

Financing Climate Change Mitigation Measures in South African Local Government

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Abstract: A transition from energy intensive economy to green economy requires a notable capital investment in addition to the capital required by municipalities for provision of services needed to meet development goals. Green infrastructure investments will need approximately USD\$5.3 trillion to effect climate change mitigation actions globally. This paper reviewed literature, paying attention to the financing of climate change mitigations within the local government with special reference to one South African Metropolitan Municipality, the City of Tshwane Metropolitan Municipality. The City of Tshwane Metropolitan Municipality relies on public finance sources which are insufficient to achieve the development goals and address the climate change issues through green projects. The review of literature revealed that local governments across the globe prefers green finance as an alternative financing source for funding green projects. Accessing private sources of capital is a challenge for the local governments due to lack of adequate skills for preparing projects, poor good governance practices and poor credit rating. This paper employs a qualitative approach and focuses on the financing of climate change mitigation measures at a local level. The paper concludes that if local government can establish innovative measures to attract financing for green projects and such will close the financing gap.

Keywords: Climate change, Development goals, Green finance, Local government, Mitigations

1. Introduction

The world is confronted by a triple catastrophe of sustainability (Addison *et al.*, 2010:118). Over and above social and economic matters such as escalating inequalities, worldwide financial crisis, unemployment, the threat of climate change associated to an over-reliance on fossil fuels and the depletion and pollution of natural resources, is prospectively pushing the world to stages of hazardous instability. Moreover, South Africa is undermined by high levels of inequality, poverty, corruption, unemployment, diseases and poor education and democratic governance. Additionally, South Africa is faced with the rise in commodity prices and debt, consumption-led growth have concealed issues such as rising costs and declining competitiveness of the economy.

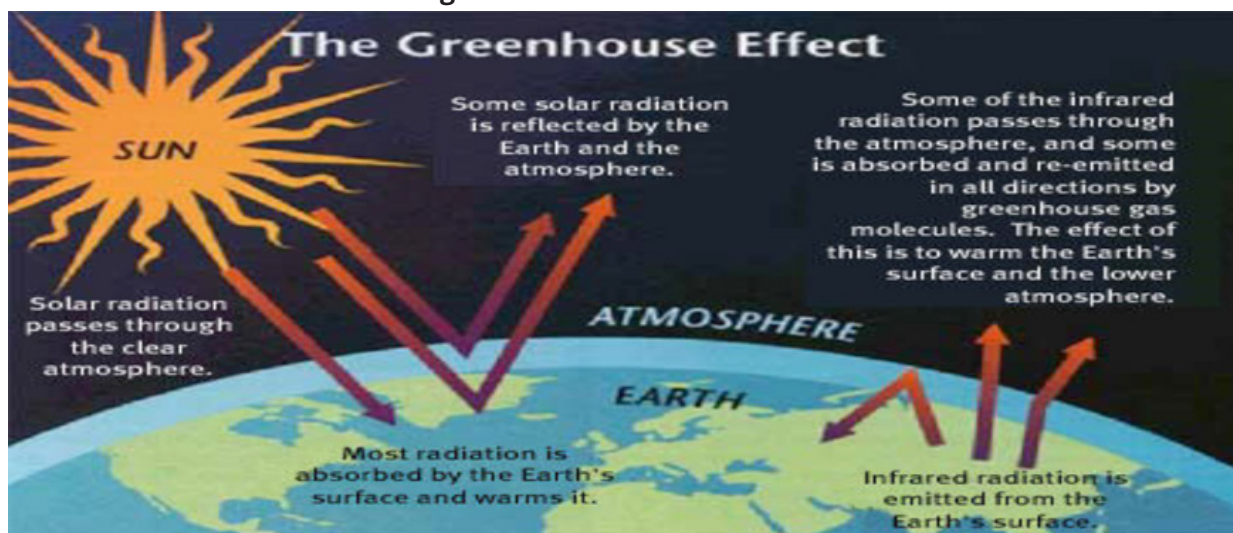
South Africa is ranked 13th largest carbon dioxide emitter globally, in spite of the country's relatively small population and economy. The country is vulnerable to global warming due to poor resilience and extreme climate events (DEA 2011). South Africa has realised far-reaching political, economic and social changes since 1994, and has illustrated a growing commitment to sustainable development. The South African *Constitution* recognises

sustainable development as a human right. South Africa has pledged to emission reduction (peak between 2020 and 2025 at respectively 34% and 42% below a business-as-usual trajectory, plateau for approximately a decade and decline in absolute terms thereafter) to the adequate provision of financial resources, technology transfer and capacity building support provided by developed countries (UNFCCC, 2011). This paper will first contextualise climate change and provide a definition thereof, describe the climate change trends from global to local context. Provide a brief discussion of the mitigation actions in South Africa and the City of Tshwane Municipality, the current financial inflows available for the municipality as well as the challenges and recommendations of financing the mitigation actions.

2. Contextualising Climate Change

Climate change is defined as "any change in climate over time whether due to natural variability or as a result of human activity" (Pielke, 2001:86). While Trewartha & Horn (1980:40) define climate change as an average weather, condition of an area characterised by its own internal dynamics and by changes in external factors that affect climate. Brainard, Jones & Purvis (2009: 18-21) and DiMento

Figure 1: The Greenhouse Effect



Source: National Research Council (2010)

& Doughman (2014:5-6) expand their definition of climate change to the involvement of both changes in average conditions and changes in variability including for instance, extreme events. It is the long-term shift in weather patterns in specific region. Therefore, from the mentioned definitions it can be generalised that climate change is the long-term shift in weather conditions identified by changes in temperature. There is a practice of interchangeable use of climate change and global warming. Climate change implies change in addition to the increasing temperatures while global warming refers to warming of the planet earth because of human activities. Intergovernmental Panel on Climate Change (IPCC) (2013) refers to global warming as an unequivocal and continuing rise in the average temperature of the earth's climate system. The process of natural warming can be seen in Figure 1, which is based on the greenhouse effects where the sunlight emitted onto the Earth's surface is absorbed by the oceans and land (National Research Council, 2010).

The strong global warming observed since the middle of the 20th century has been largely attributed to human influences on the climate. Scientists proved that human and natural activities contributes significantly towards climate change because of the greenhouse gas (GHG) emitted from burning of fossil fuel, as a result these emission form a layer in the atmosphere that traps a proportion of radiant energy from the sun. This fact disputes the possibility that climate change is caused by bio-geographical cycles of the earth only. de Costa Ferreira, Martins, Barbie & de Costa Ferreira (2011:55) attest that if

climate change was indeed just a natural caused problem, then it would mean that there is nothing that can be done about it except accepting and coping with it. However, that is not the case as there are adaptations and mitigation means to respond to the impacts of climate change.

Land use changes, such as deforestation and conversion of land to agriculture, have also contributed carbon dioxide to the atmosphere (Mastrandrea & Schneider, 2010:25). The human influences on the climate system have increased substantially. South Africa has relatively high emissions for a developing country, measured either per capita or by GHG intensity (emissions per unit of GDP). By any measure, South Africa is a significant emitter of GHGs in Africa. Currently available data indicate that, unchecked by climate mitigation action, South Africa's emissions could grow rapidly by as much as fourfold by 2050. The majority of South Africa's emissions arise from energy supply (electricity and liquid fuels) and use (mining, industry and transport), and mitigation actions with the largest emission reduction potential focus on these areas.

3. Global Climate Trends

Climate change is a phenomenon that affects all economies globally at all spheres, though the effects and impacts are not equal. For one to understand the regional trends of climate change the global trends, effects and impacts should be explored. In 2007 the IPCC reported that as a result of climate change the planet earth will experience more

frequent hot days and nights and less of cold days and nights. The report further warned that these increase in temperatures would head to significant changes throughout Arctic that will result in heavy floods. The Bulletin American Meteorological Society (2013:1112) alerts that there is a 90% chance that the global temperatures will rise by 3.50 degree Celsius to 3.70 degree Celsius in less than hundred years. This increase in temperatures could result in rising sea levels, volatile weather patterns, water shortage and other secondary effects.

Climate change has a global impact across various sectors. It has a significant impact on economies, ecosystems and the communities (Houghton, 2009:175; Sango, 2013:20). The communities' health is threatened through shortage of fresh water as well as increased diseases. These impacts have incalculable economic risks. Climate change threatens basic needs such as water, food, health, transport and shelter with the rise in temperatures, sea levels and change in precipitation as well as intense extreme events (Leary, 2008:291; National Research Council, 2010). Although climate change is a global problem, the impact will not be felt the same across the globe. Some nations will experience more adverse impact than others because of the adaptive capacity. Numerous scientific studies are in consensus that climate change has a negative impact on the economic development of the countries and the countries will experience unequal impact of climate change, but they do not specify which country will be mostly or less affected. According to Houghton (2009:233) the overall impact of climate change is predicted to be reduced to 20% in per capita production with a greater impact in developing countries.

4. African Trends

Africa is exposed and vulnerable to climate change and variability (Boko *et al.*, 2007:433; IPCC, 2011). Boko *et al.* (2007:436) put emphasis on the fact that climate change affects basic needs such as water by imposing pressure on the availability, accessibility and demand of water in Africa. On the other hand, Tadesse (2010:1) share same sentiments with authors who are concerned about the threat of climate change on basic needs, and the author is concerned that Africa is a lighter polluter globally but will experience severe impact of climate change in the pursuit of water and food security. Climate change affects several sectors, Lalthapersad-Pillay and Udjo (2012:872) attest that climate change induces migration; they assume that

people relocate from rural to urban areas because rural areas are mostly poverty-stricken and the effects of climate change are already felt on weather temperatures. The authors fear that this relocation will put more pressure on urban infrastructure. It can be deduced from various views of researchers that climate change impact is severe in different sectors and the economies of most African countries are at risk and their development is threatened, as such their capacity to adapt are limited.

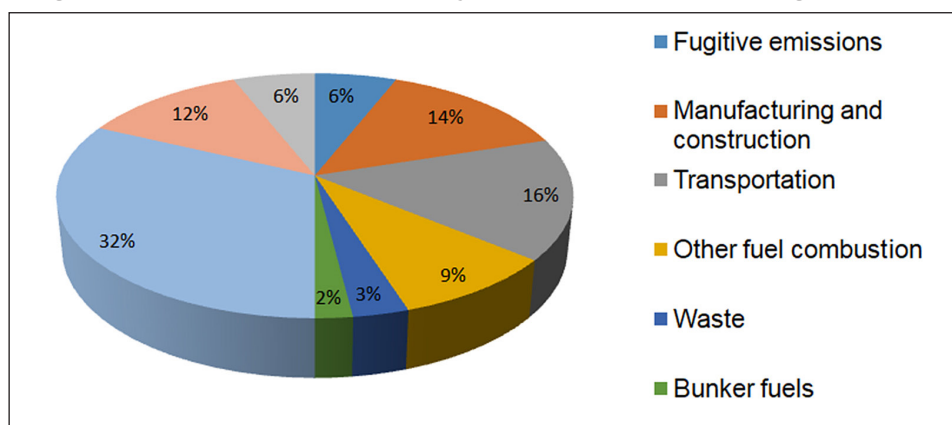
The IPCC (2007) in its Summary for Policy Makers listed the examples of specific projected impacts for Africa because of climate change:

- By 2020, between 75 and 250 million people are projected to be exposed to increased water stress due to climate change.
- By 2020, in some countries, yields from rain-fed agriculture could be reduced by up to 50%. Agricultural production, including access to food, in many African countries is projected to be severely compromised and will adversely affect food security and exacerbate malnutrition.
- Towards the end of the 21st century, projected sea level rise will affect low-lying coastal areas with large populations.
- The cost of adaptation could amount to at least 5-10% of Gross Domestic Product (GDP).
- By 2080, an increase of 5-8% of arid and semi-arid land in Africa is projected under a range of climate scenarios.

The climate predictions could mean that the heat waves and winter flooding could become more frequent with devastating impacts on people and the natural environment. In 2008 the UNFCCC acknowledged that certain scientists doubt the scientific basis of the Kyoto protocol alleging that the connection between increases in GHG emissions and climate change is not clear (UNFCCC, 2008). The compelling evidence brought forward by the IPCC (2009) proving the positive connection between increased GHG emissions and climate change disputed this.

5. South African Trends

South Africa is both a contributor to and potential victim of global climate change because it has

Figure 2: World GHG Emissions by Sector in 2012 (Excluding Land-Use)

Source: DEA (2012)

energy intensive, fossil-fuel powered economy and is highly vulnerable to the impacts of climate variability and change. South Africa is the largest emitter of the GHG emissions in Africa (Department of Environmental Affairs and Tourism, 2007 – now named Department of Environmental Affairs). The (IPCC, 2012) considers climate change to be one of the pressing challenges to the local levels globally. Research studies show that the anticipated climate impact for South Africa is no different from those experienced across the globe. Impacts such as change in rainfall time and volume, change in season (anticipating longer summers) and increased climate variability (i.e. floods and droughts) as a result consequences such as loss and damaged road infrastructure will be experienced. These studies further warn that the poor will be highly affected because they have limited adaptive capacity.

The largest emitter of the GHG emissions in Africa is South Africa (DEAT, 2007) with energy and transport sectors leading as emitters of CO₂ in South African cities, accounting for more percentages of emissions. Figure 2 above indicates the GHG emissions per sector in the year 2012.

As indicated in Figure 2 electricity is the largest emitter in South Africa. Eskom generates electricity from coal, in the year 2010 Eskom reportedly produced 224.7000 metric tons of CO₂ (Sasol, 2011). Transportation is second, these emissions are mostly from the road transport usage such as driving of private, freight and public transport vehicles and little from other modes of transport such as aviation and maritime. South Africa's increased economic development leads to an increased urbanisation and motorisation, which resulted in more people owning cars. The majority of motorised transport

relies on the availability of fuel, being almost completely dependent on oil, which 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. 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 leads to damaged road infrastructures, which may lead to an increase in accidents. 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 has actually led to the people dependent on their cars to meet their travelling needs. The National Climate Change Response Strategy (2011) has identified a transport sector mitigation programme that combines energy efficiency and emissions reduction programmes for road-going vehicles.

Climate change is generally anticipated to still be a problem in the future. According to Oduniyi (2013: 44), South African climate is expected to be drier and hotter in the future than it is today. Ragab & Prudhomme (2002:24) & IPCC (2001) indicate that by 2050, the annual temperatures will increase by 1.5 to 2.5°C in the south and 2.5 to 3.0°C in the north. NRC (2010) warns that the warming of Indian Ocean means more droughts for Southern Africa. In line with scientific opinion, South Africa believes that it is critical that average global temperatures do not rise above 2°C from pre-industrial levels in order to avoid the most severe social and environmental impacts (DEA, 2012). As a responsible global citizen, with moral and legal obligations under the

UNFCCC and its Kyoto Protocol South Africa is committed to contributing its fair share to global GHG mitigation efforts. Hence, South Africa has committed itself to an emissions trajectory that peaks at 34% below a "Business as Usual" trajectory in 2020 and 40% in 2025, remains stable for almost a decade, and declines thereafter in absolute terms. Scientific studies attempt to project what could happen at specific regional and local areas, the level of uncertainty increases (IPCC, 2012). The National Assessment notes that there is a high potential for "surprises", major, unexpected events that will have significant impacts.

In terms of the future predictions of climate change and its impacts, there is a consensus amongst scientists that with the available policies on mitigation, the GHG emissions will grow to the next century (IPCC, 2001; Agrawal, 2005; IPCC, 2007; Agrawal, 2008). In the climate change context, the transport and energy sectors are rapidly growing sources of GHG emissions and the significant mitigation benefits can be found in the sector (National Climate Change Response, 2011). The response strategy 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 production. Although everyone is at risk of climate change impact, the costs and degree of impact will vary based on regional context. South Africa is energy intensive and its economy is fossil fuel powered as a result it is amongst the countries that are highly vulnerable to the impacts of climate change.

6. Mitigating the Impact of Climate Change in South Africa

There is a need to mitigate climate change. Mitigation refers to the minimisation of the effects of climate change. According to Harris & Birjlandi Feriz (2011:29) mitigation measures involve the following:

- Reduction of GHG emissions, either reducing the level of emission related activities or by a shift to energy efficient and renewable energy technologies that permits similar level activities at a lower level of CO₂ emissions.
- Carbon sinks enhancement: preserving forested areas and expanding forestation.

In terms of the Stern review reports (2006,2007) mitigating the effect of climate change is a long-term measure, whilst adaptation to climate change is a short-term measure. This paper is more interested in the long-term measure for long-term solution. Mukonza & Mukonza (2015:90) assert that climate change has created a need for policies to address and minimise its impacts and effects. The country's National Climate Change Response Policy (2011) provides the overarching framework from which cities develop their individual climate change strategies that inform their IDPs (South African Cities Network, 2016:32). Prior to the COP17 in 2011, the South African cabinet approved the National Climate Change Response White Paper in 2010. The response paper included a proposed carbon tax, which is aimed at making funds whilst regulating emissions from carbon. There is already a heavy investment on renewable energy and the establishment of the National Development Plan (NDP) to visualise the environmentally sustainable transition and low-carbon economy to underway effectively by 2030. Mitigation actions involve various stakeholders and are executed and financed by diverse institutions such as non-governmental institutions, business and industry, research institutions, agencies and all three spheres of government. Furthermore, the response interventions on climate change are diverse, varying from action plans, regulations, policies, research, strategies and regulations of mitigation and response project and programmes. South African municipalities have various financing schemes, varying from national government to assist in mitigating the impacts of climate change. These schemes include Municipal Infrastructure Grant, Urban Settlements Development Grant, Public Transport Infrastructure and Systems Grant, Illiteracy Demand-side Management Grant, Municipal Disaster Grant, Municipal Relief Grant and Regional Bulk Infrastructure Grant, as well as opportunities to access an array of international financing options aimed at low-carbon initiatives for climate change mitigation (City of Tshwane, 2015). Moreover, municipalities can utilise some incentive schemes to stimulate action plans, and can also apply for fiscal policies (City of Tshwane, 2015). The next section discusses the South African means of financing mitigation actions.

7. Financing Mitigation Actions in South Africa

Globally there is a disagreement on climate finance. Developing countries persist that developed countries

Table 1: Four Broad Categories of Climate Change Finance

International Climate Funds	<ul style="list-style-type: none"> •Clean Development Mechanisms •Global Environmental Facility •Global Climate Change Alliance (GCCA) •UNEP and Clean Technology Funds
Bilateral and Multilateral ODA	<ul style="list-style-type: none"> •Bilateral Grants •EU/Commission •GTZ, DANIDA, DFID, etc
Domestic Public Sector	<ul style="list-style-type: none"> •Intergovernmental Transfers •Local Municipal and Provincial Revenue •Green Fund •Energy Efficiency - Demand Side Management Grants
Private Sector Financing	<ul style="list-style-type: none"> •Grant Funding •Venture Capital and Equity Finance •Debt and Project Finance

Source: Misuka Green Development Solutions (2013)

should take a lead in responding to climate change and finance the developing countries to increase their capacity in responding to climate change (IPCC 2014). Nevertheless, the developed countries are reluctant to lead in this regard. Climate mitigation for most countries is not the main target, but it is outgrowth of efforts driven by economic, security, or local environmental concerns (Jaroszowski & McNamara, 2014:16). The South African government has signed diverse global environmental agreements that are implementable at municipal level (South African Cities Network, 2016: 12). Additionally, the country has committed to mitigate the impact of climate change through the reduction of the greenhouse gas emission and facilitation of the low carbon growth development. In 2009, the South African government highlighted a determined trajectory for reducing emissions, subject to international financial aid.

Addressing climate change has become a priority for South African municipalities. According to South African Local Government Association (2016), the municipalities have begun to source financing for the remarkable capital investment and engage in testing different inventive models for funding. These tests may influence the future of municipal infrastructure financing and address the current challenges of investment in the green infrastructure (SALGA, 2016). Therefore, lack of access to finance for climate-related projects could be a death knell to attempts of dealing with the impacts of climate change. In the 2009 Copenhagen Accord, developed countries pledged raising USD 30 billion by 2012, increasing to USD 100 billion per year by 2020 for financing climate change project in developing countries. Again, in 2011 these commitments were repeated at the

Cancun decision and Durban Platform. Hallegate, Heal, Fay and Treguer (2012:17) state that implementation of mitigation actions is important for sustainable development. The climate resilient road projects and programmes require financing mechanisms to cater for each phase. Hammer *et al.* (2011:76) assert that regulatory authority and financial tools are important policy instrument necessary for municipalities to achieve the outcome of the climate resilient projects and programmes. The City of Tshwane has been able to access different sources of funding with different degrees of success; funding such as the international multilateral grants and bilateral grants; municipal own revenue raised through property taxes; intergovernmental grants; and concessionary loans for very large infrastructure projects. However, DBSA (2012) acknowledged that climate finance complex and fractured, as a result the ability to duplicate and upscale the climate change projects is limited. Literature review indicates that municipality mixes the four broad categories of funding as indicated in Table 1 above to finance the climate change projects. However, there is a large dependence on grants from international sources to finance innovation, and intergovernmental grants to finance planned policy interventions.

Developed countries are obliged to provide funding for developing countries under the United Nations Framework Convention on Climate Change (UNFCCC) for extra costs for reducing the climate change impacts. For instance, the cost of shifting energy generation from fossil fuel to renewable energy. Numerous climate finance institutions are established to provide financial support. Globally, financing mechanisms developed includes a

number of multilateral, bilateral, domestic public and private climate. However, for a country to access international climate finance it has to have a high standard of capacity and expertise to establish projects in terms of stringent, unfamiliar and rigorous requirements. The same applies to the equity partnerships and private debts; significant standard of preparatory work is required to ensure that the projects are financially feasible to the lender. The normal climate finance support accessible to developing countries are sourced from private sector and government cooperation, national public finance budget and the market mechanisms such as carbon markets. South Africa has access to the following climate finance support:

- Technical assistance, which is accessible through particular climate finance grants from multilateral and bilateral agencies, including the Global Environment Facility and once operationalized, the Green Climate Fund and the bilateral development assistance programmes like the Germany's Gesellschaft für Internationale Zusammenarbeit (GIZ).
- Access to the carbon markets through the Clean Development Mechanism (CDM) have been used, though not easy, through the climate change mitigation projects. The Clean Development Mechanism (CDM) is a flexible mechanism under the United Nations Framework Convention for Climate Change (UNFCCC) to enhance the implementation of projects that have specific carbon reduction advantage, but would be difficult to be implemented because of financial barriers. Only projects that meet the stringent regulations of the CDM would qualify for certified emission reductions (CERs) which have a monetary value. The CDM has mainly two goals:
 - » To financially assist countries without emissions targets (i.e. developing countries) in achieving sustainable development.
 - » To help those countries with emission reduction targets under Kyoto (i.e. developed countries) in achieving compliance by allowing them to purchase offsets created by CDM projects.

United Kingdom's Department of Energy and Climate Change and the Department for International Development are the major donors in South Africa

for climate-related projects and programmes. Additionally, Germany through its twin arms of GIZ and KfW as well as others such as Denmark, Finland, France, United States and Switzerland are amongst the major donors. For municipalities to access the bilateral or multilateral Official Development Assistance (ODA) must approach the National Treasury and apply for funding (DBSA, 2011). ODA accounts less than 2% of the South African budget. South Africa's evolving status as a middle-income country, its increasing role in the development of the BRICS bank together with other factors related to the domestic pressures faced by donors could mean that donors may reduce or terminate traditional ODA to South Africa. Chapter 11 of the South Africa's climate change response Change Policy stipulates the legal framework for resourcing. The chapter encourages private and public finance institutions to collaborate with civil societies and the communities to finance the mitigations actions and any other interventions to climate change. Since 2003, South Africa has received US\$536 million from international climate funding instruments for climate change projects. Of these funds, US\$524 million targeted mitigation projects and US\$6.78 million were earmarked for adaptation projects.

Financial instruments and support provided to South Africa consists of loans (85%), grants (5-10%) and technical assistance (5%). The focus of this support is on energy efficiency and renewable energy projects with smaller allocations to natural resource management, climate policy and demonstration of other green technologies. In addition to the allocation for environmentally related public expenditure in the national budget, the South African Government has established and supported a number of climate specific budget allocations through its agencies and departments. These include the Department of Energy's Energy and Eskom's Efficiency Demand Side Management (EEDSM) grant. The grant is available to energy efficiency projects implemented by municipalities to assist with the retrofitting of municipal infrastructure and other project developers and the National Green Fund (GF) launched in October 2012 and administered by the DBSA with an amount of R1.1 billion over three years.

8. Challenges and Recommendations of Financing Mitigations in South Africa

South Africa as a developing country with high rate of poverty and unemployment needs to grow

its economy expeditiously. Thus, climate change threat adds stress to already existing challenges and threatens economic development. In view of the South African economic status quo, it is of crucial importance to assess whether the economic developmental goals are compatible to the international obligations and commitment to respond to climate change; to assess the possibility of the country realising the contradictory goals of promoting industrial development and at the same time employing and reducing carbon emissions and; to assess whether the available policies are sufficient to facilitate the emission reductions and any other action plans. Literature reveals a number of factors that have potential to pose risks in implementing the climate resilient projects and programmes; factors such as lack of finance, capacity, social acceptance of the projects and programmes and political will. South African Cities Network (2013:28) indicates that municipal grants and revenues are outweighed by the infrastructure needs of cities, thus leaving municipalities with fewer options but borrowing funds. Unfortunately, World Bank reports that out of 500 cities in developing countries just below 5% cities are found creditworthy enough to have access to the global financial markets (UNEP, 2015). The World Business Council of Sustainable Development and the Group of Twenty High-Level Panel on Infrastructure Provision encourages the private sector to be involved in infrastructure projects. The private sector involvement will encourage the skills transfer to the public sector. Moreover, the private sector has more advanced technological instruments that can be useful in the public projects.

Theoretically, climate change mitigation is compatible with the South African socio-economic goals. In fact, the mitigation actions can benefit the economy. For instance, the poor as the most vulnerable to climate change impact will benefit from mitigation actions as in a long-term these actions support socio-economic development goal (Bowen *et al.*, 2013:278). Moreover, the mitigation actions will make South African economy more competitive in a carbon-constrained future. South African government is confronted by formidable socio-economic challenges, and by far the government is not doing so well in addressing the challenges. Thus, turning the economy "green" is an additional challenge, with all its complexities and difficulties of socio-economy. The municipalities have to make difficult decisions to find balance between competing interests of the communities with limited resources and funding.

Furthermore, lack of political will to address the challenges faced in implementing projects and programmes is a challenge on its own. Other challenges include high transaction costs, competitiveness, costs for emission reductions, availability of investment capital and little progress in technological development. Overcoming these challenges to implementation requires policy intervention and incentives. Most importantly, the municipal spending patterns should be adjusted to accommodate the mitigation strategies.

9. Conclusion

South African government has not yet established a comprehensive national climate finance facility, the DEA and the National Treasury with the help of DBSA, have been working on developing such a scheme. The Government has acknowledged the necessity to mobilise funds at the local government level and has allocated funds towards climate change mitigation and adaptation. Globally, South Africa continues to support the agenda the Africa Group and BRICS, and has stressed that the country's reduction of GHG emissions remains conditional on appropriate financial, technical and technological assistance from developed economies.

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