead to an increased impact, e.g. by coordinating efforts on training and capacity development, by developing strategic guidance for procurement decisions and by adjusting conditions to access of national funding by environmental standards.

Co-Benefits

The NAMA will contribute to the sustainable development goals of the National Development Plan by improving human settlements through improved walking conditions and better public transport

[1] National Treasury: Estimates of National Expenditure 2016

which both contribute to the life quality in cities. Better transport services lead to improved access to markets and infrastructure.

Tsamaya NAMA will also contribute to better Road Safety and thereby it is in line with the Decade of Action for Road Safety Resolution of 2010. A comparison of the fuel consumption in different scenarios shows that in 2030 between the Tsamaya plus scenario (see Table 1) and the BAU scenario about 2.2 billion liters of fuel can be saved (including rebound effects from addition public transport services). This translates into USD 1.1 billion per year for gasoline and USD 940 million per year for diesel savings[2].

Table 1. Definition of BAU and mitigation scenarios

See 5.3.1.2 for assumptions and further details

Scenario	Definition
BASE (2015)	Calculation of CO_2 emissions based on the number of vehicles, Vehicle kilometers travelled (VKT) per vehicle and year (city specific), vehicle load, specific fuel consumption and GHG emissions factors (national average data).
BAU (2030)	Population growth in urban areas and overall improvements in specific fuel consumption,
Tsamaya unilateral (2030)	Implementation of the national urban mobility programme without international support
Tsamaya plus (2030)	Implementation of the national urban mobility programme with international

Mitigation potential and MRV

The GHG mitigation impact of Tsamaya NAMA during the period of 2020 - 2030 is estimated to reach between 13.5 and 30.4 $MtCO_2$ cumulated, and 1.4 and 3.0 $MtCO_2$ on average per year between the Tsamaya unilateral and the Tsamaya plus scenario compared to the BAU scenario. At the end of the period the annual mitigation impact between the mitigation scenarios and the BAU scenario ranges between 2.5 and 5.5 $MtCO_2$ per year in 2030.

Costs and Financing

The supportive and organisational measures sum up to about ZAR 50 million (USD 3.4 million) for the pilot phase (2017 - 2019) with direct assistance to two cities and about ZAR 200 million (USD 12.8 million) for the roll-out phase (2020 - 2026) with direct assistance to 8 more cities receiving technical assistance three years each.

In total, the approximate investment costs for direct mitigation measures were estimated according to the additionally required public transport capacity to accommodate the future passenger

[2] Price for 1 liter gasoline: USD 0.92, 1 liter diesel USD 0.90, Nov 2016

kilometres. Comparing international examples of BRT and bus-based public transport investment costs, it is expected that the required investment sums up to about ZAR 30 bn (USD 2 bn) for the unilateral scenario and ZAR 92 bn. (USD 6 bn.) for the Tsamaya plus scenario. The required funding for investment in network infrastructure of the Tsamaya plus scenario is about double the amount of the unilateral scenario. The expenses for additional buses in the Tsamaya plus scenario are estimated at nearly four times the amount of the unilateral scenario.

The direct mitigation actions will be financed through domestic sources of national and local governments and private sector funding. The supportive measures will party be financed by the Department of Transport and international donors through technical assistance projects. In addition, the Department of Transport and the municipalities are seeking for international support to finance project investment, for technical assistance to upscale the supportive measures at national and local level.

Figure 3. Building blocks of a sustainable urban mobility programme

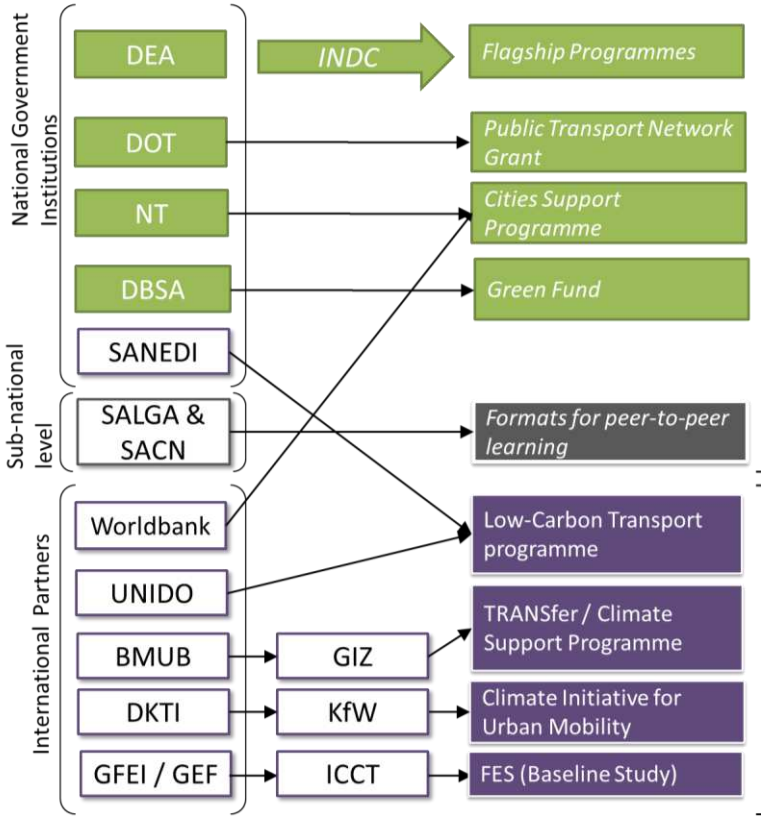


Table 2: Tsamaya NAMA at a glance

National Implementing Entity and involved stakeholders	**Institution:** Department of Transport **Name of contact person:** Mr. Themba Tenza (Chief Director: Research & Innovation) **Involved national partners:** Department of Environment, Department of Energy, South Africa Local Governments Association, South African Cities Network, City of Johannesburg; South African National Energy Development Institute (SANEDI), Council for Scientific and Industrial Research (CSIR) **Involved supporting organisations:** GIZ
Type of action	National Programme
Type of policy instruments	- Public spending/ investments - Regulations
Scope	**Geographical:** National level; 10 cities out of: Johannesburg, Cape Town, Ekurhuleni Metropolitan Municipality (East Rand), Tshwane (Pretoria), Buffalo City, Polokwane, eThekwini (Durban), Mbombela, Nelson Mandela Metropolitan Municipality (Port Elizabeth), Mangaung Municipality (Bloemfontein), George, Rustenburg **Type of approach:** Shift-Improve **Subsector:** urban passenger transport **Transport modes:** public transport; walking, cycling and light e-mobility
Main mitigation measures	- Public transport network infrastructure - Low Carbon Buses - Improving Last Mile Connectivity - Transport Demand Management measures
Timeframe	**Phase 1:** Pilot phase (2017-2019) **Phase 2:** Roll-out phase (2020-2026)
Expected GHG mitigation and further benefits	- GHG mitigation: between 13.5 and 30.4 $MtCO_2$ cumulated, and 1.4 and 3.0 $MtCO_2$ on average per year between 2020 and 2030 (unilateral scenario and Tsamaya plus compared to BAU) - Further benefits: improved air quality, public health, improved human settlement, better access to jobs and infrastructure, road safety - Fuel savings: 2.2 bn liters per year. This translates into USD 1.1bn per year for gasoline and USD 940 million per year for diesel savings[3].
Costs	**Supportive measures:** - pilot phase: ZAR 50 million (USD 3.4 million) with direct assistance to 2 cities - roll-out phase: ZAR 200 million (USD 12.8 million) with direct assistance to 8 cities **Direct mitigation actions** - ZAR 30 bn (USD 2bn) for the unilateral scenario (10 cities) - ZAR 92 bn (USD 6bn) for the Tsamaya plus scenario (10 cities)

[3] Price for 1 liter gasoline: USD 0.92, 1 liter diesel USD 0.90, Nov 2016

Financing	The supportive measures will party be financed by the Department of Transport. Further support is needed for the successful implementation of all components in 10 cities. The direct mitigation actions will be financed from domestic sources of national and local governments. In addition, the Department of Transport and the municipalities are seeking for international financial support.
Type of NAMA	Supported NAMA with unilateral elements
Type of support requested	- Technical support for technical assistance to pilot cities - Capacity building support for individuals in government, planning and management on sustainable urban mobility. - Financial support for the implementation of direct mitigation actions in pilot cities (project pipeline under development, financing instruments to channel international support will be developed during the pilot phase)

1 Introduction

The South African government aims to reduce the country's Greenhouse Gas Emissions by 34% below the Business-As-Usual (BAU) emission level till 2020 and by 42% till 2025. In its intended nationally determined contribution (INDC) South Africa takes a peak, plateau and decline GHG emission trajectory range. Between 2025 and 2035 emissions are projected to plateau followed by a decline till 2050.

The transport sector is responsible for about 9% of the country's total GHG emissions and for about 12 % of the CO_2 emissions from energy combustion (52.7 Mt CO_2 in 2014). More than 90% of the transport GHG emissions are caused by road transport. Even though the share of transport emissions within the country's GHG profile is comparably low, South Africa represents almost 20% of the transport related CO_2 emissions of whole Africa. Emissions from the transport sector are growing continuously (by 32.2% between 2000 and 2010), and are projected to increase significantly until 2050 without additional GHG mitigation measures. Consequently, the national Department of Environmental Affairs (DEA) identified the transport sector as key sector for a transition to a low carbon economy.

Urban mobility plays a particular role to achieve these targets as about 65% of the population lives in urban areas. Emissions from urban transport are growing significantly due to strong motorization growth and a modal shift from public transport towards private cars. Cities suffer from increasing car dependency and congestions as a consequence of rapidly rising motorisation rates in South Africa. Car ownership in South Africa stands at 124 cars/1000 population, for all vehicles at 190 vehicles/1000 population in 2014 (In the same year the rate referring to all vehicles was about 569 in the EU28, 102 in China and 289 in Mexico[4]).

Table 3: Key Data of South Africa

Population	54.956.920 (2015)
Urban population	65%
Population growth	0.99% (2016)
GHG emissions	544 Mt CO_2e/year (2010)
GHG emissions from transport activities	47.61 Mt CO_2e (2010)
Share of transport vs total GHG emissions	8.75 % (2010)
GHG per capita	8.86t CO_2/year (2013)
Economic growth	1.5% (2014)
CO_2 emissions from transport activities	52.7 Mt CO_2 (2014) (all African countries: 286.3 Mt CO_2)
CO_2 emissions from fuel combustion	437.4 MtCO_2 (2014)
Share of transport CO_2 emissions vs. total fuel combustion	12.05%
Growth of transport emissions (2000-2010)	32.2%
Share of road transport emissions vs. total transport emissions (2000-2010)	91,56%

[4] http://www.oica.net/category/vehicles-in-use/

The South African government has already introduced several strategies and initiatives to support sustainable urban mobility such as the Public Transport Strategy and Action Plan (2007), the Non-Motorised-Transport Policy and the National Land Transport Act (2009). With the Public Transport Network Grant (PTNG) the national governments supports the implementation of integrated rapid transit systems in 13 larger cities[5].

However, the current level of investments in sustainable transport infrastructure is not sufficient. The majority of cities in South Africa face major challenges in identifying and developing infrastructure projects that are investment ready and attractive for public and private financiers. One of the reasons for the insufficient number of well thought out projects are missing or badly prepared sustainable mobility plans and, respectively, a lack of coherent infrastructure project ideas and supporting policy frameworks.

The current situation in most South African cities is characterised by the following:

- Insufficient coverage and availability of public transport infrastructure and services;
- Lack of integration between the different public transport modes;
- Last mile connectivity is a barrier in using public transport;
- Lack of infrastructure for pedestrians or poor quality of sidewalks and safe crosswalks;
- Sustainable mobility projects (e.g. for cycling or light electric mobility such as e-bikes or pedelecs) are often implemented standalone without long-term perspective.

This leads to a series of negative impacts such as:

- Increasing levels of congestions,
- increasing time for commuting,
- Number of road fatalities,
- Car dependency is worsening the mobility of the poor population;
- Air pollution in urban areas is increasing.

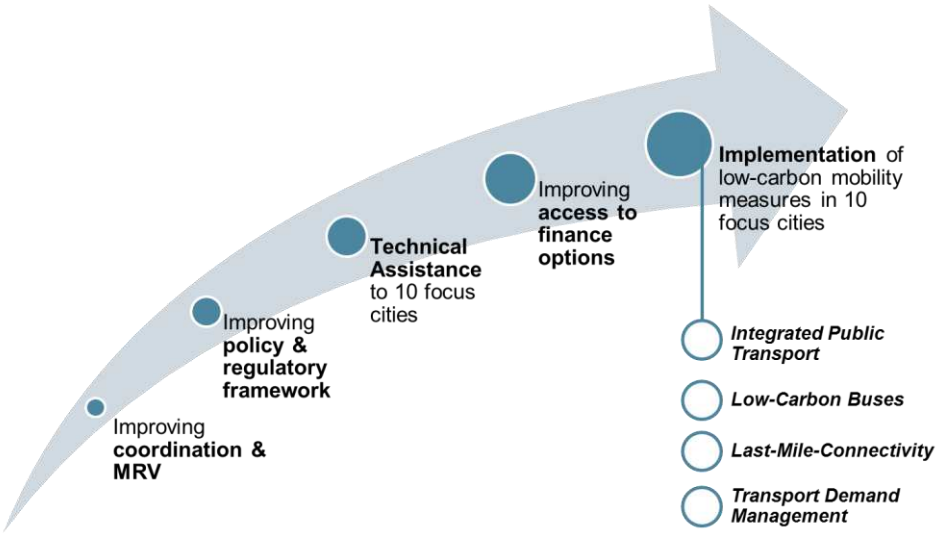
Tsamaya[6] NAMA aims to reduce GHG emissions from urban transport through a national programme approach which acts an incubator for projects and mitigation measures on sustainable mobility in South African cities (Outcome).

The core element of the NAMA is the Public Transport Network Grant of the Department of Transport which supports 13 cities through infrastructure investments. The Tsamaya NAMA will increase the impact of this programme through establishing a national urban mobility programme which integrates on-going initiatives and adds puzzle pieces that are missing to overcome the existing barriers.

[5] City of Johannesburg, City of Cape Town, Ekurhuleni Metropolitan Municipality (East Rand), City of Tshwane (Pretoria), Buffalo City, Polokwane, City of eThekwini (Durban), Mbombela, Nelson Mandela Metropolitan Municipality (Port Elizabeth), Mangaung Municipality (Bloemfontein), George, Rustenburg

[6] "Tsamaya" means "Go!" in Setwana (local language in South Africa)

Figure 4. Upscaling approach of the programm for sustainable urban mobility



The NAMA follows an Avoid-Shift-Improve approach, while focusing on the 'shift' (shifting trips to less carbon intense modes) and 'improve' (improving the energy efficiency of vehicles) element (see Dalkmann and Brannigan 2007).

The NAMA concept was developed by the Department of Transport with technical assistance from the GIZ TRANSfer project on behalf of the German Federal Ministry for the Environment (BMUB). Further implementation partners are national government institutions such as the Department of Energy (Fuel policies), National Treasury (Financing instruments) and the Department of Environmental Affairs (Climate Change Policy Coordination and MRV) and financing institutions South African Development Bank. Local governments and the respective provinces of the pilot cities (Johannesburg) have the leading role in implementation of mitigation actions) as well as transport operators and non-governmental organisations representing transport groups. National and international organisations which are already supporting sustainable urban mobility in South Africa are SANEDI, CSIR and SALGA / SACN as well as the KfW, the Worldbank and SECO.

It is foreseen by DOT to officially register the Tsamaya NAMA under the UNFCCC registry as NAMA seeking international support. During the pilot phase (2017-2019), the concept of the SUM programme will be refined and tested in cooperation with pilot cities, before it reaches out to a larger set of cities in the second phase (2019-2025).

2 Overview of the urban mobility in South Africa

2.1 The relevance of the urban mobility sector

During the last couple of years, greenhouse gas (GHG) emissions from the transport sector in South Africa have been rising significantly. Between 2000 and 2010, emissions rose by 32% (DEA 2014a). In the South African Greenhouse Gas Mitigation Potential analysis, the Department of Environmental Affairs forecasts a doubling of emissions by 2025 (and a threefold increase by 2050) compared to the level of 2000 under a business as usual scenario (see Figure 6) (DEA 2014b). In 2010, the total GHG emissions in South Africa were estimated at 544 Mt CO_2e/year (excluding forestry and land-use) (DEA 2014a). The contribution of the transport sector was estimated by Posada (2015) at 84.5 Mt CO_2/year on a well-to-wheel basis[7]. According to the GHG inventory of the DEA (2014) GHG emission from transport activities were estimated at 47.6 Mt CO_2e in 2010. The CO_2 emissions from all modes contributed the most to the GHG emissions, while the CH_4 and N_2O emission contributions were relatively small (2.1% in 2010).

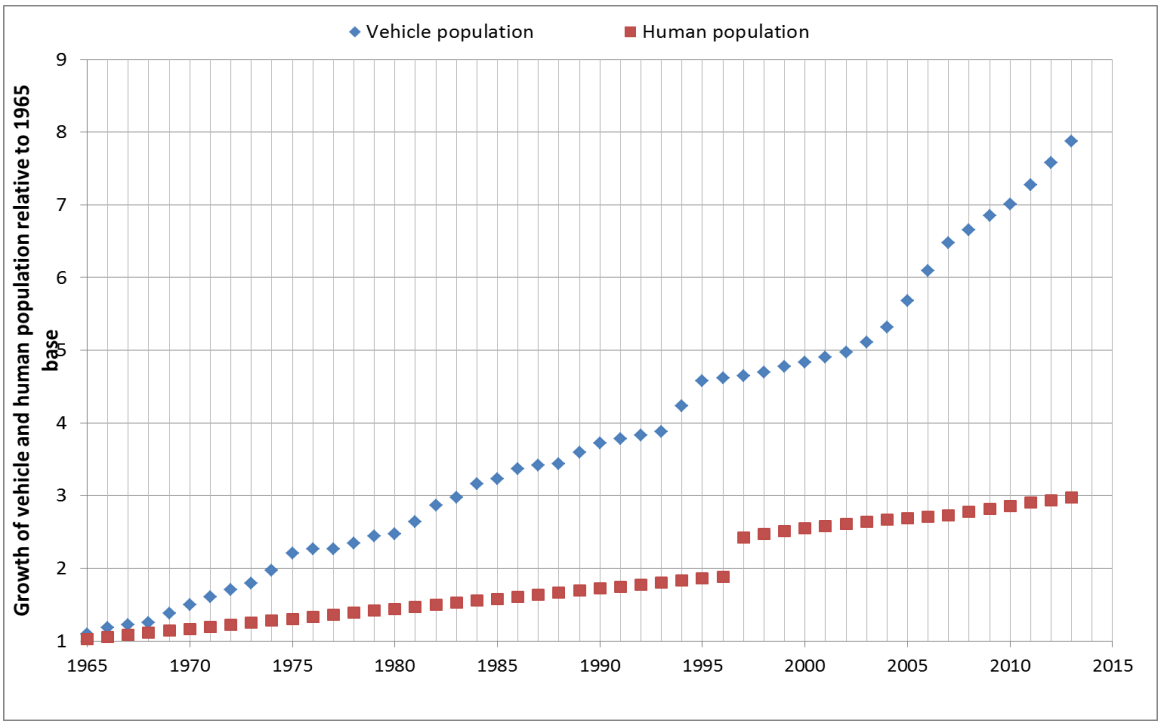
From 2000 to 2010 transport had a share of about 10.8% of the energy-related CO_2 emissions. In road transport the increase was mainly caused by the rising number of motor vehicle sales which grew from 4.2% in 2000 to 15.7% in 2010 (DEA 2014a). Upstream emissions from fuel production are high due to blending with carbon-to-liquid (CTL) and gas-to-liquid (GTL) fuels. Road transport is responsible for about 92% of the transport related GHG emissions in South Africa during 2000-2010 (DEA 2014a). Private vehicles (cars and SUVs) and light commercial vehicles (LCV) are the largest source of GHG emissions, followed by medium and heavy commercial vehicles (MCV/HCV). Mini-Bus Taxis (MBT) are the largest source of GHG emissions in land-based public transport. In 2010 the transport sector employed about 392,000 people.

Even though specific emission data is not available for the subsector, urban transport can be seen as major contributor to transport emissions. The eight metropolitan cities in South Africa are responsible for more than half of all petrol and diesel consumption in the country. As of 2015, about 65% of the total South African population lives in urban areas, and private motorised transport dominates for commuting trips in metropolitan and urban areas, followed by MBT (see Figure 7).

South Africa is experiencing rising motorisation rates. About seven million passenger cars were in operation in 2016, representing about 60% of the total vehicle fleet. As of 2013, about 29% of the households had access to a car. On average, vehicles are older than 10 years. Petrol vehicles dominate in the passenger car and mini bus sector.

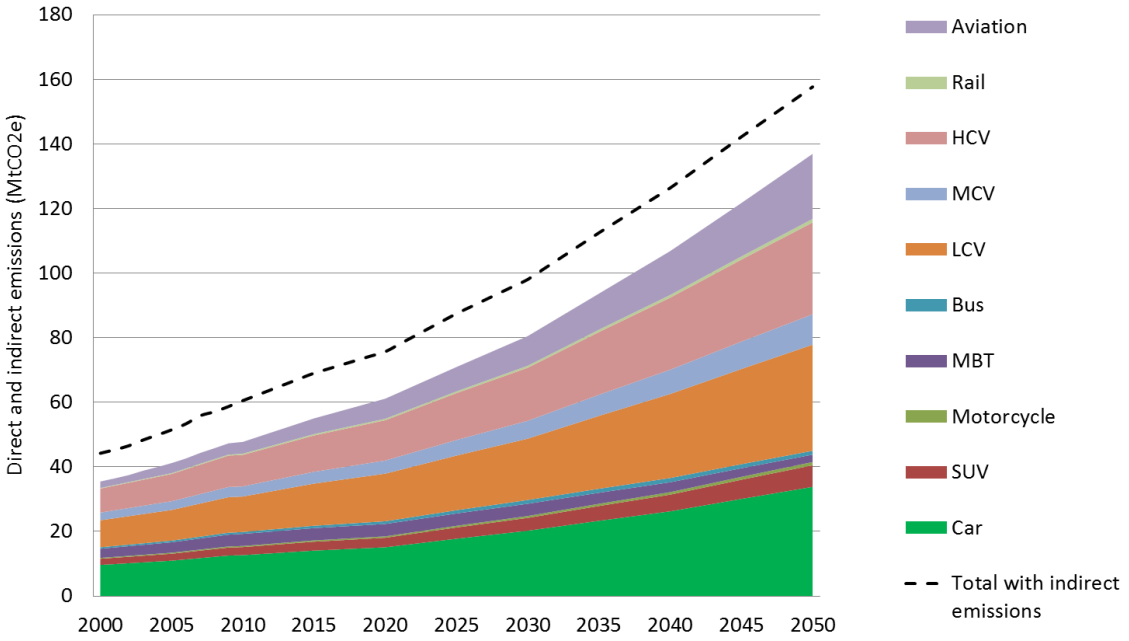
[7] Well-to-wheel emissions include all emissions from feedstock or fuel production to vehicle operation including fuel processing and delivery.

Figure 5: South Africa vehicle and human population growth trends



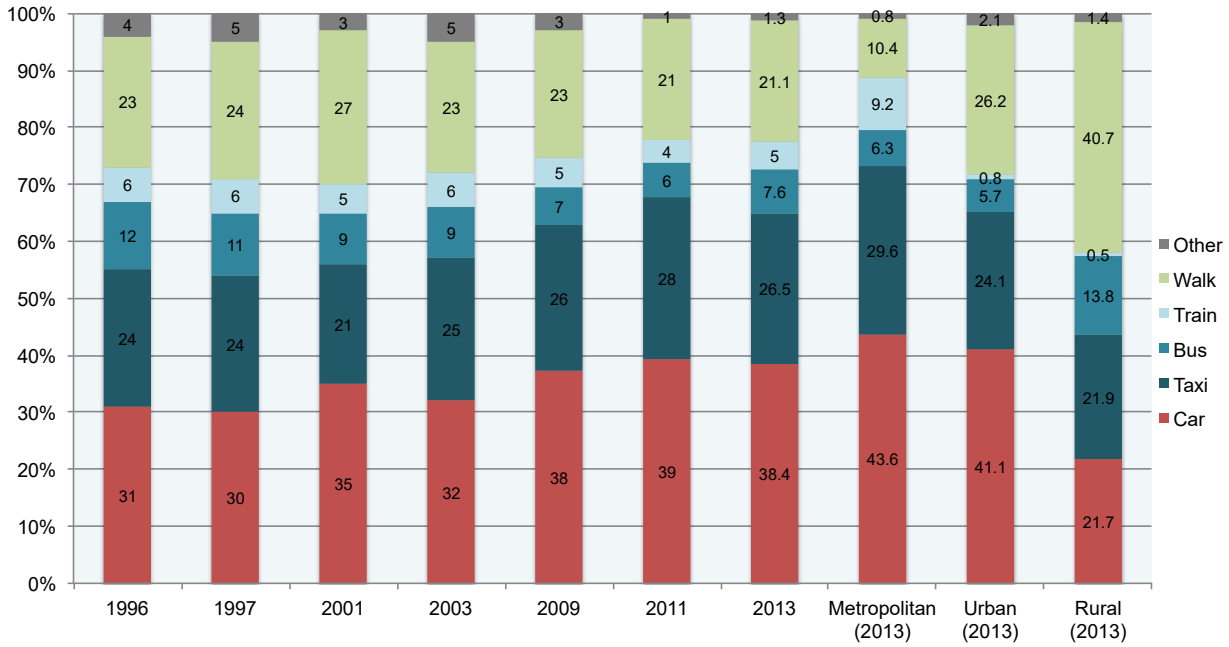
Sources: CSIR (2003), eNaTIS (2014), StatsSA (2013)

Figure 6: GHG emissions from the Transport sector BAU South Africa, 2000–2050



Source: DEA 2014b

Figure 7: Modal split in South Africa for work trips



Source: Own compilation based on Statistics South Africa - National Household Travel Surveys

The minibus taxi industry is a critical pillar of the South African public transport sector. Currently, the taxi industry is the most available mode of transport to the largest number of transport users across a variety of income and need segments. About 67% of the population uses mini bus taxis as their prime mode of transport, and they are the second most important way of commuting after private cars (DOT 2016). MBT industry is mostly informal, and it is estimated that up to 160,000 MBT in operation are non-registered (Martha, 2012), compared to the 120,000 officially registered MBT (Walters, 2013). The number of buses or minibuses is about 30,000.

The sector is highly fragmented with about two vehicles per owner. The minibus taxis, while the most prevalent mode of transport, are priced relatively high compared to other modes, partly because they are not operationally subsidised like other public transport modes (CSIR, 2016). Apart from dissatisfaction over prices, service quality and safety call for improvements.

Employment relations tend to be precarious and, for most workers, no formal contract of employment exists. There are no national minimum labour standards and no standard formula for wage payment. Workers comprise drivers, queue marshals, vehicle washers and, in some areas, fare collectors. Responsibility for the employment of the different categories of worker is divided between the taxi owners, their associations and drivers (ILO, 2003).

In most parts of the country, rail services are less developed. Metrorail commuter services are available in Cape Town, Eastern Cape Province, Durban, greater Johannesburg, and Pretoria. The Gautrain, South Africa's only high-speed train, was inaugurated in 2010 and runs between Johannesburg and Pretoria. The overall rail network in South Africa comprises about 20,247 km. About 15,000 people are employed in passenger rail services.

Non-motorised transport (mostly walking) is mainly limited to low-income households and rural areas. South Africa is facing serious problems of traffic safety, and suffers from the worldwide second highest traffic fatality rate per person (DoT, 2015). Every year, more than 10,000 fatalities occur, mostly all caused by road-transport (Das and Burger, 2015). Pedestrians are especially threatened by traffic accidents. Most fatalities are caused by motorised vehicles on the road, inter alia, due to a lack of appropriate infrastructure for pedestrians.

2.2 Urban mobility market players and their linkages

Several stakeholders are relevant for urban mobility in South Africa including national and local level stakeholders and public as well as private bodies. The stakeholders are clustered according to their importance for the successful implementation of a national SUM Programme.

Figure 8: Stakeholder landscape on urban mobility in South Africa
(Stakeholders directly involved in the SUM Programme are marked red)

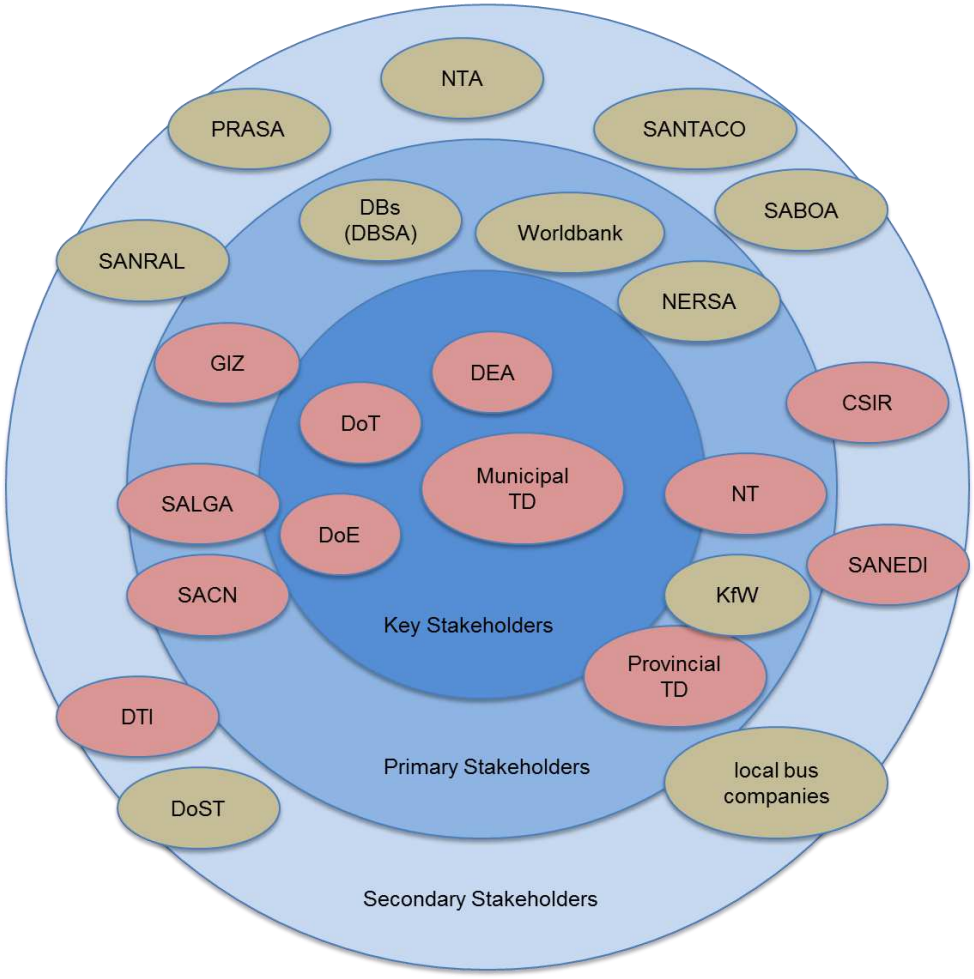


Table 4. Stakeholder overview on urban mobility in South Africa

Key stakeholders:
Department of Transport (DOT) is the main decision maker responsible for regulation of transportation. Through the DOT, the government channels its regulations and sets transport policies, which are further implemented by provinces, metropolitan and district municipalities. This includes the definition of roles for the provision and management of public transport. The National Land Transport Act (NLTA) requires municipalities to prepare Integrated Transport Plans (ITPs) for their area. However, this instrument is not used to its full potential yet (see section 3). According to NLTA, the national government is responsible for capacitating and monitoring provinces and municipalities that lack capacity or resources to perform their land transport functions. The DOT is responsible for implementing the Transport Flagship Programme under the National Climate Change Response Policy (NCCRP) and has to set emission reduction targets for the transport sector (see 2.4). Even though, DOT has a strong mandate to regulate the transport sector the enforcement of new policies is often limited and therefore several programmes and programmes are lacking behind their targets.
Department of Environmental Affairs (DEA) is in charge for the coordination of all sectors with regard to GHG emission mitigation in and the formulation of related strategies and programmes. DEA is responsible for the National Climate Change Response Flagship programme (see 2.4) and supports the DOT in implementing the Flagship on transport. DEA acts as link to international funding sources for infrastructure and capacity building with an environmental focus. Furthermore, DEA has the mandate to manage air pollution: the 2007 National Framework serves as DEA's Air Quality Management Plan. All provinces are obliged to develop AQMPs to reduce and monitor local emissions.
Department of Energy (DOE) is responsible for defining the national policy on fuels and energy use in the transport sector. **National Energy Regulator SA (NERSA)** regulates fuels and prices in line with DOE.
Municipal transport departments are mainly concerned with the development of land transport policies and strategies within their area. The largest metropolitan areas are governed by metropolitan municipalities, while the remaining urban areas are divided into district municipalities, each of which consists of several local municipalities. According to the NLTA they have to develop integrated transport plans for the area and ensure that the plans are implemented and monitored. They have to provide municipal public transport services. Municipalities and metropolitan authorities are responsible for the construction of non-motorised transport (NMT) infrastructure on the roads assigned to them (is about 40% of the national road infrastructure).
Primary Stakeholders:
Provincial transport departments supervise the development of operational plans by local governments and their compliance with provincial plans. Where capacity is lacking, provincial departments are to assist with the development of detailed plans in the short-term, but make efforts to develop the capacity of Local Government in the long-term. Provincial departments have to ensure that national level policies are put into action at local level. They provide provincial public transport services.
National Treasury manages the national finances including several transport related grants and programmes. In consultation with the DOT the National Treasury sets funding guidelines, fuel levies and taxes for the transport sector. It transfers national tax revenues to provinces and municipalities.
Development banks such as DBSA (Development bank of South Africa), KfW (German development bank and others provide funding for the implementation of sustainable transport projects.

South Africa Local Government Association (SALGA) is an autonomous association of municipalities. Its task is to provide advice and support to municipalities in form of policy analysis, research and monitoring and knowledge exchange. SALGA supports the interests of local government at the national level and interfaced with parliament the National Council of Provinces (NCOP), cabinet as well as provincial legislatures. Mandated by the Constitution of South Africa, SALGA acts as representative of local governments.
SACN (South African cities network) is a subsidiary body of SALGA focusing on the eight metropolitan municipalities in South Africa (i.e. Johannesburg, Buffalo city, eThekwini, Ekurhuleni, Mangaung, Tshwane, Nelson Mandela Metropole, Msunduzi). SACN plays an important role in knowledge management and capacity building. It provides learning platforms for instance on public transport, however their outreach an capacity is limited and further support is required to achieve a systematic learning among members. The network is financed by the participating cities, grant funding by the national Department of Cooperative Governance and Traditional Affaires (CoGTA) and project based funding by other departments.
International Implementation partners: GIZ has been supporting the DoT in developing this NAMA concept and will provide technical assistance during the pilot phase, both on behalf of the BMUB (German Ministry of Environment, Nature Conservation, Building and Nuclear Safety). Worldbank, UNIDO (see section 2.5)
Secondary stakeholders:
Research institutions such as **SANEDI (South African National Energy Development Institute), CSIR (Council for Scientific and Industrial Research)** and **universities** support the DOT in data collection, analysis and in research on transport and provide advice on transport matters.
South African National Taxi Council (SANTACO) was established and is financed by the DOT as body of the MBT industry. The organisation is divided in Provincial and Regional or District Taxi Councils, which are powerful and do not always act inline with the national representation. SANTACO has only limited influence on the taxi owners and drivers. The **National Taxi Alliance (NTA**) is the second strongest association of the MBT industry, leading to competing interests of SANTACO and NTA.
Passenger Rail Agency of South Africa (PRASA) manages the national rail network as well as metrorail in urban areas.
Local bus companies can be either operated by private actors or are set up by state authorities such as the provincial departments of transport or municipal entities.
Department of Trade and Industry (DTI) is responsible to support the development of alternative fuelled vehicles and approve vehicle standards through the South African Bureau for standards (SABS)
South African National Roads Agency limited (SANRAL) is responsible for the national road network including NMT infrastructure along national roads.

2.3 Finance for urban mobility in South Africa

In the fiscal year 2015/2016, the national government allocated ZAR 53.6 billion (USD 3.5 billion) to the transport sector. Thereof ZAR 20.7 billion (USD 1.3 billion) is transferred to provinces and municipalities as equitable shares or conditional grants and ZAR 13 billion (USD 0.9 billion) to departmental agencies such as the Passenger Rail Agency (Table 5). Public corporations and private enterprises in the transport sector receive ZAR 18.2 billion (USD 1.2 billion). From a sector specific perspective, road transport receives the largest share of the national budget in the transport sector (ZAR 23.0 billion – USD 1.5 billion) followed by rail transport (ZAR 18.3 billion - USD 1.2 billion) and public transport (ZAR 11.5 billion – USD 0.7 billion) (National Treasury 2016).

Table 5: National Expenditure programmes and subsidies in the transport sector

Fund/Programmes ***[Purpose]***	Expenditure 2015/2016 (in million)	
	ZAR	USD
Public transport network grant (PTNG) (to provinces and municipalities) *[Funding for accelerated construction and improvement of public and non-motorised transport (NMT) infrastructure (capital costs). The grant is transferred to 13 cities for technical design and construction of their integrated public transport networks such as BRT systems. The fund can be used for Public transport infrastructure including planning and construction, maintenance and upgrading of dedicated lanes, routes, stations, depots, control centres and related information technology, fare systems and vehicles (in exception). And NMT infrastructure that supports network integration (e.g. sidewalks, cycleways and cycle storage at stations)*	5,953	387
Public transport operations grant PTOG (to provinces) *[Subsidies for public transport operations such as vehicle operating costs. The PTOG is usually administered by the provinces, which can transfer budget to subsidise municipal bus services]*	4,399	286
Provincial road maintenance grant *[Maintenance of provincial road infrastructure (roads maintenance, disaster relief, roads in support of electricity generation)]*	9,807	638
South African National Roads Agency *[Development and upkeep of national road network (infrastructure investment)]*	8,591	559
Passenger Rail Agency of South Africa	11,595	754

[Maintenance and rehabilitation of passenger rail infrastructure; half of the budget is dedicated to metro rail services, the other half is for long-distance rail]		
Passenger Rail Agency of SA: Rolling Stock *[Provision of new rolling stock]*	2,561	167
South African National Taxi Council (SANTACO)	19	1
Taxi Recapitalisation Programme	331	22

Source: National Treasury (2016)

Domestic sources of finance

In addition to general tax revenues, several sector specific financing streams are available in South Africa. The fees from the toll road network generate about ZAR 4 billion (USD 300 million). These non-tax revenues remain with the South Africa Roads Agency and make up about 60% of their budget. Non-tax revenues such as ticket sale revenues cover about 42% of the expenses in passenger rail, which amount to about ZAR 11.2 billion (USD 700 million). Taxes on petrol and diesel make up between 30 to 40% of the pump price and consist of general fuel levy, road accident fund levy and customs, and excise levy. The general fuel levy generates about ZAR 56.7 billion (USD 3.6 billion) of revenues. About 18% thereof (ZAR 10.3 billion – USD 0.6 billion) is directly transferred to municipalities. Additional revenues are generated by the CO_2 emission based motor vehicle emission tax.

The **expenditures in municipalities** are funded through three main income sources: revenues from municipal services (e.g. revenues from water, electricity and waste removal, property rates), the "equitable share" budget from nationally collected tax revenues (e.g. the fuel levy) and "conditional grants" such as the public transport network grant. About 70% to 85% of the overall municipal budget is generated from local sources. Similarly, provinces receive conditional and unconditional budgets from the national level, while own revenues of provinces make up only 5% of the budget in provinces. The Public Transport Network Grant (PTNG), managed by the DOT, is the main national instrument to support the improvement of local public transport networks. The eight metropolitan municipalities and five additional cities (i.e. Mbombela, Polokwane, George and Rustenburg) receive funding under the PTNG. The grant supports the implementation of high quality bus services. 80% of the grant is allocated to the cities on a fixed basis according to specific criteria like city size. The remaining 20% are distributed by the DOT based on individual proposals from the municipality. The budget of the PTNG has been increased continuously by 4.3% per year between 11/12-14/15.

Most public transport services such as Metrorail, Gautrain, provincial bus services and Bus-Rapid-Transit (BRT) systems in South Africa are subsidised. The subsidy either stems from national streams such as the Public Transport Network Grant or the Public Transport Operations Grant, or directly from provinces and municipalities if they own and operate the service. The MBT industry does not receive any direct operational subsidies, but financial support for vehicle scrappage from the taxi recapitalisation program.

Furthermore, development banks provide financial resources, which are available for the transport sector. The Green Fund of the Development Bank of South Africa (DBSA) provides financial support in form of grants (recoverable and non-recoverable, concessional loans and equity) for projects in three different funding windows. Within the funding window “Green Cities and Towns” sustainable transport is a focus area (Green Fund 2016). Under the Infrastructure Investment Programme (IIPSA) funded by the European Union and implemented by the DBSA, infrastructure development in different sectors including the transport and logistics sector can receive support in form of loans from participating finance institutions such as KfW or African Development Bank (AfDB) (DBSA 2013). However, for instance in terms of KfW, only three cities in South Africa currently meet the requirements to receive a loan.

The given situation shows that significant resources have been allocated by the national government already to support the development of public transport infrastructure as well as to subsidise the operation. This financial support is mainly distributed in a top-down process and limited to mayor public infrastructure such as rail systems, BRT and city buses. Further support would be necessary to improve the quality of minibus taxi services which are representing more than 65% of the public transport trips. Furthermore, beyond those 13 cities other municipalities need financial support to improve their public transport systems in order to maintain the share of public transport users or, to achieve the shift from cars to public transport as proposed in the public transport strategy.

Another challenge with regard to accessing finance is the lack of capacity of most local governments to develop financing proposals to access the given financing opportunities, e.g. from the Development Bank. Also many local governments do not meet the requirements to access loans or to match with the minimum needs of a conditional grant.

2.4 South African urban mobility policy in the context of climate change

South Africa’s GHG emissions have steadily increased in the past decades. In September 2015, South Africa submitted its official GHG mitigation target to the United Nations Framework Convention on Climate Change (UNFCCC) as Intended Nationally Determined Contribution (INDC). The mitigation target takes the form of a peak, plateau and decline GHG emissions trajectory range, starting in 2020. Between 2025 and 2035 emissions are supposed to plateau in the range of 398 to 614 million tonnes CO_2e including land-use, land-use change and forestry (LULUCF), followed by a decline to between 212-428 $MtCO_2e$ by 2050. This INDC translates to an emissions level excluding LULUCF of between 417-633 $MtCO_2e$ for 2025 to 2035, which is equivalent to a 20-82% increase in the 1990 emission level, assuming LULUCF emissions remain at the average level over the time period 2000–2010 (-19 $MtCO_2e$). The long-term target until 2050 translates to emission levels which are 35% below to 29% above 1990 levels (excluding LULUCF) (Climate Action Tracker 2015). The emission reductions are economy wide, covering all sectors including agriculture, forestry and land-use (AFOLU), but the INDC does not yet provide any more details regarding sectoral mitigation targets.

The approach to achieve the current INDC is based on the **National Climate Change Response Policy (NCCRP)** and the **National Strategy for Sustainable Development (NSSD).** The NCCR White Paper of 2011 presented the country's vision for an effective climate change response and a long-term, just transition to a climate resilient and low-carbon economy and society. The NCCRP covers adaptation and mitigation aspects and has the objectives to effectively manage inevitable climate change impacts and to mitigate GHG emissions, while enabling sustainable development. With the NCCRP a set of National Climate Change Response Flagship Programmes was established. Eight Flagship Programmes have been identified, each including a set of measures to trigger a transition to a low carbon economy and to enhance climate resilience. A dedicated Transport Flagship Programme was established focusing on four measures: i) promoting low carbon mobility in five metropolitan cities and ten smaller cities, ii) creating an efficient vehicles programme to improve the average efficiency of the South African fleet iii) rail re-capitalisation to induce a shift from road to rail and iv) introducing an efficiency programme for governmental vehicles. The proposed Tsamaya NAMA is closely related and in line with the first measure within the Transport Flagship Programme.

Textbox 1. Statement of the Department of Environmental Affairs on Flagships and NAMAs

1. *The mitigation flagship programmes represent the country's de facto portfolio of NAMAs*
2. *Flagship programmes are built on a solid foundation of policy interventions, anchored within key departments with political support and public sector funding which can be leveraged*
3. *Transforming a NAMA from idea to implementation can be resource intensive: time, capacity & finance*
4. *A strategic approach to prioritisation and sequencing is essential and should be aligned to the mitigation potential*
5. *NAMA financing is a central issue in climate negotiations*
6. *To ensure full and sustainable implementation of NAMAs, strong ownership by government is needed*

Source: Presentation by Reitumetse Molotsoane, DEA (Tsamaya NAMA Roundtable Meeting, December 2016)

The reduction of the transport sector's GHG emissions is also anchored in the National Strategy for Sustainable Development and Action Plan (NSSD) prepared by the DEA and approved by the cabinet in 2011 (DEA 2011). The NSSD aims to support the implementation of the National Framework for Sustainable Development (NFSD). The NSSD 1 was supposed to be implemented between 2011 and 2014 and to be followed by NSSD 2 ranging from 2015 to 2020. The NSSD1 proposes the establishment of a Committee on Sustainable Development (NCSD), which oversees the implementation and monitoring of the interventions.

The NSSD1 formulated five strategic priorities; sustainable transport and infrastructure is mentioned as one intervention under the strategic priority "Towards a green economy" and under the priority "Responding effectively to climate change". Specific targets are formulated for the transport sector: City-wide public transport systems are to be in place by 2020 and GHG emissions from transport are to be reduced, inter alia, by increasing the modal share of public transport and non-motorised modes and by introducing hybrid and electric vehicles. The proposed SUM

Programme supports the goals of the strategy by supporting cities in providing high quality and efficient public transport services, improving conditions for NMT, cycling and light e-mobility, promoting the use of clean vehicles and fostering transport demand management.

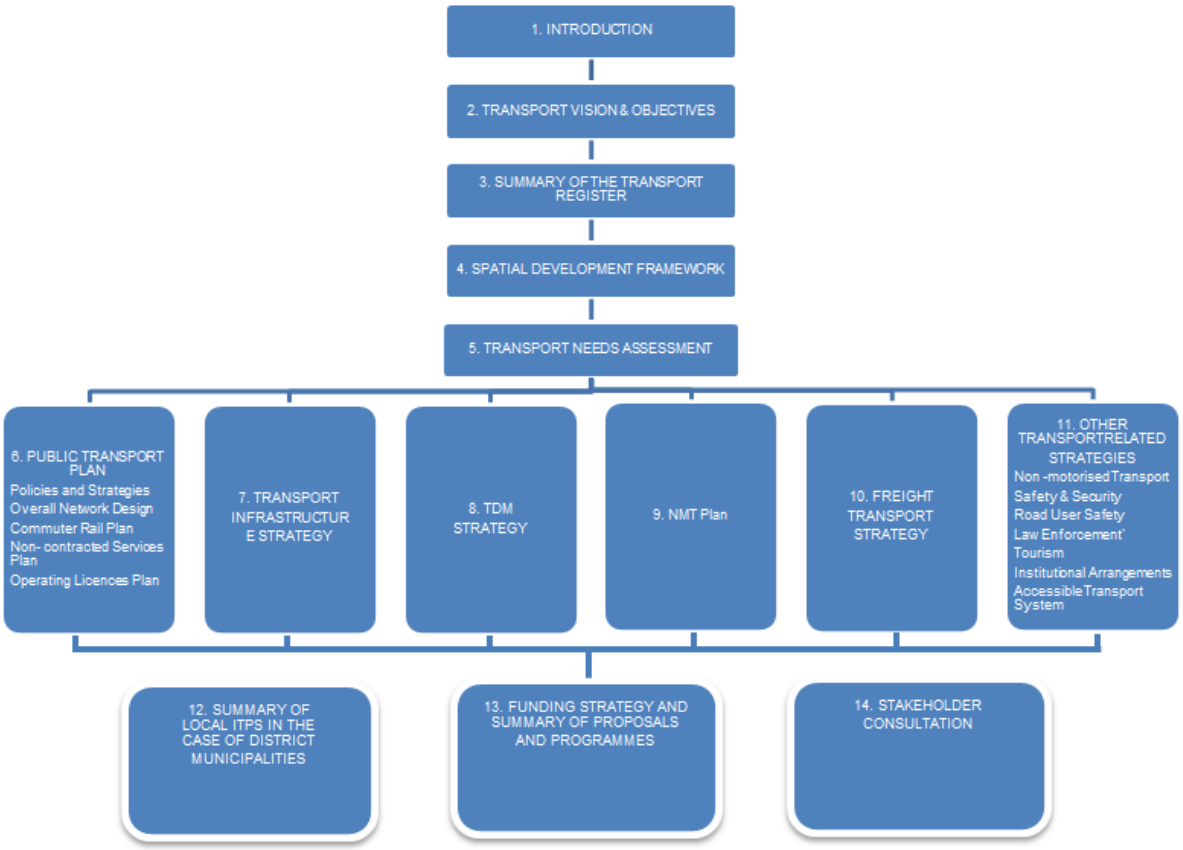
Several sector specific policies are relevant in achieving GHG emissions mitigation in the transport sector and set the overall framework for transport policy in South Africa. The White Paper on National Transport of 1996 sets the overall framework for transport in South Africa. Its vision statement recognises, inter alia, the need to improve the transport system in a manner that is environmentally sustainable. The **National Land Transport Act (NLTA**) of 2009 defines the competencies and roles of the national, provincial and municipal levels of government regarding different transport functions. According to the NLTA, the national government is responsible for capacitating and monitoring provinces and municipalities that lack capacity or resources to perform their land transport functions. The provincial departments need to ensure that municipalities that lack capacity and resources are capacitated to perform their land transport functions, and build capacity in municipalities to monitor the implementation of the Act. The proposed SUM Programme is in line with these assigned functions and supports their fulfilment.

According to the NLTA, municipalities are responsible for implementing national and provincial transport policies and strategies. National guidance is provided for instance by the **White Paper on National Transport** of 1996, the **Public Transport Strategy and Action Plan** of 2007 and the draft **NMT Policy** of 2008. In addition, some of the key requirements for municipalities that are stipulated in the Act are directly related to the SUM Programme: Municipalities have to

- develop land transport policy and strategies within their area based on national and provincial guidelines
- prepare transport plans for the municipality, and ensure that the plans are implemented and monitored.
- encourage and promote optimal use of available travel modes.
- develop, implement and monitor a strategy to prevent, minimise or reduce any adverse impacts of the land transport system on the environment.
- plan, implement and manage modally integrated public transport networks

The NLTA of DOT requires municipalities to prepare Integrated Transport Plans (ITPs) for their area. However, this instrument is not used to its full potential yet (see section 3).

Figure 9. Minimum Contents of a Comprehensive ITP



Source: Government Notice No. 881, 29 JULY 2016: National Land Transport Act (5/2009): Minimum Requirements for the Preparation of Integrated Transport Plans. DOT; NLTA, 2009 (ACT NO. 5 OF 2009)

The minimum requirements for ITPs have been revised in July 2016 and the content has been extended to a comprehensive set of measures as can be seen in Figure 9. The process of preparing ITPs and especially participation of the public as well as of representatives of different interest groups has not been further defined.

Compared to the predecessor of 2007, the NLTA empowers municipalities to regulate and manage their own public transport network and contract operators for up to 12 years. This amendment was especially made to enable the implementation of BRT systems in metropolitan areas. The objective to establish BRT systems in larger cities was already formulated in the **Public Transport Strategy and Action Plan** of 2007, which covers the period 2007 to 2020. The PT Strategy and Action plan was developed by the DOT in cooperation with 6 metropolitan cities and 6 other cities. Till 2020, 85% of a metropolitan city's population should have access to an integrated rapid public transport network within 1km and 20% of work trips are to be shifted from car to public transport. In addition, by 2014 more than 100km of high quality walkways and cycle ways were to be installed. The following BRT systems are currently in operation in South Africa : Rea Vaya in Johannesburg, MyCiTi in Cape Town, and A Re Yeng in Tshwane. There are additional systems planned in Durban, Port Elizabeth, and Brits.

1) Cape Town: The City's *MyCiTi* BRT system started operations in May 2010, just before the 2010 World Cup. Its first service was a shuttle from the Airport to the CBD. The initial Phase 1A trunk and feeder services started operating in May 2011. Phase 1A construction was completed in 2014 and 1B in 2015.
2) George: The Go George BRT system began operation in August 2015.
3) Johannesburg: The Rea Vaya first phase (phase 1A) was opened to the public in August 2009. Expansion of BRT system is under construction and in many cases both the stations and roadworks have either been completed or are in the final stages. The system was partially opened for the 2010 World Cup with the full system linking majority of Johannesburg from Soweto in the south to beyond Sandton in the north.
4) Nelson Mandela Bay system was first implemented in the city for the 2010 World Cup. At the moment, the bus lanes are being competed for the full rollout throughout the city.
5) Tshwane: A Re Yeng construction began in July 2012.
6) Rustenburg: The *Yarona* BRT system is still under construction. The initial Phase 1A trunk and feeder services expected to launch by the end 2016.

A draft **National Non-Motorised Transport Policy** was developed by the DOT in 2008 and will be integrated in the Green Transport Strategy. It sets the objectives to increase the role of NMT, to integrate NMT as an essential element of public transport, provide a safe NMT infrastructure, allocate adequate and sustainable funding for the development and promotion of NMT. Currently, the draft NMT policy is under revision within the "Green Cities Programme" (see 2.6). The NMT policy is supplemented by the NMT facility guidelines that have been updated in 2014 and provide technical guidance on the planning and design of NMT infrastructure. However, there has been limited progress in implementation of NMT infrastructure.

In early 2017, the DOT is launching a **Green Transport Strategy** (GTS) which aims to minimise the adverse impact of transport on the environment, while addressing current and future transport demands based on sustainable development principles. To achieve this aim, the GTS intends to induce mode shift from cars to public transport and non-motorised modes, to promote the use of electric vehicles and low-carbon fuels, to improve the vehicle efficiency and to promote integrated transport planning. Several measures have been identified to accomplish these objectives (DOT 2016). The SUM Programme will support the implementation of the identified actions and will deliver on the objectives of the GTS.

2.5 South African initiatives in the urban mobility sector

In preparation of the soccer World Cup in 2010, South Africa intended to introduce **Bus-Rapid-Transit (BRT) systems** in six metropolitan municipalities in South Africa. This objective was anchored in the Public Transport Strategy and Action Plan in 2007, and the NLTA was changed in 2009 to create an enabling environment for BRT systems operated under municipal authority. The BRT systems are funded by the Public Transport Network Grant (PTNG) (see 2.3). South Africa mentioned the national investments in public transport infrastructure in the country's INDCs. Till 2016, BRT systems have been launched in Johannesburg, Cape Town, Tshwane, and George. Extensions of the system are planned, for instance, in Johannesburg. Planned BRT systems in Nelson Mandela Bay and Port Elisabeth are not yet in operation. Strong opposition of the MBT industry impedes the implementation of BRT projects in several cities in South Africa.

Johannesburg overcame this barrier by compensating MBT drivers for lost income and offering them shares of the BRT operating company. Former MBT drivers own 75% of the operating company of the second BRT route in Johannesburg. The existing BRT systems were criticised by some authors for not being integrated properly in the existing public transport system and for being too expensive for the urban poor (Walters 2014 and Jennings 2015).

Another initiative that was anchored in the Public Transport Strategy and Action Plan is the **Shova Kalula National Bike Program**. The Program, which was launched by the DOT and is supported by NGOs and international partners, started in 2011 with the aim to increase cycling, especially in rural areas. Within the programme initially about one million bikes were to be distributed. However, the programmes remained far behind this target. Till 2014 only 95,000 bicycles were circulated. Between 2014 and 2017 another 21,000 bicycles are to be distributed. The limited effectiveness of the programme is caused by the lack of financing for the programme, the lack of bicycle manufacturing capacity as well as the low extent and quality of the cycling infrastructure as the programme is not coupled with cycle path network extensions. One of the success indicators of the programme is to contribute to job creation and strengthen the local cycling industry. In order to overcome the supply challenges it may be recommendable to consider the import of bicycles and at the same time support to local manufacturers.

In 2009, the DOT launched the **Taxi Recapitalisation Programme** to improve the shortcomings and push the taxi industry out its informal state by offering taxi drivers a scrapping fee and setting higher service standards for new vehicles, therefore phasing out non-compliant vehicles.

The programme targeted at the introduction of more efficient and higher capacity vehicles by offering a scrapping bonus of up to ZAR 50,000 (USD 3,250) to minibus owners. In total, ZAR 7.7 billion (USD 0.5 billion) were made available for the scrappage programme. At the same time, new regulations were introduced for MBT operation such as the replacement of radius-based operation permits to route-based licences. Furthermore, the sector was meant to be formalised by introducing minimum wages, maximum driving hours, safety and service requirements, and tax obligations. The programme considerably lags behind initial plans.

Although proposed in 1999 and initially planned to be in force only from 2001-2006, the program was extended multiple times and until today failed to reach its initial goal of phasing out non-compliant vehicles throughout the whole industry as well as pushing MBT taxis out of informality. Reasons for this failure include administrative shortcomings as well as in the resistance of the taxi industry.It faces strong opposition from the MBT industry, inter alia, due to delays in granting route based licences and fear of job losses. To accelerate the implementation and negotiate with the MBT industry, SANTACO was created as a single body representing the MBT industry. However, not all regional offices of SANTACO support the Taxi Recapitalisation Programme. The recapitalization program is driven by the DoT in a top-down fashion, whereas the South African MBT industry is organized in a bottom-up way (Woolf and Joubert, 2013).

South Africa's National Treasury initiated the **City Support Programme** to address development challenges at the city level. The programme provides technical support to large urban municipalities in South Africa with a focus on the eight metropolitan municipalities. The programme focuses on public transport, human settlements, economic development, climate resilience and

sustainability. It aims at encouraging better governance in cities including governance structures, spatial planning and infrastructure finance and delivery. For each city a support plan is developed along the focus areas. The programme does not support infrastructure investments, but provides technical advice and funds consultancy services.

In addition to national initiatives, there are several municipal activities in the field of sustainable urban mobility. For instance, the city of **Johannesburg** introduced several measures to promote **cycling,** including construction of cycle lanes and bicycle parking infrastructure, dedicated promotional events such as the Freedom Ride and increasing cycling safety by changing road speeds and signage (City of Johannesburg 2014). The city has assigned ZAR 110 million (USD 7.2 million) towards constructing bicycle routes and pedestrian walkways (Johannesburg Development Agency).

2.6 International cooperation with South Africa in urban mobility

Some international cooperation projects on urban mobility already exist in South Africa.

Green Cities Programme (DEA/KfW):

The Government of South Africa through DEA receives grant funding from the German Development Bank (KfW) to implement a Non-Motorised Transport Programme. The objective of the programme is to develop infrastructure for non-motorised transport and associated services to reduce carbon emissions, improve air quality and to encourage a healthier lifestyle. The first phase of the programme was initiated in 2011. For this phase eThekwini, Johannesburg and Polokwane were selected for NMT-infrastructure development. In addition, several knowledge sharing events and a national conference on NMT were organised and a NMT Best Practice Manual for municipalities was developed. In 2016, the second phase of the programme was launched and receives EUR 5 million (ZAR 86.7 million) from KfW. Over a period of five years, NMT associated services are promoted such as the establishment of Bicycle Empowerment Centres and advocacy campaigns to encourage NMT use by communities are conducted. Furthermore, existing bicycle networks will be extended. Phase two is not limited to the pilot municipalities, who participated in phase one.

Energy efficient low-carbon transport in South Africa (UNIDO/SANEDI)

UNIDO and SANEDI are jointly implementing a three year project on the promotion of energy efficient, low carbon transport in South Africa. Additional project partners are the Technology Innovation Agency (TIA), Cities of Durban and Johannesburg, Department of Trade and Industry (DTI), Department of Environmental Affairs (DEA), Department of Transport (DOT), and Department of Energy (DOE). The project aims to promote the widespread use of electric vehicles (EVs) and non-motorised transport (NMT), as well as the development of the necessary infrastructure. The project takes a two level approach: at the national level it aims to improve the policy and regulatory frameworks for EV use and local manufacturing and NMT; at the local level the project intends to strengthen the local policy and regulatory frameworks for EVs and NMT, to increase the institutional capacities and to install supporting infrastructure for EVs. The project receives USD 1.3 million (ZAR 19.9 million) grant funding by the Global Environmental Facility

(GEF). Co-financing by SANEDI, UNIDO, TIA, DTI and the participating cities amounts to USD 7.1 million (ZAR 109.2 million).

Climate Support Programme (GIZ, DEA)

Climate Support Programme (CSP) was initiated in 2009. It is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). The programme aims to reduce South Africa's carbon footprint and to strengthen the country's resilience to climate change. From 2017 the programme will (among others) focus on supporting the implementation of flagship programmes.

Cities fit for Climate Change (GIZ, CoGTA)

In cooperation with the South African Ministry of Cooperative Governance and Traditional Affaires (CoGTA), GIZ is implementing the project Cities fit for Climate Change in Durban (eThekwini). Besides South Africa, Chile and India are participating in the project. The project receives EUR 3.5 million (ZAR 60,7 million) grant funding from the German Ministry of Environment, Nature Conservation, Building and Nuclear Safety (BMUB) under the International Climate Initiative (IKI). The activities started in November 2011 and will run till October 2018. The project supports the participating cities in developing climate-sensitive strategies to become more resilient to climate risks and to take into account the need to mitigate climate change.

MobiliseYourCity Initiative (GIZ, AFD, EU)

MobiliseYourCity is a partnership initiative, launched at COP 21, bringing together diverse stakeholders who are committed to sustainable mobility. During the pilot phase, the Steering Committee will decide about the opportunity of becoming a national MYC member and also local governments of the programme are invited to apply. It supports local governments in developing countries to plan sustainable urban mobility in order to develop more inclusive, liveable and economically efficient cities and reduce GHG Emissions.

3 Barriers to a low carbon urban mobility in South Africa

As shown in the overview section above, there are several programmes and initiatives as well as good practice in cities that promote sustainable urban mobility. However, there is a variety of barriers that prevent the large-scale transformation towards sustainable urban mobility in South Africa. The following findings result from different stakeholder consultations and may be subject to individual experiences. Though, generally it was observed that these findings have been confirmed widely. The main barriers can be summarised as follows:

Institutional barriers

The responsibilities for regulation, management and funding of different sustainable transport modes in South Africa are currently divided between different governmental levels (i.e. nation, provincial, municipal and district level) leading to a fragmented system and a lack of a coherent policy for sustainable urban mobility (Dawood and Mokonyama 2015b). Also within one governmental level the coordination and consultation between different departments and divisions could be improved.

In addition, coordination is inhibited by a lack of a common vision and terminology concerning sustainable urban mobility. As a result, projects and policies are not sufficiently aligned and the prioritisation and implementation of individual projects is sometimes not in line with the overall strategy towards an integrated transport system. It appears that governmental units implement projects and programmes in municipalities, which are not incorporated in local strategies and the municipal ITPs. Public transport is often managed isolated as routes and NMT remains unconnected to other modes (Dawood and Mokonyama 2015a). The obligation of ITPs does already improve the integration of different transport modes, however, in practice the implementation, budgeting and management are often still handled in silos.

Policy and regulatory barriers / Technological barriers

The existing policy framework in South Africa highlights the role of public transport and provides support instruments to finance investment and operation and integrated planning. Though, the instrument of ITPs has some potential for improvement, e.g. the integration of measureable planning targets, dialogue with the minibus taxi industry. Also the identification of projects is not always in line with these plans. A critical review of the procedures may be advisable.

An area where policy and regulation has been identified as an important instrument to achieve low-carbon transport is regarding the introduction energy efficient vehicle technology and (alternative) fuels. South Africa has a large car producing industry and due to that a great opportunity to reduce GHG emissions from road transport significantly by introducing Fuel Economy Standards. A dialogue between the Department of Energy, Department of Environmental Affairs and Department of Transport has already been initiated and a baseline is currently under development with support from the Global Fuel Economy Initiative. The transition to a low-carbon vehicle fleet can be enforced through Fuel Economy Standards without significant addition costs for the government.

A strategy of the national government with regard fuels and clean technology is urgently needed to provide orientation for infrastructure investment (e.g. charging infrastructure, bus fleets). For

instance, electric vehicles are currently subject to luxury tax and Compressed Natural Gas (CNG) is not classified as transport fuel and correspondingly a transport fuel tax does not apply. Also an adequate policy framework for light electric vehicles such as pedelecs or e-bikes, which can be used for the last mile, is missing. The Road Traffic Act of 1996 currently does not support the development of eco-mobility (e.g. non-motorised transport, cycling, light electric mobility). A Guideline for non-motorised transport is currently under development. A mandatory standard for safe pedestrian facilities though does not yet exist. Also the importance of transport demand management measures, such as parking management could be integrated into a national policy framework to unlock the potential of public transport investment.

Financial barriers

The ability of local governments to implement sustainable urban mobility systems is currently inhibited by limited own financial resources and access to finance. Cities often lack equity for infrastructure investments or fleet upgrades. Expansion of public transport services does not go hand in hand with an increase in operational subsidies. Implementing actors experience procurement procedures as too strict and lengthy and see a need to adapt the Public Finance Management Act accordingly. Many cities do not meet loan/grant requirements. If they can access loans, they are hesitant due to balance sheet risks. Local governments are reluctant in accessing new revenue streams or innovative funding sources as they lack the necessary capacity and experience. Application processes to access international finance are perceived as too elaborate and cities lack the abilities to identify funding options and follow the application process.

Lack of knowledge, capacity and awareness

Many local governments lack the necessary capacity and expertise in integrated transport planning and often do not have the authority to implement the plans due to the fragmentation of powers between the different spheres of government (see section 2.2). Furthermore, other spheres of government and other stakeholders implement projects and programmes in municipal jurisdictions that have not been incorporated in the ITPs. The effectiveness of Integrated Transport Plans could be improved if awareness and expertise of local decision makers and practitioners would be increased. The plans cover a period of five years and form the basis for budgeting. During the development of ITPs public participation is mandatory. (Dawood and Mokonyama 2015)

Also, actors at national level are facing several challenges, new topics and a significant workload in their day-to-day work and often do not have the resources and capacities to handle everything with the necessary attention. (SACN 2015).

Social and political barriers

Managing the fragmented public transport market is received as a key challenge of improving urban transport systems. Operating minibus taxi services are often not well integrated in South Africa. Besides a lack in physical and route integration, the service is also impeded by the absence of integrated ticketing and information. The public transport industry is largely fragmented and characterised by small private firms with a limited fleet. About 96% of the bus operators own less than 30 buses. In the MBT industry, on average only two vehicles are owned per operator. There is strong competition between different public transport modes and among different public

transport providers, especially between subsidised public transport services and the MBT industry, which is largely unsubsidised and has small profit margins. However, the MBT industry is the backbone of the South African public transport system and provides employment for 180,000 to 250,000 people, who are organised in strong labour unions such as the South African Transport and Allied Workers Union (SATAWU) and the National Transport and Allied Workers Union (NATAWU).

The MBT industry usually opposes measures targeting a rationalisation of public transport fearing loss of income and jobs. The sector is considered politically and socially highly sensitive to regulation. The industry is organised in two rivalling associations (SANTACO and NTA – National Taxi Alliance). Some cities have already successfully managed a transition of the MBT industry into formal public transport services (Cape Town and Johannesburg), but these experiences and lessons learned are not yet known to many local decision makers.

Public perception of public transport and non-motorised transport is poor in South Africa. These modes are often not considered as favoured mode of choice, but as only option for those who cannot afford a car. Public transport is often perceived as inaccessible and unreliable. Especially the service quality of MBT deters people from using this mode (Statistics South Africa 2014). Often, MBTs are associated with rude drivers and reduced roadworthiness of vehicles. Furthermore, the mode is particular prone to accidents.

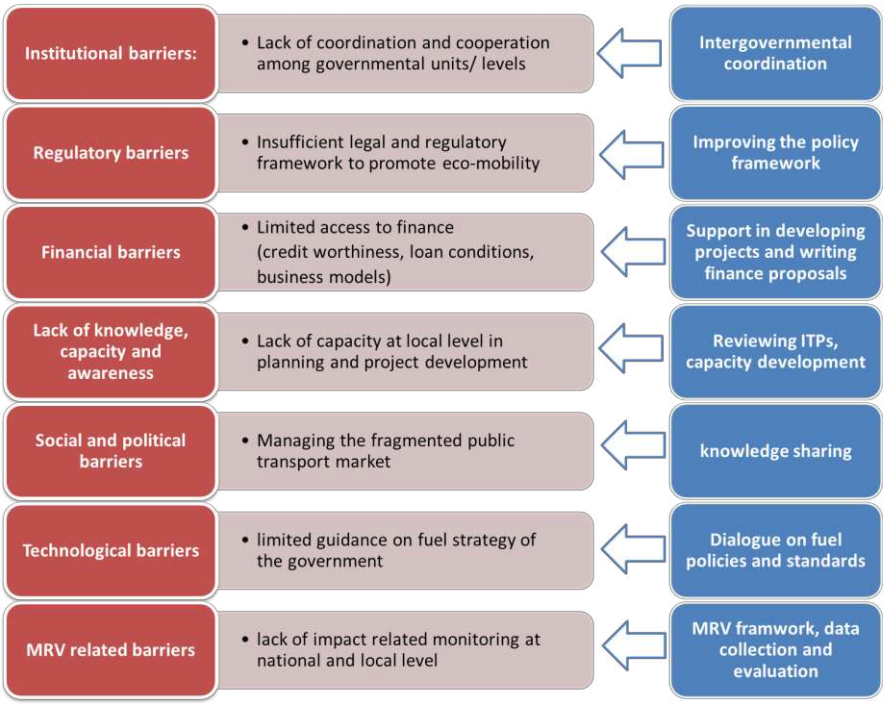
Non-motorised transport is regarded as means of transport for the poor. While a significant share of people walk to work (see 2.1), less than one percent of people cycle to work in metropolitan areas. Public initiatives to raise awareness and promote sustainable mobility modes are lacking or insufficient. Good practices and pilot projects on non-motorised transport are poorly communicated and projects often lack public participation and involvement.

MRV related barriers

An overall assessment of the availability and quality of transport planning data is that while relevant datasets are available, they are usually not easy to access. Perhaps the lack of planning targets, which is prevalent in most transport plans, gives rise to the apparent complacency relating to making data properly consolidated. The Department of Transport is strategically placed to address this challenge through developing standards for transport planning data in South Africa. The use of the Statistics South Africa Act to resolve this deficiency should be explored.

The proposed NAMA aims at alleviating these barriers through targeted technical and capacity support at national and local level as illustrated in the following graph. In the following, the concept of the NAMA will be described and a number of practical next steps for the removal of the barriers proposed.

Figure 10: Overview of barriers and selected support measures of Tsamaya NAMA



4 The NAMA: Objectives, measures and impacts

4.1 The NAMA in a nutshell

Urban mobility in South African cities is dominated by cars, minibus taxis and pedestrians. Minibus taxis are provided informally without any quality assurance and are perceived as very inconvenient. Pedestrian infrastructure is not well developed in many places leading to big road safety problems. The national government has already established programmes and initiatives to strengthen public transport and improve the integration of different transport modes. However, in practice many local governments are facing a variety of challenges with regard to the legal and regulatory framework, difficulties in accessing finance, lack of technology guidance and a lack of capacity to plan and implement effective measures for low-carbon transport.

Tsamaya NAMA is a National Programme for Sustainable Urban Mobility building up on existing efforts of the government and adding the missing puzzle pieces (e.g. environmental standards, monitoring support, technical assistance) in order to unlock the potential of national and local government spending. This programme will increase quantity and quality of GHG mitigation actions to promote low-carbon urban transport. In this way, Tsamya will contribute to the achievement of South Africa's NDC. But there is much more to gain from sustainable urban transport than CO_2 emission reductions: better air quality, reduced congestion, reduced road fatalities and economic development.

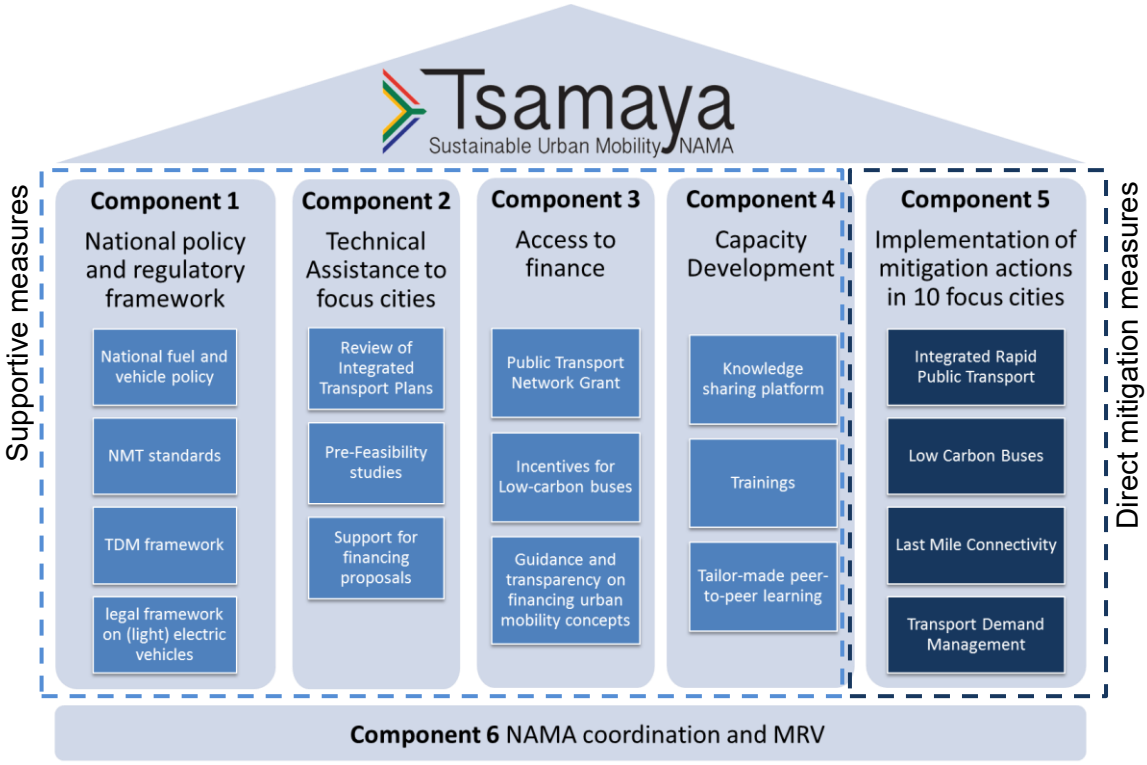
The national government is also seeking international support for the implementation of Tsamaya NAMA: Technical assistance and capacity development needs have already been formulated. Further financial support needs will be specified during the pilot phase.

The implementation takes place in two phases starting with support for two pilot cities in the first three years (2017-2019). During this time, the support mechanism (e.g. programme office, consultant pool, training courses, and financial incentives) can be established and first experiences gained. In the full-implementation phase (2020-2026) 10 focus cities in total will receive assistance from the programme.

As shown in Figure 11, a joint coordination and overall monitoring (incl. MRV) are part of Tsamaya NAMA. This will help to systematically and effectively adapt national and local efforts to future demands and technological developments. In this way, South Africa can contribute to reducing greenhouse gas emissions while at the same time improving mobility of the urban population and strengthening a low-carbon economy.

The concept of national urban mobility programmes (NUMP) has been applied by several countries around the world already, such as Brazil, India or Germany. Brazil for example has released a New National Policy on Urban Mobility (2012) combined with Mobility Planning Guidelines. This policy comes with a budget for massive investment in urban transport (~ USD 55 billion till 2020) and includes new approaches for stakeholder involvement and a capacity development strategy from the Ministry of Cities.
The global initiative 'MobiliseYourCity' acts as a platform for national and local governments aiming to reduce GHG emissions from urban transport. Support in terms of technical assistance, methodological guidance, outreach and training will be provided by several donors and technical network partners. South Africa is considering becoming a partner of this network.

Figure 11. Overview of supportive and mitigation measures of Tsamaya NAMA



4.2 Objective of the NAMA

Tsamaya NAMA aims to reduce 30 Mt CO_2 emissions from urban transport in 10 cities compared to BAU over ten years through a national programme approach, which acts as an incubator for projects and mitigation measures on sustainable mobility in South African cities.

Indicators:

- The national policy and regulatory framework promotes integrated transport planning incl. transport demand management, green procurement of vehicles incl. buses, and eco-mobility incl. light electric vehicles.

- The sustainable urban mobility programme provides technical assistance and capacity development to 10 cities.

- The national government supports the implementation of integrated public transport systems in at least 10 cities through infrastructure funding of at least 5bn ZAR annually (USD 325 million) under the PTNG and USD xxx (## to be defined during the pilot phase) million from additional international support.

4.3 Scope / coverage of the NAMA

Tsamaya NAMA covers national and subnational elements. Direct mitigation actions will be implemented in ten focus cities. The ten cities currently envisaged, each with more than 500,000 inhabitants, sum up to about 22.4 million inhabitants which represent about 40% of South Africa's population.

During the first phase two cities will benefit from technical assistance of the programme: City of Johannesburg and another city to be decided upon in 2017.

Textbox 2. Criteria for the selection of focus cities of the sustainable urban mobility programme

1. Beneficiary of the Public Transport Network Grant (as of 2017: 8 metropolitan municipalities and 5 large / secondary cities: City of Johannesburg, City of Cape Town, Ekurhuleni Metropolitan Municipality (East Rand), City of Tshwane (Pretoria), Buffalo City, Polokwane, City of eThekwini (Durban), Mbombela, Nelson Mandela Metropolitan Municipality (Port Elizabeth), Mangaung Municipality (Bloemfontein), George, Rustenburg)
2. Large or metropolitan municipality with more than 500,000 inhabitants to achieve a significant mitigation potential
3. Integrated Transport Plan indicates structural elements to achieve a significant mitigation potential (BRT or Bus system, non-motorised transport, TDM measures)
4. Significant budget allocation to ensure a base funding for investment
5. Political will expressed by the mayor or head of the transport department

The Tsamaya NAMA addresses urban passenger transport in South African cities. The transport modes considered under this NAMA are road-based public transport (bus and minibus taxis), non-motorised transport (walking and cycling) as well as light electric mobility (e.g. pedelecs, trikes). Private cars are also part of the programme especially with regard to trip-sharing, park & ride and other transport demand management measures such as parking management. Furthermore, fuel and vehicle policies and regulations will impact all modes of road transport.

Approaches to mitigate GHG emission from urban passenger mobility include measures to reduce or minimise and manage travel demand (Avoid), shift demand to low-carbon modes or maintain its share (Shift) and/or improving vehicle technologies and fuels/energy (Improve). The Tsamaya NAMA covers basically all these approaches with regard to the national policy framework, but focuses in particular on local level implementation on "shift" measures towards public transport and "improve" with regard to the public transport vehicle fleet.

The programme will build upon and strengthen already existing initiatives and programmes on sustainable mobility in cities (unilateral elements) and seek for international support in terms of technical support and finance to accelerate and upscale the implementation of mitigation measures in cities.

4.4 Mitigation measures under the NAMA

Public Transport Network Infrastructure

As a backbone of sustainable mobility in cities the development and extension of integrated public transport networks will be realized through national funding under the PTNG. This covers in particular accelerated construction and improvement of public and non-motorised transport (NMT) infrastructure (capital costs). The grant is transferred for technical design and construction of integrated public transport networks such as BRT systems. The fund can be used for public transport infrastructure including planning and construction, maintenance and upgrading of dedicated lanes, routes, stations, depots, control centres and related information technology, fare systems and vehicles (in exception), and NMT infrastructure that supports network integration (e.g. sidewalks, cycleways and cycle storage at stations).

Low-carbon buses

The network infrastructure provides the basis for different types of buses. Larger cities are planning / operating BRT systems in combination with conventional city bus systems. Obviously an extension of a public transport system requires additional vehicles and improving requires the replacement of old vehicles. In South Africa bus procurement is led by local governments however with conditions from the Department of Transport and procurement regulations from the Department of Industry (e.g. local production). Today, these regulations do not include any environmental standards with regard to fuel or technology.

Tsamaya NAMA aims to promote energy efficient vehicles, without definition of a certain technology. Procurement of energy efficient buses will be supported through (1) the development of green procurement guidelines for new buses and (2) the definition minimum environmental standards for new buses as a precondition to access funding from the PTNG. It is furthermore envisaged to promote the utilisation of existing financing instruments and possibly to establish new financing mechanisms (e.g. low-carbon bus fund) to cover the upfront investment.

Furthermore, a dialogue on fuel economy policies between the relevant ministries has been initiated during the preparation of the NAMA. Depending on the type of policy (e.g. Standard, Label) and the vehicle category targeted by the policy (e.g. light duty vehicles, heavy duty vehicles) improved efficiency could also have an impact on operation costs of public transport providers. The Tsamaya programme office will further support this process.

Last-Mile-Connectivity

One of the main barriers in using public transport is the accessibility of public transport stops. Improving the “last-mile-connectivity” requires the provision or adaptation of infrastructure for pedestrian and cyclists but also accompanying measures to improve comfort and road safety (e.g. street lightning, safe intersection design and crossing opportunities). Furthermore it is essential to link different public transport services (including mini bus taxis) and integrate drop-off points, park&ride and new forms of mobility such as light-electric vehicles (pedelecs, tricycles) or car-sharing.

In addition to the above mentioned measures, Tsamaya NAMA will systematically address and promote non-infrastructure measures (e.g. policies, regulations, campaigns) in order to tab the full potential and initiate a paradigm shift of passengers.

Transport Demand Management

Transportation demand management strategies tend to be most effective and acceptable if implemented as an integrated programme that includes both *pull* strategies (sometimes called *carrots*) and *push* strategies (sometimes called *sticks*). Most of the measures described above are aiming to "pull" passengers from private cars to public transport and non-motorised transport. In order to achieve large scale behavioral change and to make efficient use of the infrastructure it is necessary to implement "push" measures as well which discourage people to use the private car. International examples demonstrate that a successful transformation of urban transport systems needs both sides (compare GIZ, 2012).

As of now, TDM has not been applied systematically in South African cities yet. With the support of Tsamaya NAMA appropriate measures will be defined for each city and local governments will receive technical assistance in designing and implementation strategies (e.g. participation, campaigns). The following list gives an indication on the type of measures foreseen:

- Road pricing and congestion charging,
- Parking management and pricing,
- Vehicle travel restrictions,
- Corporate mobility management programmes.

A pipeline of projects showing the current phase of the project cycle provides an overview of all cities under the Tsamaya NAMA. It also includes a specification on support received through the programme as well as further support required from other potential national or international partners and donors. For the pilot phase a project pipeline for the City of Johannesburg (**Fehler! Verweisquelle konnte nicht gefunden werden.**) as the first focus city has been prepared, different support needs have been identified, will be further specified and partly realised during the pilot phase.

The project list results from a dialogue between the local government and the national government. The city's Integrated Transport Plan (ITP) builds the basis for the discussion. ITPs need to be updated annually and a new version to be developed every 5 years. The programme office will assist focus cities in developing their ITPs and provide strategic advice.

Current state of planning

The Strategic Plan of the Department of Transport (2015/2016 – 2019/2020) defines medium term targets for the PTNG as shown in Table 6 which are a core element of the mitigation actions under Tsamaya NAMA.

Table 6: Implementation of integrated public transport networks supported by the PTNG

Milestones for the Public Transport Network Grant				
2015/2016	2016/2017	2017/2018	2018/2019	2019/2020
- A Re Yeng (Tshwane) Inception Phase, - Go George (George) Pilot phase, - Rea Vaya (Johannesburg) Phase 1a and Phase1b - My CiTi (Cape Town) Phase 1 and partial Phase 2 (N2 Express)	- A Re Yeng (Tshwane) Phase1, - Go George (George) full network, - Rea Vaya (Johannesburg) Phase 1a and Phase1b - My CiTi (Cape Town) Phase 1 and Phase2.	- Ya Rona (Rustenburg) - Libhongo Lethu (Nelson Mandela Bay) - Go Durban (eThekwini) - Aero Bus (Ekurhuleni)	- A re Yeng (Tshwane) Full Phase 1	- Mangaung - Mbombela - Polokwane - Msunduzi

The following textbox gives an example of measures implemented with support from the PTNG in Cape Town.

Textbox 3: Example of specific projects implemented with support from the PTNG in Cape Town (as of June 2015)

- 31,5 km of dedicated bi-directional trunk routes
- 90 km of mixed traffic bi-directional trunk routes
- 30,6 km two-way shared pedestrian/cycle NMT facility
- 42 closed Integrated Rapid Transit stations
- 591 Bus Stops
- 284 km of mixed traffic bi-directional feeder routes
- 3 Bus depots

Additionally, Tsamaya NAMA will enhance the implementation of sustainable mobility projects in terms of quality and quantity. The definition of specific projects will be done city-by-city and the project pipeline will grow accordingly. A first overview of measures proposed by the city of Johannesburg can be found in **Fehler! Verweisquelle konnte nicht gefunden werden.**. It is part of the pilot phase to further refine this proposed list of projects and include additional measures which have not been considered yet.

Table 7. Selected mitigation actions planned in Johannesburg

Mitigation actions	Planned activities and support needs (December 2016)
PUBLIC TRANSPORT (REA VAYA PHASE 1C)	
North East Quadrant Operational and Business Planning and Implementation Major trunk route to link the North East Quadrant with the Rea Vaya Phase 1B and 1A corridors linking the CBD to the west and south.	Infrastructure 12,6 km BRT lanes, sidewalk, intersection, street lighting upgrade; Public transport loop into Sandton: 4km BRT lanes, mixed traffic lanes, bridges, sidewalk upgrades, street lighting upgrade. Construction of priority lanes; Walking infrastructure including pedestrian bridge. Stations (various typologies), transition stations with high/low floor interfaces, interchanges
	Bus Procurement 500 buses low entry, doors on both sides for curb-side access and Euro VI emission standard.
	Taxi Restructuring Negotiation Framework Agreement (MoU) on key transformation process principles and consultations on routes to formalise on the engagement with the taxi associations
Greater Soweto Operational and Business Planning and Implementation	Infrastructure • Operational Plan underway to identify public transport routes • Infrastructure requirements being identified, these include Interchanges, Intermodal terminals, Shelters/Stops etc.
	Bus Procurement Operational Plan underway to identify bus and minibus taxi fleet requirements for a High/Low Floor IPTN in Soweto This will include Articulated buses, Rigid buses and minibus taxis
	Taxi Restructuring • Integration of public transport services and optimising service sequences of the two phases. • Procurement service provider for provision of the Soweto operational plan, design of an implementation and business plan.
Restructuring of METROBUS	• redesign of routes according to origin/destination allocation would integrate operations of Metrobus • new bus routes requiring an additional new fleet procurement of 250 buses. • To improve service monitoring and quality of service Metrobus requires a study on current service levels and training of planning, scheduling, and dispatching teams.

CYCLING PROMOTION	
Cycle lanes	The City of Johannesburg has constructed 15km of cycle lanes in the CBD of Johannesburg linking 4 university campuses in Johannesburg and covering other major employment hubs like the South African Broadcasting Corporation. The biggest challenge is to get enough cyclists to use the provided infrastructure. Some of the inhibiting factors to the use of bicycle infrastructure include lack of access to bicycles, inadequate advocacy to mobiles the use of lanes, inadequate or lack on know how to promote the use of cycle lanes and lack of data for the development of promotion strategies. Further, the City is planning to roll out more cycle lanes in other communities
Bike Distribution	• Freight Bikes – feasibility study • School distribution • trolley pushers, waste pickers
GREEN TRANSPORT	
Metrobus refleeting	In pursuing the greening of public transport the city as a leader in the sector continues to transition its public transport fleet to use low carbon, cleaner fuels. The prospect exists to continue conversions in Metrobus to 100 DDF buses. Further Metrobus plans to refleet with a procurement of 250 buses. The options include dedicated CNG/Biogas powered fleet or Euro V/VI diesel/EuroV/VI gas buses.
	To carry out performance assessment and evaluation and mitigation tracking development of local capacitation is needed. Training of technicians, workshop staff, students and a general outreach program must also be developed to ensure optimisation of greening initiatives such as the DDF. Such an evaluation/assessment capacity could be a component of a green Transport Centre of Excellence located with the University of Johannesburg available beyond Metrobus to the Rea Vaya, Taxi Industry and other municipalities
Promotion of Ecomobile Vehicles	Enabling Ecomobile Vehicles Following the Ecomobility Festival a group of entreprenuers secured or have access to ecomobile vehicles (2 wheelers, e-bikes, scooters) ideal for last mile services. The City has identified the need for capacitation for business and entrepreneurial development support. A capacitation programme would be needed.
	A regulatory challenge exists in respect of homologation to meet compliance for operating licence. The City enabled the establishment of a Forum hosted by SANEDI and is supporting the need for homologation of vehicles which evidently requires an informed technical and legal investigation and representation to the Department of Transport with an appropriate package of documentation.

4.5 Supportive and organizational measures

The supportive and organisational measures form an integral part of the sustainable urban mobility programme. The supportive and organisational measures under the Tsamaya NAMA will complement on-going efforts on national and local level.

Table 8: Overview of supportive and administrative measures

Component 1 - National policy and regulatory framework
National policy and regulatory framework roadmap • Identify needs, gaps and barriers in the national policy related to SUM • Prepare policy improvement
Adjustments to national policy and regulatory framework • Provide technical support for policy adjustment, e.g. Road Traffic Act • Support stakeholder consultation during the adjustment process
Component 2 - Technical assistance to focus cities
• Support each pilot city in developing / updating their Integrated Transport Plan • Provide measure specific implementation support
Component 3 - Improved access to finance
• Prepare proposals to access financial resources • Provide support during the application process • Develop financing mechanisms in cooperation with financing institutions
Component 4 - Capacity Development
• Document lessons learnt in pilot cities, e.g. integration of MTB as part of PT services • Facilitate capacity building workshops for South African municipalities • Provide an online knowledge sharing platform
Component 6 - Coordination and MRV
Establish steering and management structure for the programme • Manage the programme and act as secretary (e.g. establish programme office) • Select pilot cities and measures covered under the SUM Programme • Ensure that the SUM Programme is in-line with national policies/strategies
Monitoring and Evaluation support for pilot cities • Support monitoring and evaluation of SUM measures in the pilot cities (e.g. on data collection, data quality) Provide technical support on the ex-ante and ex-post assessment of emission reduction
MRV framework • Support the establishment of a suitable MRV system for the urban transport sector Coordinate interdepartmental access to transport data

Component 1 - Improvement of the national policy and regulatory framework

In order to improve the national policy framework, to adjust regulations and to initiate new policies, Tsamaya NAMA facilitates the dialogue between all relevant governmental levels and non-governmental stakeholders.

DOT is in charge for the further refinement of the national urban mobility framework. This includes additional regulations e.g. standards for NMT design, on a national framework for data collection and monitoring. Furthermore, an adjustment of the National Road Traffic Act is foreseen to enable the use of light-electric mobility on the roads and develop a framework to promote Transport Demand Management. To guide local governments regarding fuel strategies and vehicles procurement the DOT will develop Green Procurement Guidelines.

DOT together with DOE have already started to develop a baseline on Fuel Economy which includes a roadmap toward the implementation of Labels and Fuel Economy Standards for new vehicles. This process will be further facilitated through the programme.

Furthermore, DOE in cooperation with DOT has identified the need to revise the current regulation on transport fuels to reflect the fuel and energy strategy of the country (e.g. classification of CNG as transport fuel).

Also the classification of electric vehicles will be adjusted to enable the introduction of electric vehicles which are currently considered as luxury vehicle and therefore, taxes apply)

Further implications on future policy adjustments will be identified during the pilot phase. This may include Land-use planning regulations e.g. with regard to including Transit oriented Development.

Component 2 - Technical assistance to focus cities

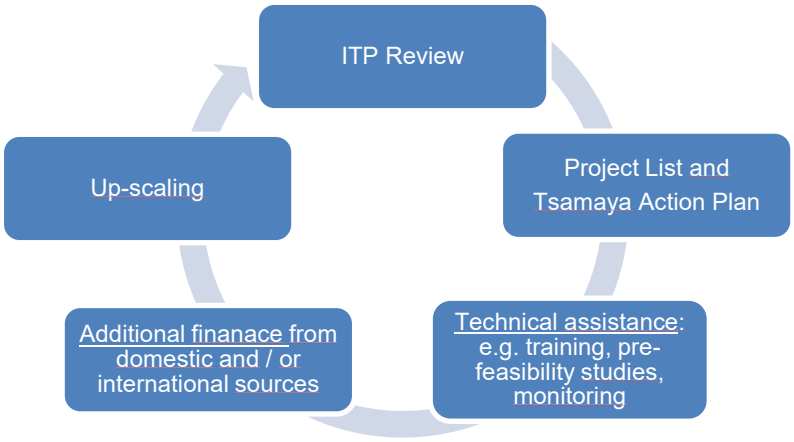
The pilot cities will receive technical assistance in developing or updating their SUM strategy and action plan and in implementing SUM measures. This includes a review of the existing municipal transport plans to identify gaps and potentials. Dedicated support will be provided for the planning and implementation of SUM measure. In particular, the implementation of integrated public transport systems will be supported. Furthermore, specific technical consultation such as on the design of NMT infrastructure or on the selection of vehicles and energy sources for public transport will be offered. The SUM Programme Office will provide the technical assistance directly to the cities. When suitable, technical partners will provide additional expertise.

The support mechanism will assist cities in:

1. Review of Integrated Transport Plans
2. Support stakeholder dialogues (e.g. with minibus industry)
3. Provide technical support (e.g. pre-feasibility studies)
4. Support project development (e.g. business models, financing proposals)
5. Support to implementation

The following figure illustrates the standardized steps to identify specific mitigation actions. The process builds up on experiences from the Cities Support Programme of the National Treasury.

Figure 12. Standardised process of supporting focus cities under Tsamaya NAMA



Component 3 – Improved access to finance

The SUM Programme Office will support the pilot cities in identifying and accessing finance options for the implementation of SUM measures. Practically this covers information sharing and awareness rising on existing financing options. Furthermore, the support team will help local governments in developing financing proposals and attracting financing partners. In cooperation with financing institutions the SUM office will initiate the development of new financing mechanisms and attract private finance contributions.

Component 4 - Capacity building and knowledge sharing

Many local governments lack resources and capacities to plan and manage the mobility system in a sustainable manner. In addition, existing experience on successful approaches to implement SUM measures are not shared among cities in South Africa. The SUM Programme will provide dedicated capacity building activities such as workshops or training events for urban mobility decision makers and practitioners in South Africa. Lessons learnt in pilot cities will be documented and disseminated to other cities. Additional technical guidelines on SUM matters will be developed and all resources will be made easily accessible on an online knowledge-sharing platform.

Component 6 - Coordination and MRV

The coordination of the programme will be ensured through a steering and coordination structure is defined in the following section. The programme office will manage the programme and facilitate active stakeholder management. This includes the preparation, documentation and follow up of steering committee meetings as well as improving the information and knowledge management among the different partners.

To enhance transparency about progress and impact of the prorgamme a systematic monitoring and reporting mechanism for urban mobility will be established as part of the national MRV system. MRV will be coordinated through the Tsamaya programme office. It will coordinate the interdepartmental access to respective data sets. Cities will receive direct support on data collection, monitoring and evaluating their SUM measures. The SUM Programme Office will collect

and analyse the data and will ensure that local and national partners follow a consistent monitoring system for emission reductions and other sustainability benefits.

4.6 NAMA Coordination and management

At the national level Tsamaya NAMA contributes to an improved coordination between and within national departments and across different levels of the government. To ensure an effective implementation of the Tsamaya NAMA, the following institutional set-up is planned:

National Transport NAMA Steering Committee

The design of the NAMA Programme was guided and steered through regular roundtable meetings of government representatives from the Department of Transport (Public Transport Division, Integrated Transport Planning, Non-motorised transport), the Department of Environmental Affairs, Department of Energy as well as several semi and non-governmental institutions such as SANEDI, CSIR and WWF.

As a next step, a national steering committee needs to be established and aligned with existing steering structures. It oversees all transport NAMAs in South Africa and the overall implementation of the Transport Flagship Programme under the NCCRP. The lead agency is the DOT in close coordination with DEA, DOE, DTI, SALGA, SACN and local Metros. The National Transport NAMA Steering Committee will take strategic decisions on the implementation of the Tsamaya NAMA such as the selection of the cities to participate as well as the selection of projects or measures eligible to receive support from the SUM Programme.

The Department of Transport will lead the SUM Programme Office. The DOT's Integrated Planning Unit will provide budget for the Programme Office operation based on an additional budget request to National Treasury. DOT's Public Transport Unit will support the PO on an in-kind basis. The DOT is responsible for the national transport sector policy. Based on this mandate the DOT will improve relevant policies. The DOT's NMT branch under the Road Transport Unit will contribute to the policy improvement of last-mile eco-mobility.

The Department of Environmental Affairs will ensure the integration of the programme with the climate change agenda and guide the establishment of an MRV-System for the transport sector. DEA advocates for the alignment of national policies with GHG emission reduction targets. The department acts as link to international funding sources for infrastructure and capacity building with an environmental focus.

SUM Programme Office

The programme office is responsible for the overall coordination and implementation of Tsamaya NAMA and fulfils the management and secretary function for the programme. It is responsible for preparing and convening steering committee meetings, for documentation and reporting of the programme activities. It provides technical support (on implementation, financing and monitoring) to the partner cities and collects and validates monitoring data. If necessary, the programme office seeks external expertise and support from associated partners on a service contract basis.

It concludes contracts with service providers and manages the flexible budget earmarked for these services. The programme office acts as a facilitator to promote the dialogue on topics, which have

not (yet) been taken up by one of the departments or which require additional support that cannot by provided by the responsible units.

Furthermore, the office represents the programme nationally and internationally and has a networking function. The Integrated Transport Planning unit of the DOT will lead the Programme Office.

National Government Institutions

All national departments that have a role in supporting urban mobility are part of the support mechanism. They contribute to the programme by improving or developing the national policy framework to create supportive framework conditions for sustainable urban mobility. SUM PO in cooperation with the advocacy partners will advocate for SUM matters among the policy partners and will engage in agenda setting inter alia based on the experience in the pilot cities.

Networking and dissemination partners

Building on existing institutional structures and mandates, several partners will contribute to the further improvement of national policy and knowledge sharing. SACN in partnership with SALGA will convene municipalities to share the knowledge gathered in the SUM Programme and will coordinate a capacity building programme.

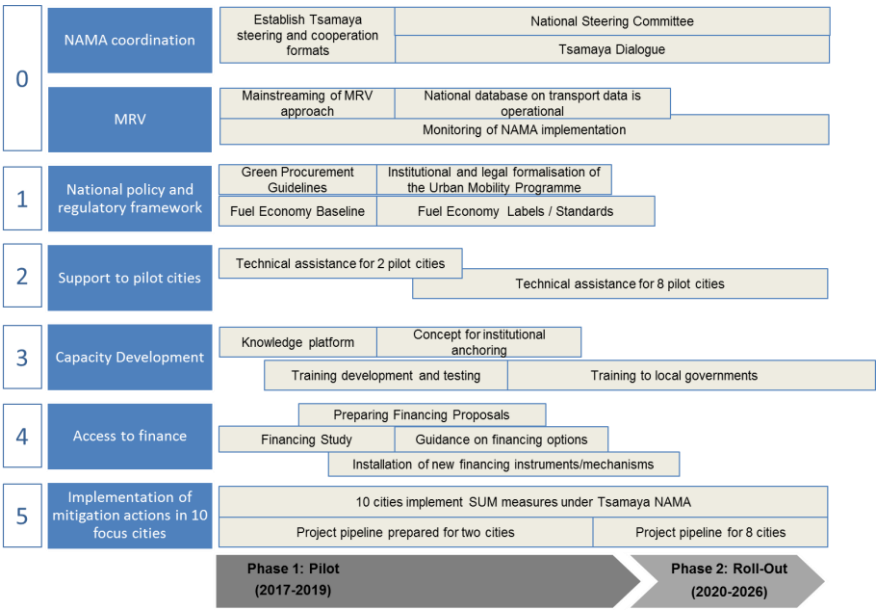
Technical partners

Several technical partners will provide expertise on a service contract basis. This concludes implementation support for the pilot cities as well as consultancy services on the national policy context.

4.7 Way forward

The following sections highlights some measures to be prioritised during the pilot phase and provides an overview on main stakeholders relevant for the implementation.

Figure 13. Gant chart for the pilot phase of Tsamaya NAMA



The pilot phase will be supported through GIZ on behalf of the German Ministry for the Environment through the Climate Change Support Programme. The branch of Integrated Transport Planning of the Department of Transport leads the overall coordination and reporting on the Tsamaya NAMA. The implementation will be carried out in strong collaboration with different branches of DOT, other national ministries (Department of Energy, of Environmental Affairs, National Treasury), local governments as well as several other implementation partners. The following table shows the relevant institutions and partners for the implementation of each component.

Table 9. Components and main stakeholders relevant for implementation

	Component	Primary Stakeholders
0	NAMA coordination and MRV	DOT, DEA, GIZ
1	Improved policy and regulatory framework	DOT (ITP, PT), DOE, ICCT, SANEDI, UNIDO
2	Support to pilot cities	NT, Worldbank, SANEDI; CSIR, SACN, SALGA
3	Capacity Development	SACN / SALGA
4	Enhancing financing options	NT, DEA, DTI, DBSA
5	Implementation of mitigation actions in 10 focus cities	DOT (PT), Selected local governments (transport authorities, planning departments)

The following activities were collected during a roundtable meeting with the different actors involved in the implementation of Tsamaya NAMA (see Table 10).

Table 10. On-going activities and measures in the pipeline by different stakeholders

Supporting activities during the pilot phase (as of April 2017)	**Focal point**
0) Monitoring and MRV	
Development of an MRV System for urban transport	DOT (ITP/PT)
Consolidation of methodologies for monitoring of Integrated transport plans	DOT (ITP/PT)
Guidance for data collection (based on existing material for other countries)	DOT/GIZ
1) National policy and regulatory framework	
Development of Green Procurement Guidelines (Buses, government fleet)	DOT - ITP
Promoting the revision of regulations on the PTNG (environmental standards, TDM framework)	DOT – ITP
Promoting the revision of regulations on electric vehicles (DTI, DOE, DOT)	SANEDI
Development of NMT guidelines	DOT - NMT
12 Ltax incentives (framework to promote efficient company fleets)	SANEDI
2) Support to pilot cities	
Selected technical assistance measures in the context of - Monitoring and evaluation of Rea Vaya Phase 1C-A - Congestion Management and Parking Policy - Support for the Metrobus Transformation project on performance assessment and change management	GIZ, City of Johannesburg
3) Capacity Development	
Development of an Urban Support Programme as an umbrella for trainings provided by different institutions and initiatives (incl. Cooperation with Cities Support Programme of the National Treasury)	SALGA
Low-Carbon Transport Project providing awareness raising events, study tours and trainings on efficient vehicle technology / e-mobility	SANEDI
Training series for local governments on non-motorised transport planning	DOT - NMT
Smart Cities in Southern Africa as a platform to develop innovative concepts for intelligent transport systems	SALGA
Training of engineers and developing a training manual for sustainable transport planning	WWF
Cities Challenge on sustainable transport projects/solutions: Travel demand management for companies; Travel management for schools	WWF
communication and dialogue platform, especially on TDM	WWF
Guidance for quality management / maintenance of NMT infrastructure	DOT - NMT
4) Enhancing Financing Options	
To be further elaborated during the pilot phase	DOT- ITP

4.8 Expected impacts

The expected GHG mitigation impact ranges between the unilateral and the Tsamaya plus scenario between 3,2 and 5,5 $MtCO_2$ per year in 2030 or 13.5 – 30.4 $MtCO_2$ cumulated from 2020-2030 compared to Business-as-usual. This corresponds to 1.4 - 3.0 $MtCO_2$/year in average.

The NAMA will contribute to the sustainable development goals of the National Development Plan as follows by improving human settlements through sustainable mobility concept including improved walking conditions and better public transport. This will contribute to better life quality in cities. Enhanced transport services lead to improved access to markets and infrastructure.[1]

Tsamaya NAMA will also contribute to better Road Safety and thereby it is in line with the Decade of Action for Road Safety Resolution of 2010. South Africa committed to reducing the road fatalities by 50% from the 2010 baseline of 13 967 to 7 000 by 2020, with an expected annual reduction of 700.

Fuel Savings: A comparison of the fuel consumption in different scenarios leads to the finding that in 2030 between the Tsamaya plus scenario and the business-as-usual scenario about 2.2 bn liters of fuel will be saved with approximately 1.17 billion liters Gasoline per year and 1.04 bn liters diesel per year (including rebound effects from addition public transport services). This translates into USD 1.1bn per year for gasoline and USD 940million per year for diesel savings[2].

[1] objective of the NDP: The proportion of adults working should increase from 41 percent to 61 percent

[2] Price for 1 liter gasoline: USD 0.92, 1 liter diesel USD 0.90, Nov 2016

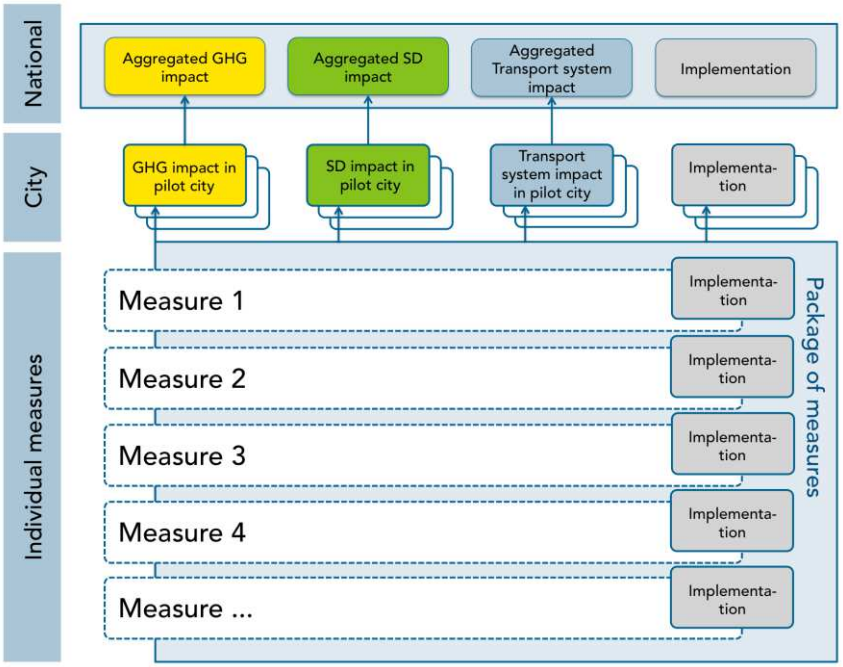
5 The MRV approach: Monitoring, Reporting and Verification

5.1 Introduction

This section describes the approach for monitoring, reporting and verifying (MRV) of Tsamaya NAMA. It covers the MRV methodology used, an *ex ante* GHG mitigation estimation and MRV of implementation, impacts and support from local, national and international sources.

The monitoring and reporting concept covers transport-related GHG emissions reductions in urban passenger transport in the 10 pilot cities (GHG impact), sustainable development effects (SD impact), the progress towards achieving the programme targets (transport system impact), as well as indicators that reflect implementation of the mitigation action (implementation progress and quality). GHG emissions and the transport system impact will be assessed on city level for the whole package of measures, the success of single measures can be assessed on the basis of a mix of qualitative and quantitative implementation indicators.

Figure 14. Monitoring and reporting approach of Tsamaya NAMA[1]



5.2 Qualitative analysis of GHG impacts

The following impact chain captures the main emission impacts expected from the mitigation measures. The direct impacts result from shift from private cars to public and non-motorized transport as a result of different mitigation measures to be implemented in the pilot cities. The additional provision of public transport will also lead to additional emissions from buses. Another direct impact intended by the programme is the reduction of emissions from buses per kilometer driven as a result from the promotion of low-carbon buses.

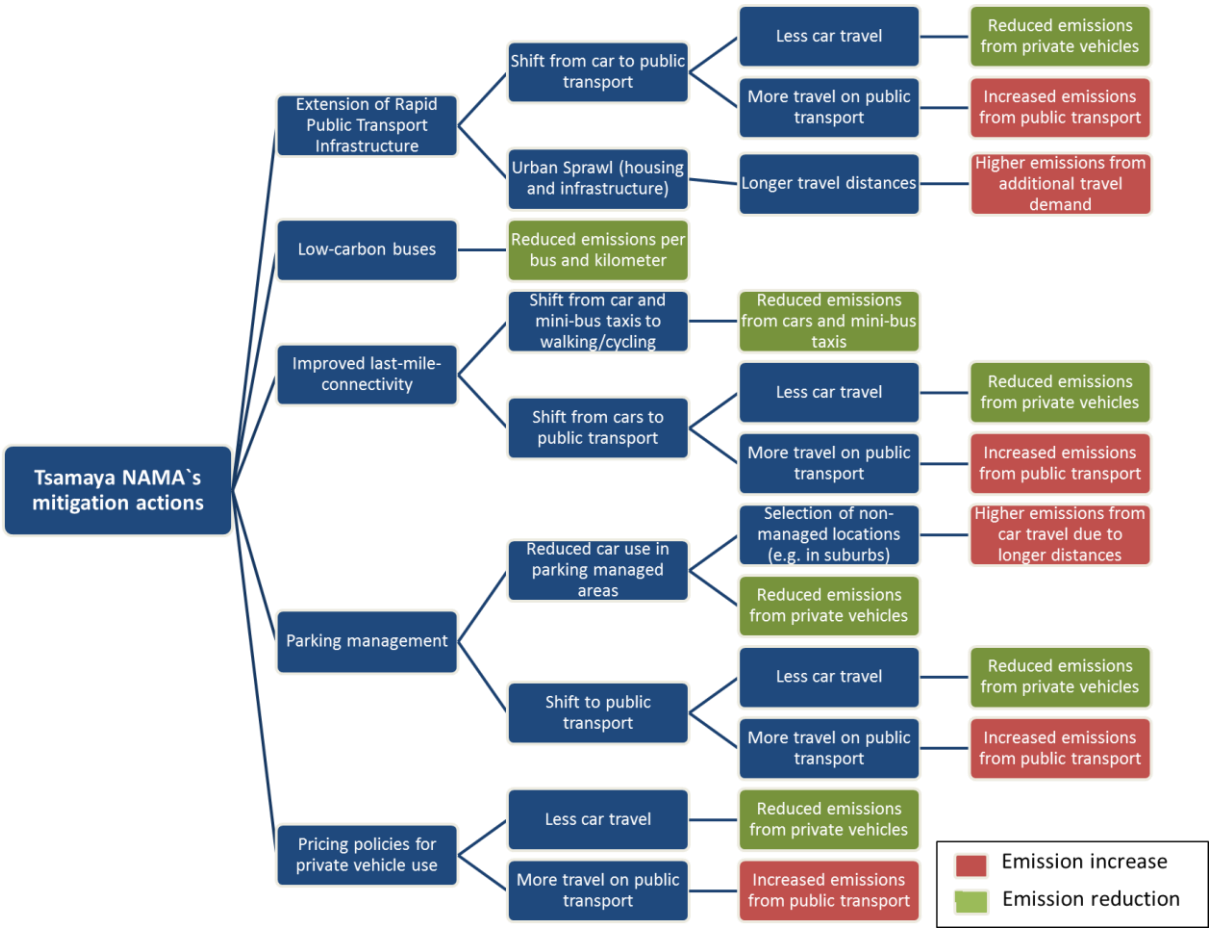
[1] source: GIZ 2016: MRV Blueprint for Sustainable Urban Transport Programmes (www.transport-namas.org)

Indirect emission impacts to be expected relate to an increased attraction of housing and infrastructure development at the outskirts of urban areas which may cause additional emissions due to longer distances in the long-term. However, the integrated planning approach aims to mitigate this trend through transit oriented development.

Since the implementation of mitigation measures will follow the framework of the Integrated Transport Plans, it can be expected that negative indirect impacts will be reduced to a minimum. This is one of the added values of planning and implementing comprehensive packages of measures.

During the implementation and for the monitoring framework rebound effects however will be considered and as far as possible reduced.

Figure 15. Cause-Impact-Chain Tsamaya NAMA



To monitor the emission impact on city level an emission inventory for each city is required. Inventories can be developed top-down (based on fuel sales) or bottom-up (based on travel activity and vehicle types). At urban level, the bottom-up approach is preferable since it has a direct geographical reference. Fuel sales at urban level are difficult to gather and do not inform about the place of combustion.

Transport models provide a valuable basis for developing an inventory. However, the effort to update a transport model is rather high. Therefore the update period is usually 5 years or more. To update the emission inventory in between it is recommended to add updated information on the composition of the vehicle fleet, and as far as available information on the average trip length and mode share.

5.3 Qualitative analysis of sustainable development impacts

The sustainable development impacts can be derived from the causal chain in the above section.

Table 11. Analysis of sustainable development impacts[1]

Criteria	Impact description
Environmental	
Energy use	- A shift from car to public transport and congestion reductions lead to reduced energy consumption per passenger km. - An unintended shift from non-motorised to public transport can also cause additional energy consumption per pkm. - As public transport is usually more efficient in terms of energy consumption per pkm, a net decrease in energy use can be expected.
Air quality	- A shift from car to low-carbon buses reduces the tailpipe emissions of CO, NOx and soot (PM) per pkm. The alleviation of congestion can have additional positive impacts by reducing stop-and-go traffic, which has higher pollutant (as well as GHG) emissions than free flow traffic. - The size of the air quality effect depends on the exhaust emissions of the car fleet, as well as the (new and expanded) bus fleet.
Land use	- Cars use much more space to transport the same number of passengers as do buses, bikes and feet. Shifting people from cars to public transport and non-motorised modes therefore reduces the required space for transport infrastructure.
Economic	
Reduced congestion / societal costs	- The alleviation of congestion reduces the societal costs caused by (unexpected) delays and improves the reliability of travel times. Costs to society are further reduced through safer and cleaner traffic, limiting health expenditures. - Furthermore, the maintenance costs for public transport oriented transport systems are lower than car-oriented models.
Travel time	- The alleviation of congestion leads to travel time savings for private car and bus users (if buses do not travel on dedicated bus lanes). - Designing denser and better integrated public transit systems with intermodal hubs may also reduce the travel times of public transit customers.
Travel costs	- Public transport fares are usually lower than a comparable trip by private cars, if the full costs of operation (and ownership) are taken into account. - When normalised to indicative average trip lengths, province contracted buses are currently the cheapest (12 cents per passenger km), municipal buses (29 cents per passenger km), bus rapid transit (39 cents per passenger km), minibus taxis (45 cents per passenger km). The minibus taxis, while the most prevalent mode of transport, is priced relatively high compared to other modes - Improvement of public transit networks increases accessibility for low-income groups and a shift public transport can lead to individual cost savings.

[1] The following assessment is based on an assessment of the Transit Metropolis Programme (Beijing) with adjustments to the South African context and the scope of Tsamaya NAMA.

Job creation	- The extension of public transit systems, as well as the introduction of congestion charging creates temporary jobs for bus network and monitoring equipment construction and permanent jobs for additional service staff. - In addition, better access to mobility and improved network connectivity of public transport may improve access to job opportunities.
Income of minibus taxis	- The shift from minibus taxis to formal public transport may lead to a loss of income of taxi operators. However, the results of all scenarios show that due to an increasing travel demand the demand for minibus taxis as a feeder mode remains stable.
Energy security	- The reduction of vkm travelled by private car can reduce the oil demand and thus oil import costs and import dependency at the national level.
Social	
Human health	- Improved air quality through a shift to public transit, as well as the improvement of the bus fleet, reduces the air pollution concentration levels and thereby the impacts on human health. - In addition, public transport users usually have a higher level of physical activity, leading to positive health effects. - The reduction in traffic accidents through reduced car travel is another positive impact on human health.
Traffic safety	- Studies have shown positive effects of congestion charging on the number of car accidents.
Passenger comfort	- Improved public transit services and inter-modal connectivity lead to higher comfort for passengers. Especially since today, the customer comfort of the pre-dominant minibus-taxis is mostly rated at a rather low level.

The following indicators are relevant for monitoring and evaluation of sustainable development impacts. An assessment on the availability and quality of those data can be found in 8.1.

5.3.1 Methodology

In this chapter the methodology and data sources as well as the results from the impact assessment on the CO_2 emission reduction potentials from Tsamaya NAMA are given.

5.3.1.1 System boundaries and scenario definition

The impact assessment considers **greenhouse gas emissions from transportation of inhabitants of ten metropolitan municipalities**. Since the selection of cities has not been done yet, the 10 largest cities which receive support from the Public Transport Network Grant were chosen for the emission scenarios.

As “Priority 1” emission source according to the Global Protocol for Community-Scale GHG Emissions (GPC) **motorized passenger road transport** (passenger cars, motorcycles, bus and minibus) is considered. Rail passenger transport, which also belongs in this category, is not analysed due to the minor relevance in the cities as well as the scope of Tsamaya NAMA. Also, modes of Priority 2 (freight road transport) and 3 (passenger aircrafts, ships) are not analysed as they are not addressed by the mitigation actions.

The greenhouse gas emissions reported in this assessment cover only **CO_2 emissions from fuel burning (tank to wheel**) and no emissions from fuel supply (well to tank). This approach was assumed adequate for a simplified CO_2 emission estimation, since only conventional fuels (gasoline and diesel) are investigated, so that CO_2 emissions are dominated by the tank to wheel

share. To give an indication what the CO_2 emissions including the fuel supply would look like, the well to wheel emissions are calculated for 2015. Other greenhouse gases than CO_2, e.g. methane and N_2O are not calculated.

The **time line** is described for the **current situation in 2015**. It is assumed that the implementation of Tsamaya NAMA starts in 2017 and will reach a significant impact between **2020 and 2030**. However, it must be noted that both CO_2 reduction impacts and maintenance expenses of the measures should be considered in the long term after 2030.

The **impact of NAMAs** is analysed by comparing the CO_2 emissions in different scenarios for 2030 – in a **Business as Usual (BAU)** scenario and two mitigation scenarios, **"Tsamaya unilateral"** and **"Tsamaya plus"**. Both, the emissions in the year 2030 and the cumulative emissions from the time of implementation until 2030 are investigated.

5.3.1.2 Calculation approach and input data

The CO_2 emissions of transport and the emission reduction impact from the mitigation actions are estimated for ten pilot cities. For the larger cities the following metropolitan municipalities are used as a basis for the calculation (see **Table 12**).

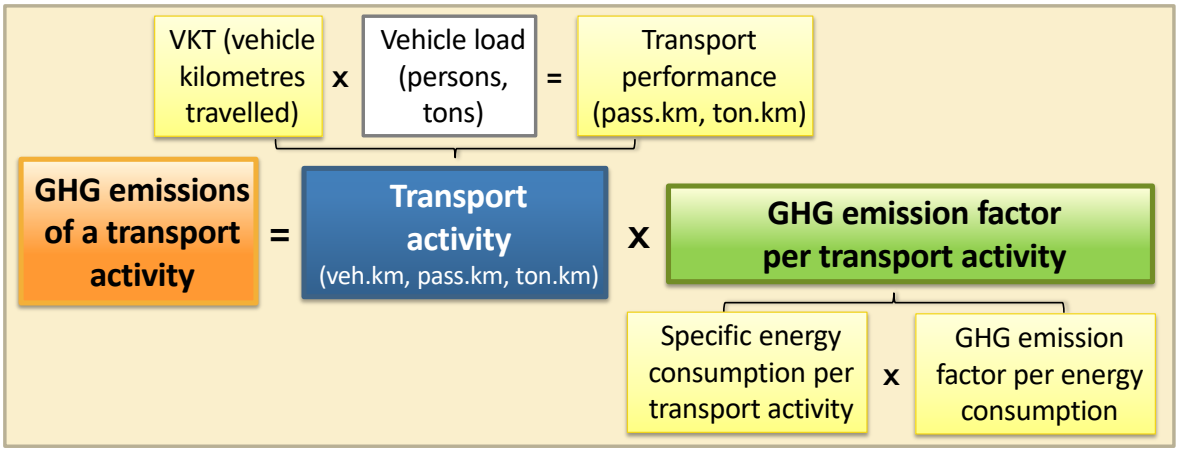
Table 12: Overview of the focus cities

City	Province
City of Johannesburg	Gauteng
City of Cape Town	Western Cape
Ekurhuleni Metropolitan Municipality (East Rand)	Gauteng
City of Tshwane (Pretoria)	Gauteng
Buffalo City	Eastern Cape
Polokwane	Limpopo
City of eThekwini (Durban)	KwaZulu-Natal
Mbombela	Mpuamalanga
Nelson Mandela Metropolitan Municipality (Port Elizabeth)	Eastern Cape
Mangaung Municipality (Bloemfontein)	Free State

In order to estimate the transport emissions on a city level a **simplified bottom-up calculation** based on data for transport demand, specific energy consumption and specific emission factors has been done (see Figure 16).

Figure 16: GHG emissions calculation scheme for transport activities[1]

[1] Dünnebeil, et al., 2014



The impact analysis includes the following **vehicle categories** and fuel types:

- passenger cars (PC); 5 seats; gasoline (including SUVs)
- passenger cars (PC); 5 seats; diesel (including SUVs)
- motorcycles (MC); 2 seats; gasoline
- mini bus; 15 seats; gasoline
- bus; 60 seats; diesel

Depending on the timeline and scenarios, different **input data and assumptions are used**:

- **BASE (2015):** Calculation of CO_2 emissions based on the number of vehicles (region specific motorization and fleet composition is used to calculate city specific data), Vehicle kilometers travelled (VKT) per vehicle and year (city specific), vehicle load, specific fuel consumption and GHG emissions factors (national average data).
- **BAU (2030):** Population growth in urban areas and overall improvements in specific fuel consumption, growth in urban transport activity (additional transport demand) and changes to the modal split (shift from public transport to individual motorized transport); VKT per vehicle and vehicle load remain stable.
- **Tsamaya unilateral (2030):** Based on population growth, efficiency improvements and growth in transport activity from BAU, but modal split remains stable to 2015.
- **Tsamaya plus (2030):** Based on population growth, efficiency improvements and growth in transport activity from BAU and modal shift from Tsamaya unilateral. Further improvements for bus efficiency due to low-carbon buses and higher vehicle load. 20% modal shift from cars to public buses.

5.3.2 Results for the pilot cities

5.3.2.1 Base year and BAU scenario

The basis for all developments is a sharp increase in the population in urban areas in South Africa during the next years (shown in **Table 13**).

Table 13: Population in the pilot cities (metropolitan area)[1]

City	2011	2015	2030

[1] Population statistics South Africa Calculation of 2015 and 2030 based on national growth forecast rates [UN 2014]

City of Johannesburg	4,397,282	4,683,690	5,595,808
City of Cape Town	3,667,842	3,906,740	4,667,552
Ekurhuleni Metropolitan Municipality (East Rand)	3,442,361	3,666,572	4,380,613
City of Tshwane (Pretoria)	3,159,176	3,364,943	4,020,243
Buffalo City	2,901,873	3,090,881	3,692,810
Polokwane	1,142,465	1,216,877	1,453,856
City of eThekwini (Durban)	755,200	804,388	961,038
Mbombela	745,215	793,753	948,331
Nelson Mandela Metropolitan Municipality (Port Elizabeth)	627,469	668,338	798,492
Mangaung Municipality (Bloemfontein)	588,794	627,144	749,276
Total	**21,427,677**	**22,823,326**	**27,268,019**

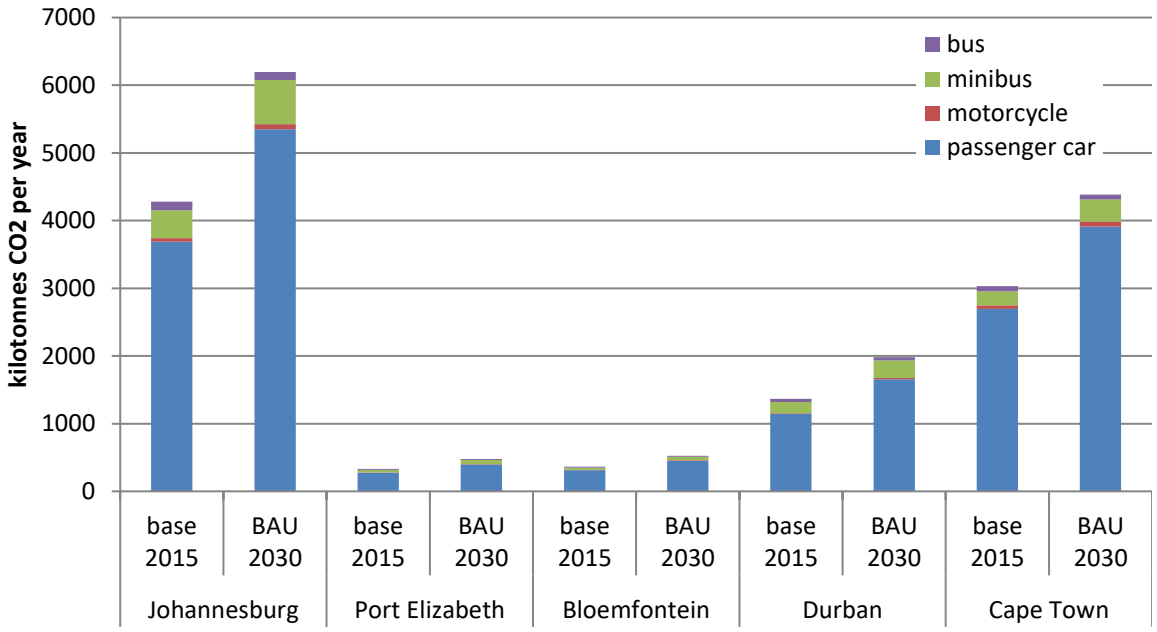
Due to an increased growth in GDP, it can be expected that there will be a sharp increase in passenger travel demand. Other studies (SANEDI 2012) have shown that this growing passenger transport demand results in an increased use of passenger cars, if no additional measures are taken. This trend is also in the BAU scenario. Table 8 summarizes the results for 5 of the pilot cities. The modal split in the other 5 cities shows similar trends and is therefore not given here.

Table 14: Transport demand and modal split 2015 and 2030 (BAU) in the pilot cities

City	**Year**	**Transport demand**	**Modal split**			
		million. pkm	passenger car	minibus	bus	motorcycle
City of Johannesburg	2015	46,010	51.7%	39.2%	8.1%	1.0%
	2030	63,806	61.0%	31.3%	6.5%	1.2%
City of Cape Town	2015	29,101	59.8%	30.9%	7.7%	1.7%
	2030	41,701	68.2%	23.9%	5.9%	2.0%
City of eThekwini (Durban)	2015	16,133	45.7%	44.9%	8.8%	0.6%
	2030	21,823	55.2%	36.8%	7.2%	0.8%
Nelson Mandela Metropolitan Municipality (Port Elizabeth)	2015	3,916	45.1%	44.1%	9.8%	1.0%
	2030	5,291	54.6%	36.2%	8.1%	1.2%
Mangaung Municipality (Bloemfontein)	2015	4,016	49,8%	37.8%	11.1%	1.3%
	2030	5,535	59.1%	30.3%	9.0%	1.6%

These developments lead to highly increased CO2 emissions in all the pilot cities, even though the fuel efficiency of the vehicles improves. CO2 emissions in 2030 are almost 50% higher than those of 2015, where passenger cars have the greatest impact. Figure 17 shows the development of CO2 emissions in five of the pilot cities in the BAU scenario.

Figure 17: Passenger transport CO_2 emissions of the pilot cites in 2015 and 2030 (BAU)



5.3.2.2 CO_2 reduction in Tsamaya scenarios

In the BAU scenario the CO_2 emissions of the pilot cities increase considerably until 2030 and a modal shift toward cars is observed. The impact assessment of Tsamaya NAMA measures therefore focuses on the potential to reduce CO_2 reduction according to the expected reduction impacts as shown in section 5.2. Three different scenarios with the following assumptions are investigated:

- **Tsamaya unilateral**
  - The individual transport demand is taken from BAU, but the modal split remains stable at 2015 levels.
  - Efficiency improvements are the same as in the BAU scenario.
- **Tsamaya plus**
  - With international support sustainable urban mobility concept are increasingly implemented in 10 cities (increased capacity of public transport, improved TDM policies and better conditions for eco-mobility)
  - The individual transport demand is taken from BAU, but 20% of passenger kilometers by passenger cars are shifted to public transport (bus). This shift is based on the targets of the national Public Transport Strategy. The share of mini buses is stable to 2015 due to the low density in South Africa and their potential as feeder mode to bus transit stops.
  - Efficiency improvements are the same as in the BAU scenario, but the efficiency of public busses is further increased by introducing new low-carbon buses into the fleet.

Table 15: Modal split – share in total Pass-km- (2030) in the different scenarios

		passenger car	minibus	bus	motorcycle

City of Johannesburg	BAU	61.0%	31.3%	6.5%	1.2%
	T. unilateral	51.7%	39.2%	8.1%	1.0%
	T. plus	41.4%	39.2%	18.4%	1.0%
City of Cape Town	BAU	68.2%	23.9%	5.9%	2.0%
	T. unilateral	59.8%	30.9%	7.7%	1.7%
	T. plus	47.8%	30.9%	19.6%	1.7%
City of eThekwini (Durban)	BAU	55.2%	36.8%	7.2%	0.8%
	T. unilateral	45.7%	44.9%	8.8%	0.6%
	T. plus	36.5%	44.9%	17.9%	0.6%
Nelson Mandela Metropolitan Municipality (Port Elizabeth)	BAU	54.6%	36.2%	8.1%	1.2%
	T. unilateral	45.1%	44.1%	9.8%	1.0%
	T. plus	36.1%	44.1%	18.9%	1,0%
Mangaung Municipality (Bloemfontein)	BAU	59.1%	30.3%	9.0%	1.6%
	T. unilateral	49.8%	37.8%	11.1%	1.3%
	T. plus	39.8%	37.8%	21.1%	1.3%

Table 16 demonstrates the fuel efficiency effects for the different scenarios and vehicle types. In the Tsamaya plus scenario the average number of passengers per bus increases (from 25 to 35 persons/ bus) due to higher vehicle loads. This accounts for fuel efficiency improvement of more than 20% per Pass-km. Additionally 25% of the bus fleet is replaced by hybrid buses which have 20% lower fuel consumption than conventional busses (compare [UBA, 2015]). In total, these two effects add up to more than 30% of specific CO_2 emission savings for buses in T. plus compared to the BAU/ T. unilateral scenario. The fuel efficiency and vehicle load of private cars (1.4 persons/ car) and motorbikes (1.1 persons/ motorcycle) is constant in all scenarios. The vehicle load of minibuses is assumed to decrease from 14 persons per minibus in 2015 to 8 persons per minibus in 2030. This is due to the fact that the current occupancy is extremely high and results in an unsatisfactory riding experience for the current passengers. It is assumed that passengers profit from the increase in GDP, either by using more private cars in BAU, or the better supply of bus lines (additional vehicles and seats) in T. unilateral and plus.

Table 16: Efficiency of the different transport modes (in g CO_2/ Pass-km)

	2015 base	**2030 BAU/ T. unilateral**	**2030 T. plus**
Passenger car (petrol)	151.5	130.2	130.2
Passenger car (diesel)	180.9	151.0	151.0
Mini bus (petrol)	22.8	32.7	32.7

Bus (diesel)	30.4	28.7	19.4
Motorcycle (petrol)	109.4	93.5	93.5

Source: [SANEDI, 2012] and own assumptions

The effects of the Tsamaya measures on the total emissions per city are demonstrated in Figure 18. A stabilisation of the modal split (T. unilateral) can help to reduce the increase in CO2 emissions. By shifting from passenger cars to public buses (T. plus), further significant reductions are achieved.

Figure 18: Passenger transport CO_2 emissions and mitigation potentials in 2030

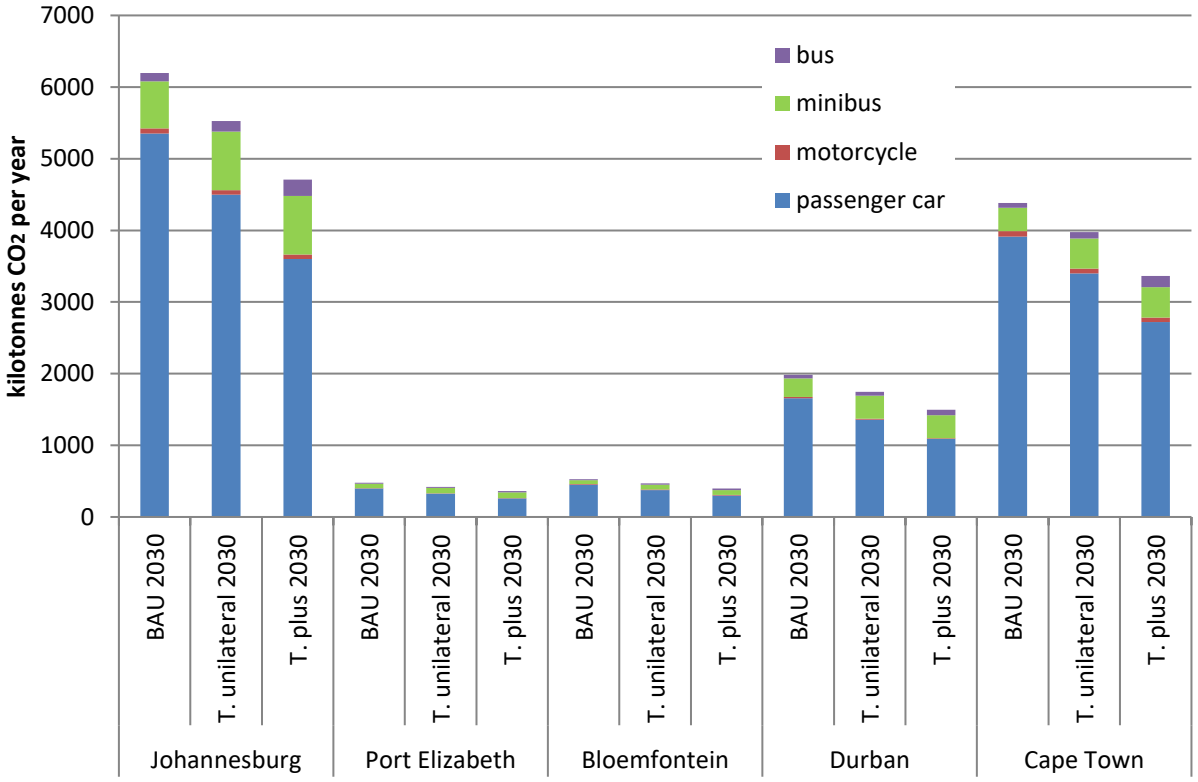


Table 17 gives a summary of the emission reductions by the two alternative mitigation scenarios Tsamaya unilateral and Tsamaya plus compared to the BAU scenario. In terms of CO_2 reduction T. unilateral can avoid around 13.5 million tons of CO_2 emissions between 2020 and 2030. Under the Tsayama plus scenario, 30.4 million tons of CO_2 will be reduced over 10 years.

According to [SANEDI 2012] the CO_2 emissions from the full transport sector in 2030 are around 82 million tons of which 45.5 million tons are attributed to passenger transport. The ten pilot cities emit 23 million tons of CO_2 in 2030 in the BAU scenario, which is about 50% of the CO_2 emissions of total passenger transport in South Africa according to [SANEDI 2012].

Table 17: Estimated CO_2 savings of Tsamaya NAMA compared to BAU

Parameter	Tsamaya unilateral	Tsamaya plus	Unit
Inhabitants 2030	27,268,019	27,268,019	[-]
Savings in CO_2 emissions 2030	2,461	5,522	1000 t/year
CO_2 saving per inhabitant 2030	0.09	0.2	t/inhabitant* year
Savings in CO_2 emissions 2020-2030	13,535	30,373	1000 t

5.4 Monitoring

5.4.1 Monitoring of GHG impacts

5.4.1.1 Overview on calculation parameters incl. data sources

The GHG impact will be assessed at city level, following a territorial approach. The methodology is in-line with the ex-ante assessment described above. Throughout the implementation of Tsamaya NAMA, the data collected will be used to validate and update the assumptions made in the scenarios. The monitoring results should wherever possible replace national average values through local data, as indicate in the tables below. This will give insights on emission trends and show the actual impact of the measures. However, these indicators will not allow the attribution of the impact of a specific measure to emission trends at city level. Additional qualitative information will help to identify how specific measures contribute to certain changes.

To be parameters at national level

Parameter	Indicators	Data source
Activity data	• transport performance of different vehicle categories differentiated by vehicle size, age and fuel type (vehicle numbers, average annual mileage (VKT), and vehicle load rates)	National vehicle statistics, trip surveys, origin-destination-surveys
Specific energy consumption:	• Emission factors by vehicle type and for different traffic situations	update envisaged as a supporting activity and in coordination with ongoing activities e.g. with SANEDI

Table 18. Indicators on GHG Impact at national level

To be monitored at city level

Parameter	Indicators	Data source
Activity data	• Vehicle mileage	GHG inventory for transport,

	• Fleet composition / energy efficiency of vehicle fleet • Modal share • Motorisation rate (cars, motorcycles)	Traffic counts, household surveys, statistical data of the police
	• passenger numbers of public transport	Local bus companies
Specific energy consumption	• detailed data on the vehicle fleet (size, age, fuel type)	

Table 19. Indicators on GHG Impact at local level

5.4.1.2 Uncertainties and need for additional data

The last chapter already demonstrated the most important parameters for quantifying GHG impacts of urban passenger transport.

The starting point for a sound bottom up monitoring approach is the activity data, including number or registered vehicles, average or total VKT (mileage), vehicles' passenger load and total transport performance (Pass-km). The previous analyses show that the data for these parameters currently mostly rely on national surveys.

A first point for optimization is the collection of representative city specific data. This includes:

- **Vehicle fleet** (total number of vehicles, share of vehicle and fuel types): The data might be available at local vehicle registration authorities of collected by surveys. Alternatively a qualitative analyses of differences between local and province or national fleet might be a first step.If only small differences are assumed it is sufficient to use the average fleet composition of the region
- **VKT**: Existing surveys e.g. indicate high variation in regional average VKT (between 26,000 km/a according to CSIR 2016 and 65,000 km/a in Johannesburg according to [SANEDI 2012]). However, current data for South Africa still shows limited accuracy. Additional data sources for VKT include odometer records from inspection, telemetric data from fleets (bus, taxis), traffic counting at major roads and mobility questionnaires.
- **Transport performance**. Total Pass-km is the basis for all mitigation scenarios. Currently, pkm are calculated bottom-up on the city level. Statistical data should be used to verify and improve the results. Public transport authorities or companies might collect data on the number of passenger or passenger-kilometers per year. For private transport usually, eigther mobility surveys can provide data on transport performance, representative average passenger loads per vehicle or traffic counting.
- **Specific fuel consumption** is another important input parameter for bottom up calculations. Ideally, the specific fuel consumption is known for each vehicle type (fuel type, size, age, technology, use of air condition, etc.) and under specific operating conditions (average speed, traffic flow (free, stop-and-go, congestion), road gradient, etc.). This however requires specific emission factors which are currently not available in South Africa.

Also alternative fuels (e.g. electricity or gaseous fuels) could be considered in further scenarios. If alternative fuels are assessed upstream (WTW) emissions need to be added. Also, the CO_2 emissions reported in the current scenarios consider no other greenhouse gases, especially N_2O (nitrous oxide) and CH_4 (methane).

5.4.2 Monitoring of non-GHG impacts

The following indicators are to be collected by the participating cities to quantify the impact of Tsamaya NAMA on sustainable development objectives:

- Modal split (share of public transport and non-motorised modes in pkm – not trips)
- traffic fatalities (road, rail, etc.) in the urban area per 100.000 inhabitants.
- Efficiency of the transport system : Access (share of population living within 500m of a public transport stop with minimum 20 minute service)
    - Level of service (capacity and frequency) of public transport
    - average commercial speed of public transport,
- Household spending on transportation (voluntary)
- Air quality at main transport corridors (voluntary)

Sources: Public transport survey, household surveys, traffic counting, air quality measurement.

5.4.3 Monitoring of NAMA activity and progress

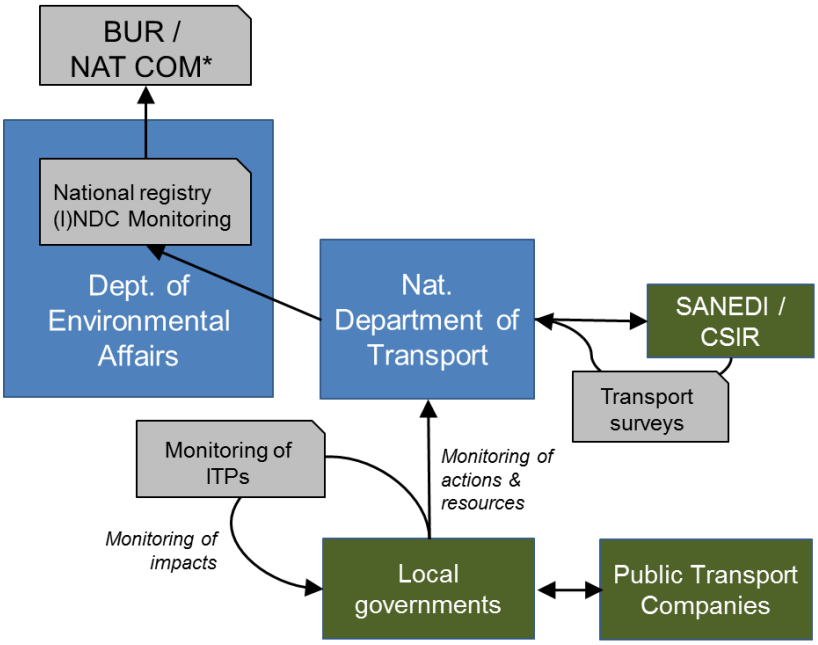
Monitoring of activities and progress will be done according to the work plan for the pilot phase and for the roll-out phase to be decided in April 2017 and early 2020.

5.5 MRV set-up and process

It is foreseen to carry out an urban transport survey in the pilot cities at the beginning of the project to improve and validate the existing transport data. Based on these findings, the mitigation scenarios will be updated and adjusted. The survey will be a starting point for a regularly implemented urban transport survey to monitor information on the mobility behavior of inhabitants as well as on the transport system and traffic situation. The survey should be updated at the end of the pilot phase, and continued afterwards by the South African Government.

The progress of project implementation will be monitored at national and local level under coordination of the programme office. The monitoring approach covers the monitoring of implementation and funding. Annual updates will be provided by DoT and local governments to compile information on the spent budget and implemented actions.

The DOT's unit ITP will be the body responsible for monitoring funding received from international partners.



* Reporting to the United Nations Framework Convention on Climate Change:
BUR: Biennial Update Reports
Nat. Com: National Communication

Figure 19. Institutional setup for MRV of Tsamaya NAMA

6 Financing the NAMA

6.1 Overview of costs

The following section provides an estimation of the approximate costs required for the implementation of Tsamaya NAMA. Calculations include investment in infrastructure as well as costs for organisational and supportive measures. The given numbers may be understood as a roundup reflecting the current development stage of the NAMA. This section should be updated according to further elaboration of the measures.

Table 20: Overview of organisational and supportive measures

Component	1 National policy and regulatory framework	2 Technical Assistance to focus cities	3 Access to finance	4 Capacity Development	5 Impl. of mitigation actions in 10 cities	6 NAMA coordination and MRV
Type of measures	supportive	supportive	supportive	supportive	Direct mitigation action	Organisa-tional

6.1.1 Costs of organisational and supportive measures

The cost estimations include required staff capacities, consulting costs, travel costs, costs for meetings and events, as well as further expenses (office rent, furniture and equipment). Furthermore, both levels, national as well as local governments are considered in this estimation.

The supportive and organisational measures sum up to about ZAR 50 million (USD 3.4 million) for the pilot phase with direct assistance to two cities and about ZAR 200 million (USD 12.8 million) for the roll-out phase with direct assistance to 8 more cities with support during three years each.

Table 21: Estimated costs for organisational and supportive measures

	Pilot phase (2 cities, 2017/19)		**Roll-out phase (8 cities, each 3 years, 2020-2026)**		**Full NAMA (10 cities, 10 years)**	
	in ZAR	in USD	in ZAR	in USD	in ZAR	in USD
National level	12,780,000	831,000	38,340,000	2,492,000	51,120,000	2,769,000
Local level	39,600,000	2,574,000	158,400,000	10,298,000	198,000,000	12,872,000
Total costs	**52,380,000**	**3,405,000**	**196,740,000**	**12,790,000**	**249,120,000**	**15,641,000**

Table 22 gives a quick overview on the organisational and supportive measures, for further details please see section 4.5.

Table 22: Organisational and supportive measures and allocation of costs

	ZAR	USD
1 - National policy and regulatory framework (national level)	1,800,000	117,000
Identification, Roadmap and step-by-step adjustments		
2 - Technical assistance to focus cities (local level)	(per city) 6,600,000	(per city) 429,000
updating Integrated Transport Plans measure specific implementation support		
3 - Improved access to finance (Local and national level)	1,200,000	78,000
Preparing proposals to access financial resources Providing support during the application process Developing financing mechanisms in cooperation with financing institutions		
4 - Capacity Development (National level)	2,940,000	191,000
Document lessons learnt in pilot cities, e.g. integration of MTB as part of PT services Facilitate capacity building workshops for South African municipalities Providing an online knowledge sharing platform		
6 - Coordination and MRV (national level)	1,260,000	82,000
Monitoring and Evaluation support for pilot cities MRV framework on urban transport Establishment of a Tsamaya Programme Office National Steering Committee		

6.1.2 Cost of direct mitigation measures

The cost estimation is based on approximate costs for expanding the public transport systems which are presumably by far the most cost intensive component of the programme. In order to build the cost estimations on realistic conditions, 10 out of the 13 cities that benefit from the PTNG (in line with the MRV section) were used as an example.

The estimations refer to approximate costs for the implementation of the transport system improvements which are necessary to accommodate the before mentioned changes in the transport behaviour (especially additional public transport capacity). The estimations are in relation to existing bus and minibus taxi routes in each city.

The investment needs are based on characteristics of the selected cities (e.g. city size, population size, and road length). Estimations on the required infrastructure facilities consider experiences from several cities around the world in which different bus systems have developed during the past years. Even though the variation between those cities and countries is large, certain correlations could be identified and the following assumptions were applied (Table 24). The unit costs shown in Table 24 are based on international experience with relation to local costs as far as available. It is recommended to update the cost assumptions and validate the unit costs throughout the pilot phase.

There is no cost value for ‘light touch’ bus priority measures – only for full BRT infrastructure. However, delivering a high quality bus network requires smaller but targeted

improvements to support the general bus network. Costs for those measures are not included in the estimations, as they are comparably inexpensive.

Table 23. Assumptions on network infrastructure for different investment scenarios

Adopted Rules	Investment Scenario I: Tsamaya unilateral	Investment Scenario II: Tsamaya plus	Assumptions and comments
BRT corridor (expansion)	1 additional corridor of 14km per 1.5m population	1 additional corridor of 14km per 1m population	Linked to highway length, with overall length benchmarked against international case studies
Rapid Transit Station	1 per 50 new bus stops	1 per 50 new bus stops	
Bus Stops	1 stop per km^2	2 stops per km^2	Standard bus stop provision on bus in urban areas is 1 every 400m along a bus route. Without detailed route length info, total stop numbers are benchmarked against SA city existing minibus stops
Bus Depot	1 depot per 200 buses	1 depot per 200 buses	Practicable depot size of 200 buses, applied to estimated increase in bus fleet
NMT Infra.	0.4% of existing roads length	1% of exsisting road length	to be reviewed (based on current BRT length in SA)

Table 24. Cost estimations per unit for investment costs

Intervention	Cost estimation per unit in USD 1,000
BRT corridor (expansion)	4,818
Rapid Transit Terminals	836
Bus Stops	7
Bus Depot	2,500
NMT Infrastructure	114
Buses	152

A large proportion of the investment relates to the bus fleet as the number of buses over the BAU is significant. In all scenarios a significant increase in the number of private cars can be observed compared to 2015. Bus, minibus and motorcycle numbers are increasing, too. In Tsamaya unilateral and Tsamaya plus the modal shift towards public transport dampens the increase in cars but leads to a higher number of minibuses and public buses. In the scenario “Tsamaya unilateral” approximately 25% more buses (1,500 buses/ 1 million capita) are needed than in BAU (1,200 buses/ 1 million capita). For Tsamaya plus, the number of buses in the cities has to be increased by more than 100% (2,000 buses/ 1 million capita) compared to BAU. In total numbers this accounts for ~ 28,700 additional buses, of which ~ 7,200 are low-carbon buses.

The number of additional buses projected under the future scenarios is high by international comparison, with an average 1,500 buses/million population in the scenario Tsamaya unilateral, and over 2,000 in the Tsamaya plus investment scenario. However, this needs to be considered in light of the high existing public transport mode share whereas two third of the passengers are currently traveling on minibus taxis.

The number of buses required in the different cities, based on modelling results, is shown in Figure 20.

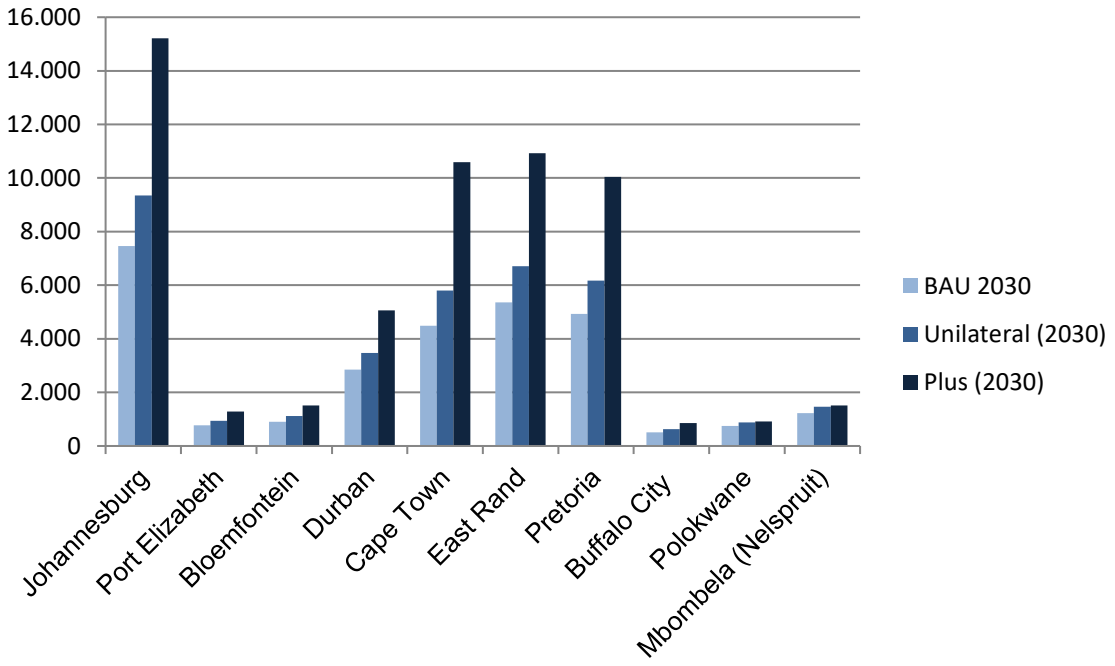


Figure 20: Number of buses in the cities in the different scenarios

The overall cost estimation for the implementation of Tsamaya NAMA can be found in the tables below. In total the approximate costs sum up to about ZAR 30 bn (USD 2bn) for the unilateral scenario and ZAR 92 bn (USD 6bn) for the Tsamaya plus scenario. Compared to the urban mobility programme of Brazil (~ USD 55 bn till 2020 with about the 4-fold of South Africa's population) the estimates are about half of the investment per person. However the type of measures as well as the financing structure of the projects cannot be compared one by one.

As can be seen in Table 26, the required funding for investment for network infrastructure of the Tsamaya plus scenario are about double than in the unilateral scenario. The expenses for additional buses in the Tsamaya plus scenario are estimated at nearly four times the amount of the unilateral scenario.

Table 25. Investment costs for network infrastructure and vehicles per scenario per city

	Tsamaya Unilateral		Tsamaya Plus	
	ZAR (in million)	USD (in million)	ZAR (in million)	USD (in million)
Johannesburg	7,028	457	24.158	1.571
Port Elizabeth	547	36	2.596	169
Bloemfontein	679	44	1.787	116
Durban	3,831	249	9.057	589
Cape Town	5,651	367	19.091	1.241
East Rand (Ekurhuleni)	5,645	367	17.530	1.140
Pretoria (Tshwane)	4,488	292	15.625	1.016

Buffalo City	442	29	1.166	76
Polokwane	385	25	495	32
Mbombela (Nelspruit)	656	43	793	52
Total	**29,352**	**1,908**	**92,296**	**6,000**

Table 26. Investment costs for network infrastructure and vehicles (over 10 years)

	Tsamaya Unilateral		Tsamaya Plus	
	ZAR (in million)	USD (in million)	ZAR (in million)	USD (in million)
Public Transport Network Infrastructure	12,318	801	25,250	1,642
Buses	17,034	1,107	67,046	4,359
Total	**29,352**	**1,908**	**92,296**	**6,000**

6.2 Economic viability

The overall economic viability of the Tsamaya NAMA largely depends on the individual economic viability of the direct mitigation measures implemented under the programme. There is existing evidence that sustainable urban mobility interventions are usually economically viable from a societal cost-benefit perspective.[1] Since the selection of direct mitigation measures will only be done during the implementation of the NAMA, examples for typical projects that could be supported under the Tsamaya NAMA are given here.

Economic viability of BRT expansion

The implementation of the Johannesburg BRT Phase 1A is taken as example for the economic viability of a project that received funding under the PTNG. A comprehensive Cost-Benefit-Analysis (CBA) of the Rea Vaya Phase 1A is available from Carrigan et al. (2013). The construction of Phase 1A of the Rea Vaya started in 2007. The system is in operation since 2009 and covers a length of 25.5 km. The CBA takes into account the expected costs and benefits induced by the Rea Vaya Phase 1A between 2007 and 2016.

The present value of costs amounts to ZAR 6.15 billion (USD 0.40 billion), including capital expenditure, bus operating contract, other infrastructure operation and maintenance, project planning, project staff labour and cost for negotiations with the MBT industry. The capital costs account for the largest share of the overall costs (63%). The construction of the busway cost about ZAR 83.7 million (USD 5.44 million) per kilometre and ZAR 14.6 million (USD 0.95 million) per station. The automatic fare collection system costs ZAR 210 million (USD 13.65 million) These kinds of infrastructure costs are eligible for funding under the PTNG. Bus procurement was realised based on a private bank credit with a low interest rate.[2] The bus operating costs of the

[1] See World Transport Policy and Practice Vol. 22.1/2 May (2016) and www.evidence-project.eu

[2] For a full list of included costs and benefits see: Carrigan, A., King, R., Velasquez, J.M., Raifman, M. Duduta, N. (2013): Social, Environmental and Economic Impacts of BRT Systems. Bus Rapid Transit Case Studies form Around the World. EMBARQ

system during the period of investigation amount to ZAR 2,033 million (USD 132 million) and constitute about 33% of the overall costs.

The present value of benefits was estimated at ZAR 7.32 billion (USD 0.48 billion). Travel time savings make up the largest share of benefits (38%), followed by avoided road fatalities (29%) and increased physical activity (16%). It is assumed that on average 19,914 tons of CO_2 emissions are mitigated on an annual basis through the Rea Vaya Phase 1A. The emission mitigation takes into account mode shift, displaced taxis, reduced congestion, improved bus technology and leakage during construction.

According to the analysis, the project has a benefit-to-cost ratio (BCR) of 1.19 and an internal rate of return of 12%. Thus, it can be considered as economically viable public investment as overall benefits are higher than the costs, although the revenues cannot cover the direct costs (see 6.1). The distributional analysis of the costs and benefits revealed that the poorest residents in Johannesburg are not significant beneficiaries of the project. Middle-income users disproportionately use the BRT.

Economic viability of eco-mobility-infrastructure expansion or upgrade

There is strong evidence from around the world that investment in infrastructure for last-mile eco-mobility often yields positive benefit-to-cost ratios. In particular, economic viability of cycling infrastructure is well documented (Parking 2016). Benefits of cycling investments to the society as a whole usually exceed the associated costs.

A review of 16 international studies on the economic effects of investments in walking and/or cycling infrastructure, found that out of 16 CBAs of walking and cycling investments, only one had a negative BCR (-0.4) and most exceeded the threshold value of 1 indicating economic viability. The maximum BCR was 32.5 and nearly half were higher than 10. The CBAs were based on very different assumptions and including different effects (Cavill et al. 2008).

The highest benefits are usually attributed to positive health effects. Underlying approaches to estimate health related benefits vary, however. Other benefits that can result from improved infrastructure for last-mile eco-mobility include travel time, comfort and security, reduced external costs associated with motorised road transport such as CO_2 emissions, local pollutants and noise in their CBA (Sælensminde 2014). The qualitative impacts resulting from walking and cycling investments (e.g. enhanced quality of life) are difficult to monetise and often not reflected in an economic assessment.

Economic viability of parking management

Parking management schemes do not require large investment and are usually financially viable. Additional benefits include reduced congestion, improve air quality and reduce land-use due to a reduction in search traffic and overall car traffic. In North America, on average 30% of urban traffic can be attributed to cruising for a parking spot. Effective parking management can increase the attractiveness of the street and attract more visitors to local businesses (Mingardo and Streng

2016). Research in Europe showed that even though retail revenues might decline shortly after parking price introduction or increase, they recover or even increase over time due to faster parking-space turnover and fewer long-term parkers (COST 2005).

Economic viability of vehicle fleet modernisation

Besides GHG emission reductions, vehicle fleet modernisation can lead to a reduction in local air pollutants and noise resulting in positive impacts on human health, building structures and the environment. Based on these benefits vehicle modernisation can be economically viable even though the cost-benefit assessment of different vehicle technologies and fuels are currently not available for South Africa. The economic viability is not only influenced by technology and investment costs, but also by local context conditions such as fuel prices, fuel carbon content or electricity mix. For instance Buekers et al. (2014) investigated the different effects on external cost relating to health and environmental impacts from electric vehicle introduction in EU countries. Assessments of different vehicle modernisation options will be conducted for South Africa in the preparation of the pubic vehicle procurement guidelines and will be supported by the Tsamaya NAMA.

6.3 Secured funding and gaps

The following table gives an overview on mayor funding sources and programmes which are expected to contribute to the implementation of Tsamaya NAMA. In the following sections, a comparison of the estimated investment needs and the available funding is made. It is recommended to update and revise the cost estimations and respective assumptions as well as the financial contributions from different partners from time to time.

Table 27. Overview on secured funding for Tsamaya NAMA

Sources	Supportive and organisational measures	Direct mitigation measures: Network infrastructure	Direct mitigation measures: Buses
National government	*Department of Transport (Integrated Transport, Public Transport)* *National Treasury: Cities Support Programme*	*Public Transport Network Grant (PTNG)*	*Public Transport Operations Grant (PTOG)*
Local governments		*Budget for the implementation of Integrated Transport Plans*	*Budget for the implementation of Integrated Transport Plans*
Private Sector			*Private Bus operators*

International Implementation partners	*BMUB / GIZ: Climate Support programme Transport Flagship component* *The Worldbank: Cities Support Programme*		*BMZ / KfW (DKTI): Climate Initiative for Urban Mobility (Durban (eThekwini); Ekurhuleni)*

6.3.1 Funding for organisational and supportive measures

- National Government institutions as well as advocacy and dissemination partners will contribute to the implementation of supportive and organisational measures on an in-kind basis given their existing mandates. The National Department of Transport's Integrated Transport Planning Branch is willing to contribute in-kind and in cash for the implementation. During the pilot phase of the Tsamaya NAMA the Deputy Director for Climate Change at the Department of Transport is in charge for the implementation supported by a team. The ITP branch of the DOT will seek additional budget through the National Treasury form the national state budget. This in-kind contribution is in particular expected regarding the improvement of the national policy framework, coordination and MRV.

- The German Federal German Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) will provide technical support through GIZ under the Climate Support Programme from 2017-2019. These resources will be used to assist in selected activities during the pilot phase to improve the policy and regulatory framework, improve the data basis as part of MRV of Tsamaya NAMA as well as technical assistance to two pilot cities.

- With the Cities Support Programme the Worldbank and SECO seek to improve targeted areas such as business-enabling environment; public financial management; infrastructure finance; land management and urban regeneration; and integrated urban transport planning over a five year period.The total volmen of this trust fund is USD 9 million.

- Further in-kind contributions will be provided by different stakeholders funded by their own sources such as SALGA, SANEDI, CSIR, UNIDO and WWF.

6.3.2 Funding for direct mitigation measures

Public Transport Network Grant

From the national state budget, resources have been allocated to the PTNG, which is administered by the Public Transport branch of the DOT. The Department's transfers to municipalities for public transport via the PTNG, are expected to increase at an average annual rate of 4.5% over the medium term (see Table 28). 13 municipalities in South Africa receive funding under the PTNG for the implementation of high quality bus systems (i.e. BRT systems or BRT-like systems). Currently, the PTNG mainly funds the implementation of infrastructure (e.g. bus routes, stations,

automatic ticketing infrastructure). Vehicle purchase is usually not eligible for funding under the PTNG.

Financial year	PTNG (1,000 ZAR)	PTNG (1,000 USD)
2012/13	4.888.401	317.795
2013/14	5.549.981	360.804
2014/15	5.870.846	381.664
2015/16	5.953.090	387.010
2016/17	5.592.691	363.581
2017/18	6.359.895	413.457
2018/19	6.793.269	441.630

PTNG budget forecast assumptions	Budget for 10 years 2017/18-2026/27 in bn ZAR	Budget for 10 years 2017/18-2026/27 in bn USD
Continuous growth 4.5% per year	80	5,18
stabilisation at 2017/18 levels	64	4,13
decrease -5% per year	57	3,68

Table 28: Expenditure estimates of the PTNG[1]

Compared to the investment needs estimated in section 6.1.2, the PTNG budget would be more than sufficient to cover the network infrastructure costs. The PTNG provides a significant amount of funding for public transport infrastructure and some funding for NMT infrastructure. As can be seen in section 6.1.2, the largest share of finance is required for bus procurement. Currently the procurement of buses is usually financed by local bus operators supported through subsidies from municipalities and/or the PTNG in some cases.

Municipal resources in pilot cities

The majority of municipal resources usually comes from municipal revenues and unconditional grants from the national government (see 2.3). The pilot cities will allocate own resources to the implementation of direct mitigation actions under the Tsamaya NAMA. According to the Integrated Development Plan of Johannesburg, the city's capital investments in transport will amount to ZAR 1 billion in 2016/2017, ZAR 1.5 billion in 2017/2018 and ZAR 1.3 billion in 2018/2019. Thereof, significant resources have been allocated to several sustainable, low carbon transport projects. For instance, for the financial years 2017/2018 and 2018/2019 in total ZAR 58 million (USD 3.77 million) have been allocated to the conversion of the existing metrobus fleet to Compressed Gas

[11] (Source: Adjusted Estimates of National Expenditure National Treasury, 2016, Transport)

and cleaner diesel. ZAR 660 million (USD 42.91 million) have been allocated for the period 2016/2017 to 2018/2019 for investments in public transport corridor development (TOD). Furthermore, budget is allocated to the installation of cycle lanes on several routes.

Existing financial support from development banks

Some South African cities receive financial support from development banks for the implementation of sustainable urban mobility projects. For instance, Johannesburg received financial support from KfW for cycling infrastructure and associated services (see section 2.6). Further financial cooperation projects with KfW are planned in Durban and Ekurhuleni for sustainable mobility.

6.4 Need for financial support

The Tsamaya NAMA includes unilateral elements (as outlined in section 6.3), but also seeks additional technical, capacity building and financial support from international sources and private sector actors.

For the NAMA implementation the Department of Transport is seeking international support in particular in terms of technical assistance for the supportive measures and capacity building. Further financial support needs are likely and will be further elaborated throughout the implementation of the pilot phase. Section 6.4.2 shows possible instruments which will be further looked at to accelerate a successful implementation.

6.4.1 Technical support and capacity development

Funding is needed especially for consulting costs within the following components:

	Technical Support (national level) (components 1, 3, 4, 6)		**Technical Support (per city) (component 2)**	
	in 1,000 ZAR	in 1,000 USD	in 1,000 ZAR	in 1,000 USD
Staff costs	2,100	137	2,400	156
Consulting costs	2,100	137	2,400	156
Travel Costs	1,440	94	720	47
Costs for meetings/ Events	1,080	70	720	47
Others	480	31	360	23
total per year	**7,200**	**468**	**6,600**	**429**

Table 29. Estimated costs per year national level and per city

An increased level of support will enable up scaling the activities and including more pilot cities and focus cities in the SUM programme.

Technical support can contribute to the following activities:

- Assessment of appropriate vehicle technologies and their GHG emission mitigation potential based on South African conditions for a) national procurement guidelines and b) for establishment or re-fleeting of BRT and metrobus systems
- Policy advice from national and international consultants for gap analysis and revision of the national policy framework related to urban mobility
- Feasibility studies, project proposal development and support during the application process for pilot cities to seek (international) funding
- Technical advice on the development and revision of the pilot city's integrated transport plans
- Consultancy services to develop and set up a sound system for high quality data collection and MRV
- Dedicated capacity building activities for key individuals in government as well as planning and management on sustainable urban mobility can address the current gaps in capacity and cooperation. Furthermore, capacity building on sound data collection and monitoring is needed to establish a high quality MRV system.

6.4.2 Financial support

This NAMA concept provides a framework for specific financing opportunities to strengthen sustainable transport in South Africa. The component 3 of this NAMA concept aims to improve access to finance. This includes the identification and preparation of new financing instruments, which are considered useful to upscale energy efficient technologies good practice in cities.

The following section will indicate a number of potential financing instruments, which could be attractive for international climate finance but need to be further elaborated:

Low-Carbon Bus Fund: To promote the introduction of low-carbon buses international support is needed to kick-start the process and cover the risk and incremental cost of the new technology. Lessons can be learnt from comparable funds e.g. from UK and China.

Loans for bus procurement: Concessional loans to finance the upfront investment of low-emission bus procurement, e.g. in the context of a BRT expansion project (While infrastructure investments are supported by the national government through the PTNG, vehicle purchase is not supported).

Project specific finance: As described in section 4 a project pipeline will be developed throughout the implementation. Further information will be added once available.

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8 Annexes

8.1 Annex I. Assessment of availability and quality of transport planning data

Indicators	State of transport planning data to produce indicators
Environment	
Traffic noise levels	- The data on noise levels is not available.
Per capita fuel consumption Management of used oil and oil leaks	- Regional level fuel consumption is reported by the Department of Energy (www.energy.gov.za). - Monitoring data on used oil and oil leaks not available.
Per capita land devoted to transport facilities Policies to protect high value farmlands and habitat	- While data on area coverage of transport facilities and infrastructure is not available, it can be estimated but with difficulty. - South Africa has policies on biodiversity management.
Economic	
Per capita GDP Portion of budgets devoted to transport Per capita congestion delay Efficient pricing Efficient prioritisation of facilities	- Good quality data generally available to estimate per capita GDP (www.statssa.gov.za) and portion of budgets for transport (Income and Expenditure Survey and household travel surveys). - Data generally unavailable to compute congestion delay. However some cities (e.g. Johannesburg, Tshwane, eThekwini, and Cape Town) maintain transport models which can be used for the purpose. - The use of mobile phone data has been tested by academia and is considered a very promising option. - Transport pricing data is not generally available, but can be gathered with much effort. - Prioritisation of facilities requires comprehensive spatial datasets that are not readily available.
Access to education and employment opportunities Support for local industries	- Household travel surveys can be used to estimate access to education and employment (e.g. Department of Transport household travel survey; Gauteng household travel survey, eThekwini household travel survey). - Measurement of the extent of support to local industry requires procurement data that is generated from administrative transactions. However, this would require much effort to collect.
Per capita transport energy consumption Per capita use of imported fuels	- The Department of Energy (www.energy.gov.za) keeps record of energy consumption data, which can be used to estimate per capita energy consumption. The department is also able to disaggregate fuel sources into local and foreign fuel supplies. However, the spatial disaggregation of fuel consumption by source is not possible.
Availability and quality of affordable modes Portion of low-income households that spend more	- Available household travel surveys provide basic datasets on availability of modes. The surveys also crudely measure the extent of satisfaction with services (e.g. Department of Transport household travel survey; Gauteng household travel survey, eThekwini household travel survey). - From the same household travel surveys, it is also possible to estimate the proportion of income spent on public transport.

than 10% of budgets on transport	-	The national household income and expenditure can also be used to estimate household expenditure on transport as a whole.
Service delivery unit costs	-	While data on service delivery costs is available, compiling it from various sources is difficult.
Social		
Ratio of destinations accessible by people with disabilities and low incomes	-	No datasets readily available to assess extent of destination accessibility to persons with disabilities.
	-	Household travel surveys can be used retrospectively to isolate areas not accessed by low income individuals. However, the reasons for not accessing such areas will not be detectable from the data.
Per capita traffic casualty	-	Data on road traffic crashes is available for computing per capita traffic casualty (www.rtmc.co.za). However the location of the accident (whether urban or non-urban) is no classified there.
Traveller assault rates	-	Although data on assaults in general is available (www.saps.gov.za), data on traveller assault is not reported separately and would be difficult to gather.
Human exposure to harmful pollutants	-	Estimation of pollutants can only be done at an aggregate level on the basis of fuel consumption statistics. Some cities (e.g. Johannesburg) have air quality stations from which area specific pollutant estimations can be made.
Portion of travel by walking and cycling	-	Data on walking and cycling available from household travel surveys.
Land use mix	-	Land use data is not generally available, and would require dedicated surveys. It is possible however to get some indication of land use from town planning schemes.
Walkability and bikability		
Quality of road and street environments	-	The quality of walking and cycling infrastructure is not explicitly measured. However, in Gauteng Province, the Quality of Life Survey (www.gcro.ac.za) does provide some indication of community perceptions on infrastructure and services quality.
Transport Modelling Data		
transport demand and supply	-	Person trips by time of day, purpose, mode of transport: Acceptable accuracy. Household travel surveys. Nonetheless, mainly limited to peak period travel.
	-	Attributes of travellers: National household travel surveys.
	-	Trip chaining: Data generally not available. Needed for improved public transport service designs.
	-	Classified road network: Limited to higher order road (national) and some provinces & cities. Acceptable accuracy.
	-	GIS based public transport routes: Generally not available. A systematic mapping programme required.
	-	Public transport route service characteristics: Generally not available. A proper asset management system required.
	-	Vehicle characteristics: Available as administrative data in eNatis. However, emission attributes generally not available. Route specific vehicle data generally not available.
	-	Network speeds: Generally not available
	-	Network throughput (e.g. passengers per vehicle km): Generally not available.
	-	Network operational costs: Incomplete datasets. Current datasets are only sufficient to report at a highly aggregated level.

Source: CSIR 2016: Design of Modules for the Sustainable Urban Transport NAMA of the Department of Transport.

8.2 Annex II. References on costs and revenues of urban transport in South Africa

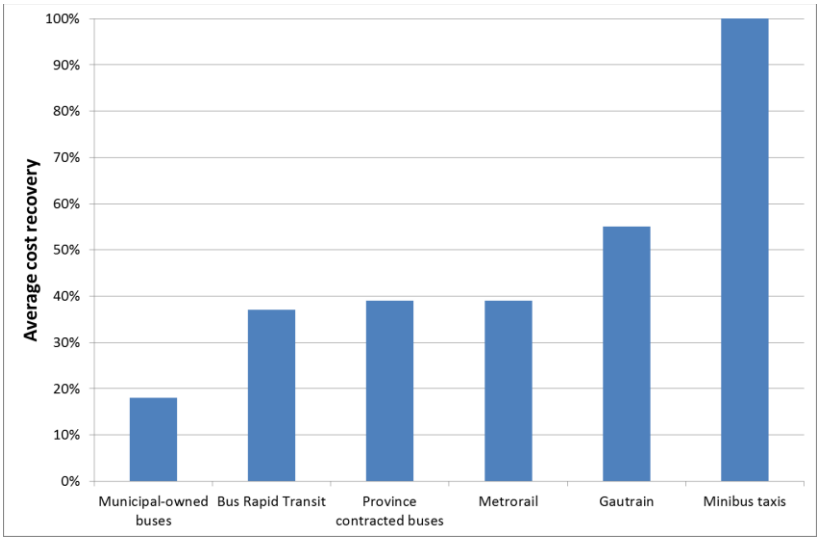
BRT expansion

The investment costs for current BRT systems are about ZAR 50 million (USD 3.25 million) per kilometre. The operating costs vary largely between the different systems. In Johannesburg, the BRT operating costs amount to ZAR 100 (USD 6.5) per vkm. In Cape Town, the BRT operating costs exceed ZAR 500 (USD 32.5) per vkm. The average fare for BRT systems is ZAR 0.39 (USD 0.03) per pkm. Based on an occupancy rate of 1.1 passengers per seat (as reported by Johannesburg) and a seating capacity of 80 seats, the fare box revenues amount to ZAR 34.32 (USD 2.23) per vkm. Consequently, cost recovery for existing BRT systems is about one third of the operating costs. The expansion of the BRT services might lead to network effects and thus better financial performance in the long term (CSIR 2016).

Except for the minibus taxis, no urban public transport service in South Africa fully covers its costs by fare box revenues, thus all are depending on subsidies and other funding sources (see

Figure 21). The MBT sector is privately owned and operated and does not receive any subsides, thus this sector needs to achieve full cost recovery by fare box revenues.

Figure 21: Average cost recovery across different public transport modes in urban areas



(Source CSIR 2016)

Infrastructure expansion and improved conditions for last-mile connectivity

Installing a high quality infrastructure for cycling and walking is currently estimated at costs of ZAR 7.5 million (USD 0.49 million) per kilometre. This includes a five meter wide lane with lighting, benches, trees and water points. Costs can vary depending on the terrain, need for bridges and the material used. If existing lanes are reallocated from an existing road or existing infrastructure is upgraded, costs can be significantly lower. In general, no direct revenues can be expected from NMT infrastructure installation (CSIR 2016). For many cities in South Africa, reducing barriers for pedestrians and improving the inter-connectivity of sidewalks through more pedestrian friendly inter-section design could improve last mile connectivity. The prioritisation of eco-mobility modes would only lead to little extra costs in the design of urban roads. An adjustment of design standards is not cost intensive but has a long-term impact in the development and use of public urban spaces. In centres of economic development a pleasant walking environment also contributes to additional revenues for local shops and service providers. Pedestrians and cyclists stay longer in spaces with well-designed infrastructure and visit the area more often than people that use on-street parking to make a specific purchase. Empirical examples in several cities worldwide reveal that in sales of local businesses are likely to rise and in the long-term rents and property values increase in these areas (Trolley 2011).

Parking Management

Parking management can be introduced cost-efficient. Main cost items include investments in signs (and/or paint) and sometime parking ticket machines. Operation costs are mainly staff costs for enforcement and maintenance of the ticket machines. If the tickets are sold manually, additional staff costs occur. Parking guidance systems can reduce search traffic and can make parking management more acceptable. Low-tech solutions for parking management are often easier to implement, cheaper and can offer employment opportunities. In South Africa, formal or informal parking pricing already exists in many locations. Parking fees can be increased or demand oriented and dynamic parking pricing can be introduced to reduce car travel. Proper parking management can also reduce the expenses for construction and maintenance of parking spots through a long-term reduction in parking demand. According to Litman (2016) one urban parking spot cost about USD 500 to 1,500 annually (ZAR 7,691 to 23,073) including construction cost, operating cost and annualised land acquisition costs.

The city of Johannesburg explored different options to generate new sources of local revenue for instance form parking management. A city tax on non-residential parking bays could generate ZAR 274 million (USD 17,81 million) per year if a tax of ZAR 5 (USD 0.33) per day is introduced to approximately 150,000 non-residential parking bays. The owners could pass the costs to the users through parking pricing (City of Johannesburg 2013).

Vehicle Fleet Modernisation

Investment cost and operating costs of vehicle fleet modernisation depend on the specific technology and the context conditions. In the minibus sector, costs for vehicle retrofitting to run on CNG are reported to be ZAR 20,000 (USD 1,300) per MBT. Based on experience of a pilot project in Johannesburg, fuel cost savings range from 19% to 25% based on an average petrol substitution of 53% to 95%.

A lifecycle cost comparison of different bus technologies that was conducted in South Africa between 2010 and 2012 found that ethanol, CNG, biogas and battery electric buses lead to 13% to 33% higher lifecycle costs in compared to Euro 5 diesel buses (Linkd 2015). However, strong technical and market developments have to be taken into account to assess today's financial viability of these technologies. To reflect current price developments national and international examples of investment and operating costs are provided in the following.

According to experience in Germany, lifecycle costs for hybrid buses are still a little bit higher than for diesel buses. Extra costs are in the range of 15% to 21%. The absolute cost difference solo bus is 0.17 to 0.23 EUR/km (2.94 to 3.98 ZAR/km) and 0.25 to 0.29 EUR/km (4.34 to 5.03 ZAR/km) for an articulated bus. However, the price difference between diesel buses and hybrid buses declined compared to 2010/2012. Furthermore, the cost difference declines to 0.07 to 0.12 EUR/km (1.21 to 2.08 ZAR/km) if external costs are taken into account (NOW 2016). Pure battery electric buses are currently only deployed on a small scale and technology and prices is rapidly evolving. International experiences suggest that investment costs for the electrification of specific bus routes are high, but depend on the technology applied. According to Wüthrich and Strahm (2016), in Europe the costs for battery electric buses range between EUR 400,000 to 600,000 (ZAR 6.9 million to 10.4 million) for solo buses and are about EUR 800,000 (ZAR 13.9 million) for articulated buses. Compared to a diesel bus, purchasing costs are 15% to 40% higher for electric solo buses and about 65% higher for electric articulated buses. Inductive charging facilities cost between EUR 80,000 to 160,000 (ZAR 1.4 million to 2.8 million). No generalised figures can be provided for charging infrastructure costs as the installation costs differ by technology applied and local context.

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn

Friedrich-Ebert-Allee 36 + 40
53113 Bonn, Deutschland
T +49 228 44 60-0
F +49 228 44 60-17 66

Dag-Hammarskjöld-Weg 1-5
65760 Eschborn, Deutschland
T +49 61 96 79-0
F +49 61 96 79-11 15

E info@giz.de
I www.giz.de