

## **Possibilities of Sustainable Transport in the City of Johannesburg (CoJ) in South Africa**

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### **Abstract**

Sustainable transport means mobility, non-reliance on fossil fuel, reliable and affordable transport; non-harmful to people, the environment and not causing climate change. Although South Africa is a lower contributor of CO<sub>2</sub> emission as compared to the OEDC countries, it is still a major contributor within the SADC countries. The City of Johannesburg (CoJ) is the largest city in South Africa where most of the economic transactions are taking place. Just like any other large city, it experiences over population making the transport system unsustainable. South Africa as a developing country is faced with socio-economic challenges which are hindering the development of sustainable transport. The study is conducted using the exploratory research method to explain the status quo of the transport system in South Africa as well as revealing major causes which slow down the development of sustainable transport. The exploratory research is chosen due to the early development of the literature on sustainable transport, supplier and enterprise development in South Africa.

### **Keywords**

Sustainable transport, Socio-economic challenges, City of Johannesburg, Department of Transport

### **1. Introduction**

The Department of Transport (DoT, 2016), states that it stays committed on the accomplishment of social and economic objectives of society, so its existence ensures the provision of effective and efficient integrated transport services that meets user's needs, as is a way of addressing legislation and constitution mandate. In achieving this goal, du Toit (2009), states that South Africa like many countries is impacted by transport unsustainability which is a disadvantage due to the very little knowledge of planning systems for sustainable transport. According to the DoT (2016), the lack of sustainable transport is still due to the common problems such as poverty and unemployment as the rate of deterioration of the current framework and insufficient capital speculation as present venture levels are not adequate to meet the fundamental support and development programs. There are so many challenges and problems which delay sustainable transport in South Africa as mentioned but looking at the present operations of DoT, one can tell that although replacing fossil fuel is much more important, it is not yet one of DoT's priorities. In order to confidently mention that the DoT has achieved sustainable transport, the following elements have to be achieved in this broad definition from the Committee of the European Union, which proposed a more exhaustive definition:

*"a sustainable transport system allows the basic access and development needs of individuals, companies and societies to be met safely and in a manner consistent with human and ecosystem health, and promises equity within and between successive generations; is affordable, operates fairly and efficiently, offers choice of transport mode, and supports a competitive economy as well as balanced regional development; limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and uses nonrenewable resources at or below the rates of development of renewable substitutes while minimizing the impact on land and the generation of noise".* European Council of Ministers of Transport (2004) as quoted in Black (2010), Litman (2008) and Integrated Transport Master Plan 2025 (ITMP25, 2013).

The other reason that developed interest in this definition is that it is also adopted in the ITMP25 by Department of Transport (DoT) South Africa. It shows that this is also well understood by the Gauteng province of South Africa, that the elements in the definition are all required if we are to say the city transport system is sustainable. According to Banister (2008), sustainable transport will form in such a way that in urban areas, it will keep average trip lengths shorter, while allowing cycling and walking modes, permitting a higher level of innovative services in public transport resulting in the elimination or minimization of the need for private cars. The amalgamation of clear planning strategies would result in cities that can be designed allowing both high-quality accessibility and environmental preservation. This can be done through the publication of the civil organizations, public and private sector information and findings from academics on sustainable transport in South Africa.

Some of the sustainable transport aspects are being met by the CoJ, but there are other external factors making it difficult for the country to keep on intervening in sustainable development. For example, with the higher crime rate South Africa is facing, specifically the CoJ, where people's personal belongings are forcefully snatched or taken from them. Who will then be willing to cycle as far as from one area to another with their own belongings? The main challenges which lead to the delay of development and sustainability within the transport sector are poverty and unemployment. Kane (2010) states that there is a tension in South Africa between the ideas of sustainability against the ideas of creating employment and the local government's mandate for greener economy. The CoJ (2016) and Juca (2014) emphasized that safety for cyclists will be monitored through CCTV cameras, marshals and law enforcement officials along the cycle pathways that are to be completed in 2016. Even though there is a safety intervention to be implemented for the cyclists, this will not diminish the main challenges South Africa is facing. The CoJ (2013) states that unemployment and poverty in CoJ are very high and inequality is also the highest levels in the world. According to Demombynesa and Ozlerb (2005), relative impacts of crime will be dictated by the spread between the requirements community and their incomes moderately poor inferring the expected level of crime will be greater in a community with higher inequality so economic incentives for crimes will be more noteworthy in a group with higher inequality. Until it is realized poverty and unemployment leads to crime, these challenges will not be addressed unless the CoJ ensures that each and every initiative developed encourages as well as supports enterprise and supplier development through action based interventions. Crane and Swilling (2010) state that investment in enterprise development and poverty elimination will be undermined unless natural assets and ecosystem services are perceived as restricting limitations and the CoJ moves quickly towards a manageable asset utilize economy. For South Africa to experience very low crime rate, there is a need for sustainable enterprise development which will assist in eradicating poverty and increasing employment. Out of the many initiatives done so far by the city, one of them being the Metro bus which utilizes clean fuel through natural gas and biofuels.

Currently, most of the fuel is being imported. This clearly means that there is no strong initiative for enterprise development within the transport sector. Natural gas cannot be recommended as sustainable, regardless of how clean the fuel is because it is produced from a nonrenewable source. As much as the city is implementing the gas intervention, still there is a huge need to keep on pushing for the renewable energy sources which will replace fossil fuels. Many issues and challenges need to be addressed whilst working towards a CoJ sustainable transport system.

## **2. Literature review**

To address transport challenges and opportunities in the Gauteng province of South Africa, the government has so far implemented public transport to meet the transport needs of the society, benefiting low-income households by facilitating mobility (NPC, 2013) and it also aims to discourage motorists, especially on the busiest roads towards the inner city. The CoJ (2016) states that the city will definitely lessen the requirement for private vehicles as the city logically moves towards compelling open transport frameworks, cycling paths and person on foot walkaways. The NCP (2013) states that better infrastructure has rushed the stream of individuals into towns and urban communities. Book (2004) states that urban areas focus on the public transport systems in order to meet the basic needs of transport for the low income communities who cannot cycle, or drive to their final destination. Book (2004) further states that medium to high income earners can only have rudimentary services available which can be considered if a motor car is not used. According to Black (2010) transport portability is the capacity to address the issues of the general public to move unreservedly, access versatility, impart, exchange and set up connections without giving up other coming era's needs and trading off biological angles. The Gauteng Provincial Government (GPG, 2014) published the 2014 Gauteng Household Travel Survey Report in figure 2.1, illustrating that the higher percentage of travelling mode is private cars then followed by the minibus taxi. Already the two transportation modes which are private cars and minibuses cannot fall under sustainable transport. Both have negative effects on all the factors of sustainable transport. Referring to the economy, private cars are not that cheap, private cars do not contribute much to the economy due to traffic congestion which delays the movements of goods and services on the roads and cars use fossil fuel so they are not environmental friendly. With minibus, there is a lot of dissatisfaction with the service and a huge safety risk. GPRT (2014) states that the key reasons taxi users where not satisfied with minibus services are the taxi drivers' behavior, minibus roadworthiness and safety from accidents.

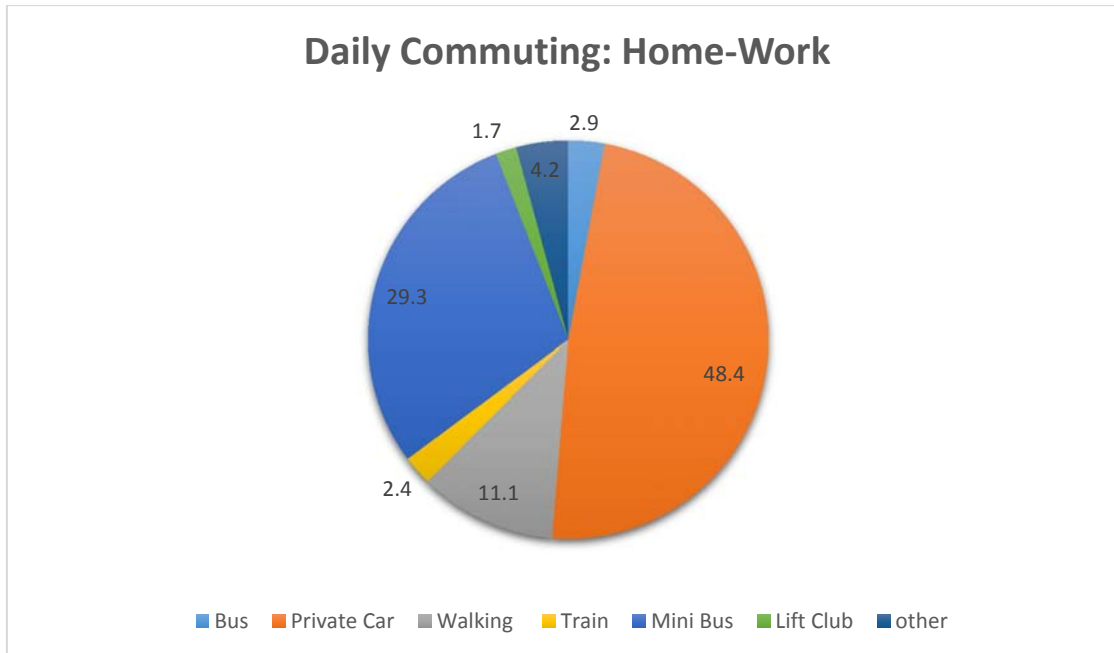


Figure 2.1. Transport modes for daily commuting from home to work, source GPG (2014)

## 2. Types of major public transport in the City of Johannesburg and the current status so far

Figure 2.1, shows modes of transportation for people commuting from home to work every single working day in the Gauteng province, which are also mostly used in CoJ. The Gauteng Province implemented the BRT for Johannesburg and Pretoria which are the current huge projects in the province can accommodate around 30 000 passengers. The BRT in CoJ called Reavaya are moving from the township of Soweto towards the inner-city of Johannesburg and also servicing other places to move people in and out of the CoJ CBD. The other is the mobility of public transport, such as rail and other government subsidized buses such as Putco, Metrobus and Megabus. However, figure 2.1 shows that bus usage was only 2.9% in 2014, and all these bus services are not using renewable energy for fuel. Black (2010) states that sustainable transport must prove practical and have a high level of mobility. In order to achieve higher mobility, there is a need firstly, to ensure sustainable enterprise development in the renewable energy sources sector by ensuring the utilization of renewable energy in the replacement of the fossil fuel. Metrobus as one of the bus companies working towards going green, has a few projects on clean fuel with some South African universities. Metrobus (2016) states that, in partnership with the University of Johannesburg, a pilot project is being undertaken by both organizations aiming at converting some of the current diesel run buses to Dual Diesel Fuel, allowing a substitution of diesel, a fossil fuel, with natural gas, which contributes less carbon emissions into the atmosphere. This project is a first in South Africa and the company aims to be the leader by developing a Centre of Excellence on Natural Gas Vehicle Conversions which, according to Pradhan and Mbohwa (2014), several African countries are already producing and commercializing biofuels. However, although South Africa has a biofuel strategy drafted in 2007, due to food security and political inaction, biofuel is not yet commercialized. The project currently being run by Metrobus could be that the biofuels are being imported from other countries. This study emphasizes that projects of renewable energy can begin to strengthen enterprise development by supporting the small scale farmers and businesses which are into manufacturing renewable energy sources.

### 2.1. Socio economic challenges affecting sustainable transport

Due to these several socio-economic challenges, the infrastructure and public transportation cannot be quickly upgraded to be on par with most developed countries. South Africa is still faced with the phase of subsidizing its people in several socio-economic needs. According to Walters (2013), the needs for investing in health services, schools and housing for the disadvantage is regarded as first priority. These are the economic aspects which in the

developed countries are easily left in the hands of the citizens to accommodate themselves while paying attention to infrastructure at large, meaning all modes of transport are easily implemented. Kane (2010) addresses the question of South African Transport Sustainability by stating that “how can we move towards sustainability in the transport sector and at the same time address the issues of inequity and poverty?” Despite these challenges, there is still a need to do something about sustainable transport through the implementation of renewable energy sources as this will also result in intervening these socio-economic challenges. The DoE (2011) states that the Energy Act of 2008 seeks that the South Africa’s economic growth and poverty elimination are achieved through the utilization of various energy resources that are affordable and available in sustainable quantities. The DoT (2015) mentioned that The National Development Plan (NDP) 2030 Need recognized radical investment conversion as a promoter to enhanced economic growth and create jobs, DoT (2015) further mentions there is a need to develop sustainable programs that this that will improve productivity and eliminate existence of inequality in the country.

## **2.2. Environmental impacts**

According to the NPC (2013) unbalanced impacts on the poor especially women and children in South Africa is due to the effects of climate change. There is a need to learn from the developed countries, so that the developing countries do not go on the same route as their economies develop. Ultimately, it is the developing countries that will experience more suffering when it comes to climate change and global warming as most are relying on agricultural aspects as a main basic needs of the families. Keijzers (2002) states that by 2040, wherever on the planet, with the exception of in Africa, material welfare levels can be accomplished that are practically identical to normal European levels of the previous decade. With such a condition of difficulties, enterprises and family units have to decrease their negative effect on the earth. This will require extensive changes to the way individuals live and work. NCP (2013) further states that emanations of carbon dioxide and other nursery gasses are changing the world’s atmosphere, possibly forcing a huge worldwide cost that will fall excessively on poor people.

The Renewable Energy Independent Power Producer Procurement Programme (REIPPP) is one of the successful programmes in South Africa which is working towards filling the electricity demand. The DoE (2016) states that South Africa has a high level of Renewable Energy potential and currently has target of 10 000 Gigawatt hours (GWh) of Renewable Energy, 3. 725 GWh is determined to be generated from Renewable Energy sources to ensure a continued constant supply of electricity required with the Renewable Energy generation in IRP 2010-2030 capacity allocated. The DOE (2016) further states that the IPP Procurement Programme is meant to contribute to the target of 3 725 megawatts, socio-economic, environmentally sustainable growth and encourage the emergence of a renewable industry in South Africa. Even though one of the objectives for renewable energy in South Africa should be replacing fossil fuels, currently the renewable energies are being commercialized mostly manufacturing industries and households as the government’s target to meet electricity demand utilizing renewable energy sources. In figure 2.2.2 it shows that industry is the second highest energy consuming sector, but there are significance changes in 2050 where the percentage drops with 3%. This is due to the initiatives which are taking place so far with the demand for electrification. According to the DoE (2015), Renewables are expected to contribute to electrification, transport fuels and electricity demand-side management through fuel switching, e.g. from electric geysers to solar water heaters. Solar energy is used for geysers to boil water. Biogas is mostly used in heavy machines within the factories and electricity generated through hydraulic is used to supply the electricity in the households. The DOE (2015) states that renewable energy implementation became a crucial issue nationwide and eventually, implementation was done through a competitive tendering system. The Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) is becoming the actual implementation in South Africa through a competitive procurement/tendering system with Renewable Energy Feed – In Tariff (REFIT) rates used as caps. The competitive bidding process, as it has become apparent in South Africa, has great potential to lower prices while still providing adequate incentives for market entry by Renewable Energy investors. Not much is solidly being implemented in terms of sustainable transport while in table 2.2.2 it shows that there will be a 10% increase of fuel demand in the sector. This is due to socio-economic issues such as poverty, unemployment and also a shortage of electricity in South Africa. Krupa and Burch (2011) state that in 2008, an emergency was declared in the Republic of South Africa for the urgent need for mass electrification due to a rapid economic growth of the industrial sectors due to poor planning in terms of maximum load planning which ended in a huge demand for energy which exceeded supply. The government is more concerned with a higher standard of living for all while also impacting positively on the environment. According to the DOE (2015), the South African government sees renewables contributing towards creating green economy jobs, the diversification of the energy mix and universal access to modern energy services, which is an aspiration built on the express commitment to expand the current 85% household electrification rate to 97% by 2025. This addresses the

social challenges which are currently very important, but apparently even the sustainable transport can lead to better life for South Africans if effective and efficient models are in place. The DoE (2016) states that future energy demand will be a mix of electricity, gas and liquid fuels, and depending on the relative cost competitiveness of each of these, an equilibrium between the three will be established. The major concern is the use of enterprise development in eradicating poverty and unemployment. Through transport sustainability the three aspects of the sustainable development which are economic, social and environment will be impacted. Owing to the establishment of the stable market for the SMMEs, this will lead to satisfying these three aspects. Looking into figure 2.2.1 below shows that it is still the mandate of the Department of Transport to satisfy the three aspects of sustainable development.

**“One of the strategic goals of the Department of transport is to ensure that the sector contributes to job creation in South Africa.**

The department’s strategic goals are to:

- *ensure an efficient and integrated infrastructure network that serves as a catalyst for social and economic development*
- *ensure a transport sector that is safe and secure*
- *improve rural access, infrastructure and mobility*
- *improve public transport systems*
- *increase the contribution of the transport sector to job creation*
- *increase the contribution of the transport sector to environmental protection.”*

Figure 2.2.1 Strategic Goals; source DoT (2015)

According to the DoT (2016) while the transport sector remains totally dependent on liquid petrol, there are very few initiatives taking place in improving the availability of petroleum liquids for transportation by making alternative fuel for other sectors. The NDP (2013) states that in future the DoT in South Africa will also encourage a low carbon economy through transport alternatives that lessen environmental harm. The major alternative will then be to replace fossil fuels, which will meet the strategic goals listed in figure 2.2.1 in the transport sector of creating jobs through enterprise development, where sustainable enterprises within the renewable energy sector will be developed by the SMMEs. The increased demand of fuel for 2050 in figure 2.2.2 will not have to be filled by the fossil fuels, as alternative programmes like the REPPPP can also be used within the transport sector.

Table 2.2.1 Energy Demand Per Sector in 2010 and Projected Demand by 2050. Source DoT (2016), adopted from DoE (2012)

| <b>Sector</b> | <b>2010</b> | <b>2050</b> |
|---------------|-------------|-------------|
| Industry      | 37%         | 34%         |
| Mining        | 8%          | 4%          |
| Agriculture   | 3%          | 3%          |
| Commerce      | 7%          | 7%          |
| Residential   | 11%         | 8%          |
| Transport     | 34%         | 44%         |

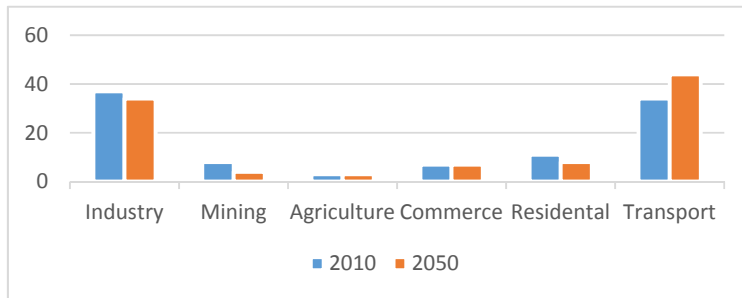


Figure 2.2.2 Energy Demand per Sector in 2010 and Projected Demand by 2050. Source DoT (2016), adopted from DoE (2012)

Stakeholders need to collaborate to ensure a sound value chain which will ensure a sustainable market for renewable energy within city of Johannesburg. There are already manufacturers of renewable energy in South Africa at a small scale; these are the SMMEs and the higher education institutions which are already producing and doing experiments on the renewable energy sources such as biogas and biofuel. On the other hand there is a higher need for enterprise development through cooperative enterprise.

For the transport sector to manage creating jobs within the renewable energy sector, there is a need for the integration of all the stakeholders, revising the status quo of renewable energy sources and the challenges faced by enterprises in the sector, to develop a sound value chain which will set a sustainable market thus ensuring sustainable enterprise development. The DoT (2015) states that in the Medium Term Strategic Framework (MTSF) 2014 – 2019, the NDP has set a growth target of 5% by 2019; in order to achieve this, the transport sector will have to embark on various interventions to increase its contribution to economic growth by partnering with the private sector partnerships and collaborations in order to unlock obstacles to investment for infrastructure development, maintenance and expansion. This could also include the strengthening of enterprise development by supporting the renewable energy sources in the manufacturing and farming sectors.

### 3. Research Methodology

The study is based on descriptive research using both the case study and observatory methods. Descriptive research in this study was used to describe and come with the understanding of the research problem which led to exploratory research. According to USC (2016) descriptive research designs help to provide answers to the questions of who, what, when, where and how, linked this research problem as a descriptive study cannot decisively discover answers to why. Descriptive research is used to obtain information concerning the current status of the phenomena and to describe "what exists" with respect to variables or conditions in a situation. It is a case study as it is based on only the experiences of the CoJ. Data was also collected using the observation method. According to van Wyk (2007), exploratory research is defined as the initial research into a hypothetical or theoretical idea, where a researcher has an idea or has observed something and seeks to understand more about the idea and attempts to lay the groundwork that will lead to future studies, or to determine if what is being observed might be explained by a currently existing theory. The aims and objectives of this study are to lay the initial groundwork for future research. This study used explanatory research, to describe the current situation of sustainable transport using published documents from the private and public sector. The study made use of conference seminars and workshops on transport to observe and take notes. The explanatory research is based on the qualitative data, where collected data and information is being described, discussed and evaluated to come with the findings and the required recommendations.

#### 3.1. Descriptive analysis

Currently in South Africa, there are no vast resources of literature concerning sustainable transport; in table 3.1, Kane (2010), Moody (2012), Onatu (2011), Du Toit (2009) and Crane and Swilling (2008) are the authors who touched in to the sustainable transport research. Most of the research identified in this paper are for Ph.D. studies, there are no continuous sustainable transport studies done in South Africa and specifically CoJ, as the majority of these studies were conducted in the city of Cape Town. None of these studies are systematic, that is the reason this study suggests an exploratory research. This could be due to there being nothing much done within the transport sector which impacts on sustainable transport. Suering (2011) states that papers published in the early stages of developing literature,

exploratory research was seen as a useful research methodology crafting the first theoretical propositions and opening up the field. The studies which are selected in this study are mainly in sustainable transport and mostly written by university students for the completion of their degrees. Only a few academics within the higher institutions are researching on sustainable transport. For the studies which were selected, the aim is to find the findings which support the main argument of this study which is to encourage enterprise development within the transport sector that is sustainable by exploring the renewable energy sector which is still only being generated on a very small scale and on stable market for the sellers of renewable energy. Within the transport sector of CoJ.

Table 3.1. Academic Research on Sustainable Transport

| Study Title  | Year | Geographic areas | Author             |
|--|------|------------------|--------------------|
| Developing a Scorecard for Sustainable Transport: A Cape Town Application  | 2009 | Cape Town        | Du Toit            |
| A New Approach to Sustainable Transport System: A Critical Appraisal of the Rapid Bus Transit System (BRT) in South Africa         | 2011 | CoJ              | Onatu              |
| Sustainable Transport Indicators for Cape Town, South Africa: Advocacy, Negotiation and Partnership in Transport Planning Practice | 2010 | Cape Town        | Kane               |
| Environment, Sustainable Resource Use and the Cape Town Functional Region – An Overview  | 2008 | Cape Town        | Crane and Swilling |

Academic papers with case studies of the South African context are still very few. Most of the studies are done in Cape Town, so it can be recommended in this paper that Cape Town is leading sustainable transport in terms of the initiatives taken so far. Jenning (2015) and Beukes et al. (2011) are one of the authors who looked into sustainable transport in terms of cycling as one of the mobilities and these studies took place in the Western Cape Province. The sustainable transport studies in South Africa so far are not systematic as yet and this is due to the challenges pointed out by the literature review of this study. Table 3.1, shows the study conducted in South Africa related to sustainable transport. Three of these studies are for Cape Town and only one from CoJ. Table 3.2 represents the publication reports, strategy and surveys on transport. Each document also considers sustainable transport. According to this study sustainable transport in South Africa is emerging in many forms and it is still in a planning stage rather than in implementation and this is due to the socio-economic challenges the country is currently facing.

Table 3.2. Government Publication on Transport in Gauteng Province and CoJ

| Title  | Year | Source      |
|--|------|-------------|
| Strategic Plan 2011/12 – 2013/14   | 2011 | DoT (2011)  |
| Department of Transport Annual Report 2012/13                                      | 2012 | DoT (2012)  |
| Gauteng Province Household Travel Survey   | 2014 | GPRT (2014) |
| Gauteng 25-year Integrated Transport Master Plan Annexure C: Sustainable Transport | 2013 | ITMP (2013) |
| Strategic Integrated Transport Plan Framework for the City of Joburg               | 2013 | CoJ (2013)  |
| Department of Transport, Strategic Plan 2015/16                                    | 2015 | DoT (2015)  |
| Department of Transport Annual Performance Plan 2015/16                            |      |             |

### **1. Findings**

The government publications on transport are more systematic when compared with academic research on sustainable transport in CoJ, it is evident that with the government publications that their more comprehensive and generic studies which results in most of the publications having something related to sustainable transport. The findings base in both the academic papers and government are presented below as:

- Renewable energy as a replacement of fossil fuels has not yet being exploited within the transport sector.
- The transport sector still has a ‘journey or miles’ to reach in terms of enterprise and supplier development, as this has to be something sustainable and creating enough job opportunities.
- Renewable energy which can be used as a replacement for fossil fuels will be biofuel and biogas;
  - ✓ Currently in South Africa, biofuel is manufactured at a very small scale, it is done in a form of used vegetable oil to produce biodiesel. Most of these manufacturers are SMMEs and unlicensed.
  - ✓ The production of the biofuel using the virgin feedstock.
  - ✓ Biogas can be produced in many forms from the waste that is deposited every day in the landfills of the city of Johannesburg.
  - ✓ Most of the waste is deposited in the landfills, the country has enough waste to make substantial quantities of methane. Most of the projects are still in the initiative process by the South African higher institutes.

### **2. Recommendations**

It is recommended that the transport sector shifts its focus from just trying to provide transport but working towards fighting poverty and creating employment through supplier and enterprise development, which is sustainable. Renewable energy in replacement of fossil fuel could be an initiative within the transport sector, through integration and collaboration, can work towards achieving a sustainable enterprise and supplier development. This will also lead to socio-economic development as it will be done by South Africans within their own communities and the benefits will lead to the creation of jobs and the lowering of the percentage of unemployed. Many countries currently are already benefiting from renewable fuels, South Africa needs to kick start the process.

### **3. Conclusion**

The issues of equity and equality need to be taken into consideration within the transport sector and as long as the country is still facing the challenges of poverty and unemployment, the chances of sustainable transport are very slim. At any time the country will always have to ensure people’s basic needs are met, such as housing, health and food, which in the long run will still lead to a problematic situation as unsustainable transport will mean unhealthy life styles. However, with sufficient income for households and the country not relying on fossil fuel, one cannot imagine how the government should not shift its focus to spending more on creative and innovative ideas which lead to better mobility and sustainable transport.

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## **Biography**

**Sebonkile Thaba** is a Ph.D. fellow and lecturer in the Department of Quality and Operations Management, University of Johannesburg, South Africa. She earned her M.Tech. in Operations Management from the University of Johannesburg. She presented and published 13 conference papers and one book chapter. Her research interest is in transport sustainability, supply chain management and enterprise development.