

# Assessing the Inclusion of Climate Change Strategies in the Integrated Transport Plans of South African Metropolitan Municipalities

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**Abstract:** Transport contributes to Green House Gases (GHG) emissions, which in turn aggravates the climate events and lead to global warming. Climate change has become a universal problem. In view of this problem, content analysis research method was utilised to establish whether all the South African metropolitan municipalities includes climate change considerations in their transport planning procedures. The Integrated Transport Plans (ITP) of eight metropolitan municipalities were analysed. The analysis revealed that out of the eight metropolitans, three have not yet mainstreamed climate change considerations into their planning, particularly the mitigation actions and strategies to minimise the effects of climate change in the transport sector. The other five municipalities have mainstreamed climate consideration into their ITPs with special attention on GHG emission mitigation. The assumption drawn is if climate change is strategically and systematically included in the transport planning, the GHG emissions from the transport sector could be curbed and the effects and impact be significantly minimised if the considerations are well implemented. The paper recommends that municipalities should mainstream climate change into transport planning in responding to its economical, efficient and cost effective manner in order to minimise the vulnerability of the road transport sector to the impacts of climate change. This can be realised through adaptive capacity building and creating acclimate change resilient road transport sector. The paper then presents the recommendations on how better to mainstream climate change into transport planning.

**Keywords:** Climate change, Mainstream, Mitigation, Transport, Transport planning

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## 1. Introduction

Climate change is an environmental problem that is critical and difficult to manage (Totty 2009; Ajewole, Ongunlade & Adewumi, 2010). It is now a global knowledge and agreement that climate change is happening, however the impact of climate change on transport sector faces uncertainties such as the adequacy of the scale of existing climate models to transport planning (IPCC, 2013; IEA, 2011). In responding to climate change, the South African government has launched the National Climate Change Response White Paper in 2011. The response white paper indicates the principles and strategies that the country will employ in addressing climate change issues (Department of Environmental Affairs, 2011). In South Africa, the Department of Environmental Affairs (DEA) is vested with the responsibility of facilitating and addressing climate change issues. Government departments and municipalities are struggling to address the challenges climate change pose to them. Municipalities are the closest institutions to develop and implement appropriate mitigation strategies for their geographical location. Municipalities are expected to draw an integrated

transport plans, outlining how they plan for their transport and challenges thereof. It is on this basis that this paper seeks to analyse the inclusion of mitigation actions and climate change considerations in the South African metropolitan municipalities since climate change is a growing challenge with negative consequences.

Revi (2008:209) attests that there is a need to incorporate climate change and its potential effects and impact into policy-making and planning on range of scale including all spheres of government. This paper supports Revi's sentiments and calls for mainstreaming of climate change into transport planning in all municipalities in order to address climate change challenges that may disturb the operation of the transportation systems. This paper provides a conceptual framework, the concept of climate change, its impact on transport sector, the influence of transport sector on climate change, the planning process of transport in South Africa, and the proposed mainstreaming of climate change into the transport planning paying special attention into South African transport planning procedure.

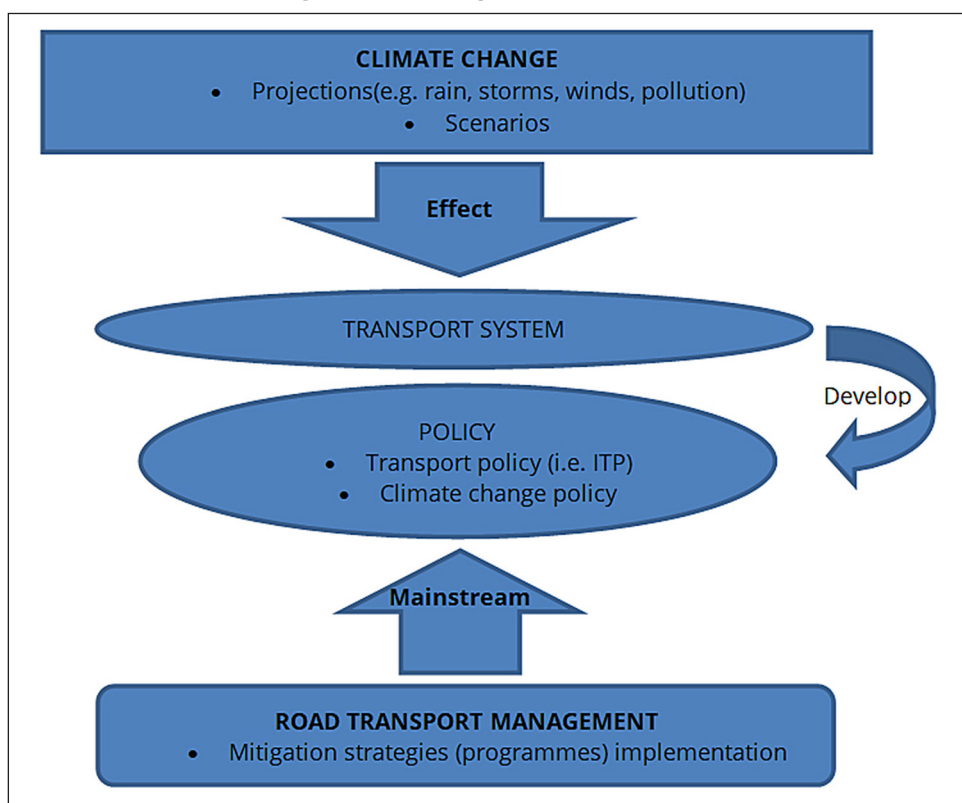
## 2. Conceptual Framework

Given the seriousness of climate change and the impact it has on the transport sector; mitigation actions have to be considered from a broad framework of transport planning. Therefore, assessing all various sectors and variables that may affect or influence the system operation is necessary. This paper developed a conceptual framework illustrating how climate events affect the transport system and operations. The sector has existing policies and plans, the framework then demonstrates that there is a need to mainstream mitigation actions into these policies in order to address climate change challenges within the sector.

The adopted conceptual framework in Figure 1 illustrates that transport and climate change events have an influence on the road transport system, as well as on climate scenarios and projections (anticipated-expectations). If the current road transport system state differs from the anticipated or expected state, then policy should be adapted accordingly. This paper uses this conceptual framework to study the inclusion of climate change strategies in the Integrated Transport Plans

(ITPs) of the South African metropolitans. In studying the efforts of municipalities in including climate change considerations into integrated transport planning, literature review and the ITPs of the eight South African metropolitan municipalities were reviewed. In order to understand the essence of including climate change considerations or mitigation actions into transport planning, it is crucial to understand the impact of climate change impact on the transport sector. The theoretical framework of this paper is on two concepts vulnerability of municipalities to climate change particularly the transport sector and the mitigation actions that should be included in the municipal's ITPs. Vulnerability is the physical elements and socio-economic conditions that determine the responsiveness to changes in climate (Miller *et al*, 2010). Climate change is happening and there is no more a debate over the existence of climate change, hence the United Nations Development Programme (UNDP) urges governments to act now immediately in order to minimise the severance of the impact of climate change. Since there is a global consensus on the existence of climate change, municipalities have to assist their communities to mitigate the effects of climate change.

**Figure 1: Conceptual Framework**



Source: Author

### 3. The Transport Planning in South Africa

The purpose of the transportation planning is to mitigate the problems caused by increase in urban population and the rapid growth of motor vehicle ownership as well as the usage while simultaneously using the full range of transport modes available for traveling. Transport planning aims at reducing the inefficiencies of the transport network and systems such as congestions, accidents and traffic delays. At the operational level transport planning is concerned with technical issues related to traffic estimation and network planning. The impact of climate change such as increase in intense precipitation events, floods, and droughts have hardly been taken into consideration when planning for transport systems and operations. The choice of a transportation system is the most important developmental decision that a metropolitan region takes and planners need to use this tool to shape the physical urban environment.

South African transport planning system has received numerous critiques in literature; amongst the critiques is the vehicle centric method of transport planning. This method largely neglects public and non-motorised modes of transport. The South African White Paper on National Transport Policy, 1996 emphasises the improvement options for both modes. The planning process should integrate all modes of transport and also improve integration of transport planning with land use. The South African transport planning is faced with old numerous challenges. Davies *et al.* (1995) identified the following challenges within the transportation planning to this date the challenges still persist such as the importance of walking is sometimes overlooked, there is poor interaction of public and private transport models and lack of qualified professionals to do the planning.

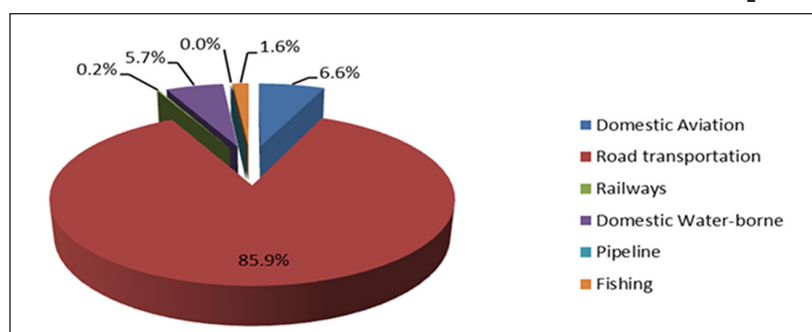
Bickford (2013) argues that the transport planning has largely continued in a business as usual fashion through much of the apartheid era. According to Walters's (2014) analysis of each mode and its operations, the challenge is policy and planning of each is done in silos. Thus, the creation of challenges for the integration of systems. It is clear from literature that transport-planning process in South Africa is not as integrated as it should be and the process is faced with inherited challenges as well. Climate change then becomes an additional challenge that threatens the planning process further, since all

modes are affected by the impact of climate change. Therefore, integrating climate change in planning becomes a necessity.

### 4. Climate Change and its Impact on the Transport Sector

Developing countries have a challenging task of reducing their vulnerability to climate change as part of the sustainable development agenda (Revi, 2008:211). Climate change is a growing economic and political concern due to its impact on economic growth and the livelihoods of the people. Hence, DEA (2010) attest that climate change undermines the government's efforts to alleviate poverty and provide environmental health. South Africa is vulnerable to climate change and is expected that this will affect the South African air quality as a result of changes in temperatures and rainfall patterns (Mitigation report, 2014). The impact of climate change varies within the different modes and their associated infrastructure. Within the road transportation, paved roads are affected differently by cold and hot weather. When it is extremely hot, the paved roads soften and require resurfacing with materials that are more durable (Schwanen, Banister & Anable, 2011:998). While in cold conditions, the base and paved surfaces are damaged. Bridges are prone to flood incidents, requiring new constructions with upgraded design specification, consequently financial costs rise. Rail on the other hand, its beds are likely to be influenced and damaged by increased rainfall and flooding, thus undermining the stability of railways (Mills & Audrey, 2002). The flooding and droughts force maritime transportation to utilise smaller vessels for inland shipping. Increase flooding and storm raise the costs of shipping and forces ships to use longer routes that are not prone to storm. Storm may result in delayed and cancelled air transportation. The world is experiencing floods, droughts and unprecedented weather conditions that are disastrous and have significant impact on the transport sector. Some of the impacts include infrastructure damages and traffic accidents.

In addressing climate change impact through mainstreaming it in the planning process, the transport sector will have range of benefits, such as improved air quality, increased road safety, reduced noise from traffic and other social and economic benefits. Jaroszweski (2012:326) is concerned that researchers overlook the fact that climate change will also affect the transport sector through a change in the

**Figure 2: Sources Contribution of GHG Emissions (CO<sub>2</sub>e)**

Source: DEA (2014)

frequency and intensity of hazardous and disruptive weather events. Clearly, the vulnerability of transport sector to climate change is already evident on factors such as infrastructure damages, traffic delays and road accidents are some of the consequent results of climate change impact.

## 5. The Influence of Transport on Climate Change

The demand for transport has grown to be an integral part of day to day living for South Africans. Urban landscape is shaped by the transport demand. South African transport sector contributed 13% of the country's total GHG emissions in 2010 (DEA, 2014), and 86% of it comes from the combustion of liquid fossil fuels. The South African transport sector is faced with the apartheid legacy of spatial planning, whereby urban development is displaced and distorted, unequal human settlement patterns that resulted in people staying far from workplace and having to travel long distances. The established travel patterns have significant negative impact on climate change. Hence, Dixon (2009:208) attest that in future the impact of transport on the land resources, water quality, air quality and biodiversity will increase rapidly. Within the transport sector, road transport is the major contributor to CO<sub>2</sub> emissions. According to DEA (2014) in 2010 road transport accounted for 91.2% of total transport GHG emissions. The road transport sector heavily relies on fossil fuel for operations hence the significant contribution to the GHG emissions. Figure 2 indicates the GHG emissions per mode of transport in South Africa.

Aviation is one of the smaller contributors of GHG emissions in the South African transportation sector. It accounts for only 6.6 % of the total transport GHG emissions (Mitigation report,

2014). The mitigation report (2014) indicates that maritime transport is also amongst the smaller contributors of emissions within the sector. This is because the nature of operation of the South African maritime. Its operations are mainly outside the South African boundaries. All these modes are directly and indirectly affecting climate change through their operation mechanisms that are on various time scales. According to Skei *et al.* (2009) these mechanisms create warming of the globe. As clearly indicated in Figure 2, road transportation is the major contributor to the emissions due to its nature of operation and its reliance on fossil fuel. The figure shows road transport accounts for 85.9% while air and others are responsible for only 14.1 percent. Growing urbanisation and demand for mobility are amongst the world's challenges and indirectly influence climate change. Motorisation because of urbanisation, affordability and availability of vehicles is expected to rapidly grow at an unprecedented rate. This growth will massively contribute to air pollution, road traffic accidents and congestion, resulting in GHG emissions increase.

Ribeiro & Kobayashi (2007:329) argue that the growth of passenger vehicle in terms of its size, weight and power increases transport energy use and carbon emissions. The vehicle technology has notably improved but the improvement is on size and power than on fuel efficiency, which would be more beneficial to the governments and their citizens. According to the United States Environmental Protection Agency (2011) if power and size of the vehicles are not increased or rather are decreased then fuel consumption will decrease thus carbon emissions will be reduced. Currently the situation is the opposite of the agency's opinion, the size and power of vehicles are increased and the fuel consumption is very high as result the emissions are increasing.



The road transport plays a pivotal role in energy use and emissions of GHG globally. IPCC (2013) reports that road transport accounts for over a third quarter of the global GHG emissions, private cars and freight trucks being the main contributors. The road transport sector as indicated before is reliant on oil-based fuel consequently the CO<sub>2</sub> emissions from the sector is proportional to its energy use. Well-designed road transport policies and infrastructure can reduce risks associated with climate change such as air pollution and traffic injuries. Under the "Business as Usual" scenario global transport energy use is projected to grow by 80% till the year 2030 with parallel rise of emissions, while the number of vehicles is projected to triple by 2050.

## **6. Link Between Climate Change and Road Transport**

The relationship between road transportation and climate change is a growing concern because, as mentioned above, scientific evidence on climate change continues to support the connection between anthropogenic activities and global warming. Greenhouse gas concentrations continue to rise at a rate of more than two parts per million each year (Stern, 2006:2). Transportation is crucial in creating wealth and quality life, enabling interaction socially through the movement of goods, services and people. It also has negative effects such as pollution, congestion and accidents. All sectors as well as communities depend on a well-functioning transport sector as a means of movement. Road transport and climate change is a cyclic phenomenon. Road transport system is affected by the extreme climate events, while the road transport operational systems contribute to global warming which in turn aggravate the extreme climate events. Weather conditions have an impact on the operation of the road transport sector, therefore understanding this cyclical link is important in order to develop a policy framework that would accommodate this link. Climate factors directly affect the planning, design, construction and maintenance of road transportation infrastructure in several ways; and indirectly affect the demand for transportation services (Mills & Andrey, 2002:77-88). Climate change further influences road transport systems, and the influence has cost implications. Clearly, the vulnerability of transport sector to climate change is already evident with factors such as infrastructure damage, traffic delays and road accidents are some of the consequent results of climate change impact.

According to the Department of Environment Affairs and Tourism (From here on referred to as DEAT) (2007), the South African government regards climate change as the greatest threat to sustainable development. It has an impact on prospects for sustainable development. South Africa's increased economic development leads to an increased urbanisation and motorisation (Lalthapersa-Pillay & Udjo, 2014:873), which results in more people buying cars. The majority of motorised transport relies on the availability of fuel, being almost completely dependent on oil that is non-renewable source of energy (IPCC, 2007; Oswald, 2011:56), thus increasing the GHG emissions. As more people buy and drive cars daily in South Africa to meet their independent mobility needs, less people will walk, cycle or use public transport (Moss, 2015:1). The increase in cars leads to traffic congestion, pressure for road space and a reduced availability of parking. The pressure put on the road surface together with weather events lead to damaged road infrastructures that may lead to an increase in accidents (Dikgang, 2013:4). This adds to difficulties of providing reliable, safe and efficient public transport as well as safe facilities for pedestrians and cyclists.

Therefore, the pursuit of independence on the car usage has actually led to people dependent on their cars to meet their travelling needs. The transport system is the pillar of South Africa's socio-economic activities as it enables the movement of people and products. In the climate change context, the sector is a rapidly growing source of GHG emissions and the significant mitigation benefits can be found in the sector (the National Climate Change Response White Paper (NCCRWP) 2011). The response white paper indicates that through the mitigation processes there are co-benefits to be realised such as improved air quality, reduction of time between trips, decrease in accident rates and increase in productions.

## **7. Research Methodology**

This paper applied an in-depth content analysis research method for analysing the content of ITPs of eight South African metropolitan municipalities. The municipalities are Buffalo City in East London, City of Cape Town, Ekurhuleni Metropolitan Municipality in East Rand, City of eThekweni in Durban, City of Johannesburg, Mangaung Municipality in Bloemfontein, Nelson Mandela Metropolitan Municipality in Port Elizabeth and

**Table 1: Inclusion of Climate Change Information in Integrated Transport Plans in their Own Terminology**

Metropolitan Municipality	Climate change content
Buffalo	<ul style="list-style-type: none"> <li>• Reduction of carbon footprint.</li> <li>• Promotion of Non-motorised Transport (NMT)</li> </ul>
Cape Town	<ul style="list-style-type: none"> <li>• Reduction of carbon footprint.</li> <li>• Addressing road traffic congestion.</li> <li>• Purchasing of alternative fuel vehicle.</li> <li>• Bus Rapid transit</li> </ul>
City of Johannesburg	<ul style="list-style-type: none"> <li>• Reduction of carbon footprint</li> <li>• Addressing road traffic congestion.</li> <li>• Purchasing of alternative fuel vehicle.</li> <li>• Bus Rapid transit</li> <li>• Improving public transport.</li> <li>• Land use and spatial planning</li> </ul>
City of Tshwane	<ul style="list-style-type: none"> <li>• Reduction of carbon footprint.</li> <li>• Vulnerability to climate change.</li> <li>• Addressing road traffic congestion.</li> <li>• Purchasing of alternative fuel vehicle.</li> <li>• Bus Rapid transit</li> <li>• Improving public transport.</li> <li>• Land use and spatial planning.</li> <li>• Public awareness.</li> </ul>
Ekurhuleni	<ul style="list-style-type: none"> <li>• Vulnerability to climate change.</li> <li>• Mitigation projects.</li> <li>• Greenhouse gas emissions policy development and implementation.</li> <li>• Minimising vehicle emissions.</li> </ul>
eThekweni	<ul style="list-style-type: none"> <li>• The emission contribution to climate change.</li> <li>• Non-motorised transport.</li> <li>• Usage of public transport.</li> <li>• Usage of cleaner fuels.</li> <li>• Shift from road to rail for freight transportation.</li> </ul>
Mangaung	No recent ITP
Nelson Mandela	No inclusion of climate change content

Source: Author

City of Tshwane in Pretoria. A page-to-page analysis of the latest ITP of each municipality was done. Integrated Transport Plan is a five-year plan that municipalities are required to plan in terms of the National Land Transport Act (2009). Content analysis is a qualitative study of qualitative data (Zhang, 2009). In analysing data, certain frequent concepts and words were counted to develop themes and keywords. The concepts and words include greenhouse gases, mitigation, climate change, carbon print, CO<sub>2</sub> and emissions. The purpose of the analysis was to assess the inclusion of climate change considerations and mitigation actions in the ITPs of the selected municipalities. This was an attempt to answer the question of "to what extent do the South African metropolitan municipalities include climate change considerations and mitigation actions into their Integrated Transport Plans?" Municipalities have a responsibility to respond to climate change, and they are better positioned to do so as they are closer to the communities, whom experience the impact of climate change.

According to Pasquini *et al.* (2013) municipalities are closest institutions to plan and implement mitigation actions suitable for geographical and social context in which they are located. This paper chose to metropolitans as case study because they are big in terms of their density and have greater economic activities, furthermore, they are more prone to climate change due to the activities taking place in their jurisdiction.

## 8. Findings and Discussions

The aim of studying and analysing the eight metropolitan municipalities' ITPs was to assess the extent that the municipalities mainstream mitigation actions and climate considerations into their ITPs. Table 1 illustrates the extent that the selected municipalities include mitigation actions and climate change considerations in their ITPs. The municipalities in the table are in an alphabetical order, not in any way related to their extent of inclusion of climate change strategies in their ITPs.

The analysis has revealed the similarities and differences amongst the municipalities in explicitly addressing climate change. One common thing is that most municipalities have set out some of their mitigation projects in their ITPs. The mitigation strategies listed have some similarities; other municipalities have more strategies than others do. Four metropolitans have indicated their intention to reduce the carbon print. The promotion of the non-motorised transport is the popular strategy amongst the municipalities. Improvement of public transport is another strategy that metropolitans have put forth. The three municipalities, City of Tshwane, City of Johannesburg and City of Cape Town have implemented the Bus Rapid Transport (BRT) system as a measure to improve public transport, reduce congestion and GHG emission reduction strategy. The BRT buses are 100% compressed natural gas powered, as a result, eliminating the carbon emissions that are a health risk.

Of the few differences established out of the eight municipalities only one has indicated intention to address climate change issues with a formal policy intervention. The Ekurhuleni metropolitan municipality has indicated that it will develop and implement a greenhouse gas emissions policy. Policy development as far as climate change is concerned has been a global problem. Climate change can pose danger and a threat to human being and welfare and therefore governments have had trouble in developing an integrated and comprehensive policy to manage climate change. The effects of climate change can only be resolved through new policy frameworks. Without policy interventions, the annual traffic growth will surpass the projected reductions of emissions; therefore, CO<sub>2</sub> emissions will increase rapidly. In responding to climate change, new policy frameworks are often developed. In terms of the future predictions of climate change and its impact, there is a consensus amongst scientists that with the available policies on mitigation, GHG emissions will grow to the next century (IPCC, 2001; Agrawal, 2005; IPCC, 2007; Agrawal, 2008). In order to address climate change effectively, integration of policies on climate change with other sectoral policies should be increased across all levels of government. Therefore, the Ekurhuleni has addressed an issue signalled in the literature.

The City of Tshwane municipality is the only metropolitan that clearly indicated how vulnerable the transport sector is to climate change. Ekurhuleni

only indicated that it is vulnerable to climate change but did not indicate the extent of the vulnerability. The drawn conclusion is that most South African metropolitan municipalities do not conduct a vulnerability study for road transport network of their areas of jurisdiction. Komen (2016:40) indicates that the degree of vulnerability to climate change is based on the projections of changes in mean temperatures and precipitation, extreme events and climate variability. There is a connection between vulnerability incidents, risks, serviceability and reliability. Thus, conducting a vulnerability study for road transport network is essential in order to have a clear indication of the extent of exposure the road network is to climate change. EThekweni has indicated its plan to shift the freight transportation from road to rail. This strategy is in line with the national plan. The national Department of Transport has shared its plans of moving freight transportation from road to rail (DoT, 2013). Rail transport has more potential to provide a cost effective freight transport. This modal shift will make the economy more efficient as rail will provide access for freight movements at the same time provide an environmentally sustainable transport solution.

The Mangaung metropolitan does not have a recent ITP, but in their latest (2017-2020) Built Environment Performance Plan (BEPP) they have indicated that their ITP is in the process of compilation. However, the BEPP was analysed for interest sake. In the BEPP, in as much as it is an environmental plan, surprisingly climate change considerations were not taken into account. Climate change issues are not addressed in the plan. On the other hand, there is the Nelson Mandela metropolitan. The municipality's recent ITP does not take into account the climate change consideration. There is no mentioning of climate change in the entire ITP document. From the analysis, it is clear that the two municipalities' transport planners need training, upskilling and education on climate change and how to mainstream climate change into ITPs. Mainstreaming climate change into ITPs is crucial for establishing effective action (Bulkeley *et al.*, 2009). Thus, municipalities need development of human resource capacity in order to effectively address climate change issues.

## 9. Including Climate Change Mitigations in Transport Planning

According to Mickwitz *et al.* (2009:3), climate change mainstreaming means incorporating climate change

mitigation and adaptation aims into all phases of policymaking and other sectors. However, Lebel *et al.* (2012) state that mainstreaming entails the integration of adaptation to climate change into development planning. Therefore, mainstreaming in this paper refers to the process of revising and expanding existing transport plans to include climate change mitigations in order to ensure long-term viability and sustainability of transportation sector. Mainstreaming can help ensure that transport plans are not odd to current and future climate risks. Mainstreaming can also ensure that policy conflicts are avoided and transport vulnerability to climate change is reduced (Lebel *et al.*, 2012). Mainstreaming climate change into transport planning will be more effective and financially sound rather than managing mitigations and planning transport separately. Agrawala and Van Aalst (2008:87) attest that it is cost effective to consider climate change in planning earlier rather than later. They further argue that it is easier to start mainstreaming than to create new plans.

Mainstreaming climate change into transport planning can help mitigate GHG emissions through the reduction of vehicle travel distance and congestions. This can be possible through the integrated transport planning and compact. This paper argues that the mainstreaming of climate change into transport planning and the implementation thereof should take place in a vertical coordination. Meaning, all provincial departments of transport and their agencies should be involved. This will expand their roles from just service providers to active developments agents, furthermore, enhancing the response to climate change with capacity. According to DEA (2010), provincial departments can play crucial role in responding to climate change by integrating the mitigation and adaptation measures into development, spatial and integrated transport plans. However, the provincial departments will need support from national government to respond effectively to climate change. The National Climate Change Response White Paper (2011) also emphasizes the role of national government in supporting the other two spheres of government in responding to climate change as a constitutional mandate.

The National Climate Change Response White Paper (2011) specifies that government departments and enterprises should ensure that they align the policies, legislations and plans with the National Climate Change Response. The white paper further identifies

integrated planning as a priority. Therefore, mitigation actions must be built into transport planning tools and public transport programmes. Parramon-Gurney & Gilder (2012) attest that mainstreaming climate change can play a crucial role in handling climate change issues and challenges. Furthermore, the department must relate climate change considerations and existing challenges in an adaptive, progressive and flexible manner in order to ensure effective mainstreaming process. The existing statutory planning tools should be utilised when mainstreaming climate change rather than bringing new tools that may add challenges.

Transport planning aims at improving road, rail, pedestrians and bicycles connections and infrastructure. However, if climate change is mainstreamed into transport planning there are potential features to be realised. This paper identified three features; firstly, the weak transport network links that are prone to climate change such as bridges and road subject to flooding will be identified and improved. Secondly, emergency transportation networks are identified and designated. For instance the roads and transport links that can be used during disastrous events caused by climate change. Lastly, enhance mitigation actions by reducing traffic congestion and prioritising non-motorised transport.

Enhanced transport planning process and new mechanism are needed to address the potential climate impact. Thus, adding climate change as a distinct planning factor. According to Schmidt and Meyer (2009) planning processes consist of various best practices across the world. In order to apply best practice in mainstreaming climate change into transport planning climate change should be incorporated in the vision, goals, trends, challenges, strategies, improvement projects and performance measures.

## 10. Conclusion and Recommendations

This paper analysed in depth the content of the ITPs of the eight South African metropolitan municipalities and the analyses revealed that the municipalities do incorporate the climate change strategies in their ITPs but not sufficiently. The other municipalities just indicate that climate change is a threat and they need to plan for transport in a way that it caters for climate change but do not share the planning or indicate their strategies. The conclusion drawn is these municipalities have challenges such as lack of expert



capacity to undertake the planning activity, limited financial resources and competitive resources and needs as a result sidelining medium- to long-term planning as opposed to short-term planning.

Given the findings above on the inclusion of climate change in the ITPs of the metropolitans, this paper has few recommendations for enhancing the inclusion of the climate change strategies in the ITPs of municipalities. The current ITPs of South African metropolitan municipalities do not adequately cover climate change considerations and mitigation actions. Therefore, the paper recommends that the municipalities should expand the coverage of climate change considerations and mitigation actions. There are inadequacies of competencies in the planning particularly in including climate change in the planning process of transport. Therefore, training and upskilling opportunities should be offered to the officials in the municipalities. The officials should acquire skills to plan for transport through the prism of climate change. Of outmost importance the officials should have a crystal understanding of the impact of the climate change and the responses thereof. Over and above all, conducting vulnerability study for road network is important. This will assist the planners to plan for appropriate mitigation actions required to minimise the magnitude of the impact of climate change on the road transport and its infrastructure.

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