PROJECT EXECUTIVE SUMMARY

REQUEST FOR COUNCIL WORK PROGRAM INCLUSION

UNDER THE GEF TRUST FUND

GEFSEC PROJECT ID: 2604
IA/EXA PROJECT ID: 3276, ATLAS ID: 00055675
COUNTRY: SOUTH AFRICA
PROJECT TITLE: SUSTAINABLE PUBLIC TRANSPORT AND SPORT, A 2010 OPPORTUNITY
GEF IA/EXA: UNDP
OTHER EXECUTING AGENCY (IES): SOUTH AFRICAN DEPARTMENT OF TRANSPORT
DURATION: 4 YEARS
GEF FOCAL AREA: CLIMATE CHANGE
GEF STRATEGIC OBJECTIVES:
CC-7 FACILITATE MARKET TRANSFORMATION FOR SUSTAINABLE MOBILITY
GEF OPERATIONAL PROGRAMME: OP-11
PIPELINE ENTRY DATE: JANUARY 2005
ESTIMATED STARTING DATE: AUGUST-2007
IA FEE: $1,007,701

FINANCING PLAN ($)		
	PPG	Project*
GEF Total	197,313	10,999,361
Co-financing	(provide details in Section b: Co-financing)	
GEF IA/ExA		
Government	178,000	323,941,952
Others		
Co-financing Total	178,000	323,941,952
Total	375,313	334,941,313
Financing for Associated Activities, If Any: US$ 69,923,000		

CONTRIBUTION TO KEY INDICATORS OF THE BUSINESS PLAN:

1. The increase in passengers using sustainable transport options and the improvements in transport system efficiency due to the project's intervention will result in direct avoided greenhouse gas emissions of approximately 423,000 tonnes of CO_2-equivalent (over the next 10 years). The indirect CO_2 emission reduction due to replication is an estimated 2 million tCO_2-equivalent over a ten-year period.
2. The annual number of person trips on sustainable transport modes promoted under the project will be increased by 20%.

Approved on behalf of the UNDP. This proposal has been prepared in accordance with GEF policies and procedures and meets the standards of the GEF Project Review Criteria for work program inclusion

Y. Glemarec

Yannick Glemarec
Deputy Executive Coordinator
UNDP/GEF
Date: 23 March, 2007

Project contact person:
Mr. Jan van den Akker
UNDP-GEF Climate Change Regional Technical Advisor a.i.
Tel.: +31 40 2019240;
Email: johannes.vandenakker@undp.org

1. PROJECT SUMMARY

a) PROJECT RATIONALE, OBJECTIVES, OUTCOMES, OUTPUTS AND ACTIVITIES

Background and project rationale

3. In South Africa the public transport system provides low levels of service, and is mainly used by lower-income groups. In the apartheid era, many subsidised rail transit and bus routes were designed to connect the urban centres with outlying black townships and homelands, while in the urban centres intra-city separate bus services were operated by local authorities and well into the 1980s both services were well-patronised. However, the rail transit and scheduled bus services (both government and privately owned) have declined rapidly since the early 1980s. The gap has been filled by the deregulated and informal services by minibus vehicles. On the other hand, the apartheid system created excellent urban road networks, especially to serve the wealthier suburbs. As incomes amongst all races rise in South Africa, private car ownership and use has increased significantly over the last decade and is anticipated to continue to rise in the future.

4. Another legacy of apartheid is a dispersed pattern of land use, with lower-income residents living far from the town centres and other employment nodes in either townships or ex-homelands. The result was long daily commuting for the black poor. In the post-apartheid 1990s, the trend of urban sprawl has continued as new low-cost housing is sited on the cheapest land, usually far from the employment centres.

5. Thus, the combination of declining public transportation and an excellent road infrastructure has created a powerful momentum for private car use by the middle and higher-income classes, while many, especially lower-income groups remain captive public transport users. The current public transportation system does not meet customer needs in terms of travel time, level of choice and quality of service. It is perceived as both unreliable and unsafe. The result is inflated travel demand, growing use of private vehicles and the use of high-carbon fuels, resulting in rapidly increasing greenhouse gas emissions from the transport sector in South Africa.

6. To change the above-mentioned trend towards a more sustainable path, the Government's strategy regarding urban public transportation focuses on a number of strategic actions:
   - Discouraging urban sprawl by concentrating mixed-zone commercial activities and settlements along development corridors complemented by improving public transport in these corridors;
   - Public transport system improvements, including infrastructure investments in dedicated bus lanes and bus rapid transit (BRT) systems as well as a better integration of rail, bus and minibus services along trunk corridors and feeder routes
   - Improved efficiency and performance of transport operators, by recapitalisation of the minibus taxi industry and reorganisation in financially viable bus operations by means of innovative public-private partnerships based on a competitive bidding for concession contracts (replacing the current ineffective cost-based subsidy system)
   - Improving transport system efficiency by road space management measures, such as separate lanes for high-occupancy (HOV) vehicles (buses and vehicles with more passengers) and giving priority in road space to alternative transport modes (walking, cycling, public transport)
   - Promoting non-motorised transportation (NMT) by building pedestrian and bicycle infrastructure and by introducing safety improvements
   - Travel demand management measures, such as providing disincentives for private car use, incentives for public transport and NMT.

Project strategy and approach

7. The Department of Transport (DoT) recognises the fundamental role of a smoothly functioning transportation system for the success of a large international event such as the 2010 FIFA World Cup. Travel demand profiles anticipate approximately 3 million local and international ticket holders.

8. The South African Department of Transport (DoT) intends to use the 2010 FIFA World Cup planning window as a catalyst for change to achieve fundamental, appropriate improvements to the South African public transport and land-use planning system. The practical demonstration of these urban transport improvement measures will be linked to substantial changes in the transport services in selected venue cities of the 2010 FIFA World Cup.

9. The "Transport 2010 Action Plan" is the articulation of the DoT's vision for the transport sector in 2010 with a particular eye to the peak in transport demand to accommodate the 2010 World Cup, focussing heavily on investments in public transport systems and infrastructure, services and non-motorized transport. To date, ZAR 3.7 billion (approx. USD 493 million)[1] have been set aside in the Public Transport Infrastructure and Systems Fund (PTIF) for public and non-motorized transport systems with a priority to the 9 venue cities supporting the 2010 World Cup. Further funding allocation to the PTIF is anticipated, but has not yet been approved.

10. The nine 2010 FIFA World Cup venues are as follows:
    - City of Cape Town Metropolitan Municipality
    - City of Johannesburg Metropolitan Municipality
    - City of Tshwane (Pretoria) Metropolitan Municipality
    - eThekwini (Durban) Metropolitan Municipality
    - Mangaung (Bloemfontein) Local Municipality
    - Mbombela (Nelspruit) Local Municipality
    - Polokwane (Pietersburg) Municipality
    - Nelson Mandela (Port Elizabeth) Metropolitan Municipality
    - Rustenburg Local Municipality

11. While the commitment of the national Government to improve urban passenger transportation is strong, a number of institutional, awareness and planning barriers put at risk the proper and timely implementation of the public transport action plans, especially at local levels of government:
    - Unclear institutional arrangements regarding transportation and land-use planning and fragmented public transport operational planning within and across municipal boundaries;
    - Limited awareness of 'international best practices' in urban transportation and little attention to sustainable transportation amongst transport planners, and insufficient capacity and manpower, particularly in the smaller municipalities, to plan, manage and implement public and other sustainable transportation options;
    - Insufficient public awareness of public and non-motorized transportation options and on the environmental implications of private vehicle use;
    - Lack of financial sustainability of the public transportation sector. Currently, the subsidy system for commuter rail and scheduled bus services is ineffective and efforts to restructure public transportation are met by opposition from minibus taxi operators.

12. If these barriers are not removed rapidly, some of the venue cities will not be able to fast-track their key transportation management projects, infrastructural investments and operational improvements to

[1] An exchange rate of 1USD = 7.5 ZAR has been used.

overlap with the 2010 spectator travel needs and instead 'quick-fix' solutions would have to be found in the form of hired private taxis, minibuses and buses, in other words the usual non-public transport options. The larger cities may be able to implement their accelerated transportation plans but they will also face some of the constraints mentioned above and this may lead to choosing for second-best public transport options rather than going for the best options available according to international experience and practice. Thus, the opportunity of showcasing the benefits of truly integrated sustainable transportation systems will be partly lost.

13. The proposed GEF supported strategy is to provide an effective, sustainable and environment-friendly urban public transport system, planned and regulated at local levels of government by addressing the above-mentioned barriers in a two-pronged way:

- Giving targeted technical assistance to specific transport system improvement projects in selected venue cities, by means of Public Private Partnerships where appropriate. While baseline funding will be made available for investment in construction and design of the 'hardware', GEF funding is needed to address certain 'software' issues such as improved and integrated design, stakeholder engagement, communications with existing minibus taxi operators, operational business cases, marketing and awareness creation and linkages with existing municipal urban transportation and land-use planning. If not addressed, these issues may result in deficiencies in the design and operational characteristics of the above-mentioned subproject and/or in delays in implementation. If well-functioning transport improvements cannot be 'showcased' at the 2010 soccer events, this important opportunity for sustainable transport promotion will be lost. Selection of venue cities for implementation of transport system improvement projects was based upon proposals submitted by the venue cities to the Department of Transport for funding from the PTIF, and based on the following criteria:
    - Contribution towards the transportation needs of the venue city beyond 2010
    - The potential for the project to promote modal shift towards low GHG emitting means of transport
    - The potential of the project to alleviate congestion and reduce GHG emission
    - The desirability of a geographic spread of projects
    - The desirability of a range of interventions applicable from large metropolitan areas through to smaller urban areas
    - The incremental improvement possible from GEF involvement
    - The capacity of the relevant authority to implement the project.

  Three categories of transport system improvements will be addressed, high-impact mode-shift projects using Public-Private Partnerships to implement Bus Rapid Transit in two venue cities, transport system efficiency improvement by implementation of a High-Occupancy Vehicle lane in one venue city and Non-Motorised Transport provision in two venue cities.

- Capacity building and institutional strengthening, in particular at the local level of government, by study and internship assistance for public sector transport professionals to upgrade their knowledge and to provide practical experience with sustainable transport projects by a series of workshops by international experts on topics related to sustainable transportation and the transport planning of mega-sporting events as well as by hosting a web-based resource base and learning tool on sustainable transport issues and options.

<u>Project goal and objective</u>

14. The goal to which the project contributes is *"To reduce greenhouse gases (GHG) from urban transportation in South African cities through the promotion of a long-term modal shift to more efficient and less polluting forms of transport"*.

15. The project objective is *"The promotion of a safe, reliable, efficient, coordinated and integrated urban passenger transport system in South Africa, managed in an accountable way to ensure that people experience improving levels of mobility and accessibility"*.

Project outcomes and outputs

16. The *outcomes* of the 'Sustainable Public Transport, a 2010 Opportunity' and the associated *outputs*, are listed below:

Outcome 1: Implementation of transport system improvements in seven 2010 venue cities

Output 1.1: Restructured public transport systems (high-impact mode-shift projects) have been supported and are implemented in two venue cities

Activities:

1.1.1 Development of the *Rea Vaya Bus Rapid Transit (BRT) system in Johannesburg* as a Public Private Partnership. The Strategic Public Transport Network (SPTN), defined in the City's Integrated Transport Plan (ITP), will be restructured as SPTN/BRT routes. The first phase of the project (2007-2010) will implement 94 kilometres of BRT. In addition, the plan includes an extensive effort to integrate with an array of other services, including feeder vehicles, metered taxis, pedestrian corridors, bicycle and private cars as well as integration with the Gautrain and Commuter Rail services. Activities include:

- Additional analysis of transportation demand in corridors and feeder services;
- Formulation and implementation of an operational plan including the analysis of operating cost and revenues, selection of routes and scheduling of feeder and trunk service operations, introduction of a combined mode ticket system and the establishment of passenger security patrols as well as signage planning;
- Formulation and implementation of business plan and PPP structure that includes a (financial) agreement with existing bus and minibus operators and, defines fare levels for feeder and trunk services, preparing the framework and performance standards for negotiated contracts between the operators and the Municipality as well as facilitating the establishment of new public transport entities;
- Training of and communications with minibus and taxi operators;
- Formulation and implementation of a marketing and public awareness plan as well as a social safeguarding plan (to overcome the negative perceptions regarding public transport);
- Support the formulation of the infrastructure plan and detailed engineering.

1.1.2 *Khulani Corridor Public Transportation System in Nelson Mandela Bay* (Port Elizabeth). Bus Rapid Transit is proposed in the Khulani corridor to support the high-density mixed land-use in the corridor. The proposed 33.4 km BRT route includes the main trunk route from the Port Elizabeth CBD to Motherwell (24 km), and spurs to Cleary Park (7 km) and Greenacres (2.4 km) Current public transport services operating in mixed traffic will be upgraded to a median BRT including the construction of walkways and pedestrian bridges, upgrading of modal interchanges and upgrading of public transport feeder roads. Project activities comprise:

- Formulation and implementation of an operation plan;
- Business plan formulation and PPP structure, and supporting the establishment of new or reorganized public transport companies;
- Detailed system design (specification of bus vehicles, preparation of tender and contract documents for the construction of the BRT system;
- Facilitation of marketing and public information (general awareness on public transportation as well as specific information, such as route maps, timetables, etc.) and a social safeguarding plan (to maximize ridership by a transport alternative that is regarded as safe)

Output 1.2 Road management and transport system efficiency improvements have been supported and are implemented in one venue city

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1.2.1 *High-occupancy vehicle (HOV) lanes on the R40 in Mbombela* (Nelspruit). The municipality proposes the widening of approximately 9 km of the main North-South Arterial (R40) by one lane on each carriageway to provide an exclusive high-occupancy vehicle (HOV) lane at the outer lane sides of the road. The project will also include signage and monitoring systems, localised rehabilitation, bus/taxi lay byes and a marketing strategy and awareness campaign. Activities include:

- Development of a law enforcement plan, and associated training and monitoring;
- Technical assistance and capacity development through secondment of a Transportation Engineer to work within the Mbombela Municipality to manage the project and assist with formulation and implementation of the ITP;
- Public transport planning routes, location of stops, optimisation of schedules as well as intensive involvement and training of public transport operators;
- A marketing and awareness creation plan involving advertising, media coverage, public meetings and focussed meetings (with minibus and bus taxi operators); Development and implementation of a social safeguarding plan;

Output 1.3: Non-motorized transport (NMT) projects have been supported and are implemented in three venue cities

1.3.1 *Polokwane Non-Motorised Transport Network*. The project aims at constructing a system of cycle paths and walkways along 55.5 kilometres within different areas of Polokwane including previously disadvantaged communities as well as the city centre. The initiative will also have parking and public facility upgrades and improved security and public safety by installing lighting, community policing and cameras. The various activities to be included are:

- Assistance with detailed planning and design to ensure that the project meets all social and environmental objectives, taking into account the location of existing public transportation routes and promotion of existing urban strategies in Polokwane;
- Signal setting and signage planning (to avoid conflicts between users of cycle paths and walkways with the motorised traffic);
- Marketing and awareness plan and campaign that includes a public participation process to cover the needs of all users (disabled, cyclists, joggers, people with strollers, etc.), marketing the benefits and correct usage of bikeways and walkways (by means of advertising, media coverage, public meetings and stakeholder meetings)

as well as social safeguarding (compliance with regulations, safety perception of users);

- Technical assistance and capacity development through secondment of a Transportation Engineer to work within the Polokwane Municipality to manage the project and assist with implementation of the ITP.

1.3.2 *Mangaung Non-Motorised Transport Corridor*. The Mangaung Municipality has proposed to construct a 3.8 km cycle path and walkway along Fort Hare/Mashisa St. between Church St. and Moshoeshoe St. This will link the low-income residential area of Mangaung with the central business district (CBD) and the industrial area as well as linking the two stadiums (the soccer stadium and the training stadium) that will be used in the 2010 World Cup. The proposed bikeway and walkway are an integral part of the Integrated Transport Plan and it ties up with another approved project, namely the Mangaung Activity Corridor. Activities required are:

- Detailed design, cost analysis and surveying, including business case and model development and community participation;
- Preparation of tender documents;
- Tender adjudication and award of construction contract;
- Technical assistance and capacity development through secondment of a Transportation Engineer to work within the Mangaung Municipality to manage the project and assist with implementation of the ITP;
- Construction of cycleway and pedestrian walkway;
- Supervision of construction and project management.

1.3.3 *Rustenberg Non-Motorised Transport Network*. The Rustenburg Municipality has proposed to develop a network of approximately 10 km of cycle paths and pedestrian walkways linking the Phokeng Shopping Mall and Main Taxi Rank with schools in the vicinity and the Phokeng Civic Centre. This network will also serve as spectator access routes between proposed transport drop-off points and the Royal Bafokeng Stadium during the 2010 World Cup. Activities required are:

- Community participation and liaison with Schools and Department of Education to define routes and standards.
- Topographical survey
- Detailed design, cost estimates and preparation of tender documentation
- Technical assistance and capacity development through secondment of a Transportation Engineer to work within the Rustenburg Municipality to manage the project and assist with formulation and implementation of the ITP.

Output 1.4: Travel Demand Management (TDM) projects have been supported and are implemented in one venue city

1.4.1 *Cape Town TDM Project.* The specific objective of TDM in the City of Cape Town is to promote a diversity of sustainable travel modes and practices that will influence the choices made by commuters in order to reduce the overall number of trips, minimise travel time and optimise travel cost, specifically during peak times. The essence of the TDM objective is to reduce the use of single occupant vehicles, increase the use of public transport and NMT and to develop land use activities that will support the use of alternative modes. The various activities to be included are:

- Promote Higher Vehicle Occupancies. This will be done through the development of a car-pooling information desk, a car-pooling website and the establishment of supporting HOV infrastructure
- Implement Park-and-Ride facilities. Several stations along the Southern and Monte Vista rail line were identified at which safe and secure park-and-ride facilities will be established in conjunction with a marketing campaign.
- Roll-out programmes for large employers to encourage alternative transport options. As part of a pilot project, at least three large employers will be identified who will be prepared to take part in a programme to encourage employees to use more efficient modes of transport.

Outcome 2: ***Strengthened capacity and increased knowledge to plan, manage and implement sustainable transportation options***

Output 2.1: **Technical capacity in sustainable transportation has been strengthened**

2.1.1 The main focus will be to design, facilitate and undertake a technical training programme on sustainable transport options and 'best practices' in cooperation with selected South African universities aiming at public sector officials who are currently working in areas related to transport and urban planning. The programme will consist of training modules that cover the sustainable transport options mentioned in Box 1 of the Project Document. In addition, young consultants will be hired within the Client or Consulting teams working on the subprojects of outcome 1 to give them practical experience. Some 60 practitioners are expected to be supported with such training.

Output 2.2: **Increased information and knowledge about sustainable transportation options and improved dialogue amongst local and national decision-makers and transport and urban planners**

2.2.1 A large number of stakeholders (as listed in the part on 'stakeholder involvement') are crucial in decisions on sustainable transportation. For these stakeholders an awareness raising and basic capacity building programme will be designed and implemented. International renowned transport planning experts will be invited to expose 'best practices' and experiences in other cities in the world. In addition, the international expert(s) will visit at least the four small venue cities (see Outcome 1) for one-on-one discussions and advice to project managers and transport planners in these cities (to economize, the international experts may also provide input into the technical training programme mentioned under Output 2.1). The programme will provide a forum for multi-stakeholder dialogue were South African decision-makers, planners and other stakeholders can interact and exchange experiences on ongoing sustainable transportation activities in South Africa. Third, the activity will serve as information dissemination tool regarding experiences and progress in the subprojects of the venue cities as presented in this proposal.

2.2.2 A number of websites, books, magazines, reports regarding sustainable transportation will be reviewed by a Consultant. Supplemented with interviews with experienced practitioners, a web-based structure is developed containing knowledge from the above-mentioned sources, structured in a logical way in categories, folders, etc. Feedback is given by academics and planners in other cities on the usefulness and relevance of

information and knowledge stored. The Consultant will then develop the structure into an applied learning tool, distinguishing between levels of complexity and target groups (basic, intermediary, advanced) and to document successful methodologies and experiences regarding the implementation of sustainable transport projects in South Africa and elsewhere. A promotional campaign will be developed to advertise the body of knowledge to practitioners in national and local government, academia, consultants and other organizations.

Outcome 3: Monitoring, learning, adaptive feedback and evaluation

Output 3.1: Monitoring and evaluation tools formulated and implemented

3.1.1 Fine-tuning of the logical framework and project impacts with indicators and verifiers to gather project-relevant information, including baseline and end-of-project studies, mid-term and final evaluation studies. Refinement of project information and documentation on experiences and lessons learnt of the project[2]. Development of case studies on sustainable transport in South Africa and dissemination to stakeholders at national and local level (see also section 3.E 'Monitoring and evaluation').

B) KEY INDICATORS, ASSUMPTIONS AND RISKS

17. Key indicators of success for the project include those listed below:

Environmental:

- Reduction in direct GHG emissions associated with modal shifts and higher transport system efficiency at an estimated 423,000 tCO_2 over a ten-year lifespan
- Air quality improvement as measured by levels of PM, SOx, NOx, and CO in the corridors in which improvements have been made
- Reductions in ambient noise levels in the corridors

Transportation:

- Compliance with the construction schedule (by 2010) of 94 km of BRT in Johannesburg, of the Khulani Corridor BRT in Nelson Mandela Bay, 9 km of HOV lanes in Mbombela, and of cycle paths and walkways in Polokwane (55.5 km), Mangaung (3.8 km) and Rustenburg (10 km)
- Private Public Partnerships developed and working contracts in place for the operation of the system in Johannesburg and Port Elisabeth.
- Mode shift: Percentage of vehicle trips per vehicle type (identifying BRT vehicles, High Occupancy Vehicles and NMT)
- Modal efficiency: Vehicle occupancy per vehicle type in the corridor and average occupancy in the corridor.
- Mobility: Average peak period commuter travel time (including access and waiting time) in the corridor, measured separately for mixed traffic flow and BRT / HOV lanes.
- Safety: Number of road traffic collisions in the corridors, classified as fatal, serious injury, minor injury or damage only.

[2] Part of this activity was initiated under the PDF B, resulting in the current revised project document

Socio-economic and financial:

- Profitability of public transport operations: Financial performance of the public transport operations and services offered
- Financial sustainability: Public Transport subsidy payments to operators for services in the corridor
- Social equity: Number of low-income households within 500m of the improved transport system and fare per km of the transport system

Capacity building, awareness creation and knowledge dissemination:

- Integrated transport plans (ITPs) are in place in all venue cities
- Key professionals from national and local governments, private sector, academia and NGOs have acquired increased knowledge and information on planning, design and implementation of sustainable transportation systems and transport planning for mega-sporting events through courses and workshops.
- Strengthened institutional and manpower capacity of smaller venue municipalities to plan and manage sustainable transportation initiatives
- Increased awareness and acceptance by travellers of public transport and NMT options.
- Functioning web-based knowledge resource and learning tool
- Progress of project activities is monitored, lessons learned are documented and disseminated

18. Important project assumptions are:

- The first phases of the BRT system, HOV lanes and NMT systems can be constructed as planned before the 2010 World Cup events (so that they at least connect with the stadiums in the venue cities)
- Co-financing from PTIF and other sources can be secured (in time) for the design and construction of the above-mentioned transport system improvements
- Legal feasibility of the proposed systems; regulations for construction and tendering are in place; the required environmental impact assessments and approval by the relevant authorities can be achieved in time
- Public acceptance of the proposed BRT and NMT systems and the TDM measures proposed for Cape Town
- Negotiations with existing transport operators can be concluded successfully during the project; confirmed commitment by all stakeholders can be arranged
- Good law enforcement regarding the use of HOV lanes by buses and vehicles that carry more than 2-3 passengers only

19. During the project design stage, project risks have been closely analysed and mitigation strategies have been incorporated. While the project is purposefully designed to minimize these risks, some issues are not entirely within the project's control but may affect project implementation. These risks are listed below.

Market and financial:

- Private sector (in particular the minibus taxi sector) may not be interested in participating in sustainable transport improvement projects if not financially sustainable (most BRT systems are targeted to be operated on a no-subsidy basis) or if not guaranteed participation in the new transport systems
- Public acceptability of new systems if the tariffs are deemed too high

- Finance for the construction of the transport improvement projects cannot be achieved in time to be able to finalize the construction before the 2010 event; thus conventional 'quick-fix' solutions (e.g. hiring more minibus taxis to transport spectators to and from the events) are cheaper, but less optimal sustainable transport options are chosen

Policy and social

- Lack of political leadership and political will to implement significant changes to the urban transportation system is one of the major risks facing the high-impact mode shift projects. Some local government may be less politically committed to sustainable transport options and not provide sufficient support and motivation for implementation.
- Institutional inertia where the process of obtaining positive record of decision of relevant authorities regarding project approval, project implementation and environmental impacts and other legal requirements takes too long
- Opposition from key stakeholders (particularly existing minibus taxi and bus associations) may result in unrest if no agreements can be reached regarding surrender of operating permits on routes identified for implementation of improved systems or if they are not incorporated into the new operating entity that will provide services in the project corridor.
- Public acceptance may be poor of projects that reallocate road space from private vehicle use to public transport. This may result in lack of compliance regarding use of facilities such as HOV lanes.
- Ridership of new transport systems such as BRT may be low due to inadequate public awareness and lack of information regarding the operation and benefits of the new system.
- National government looses interest in sustainable transportation options once the 2010 World Cup has been held.

Institutional

- As identified during the analysis all venue cities suffer a severe shortage of technical capacity for transportation planning and project implementation. This has potential to add significant delays to the implementation process
- Public sector procurement processes are lengthy and in some cases may result in a procurement period of up to a year for appointment of Consulting and Construction services.
- The timeframe for planning, design and implementation of the sustainable transport interventions envisaged under this project is very tight if the systems are to be fully operational by mid-2010. Government funding from the third allocation of the PTIF will be available from April 2007. GEF funding may only be available from third quarter 2007.

The above risks have been rated according to perceived severity, and mitigating strategies have been developed as shown in the table below. Overall the Project Risk Rating can be categorised as Medium, although substantial institutional risks are present, particularly the risk of delay to availability of funding.

Risk	Severity	Mitigation strategies
Market and financial		
Financial sustainability for private sector	M	Baseline: Infrastructure financed by public sector grant. Private sector responsible for operating costs. Alternative: Feasibility assessments of selected routes Risk sharing through Public Private Partnerships
Public acceptance of tariffs	L	Baseline: Unchanged rate/km where possible Alternative: User preference surveys
Timely availability of construction finance	M	Baseline: DoT funding via PTIF Alternative: Additional loan sources (AFD, DBSA) Mobilisation of private sector funding
Policy and Social		
Lack of political will / leadership	S	Baseline: Varied degree of support between cities Alternative: Higher profile through international funding Active engagement through project
Institutional inertia	M	Baseline: Limited or no mitigation Alternative: Regular monitoring and reporting Technical assistance and capacity building
Opposition from existing operators	S	Baseline: Active engagement in Nelson Mandela Bay and Johannesburg Alternative: Structured plan of engagement Assistance with development of operating entities Development of business model
Public opposition to reallocation of road-space	M	Baseline: Limited or no mitigation Alternative: Project specific public awareness
Low usage of new systems	M	Baseline: Limited public awareness Alternative: Higher level of project specific awareness creation and marketing programmes
Reduced interest after 2010	L	Baseline: Ongoing focus and funding from DoT Alternative: Demonstrated success of project interventions
Institutional		
Lack of technical capacity to implement projects	S	Baseline: Limited assistance from DoT Alternative: Capacity enhancement and technical assistance
Lengthy procurement process	S	Baseline: No mitigation Alternative: Limited procurement through UNDP
Funds may become available too late to perform desired level of planning	S	Baseline: No mitigation Alternative: Advance from GEF prior to formal approval

Risk Rating: L - Low; M – Medium; S – Substantial

2. COUNTRY OWNERSHIP

A. COUNTRY ELIGIBILITY

20. South Africa is eligible for GEF financing and ratified the UN Framework Convention on Climate Change (UNFCCC) in 1997.

B. COUNTRY DRIVENNESS

21. South Africa is a signatory to the United Nations Framework Convention on Climate Change (UNFCCC) and ratified it in 1997. It is expected that one of the outcomes of this project will be transport-linked mitigation options that can be situated within the existing national level development plan and priorities.

22. The South African government priority for concepts of sustainable transport (defined public transport and non-motorised transport) is most clearly stated in a series of policy documents including "Moving South Africa", the "White Paper on Energy", the "National Land Transport Transition Act" (NLTTA), the "National Land Transport Strategic Framework", the "Transport Action Plan for 2010" and the draft "Strategy to Accelerate Public Transport Implementation via a Win-Win-Win partnership between Government, Existing Operators and Labour". A short description of these documents is given in the accompanying Project Document. The project concept also links into a growing array of transportation planning requirements, including the establishment and updating of a local and provincial Integrated Transport Plan (ITP), one aspect of municipal Integrated Development Plans (IDPs), also required by law.

3. PROGRAMME AND POLICY CONFORMITY

A. FIT TO GEF FOCAL AREA STRATEGIC OBJECTIVES AND OPERATIONAL PROGRAMME

23. The activities proposed under 'Sustainable Public Transport, a 2010 Opportunity" will remove important barriers to the adoption of sustainable transportation options. Thus, the project is fully consistent with the GEF Operational Programme 11, "Sustainable Transport".

24. The project will contribute to the following GEF Strategic Objective, "Facilitate Market Transformation for Sustainable Mobility", emphasising public transportation (buses and taxi buses), non-motorised transport (such as bicycles and pedestrian lanes), travel demand management and policy measures (public transport planning, operation and investment).

25. The total CO_2 reduction directly attributable to the proposed GEF initiative is 423,000 tonnes of CO_2 equivalent over ten years. The indirect CO_2 emission reduction due to replication is an estimated 2 million tCO_2 -equivalent over a ten-year period.

B. SUSTAINABILITY (INCLUDING FINANCIAL SUSTAINABILITY)

26. Institutional sustainability – The project will support the improvement of existing public transport services and the management thereof. Local government officials responsible for transport and

environmental management will use the project as a strong platform for engagement, monitoring and evaluation, thereby building their capacity and knowledge in a very practical 'learning-by-doing' way. Improved transport system efficiency will allow transport operators to operate more profitably, thereby increasing their ability to serve marginal and low-income markets, improving mobility for all and enabling social transformation. In this context the project will complement South Africa's plans to formalise and recapitalise the minibus taxi sector and contribute to a more sustainable financial footing for the existing public city bus services.

27. Provision of 'Technical Assistance and Capacity Development' within the four small venue cities will end on completion of the project. Institutional sustainability of the intervention will be facilitated through an undertaking from the recipient city to fill transport planning positions. Through the study and internship initiative, through the workshops and information sharing platforms, the project will have also increased the country's expertise and capacity on sustainable public transport and its implementation. Increased awareness resulting from the supported projects will hopefully generate a paradigm shift in people's perception of public transport, with analogous projects being repeated throughout the country proving a legacy after 2010.

28. The proposed 'Transportation System Improvements' are not proposed in isolation in terms of the 2010 events, but arise from the existing long-term Integrated Transportation Plans (ITPs) of the venue cities. The GEF project will fast-track elements of ITPs, enhance it with a strong and very high profile example, and allow the cities to spend scarce financial and human resources on public transport infrastructure enhancements that will serve the public transport needs of the venue cities both before and after the 2010 World Cup.

29. Financial Sustainability - The financial sustainability is closely linked to the public and private institutions and companies who are operating the public transport system. The project will contribute significantly to the financial sustainability of public transport services in the venue cities through implementation of Public Private Partnerships providing high quality public transport systems capable of running without an operating subsidy. In principle, the public and private companies that will operate the bus systems will do so in a financially sustainable way. The public transport will operate on improved and potentially dedicated busways, and with considerable enhanced infrastructure in terms of stations, stops, and inter-modal interchanges and commuter information.

30. The financial sustainability of the projects beyond 2010 will depend largely on the new tariff structure in the proposed BRT systems and ridership in bus transit systems. Particularly for the current, mostly lower-income groups, the updated public transport infrastructure will deliver a significant impact in terms of improved mobility. Will the client be prepared to pay higher tariffs? The BRT tariffs may actually be higher than fares in the existing minibus services. However, many customers are now forced to take several minibuses and thus pay multiple fares. The basic concept of the new public transport system is that the tariff paid for the unified network will be lower than the multiple fares the customer has to pay now.

31. In the end, the sustainability of the projects lies in increased ridership.The improved performance of the public transport system will attract additional users, which will help to make the system more profitable. The middle and higher-income group that can afford cars can be divided in the so-called 'stubborn' and 'selective' customers. The first group will only use cars, opting out of public transportation, no matter what the service is. However, demonstration of high-quality public transport may persuade the 'selective' customers to use public transport, if it meets their requirements of performance, speed and convenience.

C. REPLICABILITY

32. The project's key asset in terms of replicability is its relatively straightforward setup in which public transport infrastructure, non-motorised transport (NMT) and Travel Demand Management (TDM) measures offer long-term climate change mitigation opportunities. Over one million people will experience the proposed transport system changes during the 2010 World Cup. The experience itself will "train" spectators to plan on using public transport or NMT, and in many instances will provide the first opportunity for many South Africans to experience public transport. Once experienced, accepting the imposition of exclusive public transport access becomes familiar. Thus, the project goes beyond the 2010 experience to support more extensive sustainable transport infrastructure as well as road management and travel demand management measures in South African cities. Communications and public awareness budget are an integral part of the project, "selling" the need for sustainable transportation and explaining its advantages for the commuter and documenting its use. The Department of Transport (DoT) expects these two features of profile and communications to be the catalyst of a ripple effect in South Africa and Southern Africa.

33. The project offers a demonstrable example of how sustainable transport can be implemented, and a tangible opportunity to quantify the benefits of such an investment in terms of lower global and local emissions and their externality costs, reduced time delays, accident incidents and avoidance costs, improved security, empowerment, and many other benefits. This articulation of benefits as part of the project implementation will be of enormous value to policy makers as they can craft additional tools and measures to manage the urban environment and provide sustainable transport services and infrastructure. South Africa is also a leader on the continent. Given the high visibility of the World Cup across Africa, the demonstration of a well-functioning public transportation system and other sustainable transportation measures are likely to provide a best-practice model, thereby influencing a climate change benefit of lasting impact well beyond the reach of a once-off project.

34. The project is envisaged to provide examples for implementation of public-private partnership structures and business models for implementation and operation of public transport systems, which may be replicated in other South African urban areas, depending on their population, layout and infrastructure and financing availability conditions. The replicability of each category of project supported interventions in other South African cities is shown in the table below.

Metropolitan areas	Pop (mill)	Intervention of this type can be replicated in this city?		
		BRT	HOV	NMT
Johannesburg	3.295	Yes, Project	Yes	Yes
eThekwini	3.162	Yes	Yes	Yes
Cape Town	2.969	Yes	Yes	Yes
Ekurhuleni	2.528	Yes	Yes	Yes
Tshwane	2.040	Yes	Yes	Yes
Nelson Mandela Bay	1.100	Yes,Project	Yes	Yes
Buffalo City	0.765	No	Yes	Yes
Mangaung	0.705	No	Yes	Yes, Project
Msunduzi	0.565	No	Yes	Yes

35. After 2010, the project's unique feature (the government's commitment to improve transport services in time for a high-profile event) may disappear. However, having demonstrated that sustainable

transport options can be cost-effective and attractive will motivate national, provincial and municipal authorities to make commitments in sustainable transport options.

36. The project will include a component on dissemination of experiences and lessons learned to interested parties in other parts of the continent. Lessons will be extracted from that body of experience and through an aggressive communication and outreach plan. Relevant and cost effective climate and pollution mitigation measures will be demonstrated, and the cost-effective nature of the interventions and will be highlighted to encourage implementation of similar initiatives in other areas. It is hoped that within South Africa, cities and venue owners will quickly learn about the replicable elements and start including these elements in their own plans. To facilitate such learning, the project during its final stage will invite transport authorities and owners of venues to visit the transportation system improvements in the selected host cities.

37. In order to capture the experiences and impacts of the project, key performance indicators with respect to its objectives and outputs will be specified and a comprehensive monitoring and evaluation system will accompany the intervention. These indicators will facilitate monitoring of the progress of national and local authorities in implementing sustainable urban passenger transportation and will help to identify what works, what does not and why.

D. STAKEHOLDER INVOLVEMENT

38. The project will promote effective partnership arrangements for the implementation of sustainable transportation options in South Africa with the relevant stakeholders. Relevant stakeholders include:
    - South African National Departments (Transport, Environmental Affairs and Tourism, Foreign Affairs, Sports and Recreation South Africa, Provincial And Local Government, Minerals and Energy, Public Works, Housing, National Treasury, Science and Technology, National Intelligence Agency and the Police Service)
    - Provincial government transport in all nine South African provinces
    - Municipal transport authorities, in particular of the nine venue cities
    - The Office of the Presidency (coordinating the FIFA 2010 World Cup Planning and Investment)
    - Local Organising Committee for the 2010 World Cup
    - South African Football Association (SAFA)
    - Stadium owners and public transport service providers
    - Transport infrastructure finance organisations
    - Residents of all major metropolitan areas of South Africa (with particular benefit to public transport and non-motorised transport users) and consumer organizations
    - Non-governmental organisations (NGOs) and civil society organisations (CSOs), including minibus taxi associations, unions (such as SATAWU, FEDUSA, SAMWU, COSATU and TGWU), Green Goal 2010 Committee and South African Cities Network and universities
    - Private sector for financing and system operations through PPP.

39. Extensive stakeholder involvement is absolutely essential to ensure cooperation of relevant national and local government authorities, acceptance by existing operators of the public transport restructuring associated with the BRT systems and acceptance by the public at large of public and non-motorised transportation. As such, each outcome of this proposal includes specific activities targeted at stakeholder participation:
    - Formation of a Project Steering Committee with representatives from relevant government departments (DoT, DME, National Treasury and DEaT),

- The 16 workshops planned will offer the opportunity for networking of local stakeholder groups, bus operators and national and local government officials
- Post-graduate courses and mentoring for professionals in transport engineering, planning and integration with urban planning offer opportunity for strengthening the links with academia and national universities
- Civil society will be involved through community stakeholder meetings and mass media outreach campaigns associated with each of the proposed transport system improvement subprojects to strengthen public awareness
- Involvement of consultants/negotiators whose primary function will be to ensure the participation of current bus and mini bus operators in the new BRT systems
- Professional involvement of all relevant stakeholders in the formulation and implementation of PPP in the Johannesburg and Port Elisabeth.
- Development of a website to disseminate information and results in an open and transparent manner

E. MONITORING AND EVALUATION

40. The project will be monitored and evaluated according to standard UNDP rules for nationally executed projects. The Project Management Unit (PMU), under direct responsibility of the Project Manager, will elaborate and provide key monitoring and evaluation (M&E) documentation. The PMU will be responsible for continuous updating and reporting of financial and progress information, subject to approval, potential adjustments and subsequent implementation in the regular meetings held by the Project Steering Committee. In these meetings, any bottlenecks occurring in the implementation will be addressed and resolved. Another activity will be to specify appropriate performance benchmarks to enable effective M&E of project progress and to create a sound basis for informed management decisions.

41. The project indicators, as provided in the Project Logical Framework (see Annex B), are the benchmark against which Monitoring and Evaluation will take place. The detailed monitoring and evaluation process is described in Section A, Part 4, of the UNDP Project Document. Around 2.5% of GEF resources will be dedicated to internal and external monitoring and evaluation, in addition to the local efforts made on monitoring.

42. Values for each indicator will be collected each year in the Annual Work Plan and also as input for progress measurement of the Annual Project Review (APR). In addition, the performance of the individual transport system improvement projects in the selected venue cities (Johannesburg, Nelson Mandela Bay, Mbombela, Polokwane, Mangaung and Rustenburg) will be constantly monitored so that the contribution of the project can be evaluated in its appropriate context. Adaptive management that responds to changing circumstances in the context of the project will be encouraged, subject to approval by UNDP.

4. FINANCING

a) PROJECT COSTS

Project Components/Outcomes	Co-financing ($)	GEF ($)	Total ($)
1. Implementation of transport system improvements in seven 2010 venue cities	323,532,252	9,147,381	332,679,633
2. Strengthened capacity and increased knowledge to plan, manage and implement sustainable transportation options	126,500	875,980	1,002,480
3. Monitoring, learning, feedback, evaluation	-	275,000	275,000
Project management budget/cost*	283,200	701,000	984,200
Total project costs	**323,941,952**	**10,999,361**	**334,941,313**

* This item is an aggregate cost of project management; breakdown of this aggregate amount is presented in the table b) below.

b) PROJECT MANAGEMENT BUDGET/COST[3]

Component	Estimated Staff weeks	GEF ($)	Other Sources ($)	Project Total ($)
Locally recruited personnel*	576	624,000	240,000	864,000
Internationally recruited consultants*				
Office facilities, equipment, vehicles and communications		11,000	43,200	54,200
Travel		41,000		41,000
Miscellaneous		25,000		25,000
Total project management cost		**701,000**	**283,200**	**984,200**

Local and international consultants in this table are those who are hired for functions related to the management of project. Note that 'travel' is for travel of PMU staff within South Africa only. For those consultants who are hired to do a special task, they are referred to as consultants providing technical assistance and for them details of their services are given in table c) below:

C) CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

Component	Estimated Staff weeks	GEF($)	Other Sources ($)	Project Total ($)
Local consultants	2,550	7,349,105	191,200	7,540,305
International consultants	445	1,837,276		1,837,276
Total	**2,995**	**9,186,361**	**191,200**	**9,377,581**

More explanation on the cost of personnel and consultants (which does not include travel cost) is given in the Project Document

D) CO-FINANCING

43. The total budget is US$ 334,941,313 with US$ 10,999,361 from GEF. A total of US$ 323,941,952 will be available as co-financing contributions. To date confirmed co-financing from the first and second allocations from the PTIF for projects included in the scope of the proposed GEF intervention

[3] A description of consultants hired to manage the project in terms of their staff weeks, roles and functions in the project, and their position titles in the organization, such as project officer, supervisor, assistants or secretaries is provided in Section D of the Project Document

amounts to US$ 95.677 million. An additional amount of US$ 69.923 million has been allocated to other sustainable transport projects (to be implemented independently of the GEF project) in the nine venue cities as parallel financing. Total allocations by the DoT from the PTIF for sustainable projects in the 2010 World Cup venue cities amount to US$ 165.6 Million. Additional applications for funding to the venue cities are currently under evaluation and additional allocations will be made under Round 3 of the PTIF, however these allocations were not finalized at the time of report preparation. Specific co-financing requirements for the various activities, together with the status of such co-financing, are shown in the table:

	Classification	Type	Amount (US$)	Status
DoT - Public Transport Infrastructure Fund (PTIF) rounds 1 & 2, projects supported under the GEF intervention	Government	Cash	95,677,000	Co-financing
DoT - Public Transport Infrastructure Fund (PTIF) rounds 1 & 2, other projects in venue cities	Government	Cash	69,923,000	Parallel financing
Sub-total Committed DoT funding			**165,600,000**	Letter available
DoT - PTIF Round 3 and other	Government	Cash	222,363,000	Pending
Mbombela municipality / Province	Government	Cash	933,000	Pending
Mangaung municipality	Government	Cash	128,000	Pending
Johannesburg municipality	Government	Cash	3,536,000	Pending
Nelson Mandela Bay municipality	Government	Cash	134,000	Pending
City of Cape TownMunicipality	Government	Cash	570,000	Pending
Municipalities	Government	Cash	83,000	Pending
Department of Transport (DoT)	Government	In-kind	327,000	Pending
Rustenburg municipality	Government	In-kind	48,000	Pending
Mbombela municipality	Government	In-kind	48,000	Pending
Mangaung municipality	Government	In-kind	48,000	Pending
Polokwane municipality	Government	In-kind	48,000	Pending
TOTAL (US$)			**323,941,952** **69,923,000**	Co-financing Parallel financing

NB: DoT PTIF allocations to projects not included in the proposed GEF intervention (US$69.923 million) are excluded from the total co-financing shown in the table above of US$323,941,952

The GEF contribution of US$ 10,999,361 for the project represents a leverage of approximately 1 to 30. The fact that the Government of South Africa has pledged significant resources towards the incremental cost of the project demonstrates full ownership of the project and commitment to support sustainable transportation in South Africa.

5. INSTITUTIONAL COORDINATION AND SUPPORT

A. CORE COMMITMENTS AND LINKAGES

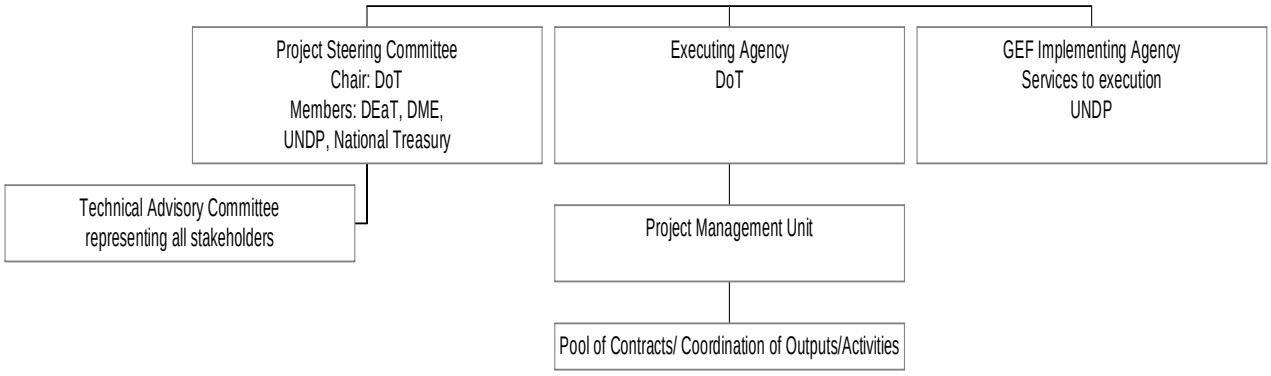
44. The UNDP is the GEF Implementing Agency for this project. The Country Cooperation Framework (CCF), within which UNDP plans and implements its development cooperation intervention, has currently been defined for 2007-2010. It includes 'environment and development' and 'local governance' as focal areas of attention. With respect to these areas, UNDP South Africa's objective is "to promote innovative legislation and action to protect the environment while contributing to the

eradication of poverty in partnership with all levels of government, civil society and the private sector" and "poverty reduction by local governance".

B. CONSULTATION, COORDINATION AND COLLABORATION BETWEEN IAS, AND IAS AND EXAS, IF APPROPRIATE

45. The project will actively engage in networking activities with other GEF-funded sustainable project activities by sharing information and knowledge with these projects and by inviting, where possible, representatives from the projects at the series of workshops that will be organised.

C. PROJECT IMPLEMENTATION ARRANGEMENT



46. This proposed full-size project would be executed by the Department of Transport (DoT), following UNDP guidelines for nationally executed projects. The Executing agency will sign the grant agreement with UNDP and will be accountable to UNDP for the disbursement of funds and the achievement of the project goals, according to the approved work plan. In particular, the Executing Agency will be responsible for the following functions: (i) coordinating activities to ensure the delivery of agreed outcomes; (ii) certifying expenditures in line with approved budgets and work-plans; (iii) facilitating, monitoring and reporting on the procurement of inputs and delivery of outputs; (iv) coordinating interventions financed by GEF/ UNDP with other parallel interventions; (v) approval of Terms of Reference for consultants and tender documents for sub-contracted inputs; and (vi) reporting to UNDP on project delivery and impact.

47. The United Nations Development Programme (UNDP) will be the implementing agency (IA) for this GEF project. The project structure will consist of a Project Management Unit (PMU) within the DoT and a Project Steering Committee (PSC), optionally with a separate technical advisory committee feeding into the PSC.

48. In addition, UNDP will provide support services in the area of recruitment, procurement, financial and technical services. An MOU between the parties will be agreed and signed by both entities, DoT and UNDP.

49. The Project management unit (PMU) will be located at DoT. The PMU will provide secretariat, coordination and overall management functions and tasks related to the different outputs and to provide support to the 2010 Transport Task Team of the DoT. The PMU project manager will report to the Deputy Director General of the DoT (department of integrated transport planning) and present

progress reports to the Project Steering Committee (PSC). The PMU will consist of a Project Manager, Project Assistant and one DoT counterpart staff.

50. Furthermore the project manager will convene regular meetings between DoT and UNDP, in order to monitor project progress and identify and resolve any bottlenecks and improve the quality of interventions. In these meetings, DoT and UNDP review and authorize the financial and progress reports, as well as update work plans prepared by the project manager. In order to create transfer of capacity, the DoT will assign some of its appropriately skilled personnel to the project management unit.

51. Project operational co-ordination and oversight will be provided by the Project Steering Committee (PSC), composed of DME, DEAT, UNDP, National Treasury and other stakeholders such as the South African Cities Network and 2010 Green Goal. The PSC will meet quarterly with the objective of monitoring project progress, coordinating institutional roles, and securing any information required for the project. The PSC is chaired by the project manager. During the first meeting of the PSC, the creation of a formal reporting/feedback arrangement will be proposed for the explicit provision of opportunities for a range of industry stakeholders to be involved in the project throughout the various stages of its implementation. This arrangement will have to guarantee full transparency at the national level. The PSC will potentially establish an advisory board (technical advisory committee) that could function as a platform to present and share ideas as well as to solicit specific inputs from its members that are envisaged to come from different sections within the stakeholder community.

52. As the GEF implementing agency for this project, UNDP will monitor all activities and outputs. UNDP will ensure that the activities are being conducted in co-ordination with the government and other stakeholders. UNDP will be ultimately accountable to GEF for project delivery and responsible for supervising project implementation. UNDP will provide technical backstopping services and monitor adherence to the work plan. The project will comply with UNDP's monitoring, evaluation and reporting requirements, as spelled out in the UNDP User Guide. Quarterly progress reports will be submitted to UNDP by the executing agency, providing a brief summary of the status of activities and output delivery, explaining variances from the work plan, and presenting work-plans for each successive quarter for review and endorsement. The Quarterly progress reports will provide a basis for managing disbursements. An Annual Project Report (APR) will be prepared at the end of each year, summarizing and evaluating work in progress in more detail, and will be reviewed by the Project Steering Committee, which shall make recommendations to the executing agency and UNDP regarding the subsequent scheduling of project activities. A Terminal Report will be prepared upon project completion and reviewed at the final PSC meeting for the project. The part on Monitoring and Evaluation in Section IV of the Project Document outlines the reporting requirements further.

53. The Government will provide the Resident Representative with certified periodic financial statements, and with an annual audit of the financial statements relating to the status of UNDP (including GEF) funds according to the established procedures set out in the User Guide and Finance Manual. The Audit will be conducted by the legally recognized auditor of the Government, or by a commercial auditor engaged by the Government.

54. In order to accord proper acknowledgement to GEF for providing funding, a GEF logo should appear on all relevant GEF project publications, including among others, project hardware and vehicles purchased with GEF funds. Any citation on publications regarding projects funded by GEF should also accord proper acknowledgment to GEF. The UNDP logo should be more prominent - and separated a bit from the GEF logo if possible, as UN visibility is important for security purposes.

ANNEX A INCREMENTAL COST ANALYSIS

1. PROJECT BACKGROUND

55. The legacy of apartheid in South Africa has resulted in a dispersed pattern of land use, with lower-income residents living far from the town centres and other employment nodes in either townships or ex-homelands. On the other hand, it created excellent urban road networks, especially to serve the wealthier suburbs. The combination of these two factors has created a powerful momentum for increasing car use by middle and higher-income groups. As incomes amongst all races rise in South Africa, private car use is anticipated to likewise rise over the next decades, while many, especially lower-income groups, will still lack basic access to an affordable and safe (public) transport system.

56. The proposed project will address the policy, institutional, financial, information and, implementation barriers to provide an effective, sustainable and environment-friendly urban public transport system, planned and regulated at local levels of government. Thus, the practical demonstration of urban transport improvement measures will be showcased in the selected venue cities of the World Cup.

2. INCREMENTAL COST ASSESSMENT

Baseline

57. The South African Department of Transport (DoT) intends to use the 2010 FIFA World Cup planning window as a catalyst for change to achieve fundamental, appropriate improvements to the South African public transport system. While the commitment of the national Government to improve urban passenger transportation is strong, a number of institutional, awareness and planning barriers inhibit the proper and timely implementation of the public transport action plans, especially at the local levels of government. If these barriers are not removed rapidly, some of the venue cities will not be able to fast-track their key transportation management projects, infrastructural investments and operational improvements to overlap with the 2010 spectator travel needs and instead 'quick-fix' solutions would have to be found in the form of hired private taxis, minibuses and buses, in other words the usual non-public transport options. The larger cities may be able to implement their accelerated transportation plans but they will also face some of the constraints mentioned above and this may lead to choosing for second-best public transport options rather than going for the best options available according to international experience and practice. Thus, the opportunity of showcasing the benefits of truly integrated sustainable transportation systems will be lost.

58. The specific baseline conditions, and expected incremental improvement as a result of the GEF intervention, vary from city to city and between the various types of intervention. The rationale for GEF intervention for each activity is specified in the bullets below:

- Activity 1.1.1: Rea Vaya BRT in Johannesburg. The current public transport system in Johannesburg can be described as a poor quality, low occupancy public transport system that serves only captive users. The current poor public transport system can not however be taken as the baseline scenario as significant actions are under way (independent of the GEF intervention) to address the situation. Johannesburg has a well defined Integrated Transport Plan (ITP) in place, one component of which is a Strategic Public Transport Network on major arterials. Implementation of the SPTN has commenced with kerb-side bus lanes and queue jumpers at intersections (both demarcated from general traffic by painted markings and signs). The City has

very recently considered upgrading the highest demand portions of the SPTN to BRT, and in November 2006 received Mayoral Committee approval to commence planning for the system. The system is required to be operational prior to the 2010 World Cup, which is a very tight implementation schedule for a 94 km network of BRT routes. The baseline scenario is that the BRT system is likely to be implemented, but in order for it to be operational before the 2010 World Cup, quick-fix solutions may be made which result in built-in inefficiencies in the system.

- Activity 1.1.2: Khulani Corridor BRT in Nelson Mandela Bay. As is the case with Johannesburg the current transport system in the Khulani Corridor is likely to be significantly improved under the baseline scenario. Conceptual planning for upgrading public transport systems in the corridor has been performed by the Nelson Mandela Bay Metropolitan Municipality. Initial works related to upgrading of public transport facilities are in progress, including rehabilitation and widening of Public Transport Routes, construction of walkways, pedestrian bridges and modal interchanges. Whilst works related to upgrading the road network are in progress detailed planning and implementation of the BRT system is dependent upon the third allocation from the PTIF, which is currently awaited. The Baseline scenario is therefore implementation of a Trunk Bus service in the Khulani Corridor, possibly utilising exclusive kerb-side lanes (due to limited funding).
- Activity 1.2.1: R40 High Occupancy Vehicle lane in Mbombela. Conceptual planning has been done by the Mbombella Municpality, however, some essential planning aspects have not been considered so far, such as linking the HOV lanes with the public transport and urban planning, stakeholder involvement and organising awareness campaigns, which will complement and affect the detailed planning and design of the HOV lanes. The baseline scenario carries a significant risk that the HOV lanes will be implemented but, without adequate public awareness and enforcement, the road space reverts back to use by all traffic. The baseline scenario may therefore be similar to the current situation of inefficient allocation of road space that gives priority to low-occupancy private vehicles.
- Activity 1.3.1: Non-motorised transport network in Polokwane. A conceptual network has been prepared by the Polokwane Local Municipality. The planning however show little linkage with the desired spatial development plan for the city and does not directly serve major corridors of movement. The institutional barrier and gap analysis identified a critical shortage of transportation planners and engineers in Polokwane. The combination of these factors creates a substantial risk under the baseline scenario that the NMT network will be implemented in a haphazard manner, with portions of the network not meeting demand patterns and hence being underutilised. The baseline scenario also carries a risk that the lack of technical capacity to plan and implement projects may result in abandonment of the NMT project. Without GEF intervention the Polokwane NMT network project is therefore unlikely to result in a significant shift in mode choice towards low GHG emitting modes of transport.
- Activity 1.3.2: Non-motorised transport project in Mangaung. In contrast to the planning in Polokwane, the conceptual design for the Mangaung Pedestrian and Cycleway project shows excellent linkages with the spatial structure of the city and appears very well conceived. Under the baseline scenario the planning is therefore likely to be adequately performed. As with other small cities, Mangaung suffers a critical shortage of transportation planners and engineers. The baseline scenario therefore carries a risk that the lack of technical capacity to plan and implement projects may result in delays to the project or substandard design and implementation. In addition the Municipality has insufficient funds for implementation of the project prior to 2010. The baseline scenario will have implementation of the NMT corridor phased over a number of years post 2010.
- Activity 1.3.3: Non-motorised transport project in Rustenburg. As with other small cities, Rustenberg suffers a critical shortage of transportation planners and engineers. The baseline scenario therefore carries a risk that the lack of technical capacity to plan and implement projects may result in delays to the project or substandard design and implementation.

- Activity 1.4.1: TDM Measures in Cape Town. With financial assistance from the British Council, the City of Cape Town has appointed a Sustainable Transport Professional who will manage the TDM programme. The City Council however lacks funds for planning and implementation. The baseline scenario will therefore comprise a continuation of the current focus on transportation infrastructure and transport services with negligible attention given to demand-side interventions
- Activity 2.1.1: Study and training assistance. The shortage of transportation professionals within the Public Sector is a symptom of a wider and more general lack of staff with training and experience in transportation issues. The baseline scenario will comprise a continued shortage of transportation professionals in both public and private sectors.
- Activity 2.2.1: Improved dialogue and workshops. Transportation professionals within both Public and Private sectors in South Africa are generally well qualified and appropriately trained. The historically insular nature of the South African economy has resulted in many transportation professionals not being sufficiently well informed regarding sustainable transport options and international best practice. This condition is likely to remain under the baseline scenario.
- Activity 2.2.2: Web-based knowledge resource. Whilst a wealth of information is available in digital and printed form, this data is dispersed and time consuming to review. Planners in South Africa do not have access to a collated set of guidelines relating sustainable transport options and lessons learnt on local and international projects. Under the baseline scenario this is likely to remain unchanged.

Goal

59. The goal to which the project contributes is *"to reduce greenhouse gases (GHG) from urban transportation in South African cities through the promotion of a long-term modal shift to more efficient and less polluting forms of transport"*.

GEF Alternative

60. The GEF-supported alternative would be to provide an effective, sustainable and environment-friendly urban public transport system, planned and regulated at local levels of government. To make this vision reality, the intervention strategy of the project is designed around the following two components:
    I. Transport system improvement (in seven venue cities).
    II. Capacity strengthening and knowledge
    II. Monitoring, learning and evaluation

61. The incremental improvements expected from the GEF alternative are described for each activity in the bullets below:

- Activity 1.1.1: Rea Vaya BRT in Johannesburg.
  The GEF intervention will assist timely implementation of a high quality public transport system on 94 km of arterial routes and explicitly address project risk factors of:
  a. Financial sustainability of the public transport system; by additional analysis of demand, formulation of operational-, business- and marketing plans
  b. Opposition of existing operators; by undertaking a structured programme of training and communication with the minibus taxi industry)
  c. Institutional inertia and lack of manpower; through support with monitoring and evaluation of infrastructure planning and detailed engineering activities funded under the project

- Activity 1.1.2: Khulani Corridor BRT in Nelson Mandela Bay.

The GEF intervention will explicitly address three project risk factors described under Activity 1.1, namely:

a. Financial sustainability of the public transport system; by additional analysis of demand, formulation of operational-, business- and marketing plans
b. Opposition of existing operators; by undertaking a structured programme of training and communication with the minibus taxi industry
c. Institutional inertia and lack of manpower; through support with monitoring and evaluation of infrastructure planning and detailed engineering activities funded under the project
d. In addition to the preceding risks, shortage of funding for the Khulani BRT is likely to result in a design utilising kerbside BRT lanes. The small additional funding from the GEF intervention will assist Nelson Mandela Bay Metro to implement the more efficient Median-lane design, which will have lower lifecycle costs due to improved vehicle operations

- Activity 1.2.1: R40 High Occupancy Vehicle lane in Mbombela.
  The GEF alternative will increase the efficiency of road space usage by ensuring international best-practice in planning, design and operation of the HOV lane. In doing so it will explicitly address the following risk factors:
  a. Institutional inertia and lack of manpower; through support with monitoring and evaluation of infrastructure planning funded under the project
  b. Public opposition to reallocation of road space; through the law enforcement and marketing actions.
  c. The GEF intervention will also assist with sustainability of the system through preparation of a personal safety and law enforcement plan

- Activity 1.3.1: Non-motorised transport network in Polokwane.
  Due to limited technical capacity to plan and implement the project the Polokwane NMT network project is unlikely to result in a significant shift in mode choice towards low GHG emitting modes of transport. The GEF alternative will rectify this weakness by making the following incremental differences:
  a. Addressing institutional inertia and lack of manpower through support with infrastructure planning and detailed engineering to ensure that international best practice is implemented and that the NMT network meets defined corridors of demand.
  b. Supporting the municipality with technical assistance and capacity development to ensure linkage of the NMT project with spatial development planning and public transport services.
  c. Assisting public acceptance of the system and encourage use by a marketing and public awareness campaign.

- Activity 1.3.2: Non-motorised transport project in Mangaung.
  The GEF assistance will supplement the technical capacity of the Municipality to plan and implement the project and will, as a result, make the following incremental differences:
  a. Addressing institutional inertia and lack of manpower through support with infrastructure planning and detailed engineering to ensure that international best practice is implemented.
  b. Assisting public acceptance of the system and encourage use by community involvement and public awareness
  c. Allow implementation of the project prior to 2010.

- Activity 1.3.3: Non-motorised transport project in Rustenburg.
  The GEF assistance supplement the technical capacity of the Municipality to plan and implement the project and will, as a result, make the following incremental differences:

a. Addressing institutional inertia and lack of manpower through support with infrastructure planning and detailed engineering to ensure that international best practice is implemented.
b. Assisting public acceptance of the system and encourage use by community involvement and public awareness

- Activity 1.4.1: Travel Demand Management in Cape Town.
  The GEF assistance supplement the technical capacity of the Municipality to plan and implement the project and will, as a result, make the following incremental differences:
  a. Support and assist the City of Cape Town's sustainable transport professionals.
  b. Assisting public acceptance of the TDM measures and encourage use by community involvement and public awareness
  c. Ensure that TDM measures comply with international best practice

- Activity 2.1.1: Strengthening of technical capacity in training
  The GEF alternative will result in an increased number of public sector officials working in the field of transport planning who will have expanded their knowledge through technical training and have received work experience in one of the GEF supported projects.

- Activity 2.2.1: Improved dialogue and knowledge dissemination
  A programme will be designed and implemented to raise awareness and basic capacity of stakeholders (government, private sector, universities, NGOs, etc.) on sustainable transportation issues and options. The programme will also provide a forum for multi-stakeholder dialogue where South African decision-makers, planners and other stakeholders can interact and exchange experiences on ongoing sustainable transportation activities in South Africa. Third, the activity will serve as information dissemination tool regarding experiences and progress in the subprojects of the venue cities as presented in this proposal.

- Activity 2.2.2: Web-based knowledge resource.
  By international experiences and examples of successful activities collecting, moderating and posting on a readily accessible web-site in South Africa, the GEF alternative will increase knowledge on sustainable transportation options and best practices amongst government and local planners, consultants, and other practitioners.

- Activity 3.1.1: Monitoring, learning, feedback and evaluation
  The activity includes adaptive management through feedback from monitoring and project progress reports as well as documentation of information and dissemination of knowledge and lessons learned through case studies and publications.

Systems boundary

62. The geographical boundary of the proposed full-size project is the national territory of South Africa

Summary of costs

63. The total cost of the proposed GEF alternative is US$ 10.999 million. A total of US$ 323.942 million will be available as co-financing contributions. To date, confirmed co-financing from the first and second allocations from the PTIF for projects included in the scope of the proposed GEF intervention amounts to US$ 95.677 million. An additional amount of US$ 69.923 million has been allocated to other sustainable transport projects (to be implemented independently of the GEF project) in the nine venue cities. Total allocations by the DoT from the PTIF for sustainable projects in the 2010 World

Cup venue cities amount to US$ 165.6 Million. Additional applications for funding to the venue cities are currently under evaluation and additional allocations will be made under Round 3 of the PTIF, however these allocations were not finalized at the time of report preparation (US$ 223.363 million). Total pending cash contributions (from PTIF, municipalities and other sources) are US$ and in-kind contributions by the national and local governments valued at US$ 0.518 million.

3. GLOBAL BENEFITS: BASELINE AND EMISSION REDUCTION CALCULATIONS

64. The total CO_2 reduction directly attributable to the proposed GEF initiative is 423,000 tonnes of CO_2-equivalent over ten years. The indirect CO2 emission reduction due to replication is an estimated 2 million tCO_2-equivalent over a ten year period.

4. INCREMENTAL COST MATRIX FOR 'SUSTAINABLE TRANSPORT AND SPORT, A 2010 OPPORTUNITY'

	BASELINE	ALTERNATIVE	GEF INCREMENT
OUTCOME 1 ***Implementation of transport system improvements in five 2010 venue cities***			
1.1 Restructured public transport systems (high-impact mode-shift) have been supported and implemented	Currently: inefficient public transportation. For 2007-2010, two projects are planned: a) Implementation of the Johannesburg Strategic Public Transport Network (SPTN) with utilising kerb-side public transport lanes and "queue-jumpers" at traffic signals b) Development of a Trunk Bus system along Khulani Corridor in Nelson Mandela Bay; Both projects will be implemented under the baseline scenario, but at a lower standard of infrastructure and may not be finalized in time before the 2010 World Cup so that 'quick-fix' options may be chosen instead of being based on a longer-term post-2010 vision	a) Implementation of a BRT system on the most heavily loaded sections of the Johannesburg SPTN, with integration of remaining SPTN routes with the BRT. b) Upgrading of Trunk Bus design in Khulani Corridor from kerb-side to median running-way c) Both projects will utilise balanced design of the BRT systems based on international best practice and on proper communications and interactions with the main stakeholders, including a limited competitive regime for regulation of urban transport operators d) Improved level of service	While the baseline will provide improved public transport operations the Johannesburg SPTN,will require buses to share large portions of the route with general traffic. The GEF intervention will provide an incremental improvement to dedicated runningways on portions of the SPTN, with associated improved travel time, improved level of service and reduced emissions, fleet and operating costs. Assist tight timeframe/operational business model The GEF assistance in Nelson Mandela Bay will allow incremental upgrading from dedicated Kerb-side bus lanes to dedicated Median Bus lanes. This will result in lower friction from roadside activities and turning traffic, with associated improvement in travel speed and reduction in fleet requirements and reduced lower emissions. Both GEF interventions will provide targeted technical assistance to address certain 'soft' issues that can otherwise form a bottleneck for the timely and proper implementation: • Travel demand analysis • Formulation and implementation of an adequate business model to obtain buy-in from the current formal and informal bus and minibus operators • Development of PPP structures for the system's operations in communication with minibus taxi operators • Social safeguarding and marketing plan to overcome negative perceptions regarding public transport • Incorporating the results of the before-mentioned tasks in the detailed design and infrastructure

	BASELINE	ALTERNATIVE	GEF INCREMENT
1.2 Road management and transport system efficiency improvements	Currently: increasing congestion on the main intersection of thoroughfares, such as the R40/N4 intersection; A high-occupancy HOV lane will be implemented in Mbombela but without being fully embedded in local transport and spatial plans	Balanced design of the HOV lanes based on international best practice and communications with stakeholders and users and embedded in the local transport and urban plans; Formulation of an operational and enforcement plan to ensure compliance of road users with use restrictions of the HOV lane Savings in passenger trip times with improved road management through HOV lanes	GEF technical assistance will address planning and operational aspects not considered so far in the (technical) HOV design, e.g.: • Linkages of the HOV lanes with public transport and urban spatial planning as part of an ITP (developed under output 1.1) • Monitoring & review of operation • Incorporating the results of the before-mentioned tasks in the detailed design and infrastructure • Formulation and implementation of ITPs is supported • Increased capacity is developed and maintained • Focussed stakeholder meetings • Social safeguarding ands marketing and public awareness plan
1.3 Non-motorised (NMT) projects have been supported and implemented	Currently: no dedicated NMT infrastructure, resulting in cycle users and pedestrians being subject to accidents. NMT projects have been proposed for implementation under the baseline scenario in Polokwane, Mangaung and Rustenburg; The NMT project in Polokwane lacks focus and in the baseline scenario may result in implementation of NMT facilities that do not serve defined routes of demand. Lack of technical and planning capacity in Polokwane may result in significant delays or cancellation of the project; The Mangaung NMT project does not have funding in place for construction and will not be implemented under the baseline scenario.	Balanced design of the NMT systems based on international best practice and communications with stakeholders and users and embedded in the local transport and urban plans;	GEF technical assistance will address planning and operational aspects not considered so far in the (technical) NMT design, e.g.: • Linkages of the NMT facilities with public transport and urban spatial planning as part of an ITP (developed under output 1.1) • Incorporating the results of the before-mentioned tasks in the detailed design and infrastructure • Formulation and implementation of ITPs is supported • Increased capacity is developed and maintained in the selected venue cities • Social safeguarding and marketing plans that include awareness campaigning and public participation In the case of Mangaung the GEF intervention will result in construction and use of the NMT facility which would not happen under the baseline scenario
COST	**US$ 323.532 million** *(DoT-PTIF and other sources)*	**US$ 333.679 million**	**US$ 9.147 million** *(GEF)*

OUTCOME 2 **Strengthened capacity and increased knowledge to plan, manage and implement sustainable transportation options**			
2.1 Technical capacity in sustainable transport planning has been strengthened	There is an undersupply of transportation engineers and planners in general and lack of knowledge on sustainable transport options with in the area of transport and land-use planning, especially in the in smaller municipalities.	Skills of transport planners technicians have been increased and young professionals are employed in municipalities or elsewhere	Support training on sustainable transport issues and options to about 60 public sector officials (that work in transport or urban planning). Provide young engineers and planners to work as junior consultant in one of the GEF-supported subprojects mentioned in Outcome 1
2.2 Increased information and knowledge about sustainable transportation options and improved dialogue between stakeholders	Insufficient knowledge about sustainable transport options and international best practices	Knowledge on sustainable transportation options and best practices amongst government and local planners, consultants, and other practitioners has been improved; Information on the achievements of the Transport 2010 initiative and international best practices has been disseminated	Awareness and knowledge dissemination programme (with participation of recognised international experts on sustainable transports) to built basic capacity of stakeholders, to provide a forum for multi-stakeholder dialogue and to present results and progress of the Transport 2010 initiative Development of a user-friendly computerised resource base and learning tool providing international experiences and examples of successful activities in South Africa
COST	**US$ 0.126 million** *(municipalities, DoT)*	**US$ 1.002 million**	**US$ 0.876 million** *(GEF)*

OUTCOME 3 **Monitoring, learning, adaptive feedback and evaluation**			
3.1 Monitoring, learning and evaluation	There is no project tool available that monitors performance of project outputs and impacts, linking global benefits and transportation options	Information and knowledge from monitoring and evaluation is captured and disseminated	Increased use of a methodological framework for measuring baseline and end-of-project indicators of project performance and project impacts
COST	-	**US$ 0.275 million**	**US$ 0.275 million** *(GEF)*

Project management	**US$ 0.984 million** *(DoT)*	**US$ 1.387 million**	**US$ 0.701 million** *(GEF)*

Total project: Domestic and global benefits	*Lack of a critical mass of professionals and practitioners that are interested in sustainable transportation and are able to lead its development beyond the immediate 2010 World Cup objective* *Transport system improvement proposals (BRT, HOV lanes, MNT) are planned , but may meet delays so that the opportunity of showcasing sustainable transport is partly lost (and conventional 'quick-fix' solutions are chosen) or solutions are chosen that may not be according to international best practice.*	*Knowledge transferred and professionals trained in (sustainable) urban transport planning and engineering and strengthening of planning capacities in the smaller venue cities.* *Sustainable transport supported by a network of practitioners from private sector, national and local governments and NGOs.* *Sustainable transport system improvements (BRT, HOV lanes, MNT) on over 127 km of BRT lanes, 9 km of HOV lanes and 59 km of improved facilities for cyclists and pedestrians* *Emission avoidance of at least 423,000 tCO_2 (over a 10 year period)* *2 million tons of CO2 emission reduction will result indirectly from project replication.*	*With a clear mandate to promote initiative including positive global impact, GEF is supporting a valuable effort to integrate global climate change and national development and energy security aspects.* *Targeted technical assistance to the planning and implementation of the proposed BRT, HOV lane and NMT initiatives so that they are implemented before the 2010 deadline, have the buy-in from existing transport operators and involvement of a broad range of stakeholders and are properly embedded in local transport and land-use plans.*
TOTAL COST	***US$ 323.924 million (DoT, DoT-PTIF, municipalities and other sources)***	***US$ 334,941 million***	***US$ 10.999 million (GEF)***

ANNEX B PROJECT LOGICAL FRAMEWORK

PROJECT STRATEGY (Objectives, outcomes, outputs)	Indicator Description	Baseline	Final Value	Sources of verification	Assumptions/ risks
GOAL *To reduce greenhouse gases (GHG) from urban transportation in South African cities through the promotion of a long-term modal shift to more efficient and less polluting forms of transport*	Reduction in GHG emissions associated with modal shifts and higher transport system efficiency Improvement of air quality (despite economic and traffic growth) as measured by levels of PM, SOx, NOx, and CO in the corridors Decrease in ambient noise levels in the corridors	The baseline of CO_2 emissions avoided in 2004-2008 will be established during the baseline survey at onset of the project. Will be established during the baseline survey at onset of the project Will be established during the baseline survey at onset of the project..	Direct reduction of 423,000 tonnes of GHG emissions over a 10 year lifespan Improvement of 30% at end of project survey. Improvement of 25% at end of project survey .	▪ Transport plans and reports ▪ Completion reports of the BRT, HOV lane and NMT subprojects ▪ Project progress, baseline surveys, end of project surveys, monitoring and evaluation reports	▪ Long-term commitment of the Government to promoting reductions in GHG emissions related to transport beyond the 2010 World Cup
OBJECTIVE The promotion of a safe, reliable, efficient, co-ordinated and integrated urban passenger system in South Africa, managed in an accountable way, to ensure that people experience improving levels of mobility and accessibility.	Transport Systems improving modal shift, efficiency and mobility for the selected interventions Public perception of public transport in the selected corridors Number of person-trips / annum on sustainable transport options	Will be established during the baseline survey at onset of the project. Baseline will be established during the baseline survey at onset of the project. Baseline will be established during the baseline survey at onset of the project	In targeted corridors increased as established during baseline survey and measured during end of project survey. Public perception of public transport in the selected corridors is improved by 50% at end of project survey. Person trips on sustainable modes increased by 20%	▪ Completion and progress reports of the proposed BRT, HOV lane and NMT projects ▪ Project progress and evaluation reports, baseline surveys, end of project surveys, ▪ Public opinion surveys ▪ Surveys in corridors improved under the project	▪ Private sector interested in participating in sustainable transport improvement projects; acceptance by existing operators of BRT systems and HOV lanes ▪ Public acceptance of (improved) public transportation and NMT
OUTCOME 1 *Implementation of transport system*	Status of infrastructure planning &	Public transport in the selected venue cities is	The first phases of the proposed BRT/corridor	▪ Traffic and on-board surveys; ticket sales;	▪ The commercial feasibility of the proposed BRT

PROJECT STRATEGY (Objectives, outcomes, outputs)	Indicator Description	Baseline	Final Value	Sources of verification	Assumptions/ risks
improvements in seven 2010 venue cities	operations for 2010 in the selected venue cities	characterised by: the large modal share of minibus taxis; no integrated fare and ticketing system between minibus, bus and rail services; no coordinated feeder services into the main trunk services	systems in Jo'burg and Nelson Mandela Bay, HOV lanes in Mbombela and the NMT infrastructure in Mangaung, Polokwane & Rustenburg have been constructed and are operational by the time of the 2010 World Cup events	surveys amongst NMT users ▪ Project progress and evaluation reports ▪ Operational, business and financing plans as well as detailed designs of the proposed transport improvement projects ▪ Photographic evidence of a running system ▪ Baseline and post project surveys	services is high enough to attract existing minibus and bus operators and other private investors ▪ Confirmed commitment of key stakeholders ▪ Financing from PTIF and other sources is secured for the design and construction of the proposed projects ▪ Interest of general public in (improved) public transportation and NMT ▪ Political willingness and legal feasibility
	Number of public transport users along selected interventions	Will be established during baseline survey	Increased share of public transport users/ amount of passengers, drivers and/or travellers using the new BRT, HOV lane and NMT facilities, to be measured at end of project survey		
	Public perception of public transport and NMT amongst the public	Poor public perception of public transport and NMT amongst the public, that will be quantified in the baseline survey	Improved perception of the public (30% compared to baseline)		
1.1 Restructured public transport system (high-impact modal shift projects): BRT systems (Rea Vaya Johannesburg and Khulani Corridor N. Mandela Bay)	Compliance with the construction schedule (by 2010) of 94 km of BRT in Johannesburg, of the Khulani Corridor BRT in Nelson Mandela Bay	Not ready	Ready and documented	▪ BRT operational plans ▪ BRT business plans ▪ Marketing and awareness creation plan ▪ Detailed infrastructure design of the BRT/corridor systems ▪ Minutes of meeting with existing operators ▪ Photographic evidence of a running system ▪ Concession contracts; local	▪ A sound business plan for partnership between local government, private sector, existing operators and labourers can be developed ▪ Financing from PTIF and other sources is secured for the design and construction of the proposed projects (e.g. Johannesburg: currently ZAR 600 million of
	Financial sustainability: Public Transport subsidy payments to operators for services in the corridor	Current subsidy situation, Will be established in baseline survey	Will be measured in end of project survey		
	Social equity:	Will be established	Will be established		

PROJECT STRATEGY (Objectives, outcomes, outputs)	Indicator Description	Baseline	Final Value	Sources of verification	Assumptions/ risks
	Number of low-income households within 500m of the improved transport system and fare per km of the transport system Traffic conditions in morning peak along BRT networks: - Johannesburg - Nelson Mandela Bay	in baseline survey (figures below to be verified in baseline study) Car: 331,259 and 372,835 vehicle.km in 2006 and 2010 Taxi: 110,416 and 99,419 vehicle.km in 2006 and 2010 Bus: 4,450 vehicle.km and 5,008 in 2006 and 2010 Car: 117,613 and 372,835 vehicle.km in 2006 and 2010 Taxi: 14,438 and 12,749 vehicle.km in 2006 and 2010 Bus: 4,394 and 4,850 vehicle.km in 2006 and 2010	in baseline survey (figures below to be verified in end-of-project study) Car: 298,097 vehicle km BRT: 12,410 vehicle.km (2010) Reduction of CO_2eq of 321,206 tonnes over 10 years due to reduction in vehicle.km Car: 123,690 vehicle.km Taxi: 5,006 vehicle.km BRT: 4,495 vehcile.km (2010) Reduction of CO_2eq of 30,602 tonnes over 10 years due to reduction in vehicle.km	bus companies operating in BRT system ▪ Municipal reports ▪ Registry of ticket sales and on-board surveys; opinion polls ▪ Project progress and evaluation reports ▪ Baseline and end of project surveys	the needed ZAR 2 billion has been secured) ▪ Financing for new bus vehicles is in place and the existing minibus sector will participate in the project ▪ Acceptance of BRT systems and tariffs by commuters ▪ Political willingness and legal feasibility; environmental clearance are given in time ▪ Regulations for tendering of construction and subsequent operations are in place ▪ The BRT system can function on a no-subsidy basis ▪ Some indicators will be measured after only 3-4 months of operation and might not reflect final mode shift potential or final profitability or financial sustainability
1.2 Road management band transport system efficiency improvements; (HOV lanes in Mbombela	Compliance with the construction schedule (by 2010) of 9 km of HOV lanes in Mbombela Financial sustainability: Public Transport subsidy	Not ready Current subsidy situation, Will be established in baseline survey	Ready and documented To be measured in end of project survey	▪ Operational plan and detailed engineering and design of the HOV lanes ▪ Marketing and awareness creation plan ▪ Minutes of stakeholder	▪ Confirmed commitment of all stakeholders ▪ Financing from PTIF and other sources is secured for the design and construction of the proposed projects

PROJECT STRATEGY (Objectives, outcomes, outputs)	Indicator Description	Baseline	Final Value	Sources of verification	Assumptions/ risks
	payments to operators for services in the corridor Social equity: Number of low-income households within 500m of the improved transport system and fare per km of the transport system Traffic conditions in morning peak along HOV lanes in Mbombela	Will be established in baseline survey (figures below to be verified in baseline study:) Average car travel speed of 30 km/h and fuel consumption of 8.2 km/litre of fuel Car: 24,895 and 27,479 vehicle.km in 2006 and 2010; Taxi: 124 and 110 vehicle.km in 2006 and 2010; Bus: 116 and 128 vehicle.km in 2006 and 2010 BRT: 1,245 vehicle.km in 2006 and 1.374 in 2010	To be measured in end of project survey (figures below to be verified in end-of-project study) Average car travel speed of 53 km/h and fuel consumption of 10.8 km/litre of fuel. Car: 27,479 vehicle.km; taxi: 110 vehicle.km; bus: 128 and BRT 1,374 vehicle.km (2010) Reduction of CO_2eq of 39,176 tonnes over 10 years (due to better fuel consumption per vehicle)	consultations ▪ Traffic surveys ▪ Opinion polls ▪ Project progress and evaluation reports	▪ Good law enforcement regarding the use of HOV lanes by buses and multi-passenger vehicles ▪ Political willingness and legal feasibility ▪ Regulations are in place ▪ Some indicators will be measured after only 3-4 months of operation and might not reflect final mode shift potential or final profitability or financial sustainability
1.3 Non-motorised transport (NMT) in Polokwane Mangaung and Rusten-burg	Compliance with the construction schedule of cycle paths and walkways (by 2010) of 55.5 km in Polokwane, 3.8 km in Mangaung and 10kmin Rustenburg Social equity: Number of low-income households	Not ready Will be established in baseline survey	Ready and documented Will be measured in end of project survey	▪ Operational plan and detailed engineering and design of the bikeways and walkways ▪ Marketing and awareness creation plan ▪ Minutes of stakeholder consultations ▪ Surveys among pedestrians and cyclists	▪ Continuing support of stakeholders (including pedestrians and cyclists) ▪ Financing from PTIF and other sources is secured for the design and construction of the proposed projects ▪ Acceptance and public

PROJECT STRATEGY (Objectives, outcomes, outputs)	Indicator Description	Baseline	Final Value	Sources of verification	Assumptions/ risks
	within 500m of the improved transport system and fare per km of the transport system Integrated transport and development plans Mode shift to NMT transport	Integrated transport and development plans not completed (Details to be established during baseline study): POLOKWANE: Cars: 61,174 and 68,852 vehicle.km in 2006 and 2010, Taxis: 4,631 and 4,170 vehicle.km in 2006 and 2010 Bus: 4,032 and 4,539 vehicle.km in 2006 and 2010 MANGAUNG: Cars: 4,078 and 4,590 vehicle.km in 2006 and 2010, Taxis: 309 and 278 vehicle.km in 2006 and 2010 Bus: 269 and 303 vehicle.km in 2006 and 2010	Integrated transport and development plans are in place in all 3 venue cities 2.5% mod shift from private cars and 5% mode shift from public transport POLOKWANE: Cars: 67,131 vehicle.km TaxI: 3,519 vehicle.km Buses: (2010) MANGAUNG: Cars: 4,475 vehicle.km TaxI: 235 vehicle.km Buses: 287 vehicle.km (2010) Resulting emission reduction of 2,006 tCO_2eq in Mangaung and 30,062 in Polokwane	▪ Project progress and evaluation reports ▪ Transport plans and reports	awareness regarding cycling and walking as a transportation option ▪ Political willingness and legal feasibility ▪ Good cooperation between levels of government (national, provincial, local) and within layers of government for integrated transport and land-use policies and planning
1.4 Travel Demand Management (TDM) in Cape Town	Number of people using car-pooling and Park-'n-Ride facilities Participation of employers in programme to encourage employees to use more efficient transport modes	Will be established in baseline survey Such a programme does not exist yet	Will be measured in end of project survey Participation of at least 3 employers	▪ Surveys among car user and other traffic participants ▪ Marketing and awareness plans; operation plan of car pool and park-'n-ride facilities ▪ Project progress and evaluation	▪ Acceptance and public awareness regarding car pooling and HOV facilities ▪ Willingness of employers to participate in sustainable transport ▪ Financing from PTIF and other

PROJECT STRATEGY (Objectives, outcomes, outputs)	Indicator Description	Baseline	Final Value	Sources of verification	Assumptions/ risks
				reports	sources will be secured
OUTCOME 2 Strengthened capacity and increased knowledge (to plan, manage and implement sustainable transportation options)	Level of individual and institutional Capacity and Knowledge on sustainable transportation	The level of capacity and knowledge of the key stakeholders, in particular local government and transport operators, regarding the design and implementation of sustainable transport options is still low	Increased capacity is proven through: ▪ Adoption of integrated transport plan in the four small venue cities that focus on sustainable transportation options ▪ Key professionals from all the venue cities in different areas have acquired knowledge on different aspects of sustainable transportation through basic capacity building as well as a web-based information and knowledge tool ▪ 60 people have obtained technical training on sustainable transport planning	▪ Interviews/questionnaires and/or surveys and trained professionals and participants of events ▪ Project progress and evaluation reports	▪ Professionals and working staff are willing to be trained and participate in sustainable transportation information dissemination events ▪ (Local) government commitment to coordinate land-use, traffic and transport dimensions of planning
2.1 Technical capacity in sustainable transport planning has been strengthened	Number of public sector transport or urban planning officials with adequate knowledge about sustainable transport options	Lack of professionals with adequate training in sustainable transport planning and engineering	At least 60 people have updated and expanded their knowledge about sustainable transport options 15 young professionals are hired as junior consultant in the GEF-supported projects	▪ Interviews with participating officials and mentors ▪ Mid-term and final evaluation reports ▪ Progress reports and evaluations	▪ Motivation of officals to follow part-time training together with their daily work ▪ Municipal managers allow their transport-related staff to participate in the technical trainings ▪ Clients are willing to use young professionals

PROJECT STRATEGY (Objectives, outcomes, outputs)	Indicator Description	Baseline	Final Value	Sources of verification	Assumptions/ risks
					and to provide a mentoring role
2.2 Increased information and knowledge about sustainable transportation options and implementation amongst local and national decision-makers and transport and urban planners	Number of information dissemination events / experience sharing platforms Web-based knowledge resource tool	Limited awareness and information sharing to effectively adopt sustainable transport options; Events are not organised in a systematic way, covering all sustainable transportation issues and options No orderly computerised structure exists in which knowledge can be categorised and stored	16 training workshops are organised on planning, design and implementation of sustainable transportation systems and transport planning for mega-sporting events in which international experts will provide information and training to all the venue cities; Each workshop is accompanied by visits by international experts to at the least the four small venue cities Functional web-based knowledge resource and tool maintained by host organisation with 1,000 hits on the web-site / annum	▪ Project progress and evaluation report ▪ The knowledge resource and learning tool itself ▪ Survey amongst users (user friendliness, amount and type of information, captured successful methodologies) Questionnaire for users of the web-based tool	▪ Professionals and working staff is willing to attend the sustainable transportation workshops ▪ DoT or another institution is willing to host and maintain the website, also after 2010
OUTCOME 2 Monitoring, learning, adaptive feedback and evaluation	Tool/logical framework of measuring project performance and impacts Capturing knowledge and information	No tool is available No capturing of knowledge and information	Measured indicators of project outputs and impacts Number of project reports and publications	▪ Baseline and end-of-project studies ▪ Mid-term and final evaluations ▪ Project technical reports, leaflets and publications	▪ Tool and framework is actually being used while doing monitoring and evaluation
3.1 Monitoring, learning and evaluation	See above	See above	See above	See above	See above

ANNEX C. RESPONSE TO PROJECT REVIEWS

1 – STAP REVIEW

Review of GEF Project Document

GEF Project ID 2604
Project Title: Sustainable Public Transport and Sport, A 2010 Opportunity
Reviewer: Sudhir Chella Rajan

General Comments

Overall, this is an excellently conceived and carefully developed project proposal to take advantage of a high-profile event in South Africa, namely the 2010 FIFA World Cup, to improve access to transport services. The comments below are brief primarily because of the extreme time constraints in conducting this review, but that in itself should not detract from the overall soundness and timeliness of the project.

Key issues

Scientific and technical soundness of project

1. Has the most appropriate and effective approach been used to remove the barriers?

In general, this project has provided a comprehensive view of the barriers and provided a timely and feasible set of options to remove them. The emphasis is rightly on what one would generally term institutional (or 'software') barriers rather than technology (or 'hardware'). The authors categorise the former into what they term institutional (by which they primarily imply planning and implementation organizations rather than practices and regulations), staffing, financing, and planning barriers and appropriately call for catalysing investments to improve public transportation and the increased use of non-motorised modes, as well as capacity development efforts to improve travel demand management and corridor planning using state-of-the-art understanding of best practices around the world.

Nevertheless, the barrier analysis shown in Paragraph 3 of Section D of the project document also indicates institutional barriers associated with divided responsibilities and lack of communication between spheres of government, primarily in the form of poor coordination of functions; in other words, these are barriers commonly associated with the lack of appropriate levels of jurisdiction for conducting transport and land-use planning and operations. The report seems to treat this primarily as problems involving lack of technical/professional capacity for project implementation and lack of knowledge about sustainable transport options. It is unlikely, however, that capacity development or information dissemination will address the broader jurisdictional barrier, which probably requires a political commitment to create the institutional and jurisdictional basis for a regional, transit-oriented urban growth planning authority in all the project cities.

It is, of course, quite clear that given the tight time constraints of the project, such a broader reorganisation may not be practical. Nevertheless, it is important that the project recognise this barrier explicitly and at least indicate ways to improve coordination among agencies, with high-level political support for a management committee to arbitrate coordination functions, so as to reduce the likelihood of entities stepping on each others toes or, conversely, allowing important planning or operational tasks to slip through the cracks.

UNDP response:
The reviewer is correct in identifying communication and coordination between spheres of government as a potential barrier. The reviewer's recommendation, that the project explicitly recognises the barrier posed by lack of inter-sphere co-ordination and indicate ways of improvement, has been accepted. Addressing the institutional

structure and organisation regarding transport and land-use planning in South Africa would be beyond the scope of this project; however certain project specific actions to address this barrier can be implemented in the context of this project as listed in the bullet points below. Coordination regarding transportation is effected by a number of committees and offices. On a national level within DoT, the World Cup Office (which is also responsible for this project) will manage the transport operational plan for the 2010 FIFA event in conjunction with the key cities, provinces and transport public entities within the framework of the Transport Action Plan for 2010. The government itself mentions on page 58 of its National Land Transport Strategic Framework (2006-2011) that 'possible conflicts between land-use and transport planning' will be minimised through 'regular communication and liaison between relevant departments involved in land-use and transport planning' through national inter-governmental liaison, between provincial departments and through provincial/municipal structures. In other words, the coordination structures are being put in place as part of an ongoing process. Such structures will not function if no adequate skilled staff is available and this has been identified as a problem in the smaller (venue) cities, hence the focus on enhancing capacity there.

- *A new sentence has been added to paragraph 105 stating "Co-ordination between local, provincial and national authorities active in transport service and infrastructure provision for the FIFA 2010 World Cup will be the responsibility of the 2010 Transport Task Team of the South African National DoT."*

- *The value of workshops towards achieving improved co-ordination has been demonstrated during project preparation. As a result the function of the quarterly workshops has been expanded to include an objective of inter-sphere and inter-agency co-ordination, through addition of the following to paragraph 79: "These workshops will have a secondary objective of facilitating contact and co-operation between role players at various levels of government. As such the workshops will provide a forum for improved inter-sphere co-ordination and dissemination of best practice".*

- *At the highest level within the project the Project Steering Committee will be responsible for removing or minimising institutional barriers. The following addition to paragraph 107 has been made in the project document. "The PSC shall facilitate co-ordination between local, provincial and national spheres of government through timely identification of bottlenecks and problems caused by lack of such co-ordination. The PSC will identify appropriate channels of communication, and relevant officials from the PSC will be tasked with resolving such issues as they occur."*

- *Five venue cities were identified as having significant institutional barriers in Table 1 of paragraph 22 of the project document, namely Cape Town, Mangaung, Mbombela, Polokwane and Rustenburg. Various changes to the project document have been made to address the reviewer's comment within the context of the proposed interventions as follows:*
    - *In paragraph 51 of the project document, that discusses the activities to be performed under the High Occupancy Vehicle Lane project in Mbombela the following addition has been made: "The seconded transportation engineer will also be required to assist with raising the profile of sustainable transport options within the municipality by liaison with technical and political officials in other departments. The transportation engineer will also assist in integrating transportation planning within Mbombela with planning of the Mpumalanga Provincial Government."*
    - *In paragraph 55 of the project document (that discusses the activities to be performed under the Polokwane Non-motorised transport project) the following addition has been made: "The seconded transportation engineer will also be required to assist with raising the profile of sustainable transport options within the municipality by liaison with technical and political officials in other departments. The transportation engineer will also assist with integration of transportation planning within Polokwane with planning of the Capricorn District Council and the Limpopo Provincial Government."*
    - *In paragraph 58 of the project document (that discusses the activities to be performed under the Mangaung Non-motorised transport project) the following addition has been made: "The seconded transportation engineer will also be required to assist with raising the profile of sustainable transport options within the municipality by liaison with technical and political officials in other departments. The transportation engineer will also assist with integration of transportation planning within Mangaung with planning of the Motheo District Council and the Free State Provincial Government."*
    - *In paragraph 63 of the project document (that discusses the activities to be performed under the Rustenburg Non-motorised transport project) the following addition has been made: "The seconded*

transportation engineer will also be required to assist with raising the profile of sustainable transport options within the municipality by liaison with technical and political officials in other departments. The transportation engineer will also assist with integration of transportation planning within Rustenburg with planning of the Bojanala District Council and the North West Provincial Government. Due to the close proximity of Rustenberg to Gauteng the Transportation Planner will also liaise and co-ordinate activities with relevant officials from the Gauteng Provincial Government"

- *Addition to the description of activities related to the Cape Town Travel Demand Management Project, in paragraph 75 of the project document of the following text: "The Project Management Unit will support the TRANsformation for Sustainable and Integrated Transport in the urban environment (TRAN:SIT) Programme initiative of the City of Cape Town to implement sustainable transportation systems through a number of actions related to the programme. These will include:*
  - *To identify Sustainable Transport Training opportunities nationally & internationally for CoCT transport staff and other cities.*
  - *To prepare and hold 2 day seminar on sustainable transport linked to the course presented by the Urban Transport Research Group of the University of Cape Town.*
  - *To extend training, mentoring and assistance for the newly appointed TRAN:SIT Advisor.*
  - *Incorporation of officials from the venue cities into TRAN:SIT Network Meetings to be held on a regular basis and printing of a brochure "Introduction to Sustainable Transport & the Socio-econo-enviro Case for It", for dissemination to the network.*
  - *To review the City of Cape Town's Integrated Transport Plan through a sustainability lens and identification of inter-sphere co-ordination problems in the region by an international expert.*

2. Has the most appropriate and effective approach been used to reduce the costs of the technologies?

As mentioned above, the project focuses less on the introduction of new technologies as such than on system improvements and institutional change. The main technologies to be implemented are Bus Rapid Transport (BRT), which involve new vehicles as well as new software for guidance and operations, although there is not much discussion of these in the project. It appears, however, that these will be developed in the course of detailed engineering analyses and planning to be carried out in the corridors where BRT will be implemented.

Also, in the most ambitious part of the project, the Rea Vaya BRT enhancement in Johannesburg, the authors have correctly identified state-of-the-art design improvements such as pre-boarding fare collection, median bus-ways, and a central control centre with vehicle control technology, feeder routes, and facilities for inter-modal transfers. These enhancements are essential to ensure that the BRT's benefits are fully realised. Similar improvements are indicated in the Nelson Mandela Bay BRT. The project will include transportation demand analysis to determine the best feeder routes, although it is somewhat unclear what the results were of previous analysis, if any. The project will also develop a web-based knowledge resource, which is a cost-effective way to promote knowledge transfer.

3. Was the potential market determined on the basis of state-of-the-art technologies?

Based on the project document, it appears that detailed travel demand analyses have not yet been conducted and there is also no tentative estimate of ridership provided explicitly. Nevertheless, some assumptions were obviously used to determine the greenhouse gas emissions benefits. It would be helpful if these ridership estimates, especially for the main BRT routes, were provided in the section on project objectives, outcomes and activities, so that the reader can independently verify the authors' estimates of fiscal viability.

UNDP response:
The reviewer's comment has been noted and the following has been added to the text of paragraph 38 of the project document which describes the Rea Vaya BRT system in Johannesburg: "Estimated morning peak period ridership on each route is shown in the table below."

\

Route	*Length (km)*	*Peak ridership (2006 AM Peak 3 hrs, both directions)*
Lenasia-Highgate-Sunninghill	*50.65*	*13,000*
Dobsonville-Troyeville	*23.67*	*30,000*
Regina Mundi-CBD	*22.63*	*16,000*
CBD-Sandton	*12.35*	*8,000*
Sandton-Alexandra	*6.17*	*10,000*
Randburg-CBD	*19.55*	*5,000*
Nasrec-Ellis Park (2010 WC Only)	*12.28*	*1,000*

Similarly the description of the Khulani Corridor BRT system in Nelson Mandela Bay has been expanded to include the following text and table (paragraph 43):

Route / section	*Length (km)*	*Peak ridership (2010 AM Peak 3 hrs, both directions)*
Motherwell – Njoli Square	*9.7*	*8700*
Njoli Square – Sheya Kulati / N2	*5.0*	*12900*
Kempston Rd – N2 – Standford Rd	*3.0*	*5000*
Standford Rd – Cleary – Korsten	*7.0*	*3700*
Langenhoven Dve – Greenacres – Korsten	*1.8*	*4500*
Harrower Rd – Govan Mbeki Ave	*2.5*	*2800*
Govan Mbeki Ave – Russell Rd	*1.8*	*3600*

The fact that the potential market was not determined in advance of project implementation does present somewhat of a risk for the project. On the other hand, since there is already a commitment from the South African government to get many of its various components implemented, the main project strategy to improve on the design of the institutional elements of the government's implementation plan will help reduce its overall risk. That is to say, this project is truly an incremental effort intended mainly to ensure that the government's ambitious plans be implemented properly, with adequate technical assistance and capacity development.

4. Is the financing mechanism adequate?

This project has obtained co-financing and parallel financing commitments of over $165 million, which is certainly very impressive in absolute terms. Nevertheless, commitment for an additional amount of nearly $228 million is pending. There is a moderate concern that most of the additional commitments in the BRT corridors pertain to money needed for exactly those enhancements (e.g., feeder system, terminal and transfer facilities, and control system) which are crucial for the successful implementation of the BRT. Nevertheless, it is heartening to note that the letter of confirmation of co-financing from the Government of South Africa is explicit that there are additional applications for funding that are currently under evaluation.

UNDP response:
Since preparation of the Draft Project Document the Government of South Africa has confirmed allocations for the third tranche of Public Transport Infrastructure Fund. An additional letter confirming the co-financing of US$228 million is forthcoming.

5. Comments on the design of demonstration project?

The project is generally an excellently designed intervention on top of an existing large-scale effort by the South

African government to provide improved transport services during the 2010 FIFA World Cup. There are, nevertheless, a few additional considerations that may need attention.

First, although the project claims to include public-private partnerships, no explicit linkages with, or commitments from, the private sector have been developed so far. This implies reliance on the appearance of private investors willing to purchase high-capacity vehicles for BRT and commitments from the minibus taxi operators to actually participate in the new system. Incentives for private investors and entrepreneurs could also be provided to develop innovative ride-sharing systems and other travel demand management programmes.

UNDP response:
The envisaged business model for the two BRT interventions will utilise private sector companies for rolling stock provision and operation. Other private sector involvement will be through ticketing, fare collection, ICT systems. These will be further developed under the project, with the Project Team developing and facilitating such PPP's. In addition a number of initiatives are in progress to formulate options for public private partnerships. The Project Preparation Team is instrumental in a business coalition facilitated by the University of Cambridge named "New Mobility for the 2010 World Cup" which aims to identify and implement private sector investment in transportation infrastructure and operations related to the 2010 World Cup.

Second, the Rea Vaya BRT, in particular, is very ambitious, with 7 routes of over 90km to be developed in just 3 years. It is not clear whether sufficient road space for BRT is already available and whether or not all the other necessary elements will align themselves. The project has no secondary, fail-safe options included in case some of these assumptions do not pan out.

UNDP response:
Timely availability of the required road reserve for construction of the proposed median BRT lanes is indeed a critical factor in the success of the Rea Vaya project. The concept for median BRT operations is an upgrade of earlier plans for a strategic public transport network (SPTN). The SPTN will still be implemented on routes other than those proposed for BRT operation. The concept of the SPTN is to use a combination of kerbside bus lanes, queue jumpers and various traffic management measures to improve the efficiency of bus operations. After a preliminary screening analysis the SPTN corridors most appropriate for BRT operations were selected for inclusion in the Rea Vaya BRT system. Should right-of-way or other constraints preclude implementation of the BRT on a particular corridor or section the fall-back option will be to implement the SPTN cross-section with services provided by conventional Metro-Bus.

Finally, for the BRT elements, the project seems to expect tariffs to be the same as current levels *and* the system to be financially viable, but this is not supported by adequate analysis. Although there are indeed other cities around the world where some of these assumptions have been borne out, there is not enough clarity that the specific project design chosen will produce these results.

UNDP response:
*On page 16 under output 1.1 it is stated that the BRT tariffs may be equal or **higher** than fares in the existing minibus services in order to have a financially viable system. Currently, many customers have no option than to take several minibuses and thus pay multiple fares. The basic concept here is that the tariff paid for the unified BRT network by the customer will be lower than the individual multiple fares per transfer he or she has to pay now.*

8. Will a process be put in place to monitor the project?

In general, the monitoring and evaluation process seems adequate.

9. Is the proposed activity feasible from an engineering and technical perspective?

Yes, all the elements of the project have been previously demonstrated in other contexts.

Identification of global environmental benefits

Based on the project's greenhouse gas emissions analysis, 423,000 tonnes of CO_2 equivalent gases will be reduced "over the next 10 years." There are two main points of relevance associated with this analysis. First, it is not clear from the report whether and how the calculations took into account the transition from the pre-project period to the period after the project's goals (mode shifts, reduction in private vehicle kilometres) have been realised. It would be helpful to have the assumptions and calculations for the baseline and alternative scenarios displayed for intermediate scenario years.

UNDP response:
Annex D of the Executive summary, that describes the methodology and results of the greenhouse gas analysis, has been modified to address the reviewers comment through addition of a new section D.6 that contains detailed tables of the GHG calculations for the baseline and alternative scenarios for each year of the analysis period. The pre-project, implementation and operation periods are clearly indicated in the new tables, as are the changes in fleet composition under the base-line scenario resulting from the move to higher capacity taxi vehicles under the recapitalisation programme.

The methodology used to calculate the indirect emissions reductions is also not clear. It appears that a bottom-up approach was used, but the individual reductions by activity replication factors should be placed in a matrix.

UNDP response:
Section D.4 of the Executive summary that specified calculation of indirect and replication benefits has been modified through addition of the matrix suggested and associated text as follows:
From the above process the replication factors for potential reduction in CO_2-eq from implementing similar in other South Africa Metropolitan areas is shown in the table below.

Metropolitan areas	***Pop (mill)***	***BRT***	***HOV***	***NMT***
Johannesburg	*3.295*	*Baseline*	*4.49*	*4.67*
eThekwini	*3.162*	*0.96*	*4.31*	*4.49*
Cape Town	*2.969*	*0.90*	*4.04*	*4.21*
Ekurhuleni	*2.528*	*0.77*	*3.44*	*3.59*
Tshwane	*2.04*	*0.62*	*2.78*	*2.89*
Nelson Mandela Bay	*1.1*		*1.50*	*1.56*
Buffalo City	*0.765*		*1.04*	*1.09*
Mangaung	*0.705*		*0.96*	*1.00*
Msunduzi	*0.565*		*0.77*	*0.80*
Total SA Metropolitan areas		*3.25*	*23.33*	*24.30*

Applying the replication factors in the matrix above to the estimated CO_2-eq for the baseline cities, namely Johanneburg for BRT, Mbombela for HOV lanes and Mangaung for NMT infrastructure, resulted in the estimated potential for reduction by replication over a ten-year period shown in the table below:

Metropolitan areas	*Potential reduction in tCO_2-eq by replication (over 10 years)*			
	BRT	***HOV***	***NMT***	***Total***
Johannesburg		*176,000*	*9,000*	*185,000*
eThekwini	*308,000*	*169,000*	*9,000*	*486,000*
Cape Town	*289,000*	*158,000*	*8,000*	*455,000*
Ekurhuleni	*246,000*	*135,000*	*7,000*	*388,000*
Tshwane	*199,000*	*109,000*	*6,000*	*314,000*
Nelson Mandela Bay		*59,000*	*3,000*	*62,000*
Buffalo City		*41,000*	*2,000*	*43,000*
Mangaung		*38,000*	*2,000*	*40,000*
Msunduzi		*30,000*	*2,000*	*32,000*
Total SA Metropolitan areas	***1,042,000***	***915,000***	***48,000***	***2,005,000***

Second, the input assumptions (passenger growth, factor to convert peak volumes to daily values are different in the projects that involve BRT or HOV lanes, but it would be helpful to make explicit the justification for choosing different assumptions (e.g., based on historical trends).

UNDP response:
The reviewer's comment has been noted and section D.3 of the Executive Summary that specifies the input assumptions to the GHG calculation has been modified to add such explanations.

Finally, it would be useful to indicate the petroleum-consumption benefits associated with the project. This information could help the project garner additional support to obtain the necessary co-financing from the government as well as private sources, if appropriate.

UNDP response:
The reviewer's comment has been noted and section D.5 of the Executive Summary has been modified with addition of the following text and table:
Direct fuel consumption savings over the ten year analysis period are shown for each intervention in the table below:

Intervention	***Petrol Savings ('000 litres)***	***Diesel savings ('000 litres)***
Rea Vaya BRT	*67,100*	*45,800*
Khulani Corridor BRT	*18,500*	*15,100*
Mbombela HOV	*13,900*	*1,700*
Mangaung NMT	*400*	*300*
Polokwane NMT	*6,400*	*5,200*
Rustenburg NMT	*Not calculated*	*Not calculated*
Cape Town TDM	*Not calculated*	*Not calculated*
Total	***106,400***	***68,200***

Regional Context

The region as a whole has a critical need for excellent models of sustainable transport, especially those that demonstrate that it is possible to provide access to the poor through attractive and affordable options like BRT and non-motorised transport. With South Africa's leadership on this issue especially during a high-profile event like the World Cup, one can hope that other countries in Africa and elsewhere will feel the inspired to follow suit with similar projects.

Replicability of the project

The project's replicability in other countries (particularly in sub-Saharan Africa) is contingent on there being similar physical conditions for implementing BRT, HOV and NMT and the availability of financing. Also, this project's unique feature (the commitment of the government to improving transport services in time for a high-profile event) may not be common everywhere. Nevertheless, the project could still demonstrate that sustainable transport solutions of the type developed here could be cost-effective and attractive, which could motivate other countries to make similar commitments.

Sustainability of the project

As noted above, the prior commitment of the government to implement various elements of the project as well as the importance of completing it prior to 2010 make it highly likely that the GEF elements will also be put into operation. The sustainability of the project beyond 2010 depends in large part on the tariff structure and ridership in the BRT systems, both of which are still unknown. It seems likely that the government will provide subsidies through 2010 to keep tariffs low and may phase them out over time. To the extent that economically derived tariffs at low levels of ridership may be unaffordable, the real hope of the project lies in increased ridership, which could result from the project's information dissemination and capacity building efforts.

Secondary issues

The project correctly notes that there could be public opposition to the reallocation of road space for BRT and HOV interventions. The authors suggest that improved public awareness could mitigate this concern. It is important to remember, however, that the problem is linked not so much to lack of information as it is to an actual reduction in benefits for some private vehicle owners. The appropriate mitigation strategy may be greater stakeholder involvement in the project from early on, so that it is clear that there will (on average) be more winners (e.g., the poor who presently have little or no access) than losers (a smaller number of private vehicle owners who do not switch to other modes and will therefore likely face longer travel times).

UNDP response:
The reviewer correctly mentioned that stakeholders should not only be informed, but should be involved (and even be engaged). Stakeholder involvement is actually one of the 'soft' technical assistance activities of the project providing a new perspective in addition to traditional top-down planning approach. To make this point more clear, stakeholder involvement is more strongly stated in the activities under outputs 1.1 (paragraph 47), output 1.2 (paragraph 51), output 1.3 (paragraphs 58 and 63) and output 1.4 (paragraph 75).

2 – GEF Secretariat Project Review (at WP inclusion)

Page 6: Several elements (e.g. Safety and security planning, Study grant, etc.) in the detailed budget need to be fully justified in terms of GEF financing eligibility: In past projects, some Council members have queried the justification for support to safety measures with respect to global benefits. Security planning is even more questionable in this regard. Either justify completely or revise. (Please see the comments on Financing)

Page 9: 1. With regard to the details of budget and financing for technical assistance activities (outcomes 1 and 2) (Page49-50 of pro/doc):
a) "Safety and security planning" (GEF: $266k) seems ineligible for GEF financing, which needs to be fully justified or eliminated.
b) " Study grants for research" (GEF: $240k) and "Internships for practical training" (GEF: $300k) are questionable in terms of GEF financing eligibility, which needs to be fully justified or eliminated.

c) "Workshops" (GEF: $265k) including "Travel costs" (GEF: $70k) need to be fully justified or eliminated.

UNDP response:
(a) Since "Safety and security planning" items are not eligible for GEF funding, the project documentation has been adapted accordingly.

(b) Study grants for research. The study grants are not for 'research' as the term indeed misleadingly suggests, but for technical training of professionals on sustainable transport issues and options. Preference will be given to public sector officials that are currently working in areas related to transport and/or land-use planning; regarding 'internships', this activity has been eliminated. The project document has been adapted accordingly.

(c)The project does not want to organize workshops for the sake of organizing workshops, but sees this is an integral part of component 2 to enhance basic capacity and increase knowledge amongst decision-makers and transport planners about sustainable transport options. By means of interaction with recognised international experts the idea is to raise awareness and knowledge about 'best practices' and experiences in other cities in the world. Furthermore, the events of this activity will serve as meeting points were South African decision-makers and planners can interact and exchange experiences on ongoing sustainable transportation activities in South Africa. Third, the activity will serve as information dissemination tool regarding experiences and progress in the subprojects of the venue cities as presented in this proposal. The text in the project documentation has been adapted accordingly.

Page 7: Please add more information on financial sustainability, if any, since it seems still weak.

UNDP response:
The financial sustainability of the projects beyond 2010 will depend largely on the tariff structure and ridership in bus transit systems. Since the projects are in the design phase, both are still unknown. In fact, GEF assistance will be provided to design a proper tariff structure in case of the Khulani and Rea Vaya bus systems. If set too high, ridership may be unaffordable, if set too low tariffs will not be enough to economically operate the system. In principle, the public and private companies that will operate the bus systems will do so in a financially sustainable way. Will the client be prepared to pay higher tariffs? The BRT tariffs may actually be higher than fares in the existing minibus services. However, many customers are now forced to take several minibuses and thus pay multiple fares. The basic concept of the new public transport system is that the tariff paid for the unified network will be lower than the multiple fares the customer has to pay now. In the end, the sustainability of the projects lies in increased ridership. To achieve this, GEF-supported activities include designing the bus systems, involving stakeholders and creating awareness amongst commuters in such a way that the systems will attract not only existing minibus customers but other commuters that otherwise would have used their private vehicles.

Page 7: The project's activities seem to have a considerable potential for replication.
Comment: Please show the potential cities for replication outside the project cities.

UNDP response:
The project focuses on seven of the venue cities of the FIFA 2010 Soccer events to showcase only one sustainable transportation modalities per city, restructured public transport systems in the large cities (Johannesburg, Nelson Mandela Bay), road management and transport efficiency improvements in Nelspruit and non-motorised projects in Mangaung and Polokwane and travel demand management in Cape Town. Depending on the city's population, layout and infrastructure and financing availability, sustainable options other than the ones chosen in this project can be implemented in the long run in the venue cities and, of course, sustainable transport options can be implemented in the venue cities that are

not part of this project (such as Durban and Pretoria) as well as the non-venue cities. The replicability of each category of project supported interventions in other South African cities is shown in Table on page 15 of the section on 'replicability'.

Metropolitan areas	***Pop (mill)***	***Intervention of this type can be replicated in this city?***		
		BRT	***HOV***	***NMT***
Johannesburg	*3.295*	*Yes, Project*	*Yes*	*Yes*
eThekwini	*3.162*	*Yes*	*Yes*	*Yes*
Cape Town	*2.969*	*Yes*	*Yes*	*Yes*
Ekurhuleni	*2.528*	*Yes*	*Yes*	*Yes*
Tshwane	*2.040*	*Yes*	*Yes*	*Yes*
Nelson Mandela Bay	*1.100*	*Yes,Project*	*Yes*	*Yes*
Buffalo City	*0.765*	*No*	*Yes*	*Yes*
Mangaung	*0.705*	*No*	*Yes*	*Yes, Project*
Msunduzi	*0.565*	*No*	*Yes*	*Yes*

After 2010, the project's unique feature (the government's commitment to improve transport services in time for a high-profile event) may disappear. However, having demonstrated that sustainable transport options can be cost-effective and attractive will motivate national, provincial and municipal authorities to make commitments in sustainable transport options. The Project Document has been amended to include this response.

Page 7: Please attach a list of potential civil society organizations and groups of citizens to be involved in the project, if any.

UNDP response:
Apart from the governmental, provincial and municipal bodies and companies, stakeholders include the private sector (in particular the minibus taxi association in Johannesburg and Nelson Mandela Bay and other bus operator) and the unions, such as South African Transport and Allied Workers Union, United Transport and Allied Trade Union, FEDeration of Unions of South Africa (FEDUSA), South African Municipal Workers Union (SAMWU), Confederation Of South African Trade Unions (COSATU), Professional Transport Workers Union and the Transport and General Workers Union (TGWU). At a more project specific level relevant Ratepayers associations will be engaged were a particular project will impact on their area. The Project Document has been amended to include this response.

Page 8: It is expected that the quantified CO2 emissions baseline and number of annual person-trips on sustainable transport options are included in the Project Logical Framework, even if the data would be rough estimation.

UNDP response:
Expected CO2 reductions for each of the subprojects under outcome 1 are given in the Project Logical Framework (logframe). The additional data shown in the table below have been added into the logframe as well.

	Activity 1.1.1 *Rea Vaya*	***Activity 1.1.2*** *Khulani*	***Activity 1.2.1*** *R40 HOV*	***Activity 1.3.1*** *Polokane NMT*	***Activity 1.3.2*** *Mangaung NMT*	***Activity 1.3.3*** *Rustenbrg NMT*
Baseline Veh-km (2006)						*Not calculated*
Car	*331,259*	*117613*	*24895*	*61174*	*4078*	
Taxi Old	*110,416*	*14438*	*124*	*4631*	*309*	
Recapitalised Taxi	*0*	*0*	*0*	*0*	*0*	
Conventional Bus	*4,450*	*4394*	*116*	*4032*	*269*	
Bus Rapid Transit	*0*	*0*	*1245*			
Baseline Veh-km (2010)						*Not calculated*
Car	*372,835*	*129823*	*27479*	*68852*	*4590*	
Taxi Old	*0*	*0*	*0*	*0*	*0*	
Recapitalised Taxi	*99,419*	*12749*	*110*	*4170*	*278*	
Conventional Bus	*5,008*	*4850*	*128*	*4538*	*303*	
Bus Rapid Transit	*0*	*0*	*1374*			
With Project Veh-km (2010)						*Not calculated*
Car	*298,097*	*123690*	*27479*	*67131*	*4475*	
Taxi Old	*0*	*0*	*0*	*0*	*0*	
Recapitalised Taxi	*0*	*5006*	*110*	*3519*	*235*	
Conventional Bus	*0*	*0*	*128*		*287*	
Bus Rapid Transit	*12,410*	*4595*	*1374*			
Reduction in Veh-km due to project (2010)						*Not calculated*
Car	*74,738*	*6,133*	*0*	*1,721*	*115*	
Taxi Old	*0*	*0*	*0*	*0*	*0*	
Recapitalised Taxi	*99,419*	*7,744*	*0*	*650*	*43*	
Conventional Bus	*5,008*	*4,850*	*0*	*4,538*	*15*	
Bus Rapid Transit	*-12,410*	*-4,595*	*0*			

NB: Pollutant reduction for Activity 1.2.1 derived from 23% reduction in fuel usage due to congestion reduction

Page 10: 2. With regard to the consultants working for technical assistance components:
The costs (Personnel: $1914/w, Local consultants: $4444/w, International consultants: 5722/w) seem a bit high, which need to be fully justified or reduced to a reasonable level

UNDP response:
We have redone the budget a bit. In the Executive Summary, in Section 4 (Financing), the tables a), b) and c) on project financing, project management and consultancy cost have changed slightly as well as the tables in the Section C of the Project Document (Total Budget and Financing).

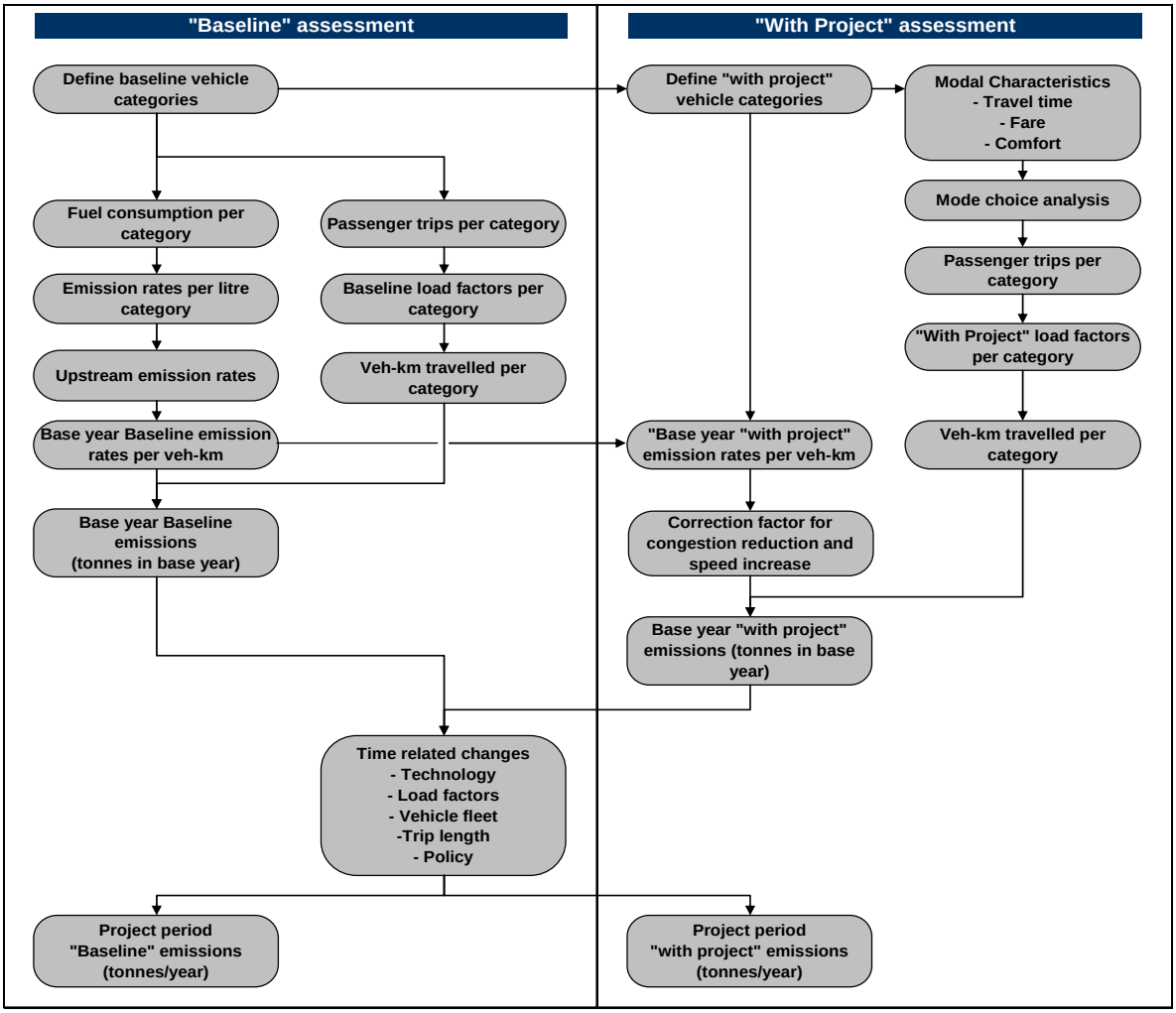
ANNEX D QUANTIFICATION OF GREEN HOUSE GAS REDUCTION

D.1 Methodology for mode-shift interventions

The methodology for calculation of GHG emission reduction has been based upon internationally accepted standards, adapted to cater for the nature and composition of the South African urban vehicle fleet. In broad terms there are three critical components necessary to develop accurate emissions inventories for transport:

1) Vehicle fleet distribution.
2) Vehicle emission rates;
3) Vehicle activity;

These three aspects have been split further into sub-activities as shown in the sketch below and described in the subsequent paragraphs. The approach broadly corresponds to the approved CDM methodology for emission calculation for the Bogotá BRT[4].



[4] http://cdm.unfccc.int/methodologies/PAmethodologies/publicview.html?OpenAll=1&cases=BNM0105-rev : Bus Rapid Transit System for Bogotá, Colombia: TransMilenio Phase II to IV

Given the likely operational life of public transport vehicles, a ten-year analysis period was used in preference to the twenty year period used for infrastructure projects.

D.1.1 Vehicle categories

Disaggregating of the vehicle fleet into vehicle categories was required due to significantly different fuel consumption and/or passenger occupancy of different types of vehicles. A coarse classification system was applied in order that it was applicable for the different categories in traffic counting in the nine venue cities, and was also compatible with categories used in relevant emission models.

Within each category vehicles using different fuel types such as petrol or diesel were identified. There is relatively little difference in GHG emissions between diesel, gasoline, natural gas and LPG. In general a separate category for vehicles of the same characteristics, but with different fuel type, is only meaningful if the vehicle type with the different fuel constitutes at least 10% of the total for vehicles with the same characteristics. For the purposes of this analysis only the dominant fuel type per vehicle type was taken. e.g. all cars were assumed to be petrol fuelled. The vehicle categories used were:

Vehicle type	Fuel
Car	Petrol
Existing Mini-bus Taxi	Petrol
Recapitalised Mini-bus Taxi	Diesel
Bus	Diesel
BRT Bus	Diesel
Light Goods Vehicle	Diesel
Heavy Goods Vehicle	Diesel

The vehicle type “Recapitalised Mini-bus taxi” refers to the new, higher capacity diesel vehicles that will replace the existing 16-seater mini-buses under the Department of Transport’s recapitalisation programme

D.1.2 Fuel consumption per vehicle category

Fuel consumption data, representative of travel in urban areas, was defined for each vehicle category. Values used were:

Vehicle type	Fuel consumption (km / l)
Car	8.0
Existing Mini-bus Taxi	5.7
Recapitalised Mini-bus Taxi	9.2
Bus	3.3
BRT Bus	3.3
Light Goods Vehicle	9.2
Heavy Goods Vehicle	3.3

D.1.3 Emissions per litre of fuel

The emission factors used were collated from a number of sources. The primary source being the HEAT[5] (Harmonised Emissions Analysis Tool) model, which in turn is derived basically from the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual (tables 1-27-45) and calibrated for South African commercial vehicles using a study from the University of Cape Town (UCT) for Diesel vehicles that reports CO, HC, NOx, SO_2, CO_2 and TSP [6].

CO_2 emissions were defined as a fixed value per litre of fuel, which is dependent on the carbon content of the fuel. Other GHG emission factors (CH_4 and N_2O) factors are more complex to estimate accurately. CH_4 emissions are a function of the fuel and engine type, and any post-combustion controls. N_2O emissions are technology based for each fuel type, vehicle category, installed control technologies and local data such as average driving speeds, temperatures, and altitude. CH_4 as well as N_2O emissions in vehicles however account on average for less than 1-2% of total CO_2eq emissions. The methodology for GHG emissions, and other pollutants listed in the table below was therefore based on fixed emission factors per vehicle category and fuel type. Values used in the analysis are shown below:

	Emission factors by pollutant and vehicle type (g/l) [1]						
Pollutant	Car	Taxi Old	Taxi Recap	Bus	BRT	Light Goods Vehicle	Heavy Goods Vehicle
CO_2	2482	2482	2512	2512	2512	2512	2512
N_2O	1.36	0.284	0.166 [2]	0.099	0.083 [3]	0.184	0.099
CH_4	0.4	0.255	0.050 [2]	0.198	0.166 [3]	0.046	0.198
NOx	4.32	5.832	5.752	43.032	34.82 [3]	13.524	43.032
SOx	0.392	0.369	0.68	5.478	4.382	4.692	5.478
VOC	7.92	6.654	1.977	3.649	2.919	0.969	3.649
CO	62.88	62.925	5.19	11.682	9.346	10.488	11.682
TSP	0.173	0.129	0.978	2.244	1.795	2.3	2.244
PM10	0.168	0.125	0.978	2.244	1.795	2.3	2.244
PM2.5	0.156	0.116	0.9	2.064	1.651	2.116	2.064
HC	8.489	8.132	1.878	3.465	2.772	0.92	3.465

Notes:

1. Values derived from the HEAT model except as noted under 2 and 3
2. Based on IPCC Guidelines 1996, Table 1-38, European Diesel, Light Duty Vehicle, Moderate Control
3. Based on IPCC Guidelines 1996, Table 1-39, European Diesel, Heavy Duty Vehicle, Moderate Control

The emission factors for CO_2, N_2O and CH4 were transformed into CO_2eq using Global Warming Potential (GWP) factors of IPCC, namely 1, 310 and 21 respectively.

D.1.4 Emissions per vehicle-kilometre travelled

For road based urban passenger transport, emissions per litre of fuel were converted to emissions per kilometre travelled for each vehicle category through use of fuel consumption factors derived earlier.

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5 International Council for Local Environmental Initiatives (ICLEI) <http://www.iclei.org/heat>

6 Stone, Adrian and Bennett, Kevin. A Bulk Model of Emissions from South Africa Diesel Commercial Vehicles. Energy Research Institute (ERI) University of Cape Town. http://www.eri.uct.ac.za/eri%20publications/NACA.pdf

D.1.5 Upstream emissions

The basic factors derived for road transport vehicles from the preceding process only consider end-use emissions of the vehicles. The process of extraction, production and transport of fuels results in additional upstream pollution and GHG emissions. A reduction of fuel usage thus reduces more than the combustion emissions. Several detailed methodologies are available, including the Lifecycle Emissions Model (LEM), developed by Mark Delucchi (2003)[7] at the University of California, Davis and the Green House Gases, Regulated Emissions and Energy Use in Transportation (GREET)[8].

For the purposes of this analysis a simplistic assumption, as used in the approved CDM Methodology of the Bogotá BRT, was applied; i.e., an additional factor of 18% was added to the calculated direct emissions to account for upstream emissions.

D.1.6 Factors likely to change under the "Business as Usual" or Baseline scenario

Technology improvement factor:
Fuel consumption and vehicle emissions are likely to improve over the life cycle of the interventions envisaged under this project. This effect must be incorporated into methodology. Technological improvement factors are dependent on a wide variety of factors including e.g. the current vehicle technology, fuel specifications, relative fuel prices, disposable income, consumer preferences etc. The Bogotá CDM procedure utilises a constant improvement factor based on historical and trend forecasts over a total vehicle population group reasonably includes all these factors. The factor used was 1% per annum.

Load factors and vehicle fleet changes:
Changes in load factors and vehicle fleet are expected to occur regardless of any intervention from this project. In particular the Taxi Recapitalisation Programme will introduce larger, modern Mini-bus taxis will have a significant impact on vehicle emissions. The baseline scenario assumed that occupancy of the Recapitalised vehicles would be 25% higher than existing vehicles, and that they would replace the existing minibus taxi fleet over a four year period commencing in 2007.

D.2 Methodology for efficiency improvement interventions

The preceding methodology will not be adequate to assess interventions that are not anticipated to result in significant mode shift. Projects which improve the efficiency of operation of the urban road network fall into this category. Benefits from such projects will result from reduced fuel consumption and vehicle emissions from:

- Increased cruise speed due to reduced congestion
- Fewer stop – go cycles involving acceleration and deceleration
- Less idling time due to reduced queuing time at intersections

Recent research to quantify the impact of vehicle stops on fuel consumption and emissions of hydrocarbons, carbon monoxide, and oxides of nitrogen indicates that the vehicle fuel consumption rate, and hence CO_2 emission, is more sensitive to cruise speed levels than to vehicle stops[9]. The study found

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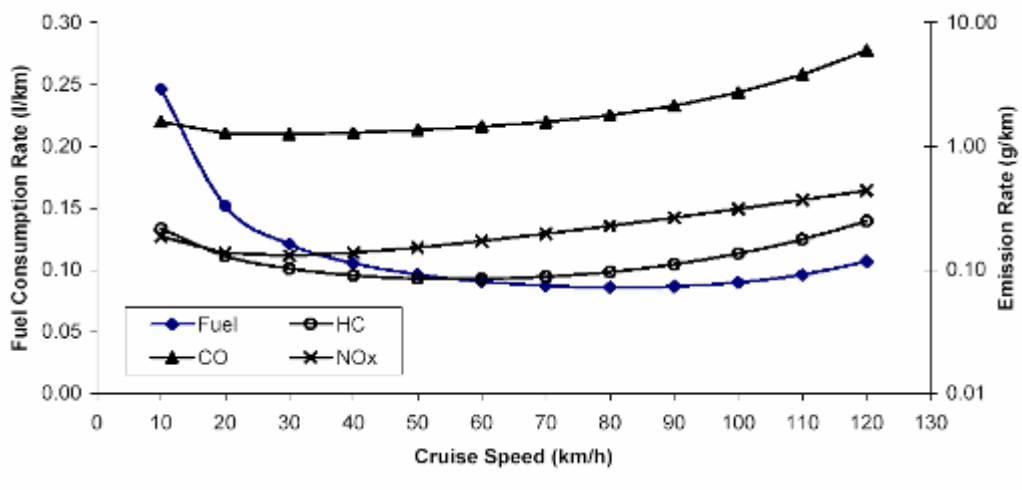
7 Delucchi, Mark, "Lifecycle Emissions Model," documented at < http://its.ucdavis.edu/faculty/delucchi.htm> 2003.

8 Sponsored by the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE), http://www.transportation.anl.gov/software/GREET/index.html .

9 "Impact Stops on Vehicle Fuel Consumption and Emissions" by Hesham Rakha and Yonglian Ding . Transp. Engrg., Volume 131, Issue 7, pp. 571-573 (July 2005)

that vehicle fuel consumption and emission rates increased considerably as a vehicle stop was introduced, especially at high cruising speeds. At speeds of less than 50 km/h the effect of a stop was slight. Vehicle fuel consumption was more sensitive to constant cruise speed levels than it was to vehicle stops.

Given the focus of this analysis on Green House Gas Emission, and the dominant contribution of CO_2 to total GHG emission, a simplistic approach to quantifying the effect of congestion reduction measures was used. This approach calculated GHG emissions based upon the change in fuel consumption resulting from a change in average cruise speed. This relationship is shown in the figure below:



Source: Bakha and Ding 2005

In order to retain a degree of comparability with the analysis of mode-shift interventions, baseline emissions were calculated using the same emission rates and vehicle.km approach as described in the preceding section. I.e. Base-line emissions were assumed to be independent of vehicle speed as was the case in assessing mode-shift interventions. For assessment of the GEF alternative, the analysis determined the percentage change in fuel consumption resulting from the anticipated before and after travel speeds. This change was applied to the CO_2 emissions. Other emissions were assumed to be unchanged.

D.3 Calculation of emission reduction

D.3.1 Rea Vaya BRT in Johannesburg

Input data

Baseline traffic conditions on the proposed BRT network are shown in the following table for the morning peak period of three hours in 2006.

After implementation of the BRT system it has been assumed that:
1. 20% of private car users will transfer to the BRT and 80% remain in their cars
2. A strict regulation and enforcement regime is implemented that will result in all bus and taxi passengers moving to BRT
3. The BRT uses 160-seater articulated vehicles operating at 80% peak load factor

ROUTE DESCRIPTION	LENGTH (KM)	AM PEAK VEHICLES (AVE.)					
		PRIVATE	TAXI	BUS	PRIVATE	TAXI	BUS
Lenasia-Highgate-Sunninghill	50.65	2015	620	55	102060	31403	2786
Sunninghill-Highgate-Lenasia	50.65	1020	0	0	51663	0	0
Dobsonville-Troyeville	23.67	1900	1825	20	44973	43198	473
Troyeville-Dobsonville	23.67	500	30	0	11835	710	0
Regina Mundi-CBD	22.63		1015	10	45260	22969	226
CBD-Sandton	12.35		280	12	0	3458	148
Sandton-Alexandra	6.17	2000	50	0		309	0
Alexandra-Sandton	6.17		590	5	8021	3640	31
Sandton-CBD	12.35		185	5	0	2285	62
CBD-Regina Mundi	22.63	1300	0	0	0	0	0
Randburg-CBD	19.55	2000	55	35	39100	1075	684
CBD-Randburg	19.55	1450	70	2	28348	1369	39
Nasrec-Ellis Park*	12.28	1585	0	0	19464	0	0
Ellis Park-Nasrec	12.28	1010	0	0	12403	0	0
* This is not a current public transport route - will be specifically for the 2010 World Cup				**Total**	**331259**	**110416**	**4450**

The resulting (2006) traffic volumes after implementation of the Rea Vaya BRT system are shown below.

ROUTE DESCRIPTION	LENGTH (KM)	AM PEAK VEHICLES		VEHICLE KM	
		PRIVATE	BRT	PRIVATE	BRT
Lenasia-Highgate-Sunninghill	50.65	1610	11	81547	557
Sunninghill-Highgate-Lenasia	50.65	815	2	41280	101
Dobsonville-Troyeville	23.67	1520	227	35978	5373
Troyeville-Dobsonville	23.67	400	5	9468	118
Regina Mundi-CBD	22.63		127	36208	2874
CBD-Sandton	12.35		38	0	469
Sandton-Alexandra	6.17	1600	6	0	37
Alexandra-Sandton	6.17		74	6417	457
Sandton-CBD	12.35		24	0	296
CBD-Regina Mundi	22.63	1040	0	0	0
Randburg-CBD	19.55	1600	26	31280	508
CBD-Randburg	19.55	1160	12	22678	235
Nasrec-Ellis Park*	12.28	1270	3	15596	37
Ellis Park-Nasrec	12.28	800	2	9824	25
* This is not a current public transport route - will be specifically for the 2010 World Cup			**Total**	**264855**	**11026**

Other input assumptions were:

- Passenger growth = 3%, based upon historical travel demand growth in the Johannesburg region and anticipated changes in population, car ownership and economic activity in the region over the analysis period.
- Car occupancy and average trip length remain unchanged
- Factor to convert AM Peak 3 hour volumes to daily values = 2.4

- Equivalent weekdays per year = 285

Summary outputs

The expected reduction in CO_2eq over operational period of ten years is 321,206 tonnes. Emission reductions in the first year of operation (2010) are shown in the following table

Greenhouse gases (tonne/year)		Other pollutants (tonne/year)	
CO_2	29,375	NOx	24
N_2O	9	SOx	2
CH_4	3	VOC	59
		CO	411
		TSP	6
		PM10	6
		PM2.5	5
		HC	62

D.3.2 Khulani Corridor BRT in Nelson Mandela Bay

Input data

Baseline traffic conditions on the proposed BRT corridor are shown in the following table for the morning peak period of three hours in 2006.

ROUTE DESCRIPTION		LENGTH (KM)	AM PEAK VEHICLES			AM PEAK VEH.KM		
			CAR	TAXI	BUS	CAR	TAXI	BUS
Motherwell – Njoli Square	In	9.7	1297	155	110	12581	1504	1067
	Out	9.7	1028	103	68	9972	999	660
Njoli Square – Sheya Kulati / N2	In	6.8	760	636	118	5168	4325	802
	Out	6.8	620	347	88	4216	2360	598
Kempston Rd – N2 – Standford Rd	In	3	1687	153	48	5061	459	144
	Out	3	1790	84	36	5370	252	108
Standford Rd – Cleary – Korsten	In	7	4592	217	53	32144	1519	371
	Out	7	2255	152	37	15785	1064	259
Langenhoven Dve – Greenacres – Korsten	In	2.4	1761	123	52	4226	295	125
	Out	2.4	1756	104	42	4214	250	101
Harrower Rd – Govan Mbeki Ave	In	2.7	2865	175	35	7736	473	95
	Out	2.7	1946	108	24	5254	292	65
Govan Mbeki Ave – Russell Rd	In	1.8	1990	220	54	3582	396	0
	Out	1.8	1280	140	38	2304	252	0
					Total	**117613**	**14438**	**4394**

After implementation of the BRT system it has been assumed that:

The resulting (2006) traffic volumes after implementation of the Rea Vaya BRT system are shown below.

ROUTE DESCRIPTION		LENGTH (KM)	AM PEAK VEHICLES			VEHICLE KM		
			CAR	TAXI	BRT	CAR	TAXI	BRT
Motherwell – Njoli Square	In	9.7	1297	78	87	12581	757	844
	Out	9.7	1028	52	58	9972	504	563
Njoli Square – Sheya Kulati / N2	In	5	760	318	130	3800	1590	650
	Out	5	620	174	109	3100	870	545
Kempston Rd – N2 – Standford Rd	In	3	1687	77	54	5061	231	162
	Out	3	1790	42	43	5370	126	129
Standford Rd – Cleary – Korsten	In	7	4592	109	54	32144	763	378
	Out	7	2255	76	43	15785	532	301
Langenhoven Dve – Greenacres – Korsten	In	1.8	1761	62	54	3170	112	97
	Out	1.8	1756	52	43	3161	94	77
Harrower Rd – Govan Mbeki Ave	In	2.5	2865	88	54	7163	220	135
	Out	2.5	1946	54	43	4865	135	108
Govan Mbeki Ave – Russell Rd	In	1.8	1990	110	54	3582	198	97
	Out	1.8	1280	70	43	2304	126	77
					Total	**112057**	**6257**	**4163**

Other input assumptions were:

- Passenger growth = 2.5% based upon historical travel demand growth in the Nelson Mandela Bay Metropolitan area region and anticipated changes in population, car ownership and economic activity in the region over the analysis period.
- Car occupancy and average trip length remain unchanged
- Factor to convert AM Peak 3 hour volumes to daily values = 2.4
- Equivalent weekdays per year = 285

Summary outputs

Emission reductions in the first year of operation (2010) are shown in the following table

Greenhouse gases (tonne/year)		Other pollutants (tonne/year)	
CO_2	2,768	NOx	15
N_2O	0.8	SOx	2
CH_4	0.3	VOC	6
		CO	37
		TSP	1
		PM10	1
		PM2.5	1
		HC	6

The expected reduction in CO_2eq over operational period of ten years is 30,602 tonnes.

D.3.3 Mbombela High Occupancy Vehicle Lane

Input data

Baseline traffic conditions for the morning peak hour on the proposed HOV corridor are shown in the following table.

ROUTE DESCRIPTION		Length (KM)	AM PEAK HOUR VEHICLES				VEHICLE KM			
			Car	Taxi	Bus	HGV	Car	Taxi	Bus	HGV
John Vorster - Sarel Cilliers	NB	1	1900	10	9	95	3800	20	18	190
	SB	1	700	9	8	35	1400	18	16	70
Sarel Villiers - Piet Retief	NB	0.6	2100	10	9	105	4200	20	18	210
	SB	0.6	800	9	8	40	1600	18	16	80
Piet Retief - N4	NB	0.3	2400	10	9	120	4800	20	18	240
	SB	0.3	1400	9	9	70	2800	18	18	140
N4 - Andrew	NB	0.5	1600	10	9	80	3200	20	18	160
	SB	0.6	1300	9	9	65	2600	18	18	130
Andrew - Riverside	NB	4.1	2200	10	9	110	4400	20	18	220
	SB	4.1	2150	9	9	108	4300	18	18	215
						Total	**33100**	**190**	**176**	**1655**

In congested urban conditions the greatest portion of travel time occurs at interactions. To calculate the reduction in travel capacity analysis was done of the performance of intersections in the corridor both with and without the proposed improvements. This analysis gave the following results.

Intersection	Total volume entering the intersection	Reduction in travel time (sec / veh)
Sarel Celliers Road	4800	108
Piet Retief	6100	109
N4	6250	266
Andrew Street	7100	40
All intersections		523

Based on an estimated current travel speed of 30 km/h the saving of 523 seconds gives an approximate travel speed after the intervention of 53 km/h. Applying the graph from Bakha and Ding shown earlier gave fuel consumption figures as shown in the table below.

	Travel time (minutes)	Speed (km/h)	Fuel consumption	
			l/km	km/l
Before	20	30	0.122	8.2
After	8.7	53	0.093	10.8
Change			-23%	+30%

The baseline value of car fuel consumption of 8.2 km/l obtained from the Bakha and Ding graph at 30km/h travel speed corresponds very well with the assumed urban cycle fuel consumption of 8 km/l used in the mode-shift analysis. With the GEF alternative of HOV lanes, average speed is expected to increase to 53 Km/h and distance travelled per litre of fuel to improve by 30% to 10.8 km/l. This also corresponds to a reduction of 23% in fuel consumption (litres per km). This factor was applied to the baseline estimate of CO_2 to derive the reduction expected from this intervention. As explained in the methodology section, all other pollutants were assumed to remain unchanged.

Other input assumptions were:

- Passenger growth = 5% based upon historical travel demand growth in the Mbombela region and anticipated continued rapid growth in population, car ownership and economic activity in the region over the analysis period.
- Car occupancy and average trip length remain unchanged
- Factor to convert AM Peak hour volumes to daily values = 6 (assumes no benefits outside the AM and PM peak periods when congestion is low)
- Equivalent weekdays per year = 285

Summary outputs

CO_2 Emission reductions in the first year of operation (2010) were estimated as 3,665 tonnes, and over the ten-year operational period of the HOV lane total reductions in CO_2 equivalent emissions amount to 39,176 tonnes.

D.3.4 NMT projects

Input data for Mangaung

Baseline traffic conditions for the morning peak hour on the proposed NMT corridor are shown in the following table:

ROUTE DESCRIPTION		LENGTH (KM)	AM PEAK HOUR VEHICLES				VEHICLE KM			
			Car	Taxi	Bus	HGV	Car	Taxi	Bus	HGV
Harvey - Hamilton	SEBound	0.6	871	38	40	24	523	23	24	14
	NWBound	0.6	1079	78	64	39	647	47	38	23
Hamilton - Magatho	SEBound	0.47	723	29	31	18	340	14	15	8
	NWBound	0.47	926	79	69	53	435	37	32	25
Magatho - Mkuhlane	SEBound	0.93	117	6	6	3	109	6	6	3
	NWBound	0.93	1094	87	72	34	1017	81	67	32
Mkuhlane - Moshoeshoe	SEBound	1.67	58	2	2	1	97	3	3	2
	NWBound	1.67	545	59	50	23	910	99	84	38
		3.67			Total		4078	309	269	146

The GEF alternative intends to promote significant use of substantially cheaper non-motorized modes of transport (NMT) particularly walking and cycling in the corridor between Mangaung and the Bloemfontein CBD. The intervention also aims to facilitate a modal shift from motorized transport to non-motorized transport modes over the 4 km corridor. The mode shift assumed for the purposes of GHG emission calculations are:

- 2.5% mode shift from private cars assumed
- 5% Mode shift from Public Transport modes of Taxi and Bus
- No shift from HGV's

Other input assumptions were:

- Passenger growth = 3% based upon historical travel demand growth in the Mangaung region and anticipated changes in population, car ownership and economic activity in the region over the analysis period.
- Car occupancy and average trip length remain unchanged
- Factor to convert AM Peak hour volumes to daily values = 10
- Equivalent weekdays per year = 285

Summary outputs for Mangaung

Emission reductions in the first year of operation (2010) are shown in the following table, while the expected reduction in CO_2eq over operational period of ten years is 2,006 tonnes.

Green House Gases (tonne/year)		Other pollutants (tonne / year)	
CO2	161	NOx	1
N2O	0.1	SOx	0
CH4	0.0	VOC	0
		CO	3
		TSP	0
		PM10	0
		PM2.5	0
		HC	0

Input data for Polokwane

Given the extensive nature of the proposed NMT network in Polokwane it was not possible to collect traffic data on the proposed routes. For the purposes of this analysis the potential reduction in GHG emissions for the Polokwane NMT network has been assumed to be the same per kilometre of NMT route as calculated for Mangaung.

Summary outputs for Polokwane

Emission reductions in the first year of operation (2010) are shown in the following table

Green House Gases (tonne/year)		Other pollutants (tonne / year)	
CO_2	2,419	NOx	12
N_2O	1	SOx	1
CH_4	0	VOC	6
		CO	40
		TSP	1
		PM10	1
		PM2.5	1
		HC	6

The expected reduction in CO_2eq over operational period of ten years is 30,062 tonnes.

Input data for Rustenburg

At the time of this analysis Rustenburg has just commissioned consulting services to prepare and ITP. Traffic count data was not available at the time of this analysis. From field observation traffic volumes in Phokeng are significantly lower than in the Mangaung corridor. Application of the unit rates of GHG reduction per kilometre of NMT route (as used for Polokwane) was therefore considered inappropriate. Until such time as traffic counts are available no GHG reduction for the Rustenburg NMT project has been included in the total savings of the GEF project.

D.4 Replication and calculation of indirect benefits

The replicability of the interventions described above was assessed for the Metropolitan areas of South Africa. The expected reduction in GHG emissions for each type of intervention (BRT, HOV lanes and NMT lanes) had been quantified in the preceding section. The replicability of these interventions was quantified on the following basis.

- The magnitude of the intervention in each city was assumed to be proportional to the population of the city. For example City A with twice the population of City B was assumed to have potential for twice the length of BRT, HOV and NMT lanes.
- Johannesburg was taken as the reference case for BRT and the potential GHG reduction in other cities was calculated pro-rata to the reductions calculated for Johannesburg.
- BRT systems were not considered viable for replication in cities with population less than 1 million, due to lower density of demand.
- HOV lanes were considered favourable for replication in all cities, and were considered as supplementary to the BRT and not in competition for implementation in the same corridors. The cities with over 1 million of people could therefore have both a BRT system and HOV lanes.
- Mangaung was taken as the reference case for NMT infrastructure. All other metropolitan areas were considered as potential sites for replication of pedestrian walkways and cycle lanes.

From the above process the replication factors for potential reduction in CO_2-eq from implementing similar in other South Africa Metropolitan areas is shown in the table below.

Metropolitan areas	**Pop (mill)**	**BRT**	**HOV**	**NMT**
Johannesburg	3.295	Baseline	4.49	4.67
eThekwini	3.162	0.96	4.31	4.49
Cape Town	2.969	0.90	4.04	4.21
Ekurhuleni	2.528	0.77	3.44	3.59
Tshwane	2.04	0.62	2.78	2.89
Nelson Mandela Bay	1.1		1.50	1.56
Buffalo City	0.765		1.04	1.09
Mangaung	0.705		0.96	1.00
Msunduzi	0.565		0.77	0.80
Total SA Metropolitan areas		3.25	23.33	24.30

Applying the replication factors in the matrix above to the estimated CO_2-eq for the baseline cities, (namely Johanneburg for BRT, Mbombela for HOV lanes and Mangaung for NMT infrastructure), resulted in the estimated potential for reduction by replication over a ten-year period shown in the table below.

Metropolitan areas	Potential reduction in tCO_2-eq by replication (over 10 years)			
	BRT	**HOV**	**NMT**	**Total**
Johannesburg		176,000	9,000	185,000
eThekwini	308,000	169,000	9,000	486,000
Cape Town	289,000	158,000	8,000	455,000
Ekurhuleni	246,000	135,000	7,000	388,000
Tshwane	199,000	109,000	6,000	314,000
Nelson Mandela Bay		59,000	3,000	62,000
Buffalo City		41,000	2,000	43,000
Mangaung		38,000	2,000	40,000
Msunduzi		30,000	2,000	32,000
Total SA Metropolitan areas	**1,042,000**	**915,000**	**48,000**	**2,005,000**

The above assessment can be considered conservative as HOV lanes and NMT infrastructure could be applied in smaller areas as well as the larger Metros considered in the analysis above.

D.5 Summary

Over the ten year analysis period the reduction in tonnes of CO_2-eq for each intervention under Outcome 1 is as follows:

Rea Vaya BRT in Johannesburg	321,206
Khulani Corridor BRT in Nelson Mandela Bay	30,602
R40 High Occupancy Vehicle lane in Mbombela	39,176
Polokwane Non Motorised Transport Network	30,062
Mangaung Non Motorised Network corridor	2,006
Rustenburg	Not calculated
Cape Town TDM	Not calculated

Total emissions are 423,000 t CO_2-eq over the ten year project life span. If the interventions proposed under this project are replicated in other Metropolitan areas of South Africa the indirect benefits of the project will amount to approximately 2 million tonnes of CO_2-eq over a ten year period.

Direct fuel consumption savings over the ten year analysis period are shown for each intervention in the table below:

Intervention	**Petrol Savings ('000 litres)**	**Diesel savings ('000 litres)**
Rea Vaya BRT	67,100	45,800
Khulani Corridor BRT	18,500	15,100
Mbombela HOV	13,900	1,700
Mangaung NMT	400	300
Polokwane NMT	6,400	5,200
Rustenburg NMT	Not calculated	Not calculated
Cape Town TDM	Not calculated	Not calculated
Total	**106,400**	**68,200**

D.6: Detailed GHG calculation sheets

Reduction in GHG & other emissions for Rea Vaya BRT network in Johannesburg

Assumptions	
Traffic growth =	3%
Daily:AM Peak 3 hour factor	2.4
Equivalent weekdays per year	285
Recpitalised Taxi Load Factor increas	25%
Technology improvement factor =	0.99
Upstream emission factor =	18%

Results		Direct	Direct & Upstream
Reduction in CO_2eq over operational period (tonnes)		293,135	345,899
Emission reductions in first year of operation (tonnes)			
Green House Gases	CO2	26,808	31,633
	N2O	9	11
	CH4	2	3
Other pollutants	NOx	-11	-13
	SOx	-3	-3
	VOC	56	66
	CO	402	474
	TSP	4	5
	PM10	4	5
	PM2.5	4	4
	HC	59	70

		Implementation period				Operational period of Rea Vaya BRT									
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Baseline		Veh.km AM Peak 3 hrs													
Car		331259	341197	351433	361976	372835	384020	395541	407407	419629	432218	445185	458540	472296	486465
Taxi Old		110416	85296	58570	30164										
Taxi Recap			22746	51542	72392	99419	102402	105474	108638	111897	115254	118711	122273	125941	129719
Bus		4450	4583	4721	4862	5008	5158	5313	5472	5637	5806	5980	6159	6344	6534
BRT			0	0	0	0	0	0	0	0	0	0	0	0	0
Alternative															
Car		264855	272801.1135	280985.1469	289414.7	298097.14	307040.057	316251.26	325738.8	335510.96	345576.29	355943.58	366621.88	377620.54	388949.16
Taxi Old		0	0	0	0										
Taxi Recap			0	0	0	0	0	0	0	0	0	0	0	0	0
Bus		0	0	0	0	0	0	0	0	0	0	0	0	0	0
BRT		15585	16052.138	16533.70214	17029.713	17540.605	18066.8227	18608.827	19167.092	19742.105	20334.368	20944.399	21572.731	22219.913	22886.511
Reduction in annual vehicle.km's ('000's)															
Car		45420	46783	48186	49632	51121	52654	54234	55861	57537	59263	61041	62872	64758	66701
Taxi Old		75524	58342	40062	20632	0	0	0	0	0	0	0	0	0	0
Taxi Recap		0	15558	35254	49516	68003	70043	72144	74308	76538	78834	81199	83635	86144	88728
Bus		3044	3135	3229	3326	3426	3528	3634	3743	3855	3971	4090	4213	4339	4470
BRT		-10660	-10980	-11309	-11648	-11998	-12358	-12728	-13110	-13504	-13909	-14326	-14756	-15198	-15654
Reduction in annual Fuel Consumption (litres, '000's)															
	Rate (km/l)	2006													
Car	8	5678	5848	6023	6204	6390	6582	6779	6983	7192	7408	7630	7859	8095	8338
Taxi Old	5.7	13250	10236	7028	3620	0	0	0	0	0	0	0	0	0	0
Taxi Recap	9.2	0	1691	3832	5382	7392	7613	7842	8077	8319	8569	8826	9091	9363	9644
Bus	3.3	922	950	978	1008	1038	1069	1101	1134	1168	1203	1239	1277	1315	1354
BRT	3.3	-3230	-3327	-3427	-3530	-3636	-3745	-3857	-3973	-4092	-4215	-4341	-4471	-4606	-4744

Reduction in annual pollutant emissions (tonnes)

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
CO_2	Rate (g/l)	**41178**	**37813**	**35157**	**30632**	**26808**	**27336**	**27874**	**28423**	**28983**	**29554**	**30137**	**30730**	**31336**	**31953**
Car	2482	14092	14369	14652	14941	15235	15535	15841	16154	16472	16796	17127	17465	17809	18159
Taxi Old	2482	32886	25151	17097	8717	0	0	0	0	0	0	0	0	0	0
Taxi Recap	2513	0	4207	9438	13124	17843	18195	18553	18919	19291	19671	20059	20454	20857	21268
Bus	2513	2318	2363	2410	2457	2506	2555	2605	2657	2709	2763	2817	2872	2929	2987
BRT	2513	-8118	-8278	-8441	-8607	-8776	-8949	-9126	-9305	-9489	-9676	-9866	-10061	-10259	-10461
N_2O	Rate (g/l)	**11**	**11**	**10**	**10**	**9**	**10**	**10**	**10**	**10**	**10**	**10**	**11**	**11**	**11**
Car	1.36	8	8	8	8	8	9	9	9	9	9	9	10	10	10
Taxi Old	0.284	4	3	2	1	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.166	0	0	1	1	1	1	1	1	1	1	1	1	1	1
Bus	0.099	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BRT	0.083	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_4		**5**	**5**	**4**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Car	0.4	2	2	2	2	2	3	3	3	3	3	3	3	3	3
Taxi Old	0.255	3	3	2	1	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	0.198	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BRT	0.166	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
Total Equiv. tonnes CO_2 / Year		**44794**	**41273**	**38471**	**33757**	**29753**	**30339**	**30937**	**31546**	**32167**	**32801**	**33447**	**34106**	**34778**	**35463**
NOx		**29**	**20**	**12**	**-1**	**-11**	**-12**	**-12**	**-12**	**-12**	**-13**	**-13**	**-13**	**-13**	**-14**
Car	4.32	25	25	26	26	27	27	28	28	29	29	30	30	31	32
Taxi Old	5.832	77	59	40	20	0	0	0	0	0	0	0	0	0	0
Taxi Recap	5.752	0	10	22	30	41	42	42	43	44	45	46	47	48	49
Bus	43.032	40	40	41	42	43	44	45	45	46	47	48	49	50	51
BRT	34.820	-112	-115	-117	-119	-122	-124	-126	-129	-131	-134	-137	-139	-142	-145
SOx		**-2**	**-2**	**-2**	**-2**	**-3**	**-3**	**-3**	**-3**	**-3**	**-3**	**-3**	**-3**	**-3**	**-3**
Car	0.392	2	2	2	2	2	2	3	3	3	3	3	3	3	3
Taxi Old	0.369	5	4	3	1	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.68	0	1	3	4	5	5	5	5	5	5	5	6	6	6
Bus	5.478	5	5	5	5	5	6	6	6	6	6	6	6	6	7
BRT	4.382	-14	-14	-15	-15	-15	-16	-16	-16	-17	-17	-17	-18	-18	-18
VOC		**127**	**110**	**94**	**75**	**56**	**57**	**58**	**59**	**61**	**62**	**63**	**64**	**66**	**67**
Car	7.92	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Taxi Old	6.654	88	67	46	23	0	0	0	0	0	0	0	0	0	0
Taxi Recap	1.977	0	3	7	10	14	14	15	15	15	15	16	16	16	17
Bus	3.649	3	3	3	4	4	4	4	4	4	4	4	4	4	4
BRT	2.919	-9	-10	-10	-10	-10	-10	-11	-11	-11	-11	-11	-12	-12	-12

CO		1171	991	804	606	402	410	418	426	434	443	452	461	470	479
Car	62.88	357	364	371	379	386	394	401	409	417	426	434	442	451	460
Taxi Old	62.925	834	638	433	221	0	0	0	0	0	0	0	0	0	0
Taxi Recap	5.19	0	9	19	27	37	38	38	39	40	41	41	42	43	44
Bus	11.682	11	11	11	11	12	12	12	12	13	13	13	13	14	14
BRT	9.346	-30	-31	-31	-32	-33	-33	-34	-35	-35	-36	-37	-37	-38	-39
TSP		-1	0	2	3	4	4	4	4	4	4	4	5	5	5
Car	0.173	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Taxi Old	0.129	2	1	1	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.978	0	2	4	5	7	7	7	7	8	8	8	8	8	8
Bus	2.244	2	2	2	2	2	2	2	2	2	2	3	3	3	3
BRT	1.795	-6	-6	-6	-6	-6	-6	-7	-7	-7	-7	-7	-7	-7	-7
PM10		-1	0	2	3	4	4	4	4	4	4	4	5	5	5
Car	0.168	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Taxi Old	0.125	2	1	1	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.978	0	2	4	5	7	7	7	7	8	8	8	8	8	8
Bus	2.244	2	2	2	2	2	2	2	2	2	2	3	3	3	3
BRT	1.795	-6	-6	-6	-6	-6	-6	-7	-7	-7	-7	-7	-7	-7	-7
PM2.5		-1	0	2	2	4	4	4	4	4	4	4	4	4	4
Car	0.156	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Taxi Old	0.116	2	1	1	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.9	0	2	3	5	6	7	7	7	7	7	7	7	7	8
Bus	2.064	2	2	2	2	2	2	2	2	2	2	2	2	2	2
BRT	1.651	-5	-5	-6	-6	-6	-6	-6	-6	-6	-6	-6	-7	-7	-7
HC		150	129	107	83	59	60	62	63	64	65	67	68	69	71
Car	8.489	48	49	50	51	52	53	54	55	56	57	59	60	61	62
Taxi Old	8.132	108	82	56	29	0	0	0	0	0	0	0	0	0	0
Taxi Recap	1.878	0	3	7	10	13	14	14	14	14	15	15	15	16	16
Bus	3.465	3	3	3	3	3	4	4	4	4	4	4	4	4	4
BRT	2.772	-9	-9	-9	-9	-10	-10	-10	-10	-10	-11	-11	-11	-11	-12

Reduction in GHG & other emissions for Khulani Corridor BRT in N. Mandela Bay

Assumptions	
Traffic growth =	3%
Daily:AM Peak 3 hour factor	2.4
Equivalent weekdays per year	285
Recpitalised Taxi Load Factor increas	25%
Technology improvement factor =	0.99
Upstream emission factor =	18%

Results		Direct	Direct & Upstream
Reduction in CO_2eq over operational period (tonnes)		30,602	36,110
Emission reductions in first year of operation (tonnes)			
Green House Gases	CO2	2,768	3,266
	N2O	0.8	1
	CH4	0.3	0
Other pollutants	NOx	15	18
	SOx	2	2
	VOC	6	7
	CO	37	44
	TSP	1	1
	PM10	1	1
	PM2.5	1	1
	HC	6	7

		Implementation period			Operational period of Khulani Corridor BRT									
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Baseline	Veh.km AM Peak 3 hrs													
Car	117613	120553	123567	126656	129823	133068	136395	139805	143300	146883	150555	154318	158176	162131
Taxi Old	14438	11099	7584	3887										
Taxi Recap		2960	6674	9329	12749	13068	13395	13730	14073	14425	14785	15155	15534	15922
Bus	4394	4504	4617	4732	4850	4972	5096	5223	5354	5488	5625	5766	5910	6058
BRT		0	0	0	0	0	0	0	0	0	0	0	0	0
Alternative														
Car	112057	114858	117729	120673	123690	126782	129951	133200	136530	139943	143442	147028	150704	154471
Taxi Old	6257	4693	3129	1564										
Taxi Recap		1251	2753	3754	5006	5006	5006	5006	5006	5006	5006	5006	5006	5006
Bus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BRT	4163	4267	4374	4483	4595	4710	4828	4949	5072	5199	5329	5462	5599	5739
Reduction in annual vehicle.km's ('000's)														
Car	3801	3896	3993	4093	4195	4300	4408	4518	4631	4746	4865	4987	5111	5239
Taxi Old	5596	4382	3048	1589	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0	1168	2682	3813	5297	5515	5738	5967	6202	6443	6689	6942	7201	7467
Bus	3006	3081	3158	3237	3318	3401	3486	3573	3662	3754	3848	3944	4042	4143
BRT	-2848	-2919	-2992	-3067	-3143	-3222	-3302	-3385	-3470	-3556	-3645	-3736	-3830	-3925
Reduction in annual Fuel Consumption (litres, '000's)														
Rate (km/l)		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Car	8	475	487	499	512	524	538	551	565	579	593	608	623	639	655
Taxi Old	5.7	982	769	535	279	0	0	0	0	0	0	0	0	0	0
Taxi Recap	9.2	0	127	292	414	576	599	624	649	674	700	727	755	783	812
Bus	3.3	911	934	957	981	1005	1031	1056	1083	1110	1137	1166	1195	1225	1256
BRT	3.3	-863	-884	-907	-929	-952	-976	-1001	-1026	-1051	-1078	-1105	-1132	-1161	-1190

Reduction in annual pollutant emissions (tonnes)

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
CO_2	Rate (g/l)	**3736**	**3524**	**3357**	**3040**	**2768**	**2831**	**2894**	**2959**	**3024**	**3090**	**3157**	**3224**	**3293**	**3362**
Car	2482	1179	1197	1214	1232	1250	1269	1287	1306	1326	1345	1365	1385	1406	1426
Taxi Old	2482	2437	1889	1301	671	0	0	0	0	0	0	0	0	0	0
Taxi Recap	2513	0	316	718	1011	1390	1433	1476	1519	1563	1608	1652	1698	1744	1790
Bus	2513	2289	2323	2357	2392	2427	2463	2499	2536	2573	2611	2650	2689	2729	2769
BRT	2513	-2169	-2200	-2233	-2266	-2299	-2333	-2368	-2403	-2438	-2474	-2510	-2547	-2585	-2623
N_2O	Rate (g/l)	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Car	1.36	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Taxi Old	0.284	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.166	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	0.099	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BRT	0.083	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_4		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Car	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Old	0.255	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	0.198	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BRT	0.166	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Equiv. tonnes CO_2 / Year		**4039**	**3815**	**3638**	**3306**	**3020**	**3087**	**3155**	**3224**	**3294**	**3364**	**3435**	**3508**	**3580**	**3654**
NOx		**17**	**17**	**16**	**16**	**15**	**15**	**16**	**16**	**16**	**16**	**17**	**17**	**17**	**18**
Car	4.32	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Taxi Old	5.832	6	4	3	2	0	0	0	0	0	0	0	0	0	0
Taxi Recap	5.752	0	1	2	2	3	3	3	3	4	4	4	4	4	4
Bus	43.032	39	40	40	41	42	42	43	43	44	45	45	46	47	47
BRT	34.820	-30	-30	-31	-31	-32	-32	-33	-33	-34	-34	-35	-35	-36	-36
SOx		**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
Car	0.392	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Old	0.369	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.68	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	5.478	5	5	5	5	5	5	5	6	6	6	6	6	6	6
BRT	4.382	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-5	-5
VOC		**11**	**10**	**9**	**7**	**6**	**6**	**6**	**6**	**6**	**6**	**7**	**7**	**7**	**7**
Car	7.92	4	4	4	4	4	4	4	4	4	4	4	4	4	5
Taxi Old	6.654	7	5	3	2	0	0	0	0	0	0	0	0	0	0
Taxi Recap	1.977	0	0	1	1	1	1	1	1	1	1	1	1	1	1
Bus	3.649	3	3	3	3	4	4	4	4	4	4	4	4	4	4
BRT	2.919	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3

CO		**94**	**81**	**68**	**53**	**37**	**38**	**38**	**39**	**40**	**40**	**41**	**42**	**42**	**43**
Car	62.88	30	30	31	31	32	32	33	33	34	34	35	35	36	36
Taxi Old	62.925	62	48	33	17	0	0	0	0	0	0	0	0	0	0
Taxi Recap	5.19	0	1	1	2	3	3	3	3	3	3	3	4	4	4
Bus	11.682	11	11	11	11	11	11	12	12	12	12	12	12	13	13
BRT	9.346	-8	-8	-8	-8	-9	-9	-9	-9	-9	-9	-9	-9	-10	-10
TSP		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Car	0.173	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Old	0.129	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.978	0	0	0	0	1	1	1	1	1	1	1	1	1	1
Bus	2.244	2	2	2	2	2	2	2	2	2	2	2	2	2	2
BRT	1.795	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
PM10		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Car	0.168	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Old	0.125	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.978	0	0	0	0	1	1	1	1	1	1	1	1	1	1
Bus	2.244	2	2	2	2	2	2	2	2	2	2	2	2	2	2
BRT	1.795	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
PM2.5		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Car	0.156	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Old	0.116	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.9	0	0	0	0	0	1	1	1	1	1	1	1	1	1
Bus	2.064	2	2	2	2	2	2	2	2	2	2	2	2	2	2
BRT	1.651	-1	-1	-1	-1	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
HC		**13**	**11**	**10**	**8**	**6**	**6**	**6**	**6**	**7**	**7**	**7**	**7**	**7**	**7**
Car	8.489	4	4	4	4	4	4	4	4	5	5	5	5	5	5
Taxi Old	8.132	8	6	4	2	0	0	0	0	0	0	0	0	0	0
Taxi Recap	1.878	0	0	1	1	1	1	1	1	1	1	1	1	1	1
Bus	3.465	3	3	3	3	3	3	3	3	4	4	4	4	4	4
BRT	2.772	-2	-2	-2	-2	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3

Reduction in GHG & other emissions for Mbombela High Occupancy Vehicle Lane

Assumptions	
Traffic growth =	3%
Daily:Peak hour factor	6
Equivalent weekdays per year	285
Recpitalised Taxi Load Factor increase	25%
Reduction in fuel consumption with project	23%
Technology improvement factor =	0.99
Upstream emission factor	18%

Results		Direct	Direct & Upstream
Reduction in CO_2eq over operational period (tonnes)		39,176	46,227
Emission reductions in first year of operation (tonnes)			
Green House Gases	CO2	3,665	4,324
	N2O	1.8	2
	CH4	0.6	1
Other pollutants	NOx	13	15
	SOx	1	2
	VOC	11	13
	CO	84	99
	TSP	1	1
	PM10	1	1
	PM2.5	1	1
	HC	12	14

			Implementation period			Operational period of Mbombela HOV Lane									
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Baseline		Veh.km AM Peak 3 hrs													
Car		24895	25517	26155	26809	27479	28166	28871	29592	30332	31090	31868	32664	33481	34318
Taxi Old		124	96	65	33										
Taxi Recap			26	58	80	110	113	115	118	121	124	127	131	134	137
Bus		116	119	122	125	128	132	135	138	142	145	149	153	156	160
Heavy Goods Vehicle		1245	1275.86875	1307.765469	1340.4596	1373.9711	1408.32037	1443.5284	1479.6166	1516.607	1554.5222	1593.3852	1633.2199	1674.0504	1715.9016
Alternative															
Car		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Old		0	0	0	0										
Taxi Recap			0	0	0	0	0	0	0	0	0	0	0	0	0
Bus		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reduction in annual vehicle.km's ('000's)															
Car		42570	43635	44726	45844	46990	48165	49369	50603	51868	53165	54494	55856	57253	58684
Taxi Old		213	164	112	57	0	0	0	0	0	0	0	0	0	0
Taxi Recap		0	44	98	137	188	193	197	202	207	213	218	223	229	235
Bus		199	204	209	214	220	225	231	236	242	248	255	261	267	274
Heavy Goods Vehicle		2129	2182	2236	2292	2349	2408	2468	2530	2593	2658	2725	2793	2863	2934
Reduction in annual Fuel Consumption (litres, '000's)															
	Base rate (k	Reductic	2006												
Car	8	23%	1224	1254	1286	1318	1351	1385	1419	1455	1491	1528	1567	1606	1646	1687
Taxi Old	5.7	23%	9	7	5	2	0	0	0	0	0	0	0	0	0	0
Taxi Recap	9.2	23%	0	1	2	3	5	5	5	5	5	5	5	6	6	6
Bus	3.3	23%	14	14	15	15	15	16	16	16	17	17	18	18	19	19
Heavy Goods Vehicle	3.3	23%	148	152	156	160	164	168	172	176	181	185	190	195	200	205

Reduction in annual pollutant emissions (tonnes)

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
CO_2	Rate (g/l)	**3467**	**3515**	**3565**	**3614**	**3665**	**3719**	**3773**	**3829**	**3886**	**3943**	**4001**	**4060**	**4120**	**4181**
Car	2482	3038	3083	3128	3174	3221	3268	3317	3366	3415	3466	3517	3569	3621	3675
Taxi Old	2482	21	16	11	6	0	0	0	0	0	0	0	0	0	0
Taxi Recap	2513	0	3	6	8	11	12	12	12	12	12	12	13	13	13
Bus	2513	35	35	36	36	37	37	38	39	39	40	40	41	42	42
Heavy Goods Vehicle	2513	373	378	384	390	395	401	407	413	419	425	432	438	444	451
N_2O	Rate (g/l)	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
Car	1.36	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Taxi Old	0.284	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.166	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	0.099	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle	0.099	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_4		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Car	0.4	0	0	1	1	1	1	1	1	1	1	1	1	1	1
Taxi Old	0.255	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	0.198	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle	0.198	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Equiv. tonnes CO_2 / Year		**3999**	**4056**	**4113**	**4170**	**4229**	**4291**	**4354**	**4419**	**4484**	**4550**	**4617**	**4685**	**4754**	**4824**
NOx		**12**	**12**	**13**	**13**	**13**	**13**	**13**	**14**	**14**	**14**	**14**	**14**	**15**	**15**
Car	4.32	5	5	5	6	6	6	6	6	6	6	6	6	6	6
Taxi Old	5.832	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	5.752	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	43.032	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Heavy Goods Vehicle	43.032	6	6	7	7	7	7	7	7	7	7	7	7	8	8
SOx		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
Car	0.392	0	0	0	1	1	1	1	1	1	1	1	1	1	1
Taxi Old	0.369	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.68	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	5.478	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle	5.478	1	1	1	1	1	1	1	1	1	1	1	1	1	1
VOC		**10**	**10**	**11**	**11**	**11**	**11**	**11**	**11**	**12**	**12**	**12**	**12**	**12**	**12**
Car	7.92	10	10	10	10	10	10	11	11	11	11	11	11	12	12
Taxi Old	6.654	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	1.977	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	3.649	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle	3.649	1	1	1	1	1	1	1	1	1	1	1	1	1	1

CO		79	80	81	83	84	85	86	87	89	90	91	93	94	95
Car	62.88	77	78	79	80	82	83	84	85	87	88	89	90	92	93
Taxi Old	62.925	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	5.19	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	11.682	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle	11.682	2	2	2	2	2	2	2	2	2	2	2	2	2	2
TSP		1	1	1	1	1	1	1	1	1	1	1	1	1	1
Car	0.173	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Old	0.129	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.978	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	2.244	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle	2.244	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM10		1	1	1	1	1	1	1	1	1	1	1	1	1	1
Car	0.168	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Old	0.125	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.978	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	2.244	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle	2.244	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM2.5		1	1	1	1	1	1	1	1	1	1	1	1	1	1
Car	0.156	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Old	0.116	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	2.064	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle	2.064	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HC		11	11	11	11	12	12	12	12	12	13	13	13	13	13
Car	8.489	10	11	11	11	11	11	11	12	12	12	12	12	12	13
Taxi Old	8.132	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	1.878	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	3.465	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle	3.465	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Reduction in GHG & other emissions for Mangaung & Polokwane NMT projects

Assumptions	
Traffic growth =	3%
Daily:Peak hour factor	10
Equivalent weekdays per year	285
Recpitalised Taxi Load Factor increase	25%
Technology improvement factor =	0.99
Upstream emission factor =	18%
Mangaung route length	3.7
Polokwane Route length	55.0
Ratio Polkwane : Mangaung	15.0

Results for Mangaung		Direct	Direct & Upstream
Reduction in CO_2eq over operational period (tonnes)		2,006	2,367
Emission reductions in first year of operation (tonnes)			
Green House Gases	CO2	161	190
	N2O	0.1	0
	CH4	0.0	0
Other pollutants	NOx	1	1
	SOx	0	0
	VOC	0	0
	CO	3	3
	TSP	0	0
	PM10	0	0
	PM2.5	0	0
	HC	0	0

Results for Polokwane		Direct	Direct & Upstream
Reduction in CO_2eq over operational period (tonnes)		30,062	35,473
Emission reductions in first year of operation (tonnes)			
Green House Gases	CO2	2,419	2,854
	N2O	1	1
	CH4	0	0
Other pollutants	NOx	12	14
	SOx	1	2
	VOC	6	7
	CO	40	47
	TSP	1	1
	PM10	1	1
	PM2.5	1	1
	HC	6	7

		Implementation period			Operational period of Mangaung NMT Lane									
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Baseline	Veh.km AM Peak 3 hrs													
Car	4078	4201	4327	4456	4590	4728	4870	5016	5166	5321	5481	5645	5815	5989
Taxi Old	309	238	164	84										
Taxi Recap		64	144	202	278	286	295	304	313	322	332	342	352	363
Bus	269	277	285	294	303	312	321	331	340	351	361	372	383	395
Heavy Goods Vehicle	146	150	155	159	164	169	174	179	185	190	196	202	208	214
Alternative														
Car	3976	4096	4218	4345	4475	4610	4748	4890	5037	5188	5344	5504	5669	5839
Taxi Old	293	220	147	73										
Taxi Recap		59	129	176	235	235	235	235	235	235	235	235	235	235
Bus	255	263	271	279	287	296	305	314	323	333	343	353	364	375
Heavy Goods Vehicle	146	150	155	159	164	169	174	179	185	190	196	202	208	214
Reduction in annual vehicle.km's ('000's)														
Car	291	299	308	318	327	337	347	357	368	379	391	402	414	427
Taxi Old	44	53	49	31	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0	14	43	75	124	147	172	197	223	250	277	306	335	365
Bus	38	39	41	42	43	44	46	47	49	50	51	53	55	56
Heavy Goods Vehicle	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reduction in annual Fuel Consumption (litres, '000's)														
Base rate (k	2006													
Car 8	36	37	39	40	41	42	43	45	46	47	49	50	52	53
Taxi Old 5.7	8	9	9	6	0	0	0	0	0	0	0	0	0	0
Taxi Recap 9.2	0	2	5	8	13	16	19	21	24	27	30	33	36	40
Bus 3.3	12	12	12	13	13	13	14	14	15	15	16	16	17	17
Heavy Goods Vehicle 3.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Reduction in annual pollutant emissions (tonnes)

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
CO_2	Rate (g/l)	**138**	**148**	**156**	**160**	**161**	**170**	**178**	**187**	**196**	**205**	**214**	**223**	**232**	**241**
Car	2482	90	92	94	96	97	99	101	103	105	107	110	112	114	116
Taxi Old	2482	19	23	21	13	0	0	0	0	0	0	0	0	0	0
Taxi Recap	2513	0	4	11	20	32	38	44	50	56	62	68	75	81	87
Bus	2513	29	30	30	31	32	32	33	33	34	35	35	36	37	38
Heavy Goods Vehicle	2513	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N_2O	Rate (g/l)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Car	1.36	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Old	0.284	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.166	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	0.099	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle	0.099	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH_4		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Car	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Old	0.255	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	0.198	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle	0.198	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Equiv. tonnes CO_2 / Year		**155**	**166**	**174**	**178**	**179**	**188**	**197**	**206**	**216**	**225**	**234**	**244**	**254**	**264**
NOx		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Car	4.32	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Old	5.832	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	5.752	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	43.032	0	1	1	1	1	1	1	1	1	1	1	1	1	1
Heavy Goods Vehicle	43.032	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SOx		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Car	0.392	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Old	0.369	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.68	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	5.478	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle	5.478	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VOC		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Car	7.92	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Old	6.654	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	1.977	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	3.649	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle	3.649	0	0	0	0	0	0	0	0	0	0	0	0	0	0

CO		**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Car	62.88	2	2	2	2	2	3	3	3	3	3	3	3	3	3
Taxi Old	62.925	0	1	1	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	5.19	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	11.682	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle	11.682	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TSP		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Car	0.173	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Old	0.129	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.978	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	2.244	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle	2.244	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM10		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Car	0.168	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Old	0.125	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.978	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	2.244	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle	2.244	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM2.5		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Car	0.156	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Old	0.116	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	2.064	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle	2.064	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HC		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**
Car	8.489	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Old	8.132	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxi Recap	1.878	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus	3.465	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Goods Vehicle	3.465	0	0	0	0	0	0	0	0	0	0	0	0	0	0

ANNEX E ENDORSEMENT AND CO FINANCING COMMITMENTS