South African CitiesNetwork

A case for renewable energy & energy efficiency

An analysis of cities financial implication of transitioning to a green economy

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Acronyms

BOT – Build Operate Transfer

BRT – Bus Rapid Transit

CTF – Clean Technology Fund

EE – Energy Efficiency

EEDSM – Energy Efficiency & Demand Side Management

EMM – Ekurhuleni Metropolitan Municipality

ESMAP – Energy Sector Management Assistance Programme

GDS – Growth and Development Strategy

GHG – Green House Gas

HVAC – Heating Ventilation Air Conditioning

IDC – Industrial Development Corporation

IDP – Integrated Development Plan

IP – Implementation Plan

KWh – Kilo Watt Hour

LED – Light Emitting Diode

MWh – Mega Watt Hour

NDP – National Development Plan

NERSA – National Energy Regulator South Africa

PPP – Public Private Partnership

PV – Photo Voltaic

RE – Renewable Energy

SEA – Sustainable Energy Africa

SMME – Small Medium & Micro Enterprise

UNEP – United Nations Environment Programme

ZAR – South African Rand

Executive Summary

The South African economy finds itself at a cross roads as it has done at certain junctions in the past. Call it another “crossing the Rubicon” moment. The implications of the decisions taken and their effects on society beyond the economic realm cannot be under estimated given the immense challenges to build a cohesive society. Sustainable development in the form of the green economy is touted as a fix it all for all of South Africa’s ailments; poverty alleviation, job creation, modern access to services, under investment, declining foreign exchange from energy intensive industries, current account deficits etc. Yet underpinning these well intentioned solutions is the need to understand how we can manage such a transition. From a renewable energy and energy efficiency perspective, there is a general perception that the costs of transitioning are expensive with the benefits only experienced years thereafter. Global initiatives like the City of Los Angeles street light retrofit program and local ones such as the City of Joburg’s smart metering system go some way towards dispelling these preconceived notions.

A review of these initiatives and others find that cohesive planning and coordination of implementation by the nominated actors is key to realizing a positive bottom line for a city’s finances. There exist many funding mechanisms to finance the green economic transition. Often times these funds are starved of commercially viable projects. Put simply, there are a lot of well- conceived but not good packaged project proposals and a sizeable portion of funds available. The challenge seems to be more a case of preparing good proposals especially from the local government sector, to match the available funds. Underpinning this are the processes and regulatory hurdles involved including reporting requirements especially from a municipal perspective. The need for decisive leadership in meeting policy objectives cannot be understated.

That the transition to the green economy will result in relative decoupling of resource use from economic growth is well understood. The effects can be seen through such instances as reduced greenhouse gas emissions. In the South African context, what is not so well articulated is what the financial implication of the mitigation actions mean. From a municipal standpoint, measurements of successful project implementation are well documented through such indicators as the number of solar geysers installed, street lights retrofitted etc. How these initiatives impact on the bottom line for municipal operational and capital expenditure for example is not so well communicated. The challenges here point to a need for full life cycle financial accounting of these green energy and energy efficiency initiatives through a measure like ring fencing the operational cost savings from such projects.

The financial implication of transitioning to a green economy can be a positive economic cost benefit for municipalities if careful attention is paid to the mechanisms (technology choices, funding sources, implementing agencies) used. Otherwise the much sought after benefits may accrue to other actors other than the municipalities involved eg. foreign manufacturers.

1. Introduction

Neogesi Consulting was appointed by the South African Cities Network (SACN) to undertake research on the financial implication of transitioning to the green economy by cities. The paper focuses on renewable energy and energy efficiency within South African municipalities. The SACN intends to use this input into the chapter on energy for the upcoming publication on the State of City Finances, 2015. This Paper is one of the three commissioned during 2013/14 financial year for the same intention.

2. Background

This background looks at the origins of the green economy both locally and internationally including aspects of climate change at it relates to the green economy. The chapter also goes as far as briefly defining the green jobs.

2.1 Green Economy

A green economy, as defined by the United Nations Environment Programme (UNEP), is one that "results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities" or, simply put, one that is low carbon, resource-efficient and socially inclusive (UNEP, 2011). The green economy is an alternative approach to development which seeks to integrate economic development with the environment, human well-being and socially-inclusive growth, thereby mitigating the climate change risks, which arise from environmental degradation.

According to a recent UNEP report, in a green economy "growth in income and employment should be driven by public and private investments that reduce carbon emissions and pollution, enhance energy and resource efficiency and prevent the loss of biodiversity and ecosystem services," positively impacting on poor people whose livelihoods are dependent on nature. Practically, following the green economy path to development entails reduction in carbon emissions, increasing the efficiency of resource utilisation and promoting socially inclusive growth.

From a city point of view, the challenge is to marshal both public and private investments to foster this growth in income and employment within its boundaries. From a renewable energy and energy efficiency perspective, a reduction in carbon emissions stems from uptake in energy efficient end user technologies as well as power generation and consumption. In most cases, the sought after growth in income and employment are not coexisting. What often occurs through the implementation of these projects is a growth in employment through increased implementation of green energy projects against a business as usual scenario while a reduction in operational expenditure due to less reliance on external sources for power. Often renewable energy projects require a large capital injection. From a municipal standpoint, these costs are passed to consumers and their viability as the cost recovery model is severely constrained due to the municipal mandate to extend services to all citizens without affecting the poor adversely. Simply put, if you can't get enough wealthy citizens to pay for your clean energy generation, you might not be able to recover your costs. Given the near total dependence of South African municipalities on cheaper external sources of power generation

(Eskom), a low hanging fruit in the transition to the green economy might rather be an extensive energy efficiency campaign rather than opting for expensive clean technology generation.

The Green Economy refers to two inter-linked developmental outcomes for the South African economy (DEA, 2013):

- Growing economic activity (which leads to investment, jobs and competitiveness) in the green industry sector;
- A shift in the economy as a whole towards cleaner industries and sectors with a low environmental impact compared to its socio-economic impact. Green Economy is a growing economic development model based on the knowledge that aims to address the interdependence of economic growth and natural ecosystems and the adverse impact economic activities can have on the environment.

Green Economy can create green jobs, ensure real sustainable economic growth and prevent environmental pollution, global warming, resource depletion and environmental degradation. However for a green economy to take real shape, policy prescriptions and clear enabling mechanisms need to be followed to give tangible meaning to green jobs, sustainable growth and ending resource depletion.

What are green jobs?

Green jobs can be defined as work in:

- Agricultural, manufacturing, research and development, administrative, and service activities that contribute substantially to preserving or restoring environmental quality. Specifically, this includes jobs that help to protect ecosystems and biodiversity; reduce energy, materials, and water consumption through high efficiency strategies; decarbonise the economy; and minimise or altogether avoid generation of all forms of waste and pollution.
- Greater efficiency in the use of energy, water, and materials is a core objective i.e. achieving the same economic output (and level of well-being) with far less material input.
- Green Jobs need to be decent work, for instance, jobs which offer adequate wages, safe working conditions, job security, reasonable career prospects and worker rights. People's livelihoods and sense of dignity are bound up tightly with their jobs.
- Green jobs exist not just in private business, but also in government offices (standard setting, policymaking, permitting, monitoring and enforcement, support programs, etc.),

The concept of the green economy has moved beyond the boundaries of environmental economics and into mainstream politics and business in response to the dual problems of global climate change and the economic crisis. It is argued that a green economy will enable environmental friendly, economic and employment growth on the same, or a greater scale than current environmentally unsustainable growth. The need for climate change action and overall resource management and protection is geared to accelerate the pace of green job creation and overall green investments in the years ahead. A global transition to a low carbon and sustainable economy can create large numbers of green jobs across many sectors of the economy, and indeed can become an engine of development. These developments towards a Green

Economy create needs to develop and further elaborate the economic case for environmental management and sustainable development (Department of Environmental Affairs, Pretoria, 2013). South Africa has a rich natural resource base and ranks amongst the top 3 in the world's most bio-diverse countries (Department of Environmental Affairs, 2013).

South Africa's transition to the green economy should be seen through a relative decoupling of its economic activity from natural resource use. From an energy perspective, South Africa needs to reduce its energy intensity per unit of economic activity. The historical dependence on a centralized coal fired power generation utility model creates some barriers towards cities taking a leading role in reducing energy intensity. The relative decoupling is hence important as it is in activities such as energy efficiency interventions in buildings and streetlights where cities can take a leading role while demonstrating economic cost benefits. Green jobs for municipalities need to come from mitigation actions that reduce expenditure and thus can be used to fund job creation.

The key sectors expected to drive green economy and job creation include:

i. Agriculture,
ii. Green buildings construction and refurbishment,
iii. Greener transport including electric vehicles & bus rapid transit,
iv. Green cities,
v. Energy supply and demand including grid-connected solar, thermal, and large wind power projects, energy efficiency including demand-side management,
vi. Water,
vii. Industry and manufacturing,
viii. Tourism,
ix. Waste management,
x. Consultancy, policy, research and governance.

2.2 Climate change and its relation to the green economy

The impact of climate change on Africa is likely to be severe because of adverse direct effects, high agricultural dependence, and limited capacity to adapt. Direct effects vary widely across the continent, with some areas (e.g. eastern Africa) predicted to get wetter, but many parts of southern Africa getting drier and hotter. Crop yields will be adversely affected and the frequency of extreme weather events will increase. (Collier et al. 2008). Climatic changes could be different according to location within the continent: there is no Africa-wide climate effect. Some areas of Africa will become drier, others wetter, and some regions may derive economic benefit, while most are adversely affected. Africa average rainfall is likely to increase (by 15 per cent or more) which could cause some of the Africa to suffer from droughts *and* floods with greater

frequency and intensity. How will these climatic changes affect African economies? By far the most important effects will be on agriculture, although these effects are also the least certain. Impacts on agricultural output vary from country to country (Brooks, 1998; Boko et al., 2007).

On the mitigation side, there is a need to design emissions-trading frameworks that support greater African participation than at present, and that include land-use change. Mitigation undertaken elsewhere will have a major impact on Africa, both positive (e.g. new technologies) and negative (e.g. commodity price changes arising from biofuel policies). At the basis of climate change is global warming caused by anthropogenic emissions of carbon dioxide (CO_2), methane (CH_4), and other greenhouse gases. The global warming occurrences worldwide and temperatures are rising on the African land mass and in the surrounding oceans.

South Africa's level of emissions will peak and stabilize around 2025. This transition will need to be achieved without hindering the country's pursuit of its socioeconomic objectives. This can be attained through adequate international financing and technological assistance, and a carefully aligned domestic policy and regulatory environment. Key contributors to stabilizing emission include: a commitment to undertake mitigation actions; an appropriate mix of carbon pricing mechanism; policy instruments that support mitigation; an expanded renewable energy programme; an advanced liquid and bio-fuels sector; effective mix of energy efficiency and demand management incentives; proactive local government climate change programmes; finally, investment in research and development, manufacturing, training (National development Plan, 2030).

On the adaptation side South Africa's primary approach to adapting to the impact of climate change is to strengthen the nation's resilience. This involves decreasing poverty and inequality, increasing level of education, improving health care, creating employment, promoting skills development and enhancing the integrity of ecosystem. This strategy requires that local, provincial and national government embrace climate adaptation by identifying and putting into effect appropriate policies and support mechanisms.

Local governments around the world have taken the initiative towards climate change adaptation. In 2011 during the 17th Conference of Parties, these local governments signed up to the Durban Adaptation Charter which places adaptation at the core of future local climate change response plans and urban development strategies.

It is thus evident that cities can contribute significantly towards climate change mitigation and adaptation through regulatory framework (by-laws) influence for the entire urban form and development.

2.3 International adoption of green economy and climate change

In the midst of the global economic crisis, the UN Environment Programme's called for a Global Green New Deal according to which governments are encouraged to support its economic transformation to a greener economy that creates green jobs, promotes sustainable and inclusive growth and the achievement of the Millennium Development Goals.

Investments in both public and private sectors, provide the mechanism for the reconfiguration of businesses, infrastructure and institutions, and for the adoption of sustainable consumption and production processes. Such reconfiguration will lead to a higher share of green sectors in the economy, more green and decent jobs,

reduced energy and material intensities in production processes, less waste and pollution, and significantly reduced greenhouse-gas emissions.

All over the world, cities have begun promoting green economy and climate change mitigating strategies. Countries like Denmark have made tremendous strides in industrial energy efficiency. Brazil which is a developing country has set targets for the reliance on fossil power to be reduced by 2020. China had invested a large part of its fiscal stimulus package into clean energy. The Country Energy Efficient Project in Brazil, China and India was implemented as a United Nations Environment Programme Project during 2002–06 by the World Bank and UNEP's Risoë Centre on Energy, Climate and Sustainable Development, in partnership with country teams of practitioners (also called core groups) in each of the three countries. The project was funded by the UN and the World Bank's ESMAP (Energy Sector Management Assistance Programme).

Cities like Brisbane, issued Brisbane's Plan for Action on Climate Change and Energy. Some of their action plans includes; shifting to energy-efficient light fittings, installation of rainwater tanks in homes, using more efficient air-conditioners, recycle and water preserve, installation of solar panels and solar hot water systems, reducing vehicle emission through alternative transport systems and implementation of 2 million tree planting. With all these action points, the city aims to reduce the annual carbon footprint of an average household from 16 tons of carbon dioxide (CO_2) in 2006 to 4.5 tons by 2026 (Brisbane city council, 2006). Other cities initiatives includes; Auckland in their sustainability framework, Bogota rapid transport transit for urban transport, Lahore solid waste composting, Curitiba waste and BRT programmes and Yokohama waste reduction initiatives.

The Cities of Los Angeles and Portland demonstrate two tangible examples of adoption of a green economy where energy is concerned. Both cases were able to show a positive economic benefit without negatively affecting each city's bottom line.

2.4 South African context - an evolution of the green economy policy framework and institutional arrangement

As a developing country, the country is struggling with the challenges posed by the need for growth and the creation of new and sustainable jobs whilst reducing our impact on the environment. Over the years, South Africa has identified a number of initiatives that could be undertaken to make the aspirations for a Green Economy a reality. The first phase involved input from a wide range of provincial departments and municipalities at a workshop, followed by research to acquire and synthesize relevant strategies that have made current commitments towards a green South Africa which include; air quality, climate change, economic development, energy, food security, transport, water and sanitation, waste and spatial planning and land use.

It is against this notion that there has been a policy evolution in the country. Some of these policies that help in the formulation of the transition to the green economy are depicted in the figure below:

Fig 1 – DEA National Policy Framework in support of the green economy

The policy evolution sets government's intentions in recognizing the opportunities in the development of industries that combat the negative effects of climate change and urges South Africa to develop strong

capacity in green technologies and industries. Some of the envisaged benefits of this policy framework include:

- Access to energy for rural communities far from the electricity grids;
- Reduction in CO_2 emissions;
- Diversification of electrical supply and energy security; and
- Promotion of the development of small, medium and micro enterprises (SMMEs) (Kaggwa et al. 2013).

South Africa will implement nationally appropriate mitigation actions which will result in the reduction of emissions by 34% relative to our Business as Usual trajectory by 2020 and by 42% in 2025. The extent to which this commitment is achieved depends on the provision of finance, technology and capacity building support by developed countries and through the UN climate change regime.

According to Kaggwa et al., 2013, 'Government institutions and the private sector have been the key pillars in formulating policy measures that seek to support the transition to a green economy in South Africa'.

Greening the economy is particularly important in South Africa for two basic reasons: (1) the exceptional level of unemployment that the country is experiencing and (2) the high carbon impact of the economy. One of the six priority sectors of the New Growth Path is the green economy because of its potential for job creation. The new growth path was conceived in response to the global economic downturn in 2008 and the country's poor record of job growth throughout the 2000s (Borel-Saladin and Turok, 2013). In the subsequent framework for South Africa's response to the international economic crisis, government recognises the opportunities in the development of industries that combat the negative effects of climate change and urges South Africa to develop strong capacity in green technologies and industries.

South Africa relies on its coal mines for 80% of its energy supply and that needs to change. South Africa needs to look at new ways to generate clean energy for sustainable economic and social development and to reduce its dependency on coal. Bold and achievable targets to generate clean energy must be investigated and implemented. In 2009 South Africa received a major boost in its ambition to meet clean energy goals. The $500 million for South Africa's Clean Technology Fund (CTF) Investment Plan (IP) paves the way for us to move closer to our vision of generating four percent of its electricity from renewable energy by 2013, improving energy efficiency by 12 percent by 2015, and providing 1 million households with solar water heating over the next five years (Department of Environmental Affairs, 2013).

3. City Governments initiatives towards green economy and climate change

The world's economic action is centered in its cities. More than half the people in the world live in metropolitan municipalities, a figure that is projected to rise to nearly three-quarters by mid-century. Leaders of these economic hubs continue to make progress on mitigating climate change impacts and reduced environmental

degradation. A review of few cities both international and local has been conducted as part of this research work; details are below.

3.1 Portland

The City of Portland's project objective was to replace its incandescent traffic street signals with LEDs thereby reducing energy consumption and operating costs. Prior to adopting the LED modules, the City utilized incandescent light bulbs with a short two-year life span for traffic signal indications, after which the signals needed to be re-lamped. Re-lamping the incandescent light bulbs were time-consuming and expensive, and required a two-vehicle maintenance operation: a one-bucket truck and one traffic-control pickup. The bucket truck consisted of a crew member elevated inside a bucket to the height of the traffic signal, while the traffic-control pickup followed with a warning sign. Although roads were not required to be closed to accommodate the maintenance crew, there were significant traffic delays in the city (ESMAP, 2010).

The project made use of a leasing arrangement as well as tax credits and utility rebates to make a financially viable case. The leasing of the LEDs resulted in no upfront capital investment. The leasing scheme devised was normally used by Portland for the acquisition of capital intensive equipment. For this project, Portland enlisted the services of a financial broker who carried the costs for leasing the LEDs. Portland would tender for and procure the lamps through an installation contract. However the lamps were leased to Portland by a local bank through the assistance of the financial broker. In this way, the City could maintain control of the project while spreading capital costs out over a six-year lease agreement, allowing it to pay the costs as energy and maintenance savings from the project accrued (ESMAP, 2010). This was seen as a novel public private partnership at the time due to such a financing arrangement never having being created for energy efficient technology implementation. Tax credits that were possible were applied for successfully by the local bank. This resulted in a lower monthly lease payment by Portland. The City of Portland was also able to claim a rebate through the local utility providing electricity.

The project cost was $2.2 million. A tax credit of 35%, translating to a figure of approximately $800 000 was applied for and awarded to the financial broker and bank. This allowed the financial broker to reduce the lease payment by about 22%, which was said to save the City of Portland about $500 000. With the additional rebates offered by the utilities, the net cost to the City for the project was reduced to US$1.5 million. Before the retrofit, the signal lamps used about 6.1 million kWh each year. At an electric rate of $.069/kWh, the baseline electric costs were about $420,000 per year. After the retrofit, the new LED signal lamps drew about 1.2 million kWh/year – representing an annual electric cost of $85,000 (ESMAP, 2010). Overall, the project resulted in energy savings of 4.9 million kWh per year. In cost this was about $350 000 saved per year. These savings are equivalent to powering over 350 Portland homes each year, and led to annual CO2 emissions reductions of some 2,880 tons (ESMAP, 2010).

This project's success was due to the strong technical assessment conducted by the City of Portland upfront, the innovative use of project financing, and the use of rebates and tax incentives. The successful PPP allowed the City to lease the lamps without incurring the substantial upfront investment cost, which may have prevented the project from occurring at all or having it implemented in phases. As a result, the project was

fully implemented, generated strong savings for the City, yielded significant energy savings, and resulted in an improved and more reliable traffic signal system.

The project also demonstrates that appropriate financial incentives can be successful drivers of environmentally friendly projects and new technologies, and can help overcome market barriers facing such technologies. Use of time sensitive rebates and/or financing for new, innovative and/or capital-intensive energy efficient technologies can help public agencies and their citizens learn about new technologies and encourage their adoption [ESMAP, 2010].

3.2 Los Angeles

In May of 2007, Mayor Villaraigosa unveiled GREEN LA–An Action Plan1, which committed the city to lead the nation in fighting climate change. The GREEN LA Plan included the most ambitious goal of any large U.S. city, and set LA on a course to reduce its' greenhouse gas (GHG) emissions 35 percent below 1990 levels by 2030, going beyond the targets of the Kyoto Protocol. The cornerstone of GREEN LA is maximizing energy efficiency (EE) potential and increasing the city's use of renewable energy to 35 percent by 2020 [ESMAP, 2011].

LA's LED street lighting retrofit project required a total investment of US$56.9 million. The total investment included the material costs for the LED fixtures and remote monitoring units at $48.6 million labour at $7.63 million and equipment at $0.71 million. The cost per LED fixture at the project inception was $450 compared to $150 for existing streetlight fixtures such as high pressure sodium vapor. The project was funded through a loan, an energy rebate and from budget allocations. The loan amount was for $40 million, while the budget allocation was $3.6 million. The rebate amounted to $0.24/kWh which corresponded to an amount of $13.2 million. The loan debt service payments are paid through savings from current energy and maintenance costs with no adverse impact to the Bureau's general fund (ESMAP, 2011). The cost effectiveness can be measured through the energy and maintenance cost savings that generated a cash flow which made it possible to repay the loan. The project is expected to yield US$8.1 million per year in energy and maintenance savings, providing a payback period of seven years and an internal rate of return (IRR) of 10 percent. The total financial return for the project, after factoring in the energy rebates is even more attractive, with total savings of US$10 million per year, reducing the payback period to only 5.7 years and improving the IRR to 23 percent. The total energy savings projected are estimated to be 68,640 MWh/year (40% reduction), with corresponding CO_2 (carbon dioxide equivalent) emission reductions of 40,500 tons for the City (ESMAP, 2011). In addition, due to the longer life spans of the LED fixtures, costs were reduced for replacing fixtures which included fuel savings. The LED fixtures were seen to improve illumination levels and lighting quality and reduce sky pollution. The success of this project has shown that a large scale rollout of LED streetlights can result in price reductions. Combined with the use of the rebate at approximately $0.24 per kWh reduced, the city's finances were greatly improved. As a result, the project has been able to achieve a rate of return of about 10 percent (from energy and maintenance savings only) and 23 percent (with utility rebates) (ESMAP, 2011). The project was seen as a success for various reasons. From conception, good planning was relied upon. This could be seen through the thorough technological assessments of the various LED manufacturers. The city performed its due diligence during the planning phase of this project by soliciting the right technical expertise for evaluation of potential lighting technologies in terms of lumen output, lighting quality, efficiency,

life and cost. It also considered LED appropriateness given the types and ranges of streetlight fixtures in LA. The city also pilot-tested the LEDs to assess actual performance in the target areas, solicited feedback from the affected communities, developed minimum performance standards and other technical specifications for procurement for the first batch under Year 1 of the project, and agreed on standard operating and maintenance protocols to ensure a successful outcome (ESMAP, 2011).

Both the City of Portland and City of Los Angeles showed common success factors. The first one was the thorough technical assessment used to select technologies. For the City of Los Angeles, the improvement over the course of the project of the performance criteria also resulted in innovations by the LED manufacturers, a positive spinoff for the industry. In addition these technological advances of the LEDs during the project lifespan also resulted in cost reductions. A common second factor to success was the financing arrangements made. Both projects took advantage of rebates and tax credits where available. Where Portland was more innovative was in the use of a leasing arrangement which meant no upfront cost investment, saving capital budgets for other city projects. For the City of Los Angeles, the use of a rebate greatly increased the financial strength of the project and allowed for the loan payback through generated cost savings. It cannot be understated that the case for environmentally friendly technology options for public lighting needs to pass the test of financial viability. These projects demonstrate the possibilities available and different types of funding vehicles. The power of municipalities to drive efficiencies and cost reductions in new technologies should also be noted. With such a large rollout by both cities, economies of scale can be achieved and the buying power of the municipality involved can also be used to command discounts where these are possible.

3.3 City of Johannesburg

The three local cities in the form of Johannesburg, Tshwane and Ekurhuleni were surveyed through interviews between the research team and relevant city officials as pre-identified.

The City of Johannesburg has initiated a number of notable measures with success in view of fostering a green economy transition. Particularly for the energy sector, successes of note include the waste to energy project at its landfill site as well as an Energy Efficiency Buildings Retrofit Programme. On the funding side, the City is the first municipality within South Africa to issue a green bond. The money raised through the bond will be used to finance green initiatives such as the Bio Gas to Energy Project and the Solar Geyser Initiative, as well as all other projects that reduce green-house emissions and contribute to a resilient and sustainable City (City of Johannesburg, 2014)).

The City's Environment and Infrastructure Management Department is the main agency responsible for implementation of renewable energy and energy efficiency projects. Their main implementing agent is City Power. Various projects have been implemented such as building and office lighting retrofitting, solar water geyser retrofits and solar powered traffic signals.

Funding sources for the projects come from multiple sources. Budget funding is allocated based on IDP (Integrated Development Plan) and GDS (Growth and Development Strategy) determinations. The criteria for such funds are based on a problem identification and solution strategy. In this scenario, various impacts are used to measure an intended project's merits; sustainable development, poverty alleviation, environmental

and social. This matrix allows Joburg to then determine which projects will then be given priority and included into the IDP.

The City does rely on other sources of funding. These range from donor funded initiatives to Treasury allocations and Department of Energy grants for specific projects. When asked about the adequacy of the funding, the City representatives responded to say that is it never enough. They are always looking for additional sources of funding. As was determined earlier, IDP based allocations compete with other funding priorities and thus City budget allocations do not necessarily grow exponentially. Separate department allocations, e.g. Transport for the BRT program are seen as ring fenced funds which are used for specific projects. The recently issued Green Bond by the City of Joburg is viewed by department officials as a source for additional funding which can be steered to all projects meeting the climate change mitigation and adaptation mandate

It is important to mention that the overarching emphasis for the City's green strategy is climate change abatement. As such the financial merits of certain projects are viewed in tandem with their ability to mitigate or adapt to the effects of climate change. It was unclear whether then strict financial yardsticks were made in determining which projects would be funded. In other words, as in the City of Los Angeles example where the street light retrofit project's IRR and economic payback were used as determining factors, the City of Joburg's determining criteria are based more on socio economic factors. What then does this mean in a financial sense? The impacts of projects been funded appear to be measured from the level to which they reduce green house gas emissions as well as addressing other factors such as poverty alleviation. So where a project does bring about operational cost savings (street and office light retrofits), it is unclear from the writer's perspective how these cost savings are then accounted for and impact the next budget cycle for office and street light electricity consumption. The situation is similar for Tshwane and Ekurhuleni.

Like other municipalities, Joburg is faced with the challenge of potentially losing electricity revenue from a decline in sales due to increased use of green energy and energy efficiency within its borders. The City officials are adamant that this need not be the case. They point to careful consideration of the clean technologies and project design and implementation. Take the case of smart meters. This technology is viewed positively for its ability to reduce load at the point of consumption thereby preventing the need for region wide load shedding. If the system is faced with the need for reducing load, a smart meter can be remotely programmed to reduce load individually. The smart meter system therefore works as a virtual power station and avoids load shedding by demand management. Smart meters can also be used as a revenue enhancement tool. With upwards of 40 000 smart meters already installed in Joburg, their ongoing roll out points to their positive impact on the overall electricity system health (avoidance of load shedding, demand management) and bottom line (revenue enhancement). With this system in place it is then possible to extend electricity services through clean technology to informal settlements or residents within Joburg without access to grid based electricity. It is understood that electricity theft have a far greater material impact currently to City Power's bottom line than green energy and energy efficiency projects. The City officials advocate for proper design of green energy projects to cater to the populations without electricity. The complementary fit of demand management for City of Joburg residents with high electricity consumption and roll out of renewable

energy technologies to residents without access to electricity shows how the City can continue to transition to a green economy without adversely affecting its electricity revenue.

3.4 Tshwane

The Capital City of South Africa, Tshwane, has put in place a Framework for a Green Economy Transition. The framework includes green economy thematic areas for action which seek to prioritize areas of intervention as well as developing a means of implementation. Financing and fiscal instruments for the implementation are listed as various grants such as the Municipal Infrastructure Grant, Urban Settlements Development Grant etc, as well as international co-funding.

Tshwane has undertaken a number of renewable and energy efficiency projects to date. These include municipal facility and street light retrofits, traffic signal retrofits as well as solar geyser retrofits. In all, these projects have witnessed a reported 9 932 MWh in energy savings. The current sources of funding for these projects are municipal budget allocations, Eskom EEDSM (Energy Efficiency & Demand Side Management) funds and Department of Energy EEDSM. Although no definitive targets have been set, Tshwane has seen a reduction in infrastructure and related operations and maintenance costs. Similar to other municipalities Tshwane sees the merits of a green economy as not just an overall reduction in greenhouse gas emissions but also poverty alleviation.

Some of the current barriers to increased use of green energy and energy efficiency by Tshwane include consumer preferences, the perception that the costs of these initiatives are too high as well as a real challenge of affordability and lack of investment. With the establishment of the City Sustainability Unit within the Office of the Executive Mayor in 2013, Tshwane's foray into the green economy transition is still at an initial phase and as such there is still a heavy reliance on external sources of funding for actual project implementation. The City intends to develop a Sustainability Finance Mechanism Strategy which will assist in ensuring that all the identified projects are aligned to the financing models which mainly address the revenue enhancement. For projects with the ability to generate revenue, Tshwane aims to involve the private sector as financiers and operators in a Build-Operate-Transfer envisioned model that will include a profit sharing mechanism with an eventual handing-over of the project back to Tshwane. The private sector is always looking for an opportunity to work with government through partnerships (PPPs) to activate the profit sharing mechanisms.

Green Economy is a new concept which has been prioritised by the City. Tshwane is currently establishing relationships with different investors, financiers, donors and stakeholders to access funding for green projects as the plan is to fund these initiatives off-balance sheet of the city. The long-term vision is that of reducing the City's reliance on its own budget allocations for green economy initiatives.

3.5 Ekurhuleni

The Ekurhuleni Metropolitan Municipality (EMM) had put in place a plan and strategy to explore various green technologies in the energy and energy efficiency sector in order to reduce the burden on the current available sources of energy. The plan also highlights the cost of implementing the suggested sources as well as the order of priority for each implementation phase. The main goal of the plan is to maintain control of economic

costs. The plan determines the financial feasibility of the various interventions while giving priority to certain measures. To date, the municipality has been a leading example as a platform for roll-out and implementation of renewable and energy efficiency interventions within South Africa. These includes; solar water heaters, energy efficiency retrofits in streetlights and offices as well as solar PV lighting for informal settlements but to name a few. What should be noted is that funding for these interventions is a mix of both allotments from the national Department of Energy as well as municipal allocations. The challenge for Ekurhuleni like other metros and municipalities is to create a sustainable funding model that is not solely reliant on government grant and once-off budget allocations.

The municipality's Energy/Electricity department consists of six key sub departments ie operations and maintenance; planning and construction; support services; alternate energy (RE/EE); revenue services; as well as corporate governance and strategy. Like the other metros interviewed, Ekurhuleni derives the majority of its budget for energy projects from IDP allocations as well as funding from national government and electricity sales. Its electricity revenue is a NERSA (National Energy Regulator of South Africa) determined budget allocation for which motivation for certain projects can be made. The circumstances for external sources of funding are made on a per project basis. Suffice to say though that the plausibility for a PPP type of project was severely limited due to the inherent municipal processes and procedures in line with the Municipal Systems Act. It is under these auspices that Ekurhuleni sought pragmatic ways to advance RE/EE within its boundaries.

A review of the metro's case for introducing RE/EE interventions shows that the net financial impact can be potentially neutral on the metro's budget. Earlier work has been undertaken by Sustainable Energy Africa (SEA) to measure the impact on localized energy efficiency and renewable energy on Ekurhuleni's finances over the next ten years. Interventions modeled included solar PV and energy efficiency technologies across all customer sectors. The modeling results showed that for PV there was to be a low penetration in the coming ten years while energy efficient interventions across all customer sectors would experience higher penetration rates than PV. The reasons for these varying penetration rates are due to the financial viability of the technologies selected. Interventions need to be affordable to make them attractive to the market, and as such uptake will be directly linked to a strong financial case. Energy efficiency interventions (efficient lights, water heaters, motors, HVAC etc) are mostly financially feasible already, and uptake is expected to be rapid over the next 10 years. However, the financial feasibility of PV is not clear as prices are expected to reduce in future as global demand increases (Sustainable Energy Africa, 2014).

The study also showed that the metro's current own initiatives in energy efficiency showed a saving in operational revenue which in fact had a positive impact on the metro's finances. It is important to note that for the PV scenario, the model assumed self generation for own consumption which then lead to a reduction in electricity sales by the metro to those particular consumers. With this technology, the metro would experience declining electricity sales from year 3 and these would amount to losses of 5 – 15% of operational revenue by year 10 compared to a business as usual scenario. Other scenarios of the study included load shifting, customer growth as well as optimised PV system sizes. However these scenarios were not found to impact on the initial outcome of the study. Given the impacts modeled one outcome of the study was suggestions on how to protect revenue given the likely revenue losses associated with the selected technologies. It is

important to note that for the coming 5 years, the study modeled a revenue loss potential of 1-5% of operational revenue for a low to high scenario.

The impact of other forms of generation by customers and the municipality itself were not taken into consideration by the SEA study. In interviews with the metro officials, municipal generation from RE was found to potentially raise electricity revenue if the power being produced was fed into the grid. Self-generation in general, either by customers or the municipality, increased the amount of units of electricity for sale and therefore available on the grid. There was a need to determine how to compensate self generators while determining the proper tariff to incentivise power producers to feed onto the grid while also protecting revenue. It stands to reason then with the right selection of technology by the municipality and its customers for self generation, the impact on revenue loss would be low in the coming decade while the additional availability of units of electricity on the grid could raise revenue. What is just as important as the choice of technology is the appropriate regulatory mechanism and tariff option. This is a question of methodology and accounting. Where energy efficiency savings are concerned, the question of ring fencing the operational savings achieved by the municipalities through such interventions go a long way in determining the impact of the program on city finances.

In South African cities, the distribution of electricity to customers is a function of local government, and to a smaller degree Eskom. Local government finances have been set up in such a way that surplus income from their electricity service (and to a smaller degree their water service) is needed to balance the books. The money moving over to the rates account from electricity is not allocated specifically, and can be used at the discretion of the administration (Sustainable Energy Africa, 2013).

Ekurhuleni, like Johannesburg and Tshwane currently have no way of ring fencing savings gained by its various energy efficiency interventions. Such an exercise requires a discussion around the accounting methodology of municipal finance. Conventional wisdom holds that the emissions and kWh consumption savings obtained by the EE interventions such as street lighting and municipal office light retrofits have a tangible ZAR equivalent. Yet in the absence of a mechanism to account for the Rands and cents saved, the financial impact is not seen. This is seen by the Ekurhuleni staff to be one of the biggest challenges. If the savings obtained by the energy efficiency interventions were given back to the electricity department, these could potentially reduce the amount asked for an increase in operational budget at year end. Such a scenario would be akin to the City of Los Angeles example where all their savings directly reduced their operational budget.

4. Analysis of success factors and enablers

South Africa's main challenge is that, as a developing country, it now needs to overcome the socio-economic challenges of poverty and unemployment with industries that use resources that contribute directly to GHG production. South Africa's economy is still heavily reliant on extractive industries. It is among the leading countries in terms of gold and platinum production, and mining is thus the biggest consumer of energy. Given this background, the country faces a number of challenges in comprehensively transforming its economy to a green economy (Kaggwa et al., 2013).

Against this backdrop one has to take cognizance of the factors and enablers for success that need to underpin the green economy transition for renewable energy and energy efficiency. The issue is not so much one of unlocking funding as there are numerous avenues to funds whether through the fiscal allocations, grants, subsidies, tax breaks or the like. The challenge is more of a coordinated approach to see that whichever prescriptions are applied, it is done so in such a way that one is able to link the financial mechanism to the objective – e.g. reduced energy consumption, increased renewable energy power generation – in such a way that one measures the effects of both.

4.1 Clear policy objective

The City of Los Angeles example shows the overall objective of the GREEN-LA Plan to reduce greenhouse gas emissions by 35% below 1990 levels by 2030. In stating this objective, one cornerstone was the maximization of energy efficiency. From this clear overarching objective to reduce green house gas emissions, the driver for such a reduction is identified as the increased use of energy efficiency. Tshwane, Johannesburg and Ekurhuleni have all formulated clear policy objectives that put the green economy as one overarching agenda in all their development goals. Adaptation and mitigation form the basis of these policy measures.

4.2 Coordinated policy support mechanisms

The City of Los Angeles utilized a number of financial mechanisms to implement its street light retrofit project. These included a rebate ($0.24/kWh), a loan ($40 million) as well as a budget allocation ($3.6 million). These were used in such a way that the rebate allowed for an immediate saving on the electricity consumption of the new streetlights to the value of $13.2 million. Loan debt service payments were derived through energy and maintenance cost savings which generated a cash flow. This resulted in no need for additional funding to pay the loan on top of the budget allocation. Combining the rebate resulted in an IRR of 23%, payback of 5.7 years and a total yearly energy and maintenance cost saving of $10 million. The careful structured coupling of the 3 financial support mechanisms resulted in a positive IRR and reduced payback (ESMAP, 2011). In the South African context, what is essential to achieve a positive bottom line on city finances through implementation of greening is a complementary fit of the funding and the project selection.

4.3 Coordinated public and private sector institutional actors

The City of Los Angeles Water and Lights Department were not the only actors involved in the project. AS the project lead, the City of Los Angeles instituted minimum performance standards and other technical criteria

that drove private sector suppliers who wanted to participate to offer the most innovative product at a reasonable price through its procurement. Additionally, by establishing minimum performance criteria for LED equipment, the city indirectly exerted its buying capacity to nudge the lighting industry towards providing the market with advanced LEDs products (ESMAP, 2011). This project also demonstrates how municipalities can use their unique positions to initiate change in favor of advanced energy and environmental technologies. LA not only used its jurisdiction, scale and capacity to show the viability of LEDs to its community and the private sector; it used the success from this project to make policy changes in favor of this energy-efficient and environmentally-friendly technology (ESMAP, 2011). There are a number of government agencies at local, provincial and national level involved as stakeholders in the greening agenda. Their roles as actors, implementers and policy coordinators need to be spelt out clearly so as to make effective use of the mechanisms available to green funding. The role of the private sector should not be underscored or relegated simply to service providers. However especially as it pertains to cities, coordination amongst government institutions is key.

5. Implication of the Transitioning by South African Government

It is no secret that the transitioning to the green economy will be done at a cost to the government. Finance can be a stumbling block to the introduction of intensive policies to shift cities away from a carbon and resource-intensive metabolism. Although several sources of revenues exist, in many countries national fiscal policy prevents local authorities from raising enough capital both, locally and on the international financial markets. This has been reinforced in many parts of the developing world by decentralization reforms that have often entailed a dispersal of central government functions, without any transfer of resources and power to autonomous lower level authorities (Government of Japan and JICA, 2013).

Many of the green city investment projects are within the reach of city governments, which can leverage national or private funds to pay for the initial capital investments. In Hong Kong, the enormous costs for new urban rail infrastructure are covered by the city's principle rail operator, the MTR Corporation, which capitalises on the real-estate potential of its stations as part of an integrated rail-property development model (Cervero and Murakami, 2009). In Paris and London, urban bike hire schemes are paid for privately in return for prime advertising space, while the biogas in São Paulo's landfills are a resource that is privately turned into energy and for which the city receives carbon credits.

Once the initial investment has been made, these projects bring in a steady revenue stream that can be reinvested. Some projects do not even need initial capital investments as they rely on statutory regulations, such as the green building programmes in Berlin or Austin. A priority in any green urban planning is investment in cost-effective public transport infrastructure particularly over investment in road construction that further promotes private car use. In both developing and developed countries, another priority is investing in education and training at the city level. Training of workers in green technologies and job skills would be required to ensure that they can access green employment opportunities and training for low-carbon jobs.

Coming back to the South African context, the government has adopted the National Development Plan (NDP) as a road map to deliver public services efficiently up to 2030, in particular water, electricity, sanitation, jobs, housing, public transport, adequate nutrition, education, social protection, quality healthcare, recreation and a clean environment. This Plan further supports the transitioning to the green economy only if applied innovatively with new thinking of delivering such public services.

Below is the detailed breakdown of the financial implication of such a transitioning to date as well as other spin-offs lined to the process such as job creation and socio-economic development.

5.1 Financial Implications

At the national level significant strides have been made between 2009 and 2013 in reorienting the economy towards a green economy. Approximately R860 billion has been spent on 'green' infrastructure, R300 million on the Green Fund and R400 million on green economy projects. Approximately 315 000 solar geysers were installed while 200 000 households were connected to the national electricity grid, through the NDP initiative. Additionally, the Industrial Development Corporation (IDC) has committed about ZAR25 billion (approx. $3 billion) to green economy investments over the next five years (2010–2015) (Financial Mail 2011) and is thus key in the transformation to a green economy. In conjunction with IDC, the Department of Economic Development is already undertaking green initiatives, and has installed about 25,000 units of solar water geysers in low-cost houses both in urban and rural areas. The IDC focuses on green industry projects that struggle to get funding from traditional sources, through the establishment of the Strategic Business Unit (SBU) from 2010 to 2015 (Musyoki, 2012).

In addition to the initiatives mentioned above, there exist a number of financial instruments that could be used in South Africa to fund green economy projects or alternatively create favourable market conditions for the green economy to take off. A few of these are touched on below:

i. **Carbon Pricing/ Emissions Trading Schemes** – The global carbon emissions trading scheme is yet to impact South Africa significantly or Africa overall. China in particular has been able to take advantage of this funding mechanism to decouple somewhat especially given its large manufacturing base. The barriers to its uptake in South Africa are not at all clear. There is awareness for the trading scheme, there are a host of potential projects given the large dependency on energy intensive production and processes, there also exist a number of implementing agencies and actors on the ground. Yet the success of this scheme as a funding mechanism is dismal. This points in partly to the institutional apparatus not being in place to drive projects from inception to completion in South Africa as tangibly as China or Brazil.

ii. **Taxes** – The National Treasury implemented the first environmental levy on Eskom (approx 2c/kWh) with the funding said to go towards green economy projects. Tracking the allocation of this levy has been difficult thus far. The power of National Government to enforce more levies on sectors of the economy is due to be tested with the coming carbon taxes in 2015/16. In his 2013 budget speech, Minister of Finance Pravin Gordhan highlighted the government's intention to price carbon by way of

implementing a carbon tax with a proposal to initiate the carbon tax at $12 per tonne of carbon dioxide equivalent (CO_2e), effective from 1 January 2015. The proposal sought to soften the impact by introducing a tax-free exemption threshold of 60%, with additional allowances for emissions-intensive and trade-exposed industries (SAII). The goal of this carbon tax will be to penalize fossil fuel intensive processes through an increase in tax, thereby creating additional revenue for the national budget. At the same it is envisioned that any increase in the tax of fossil fuel driven processes should in turn spur investment in the clean technology sector. It is important however to tie any taxation of the fossil fuel industry to a suite of policy driven support mechanisms in the clean technology sector. To put it another way, private sector investment will require clear policy objectives supported by mechanisms to realize these objectives.

iii. **Grants** – Grants, both from donor and non donor sources have played a significant role in the ongoing implementation of green economy initiatives within South Africa. Donor agency funding has been significant in matching national government grant support. In a number of circumstances, grant support has funded pre commercial activities where renewable energy and energy efficiency projects are concerned which serve to assist in creating the required necessary favourable market conditions. Funds received by the South African Government from international finance institutions have also been used as grant funding for the implementation of green economy projects. The DBSA managed Jobs Fund, the Green Fund as well as Department of Energy funding for municipal demand side management and energy efficiency programs are but a few of these funds available. By directly applying to these funds, municipalities can rely on earmarked funds to kick start green energy and energy efficiency initiatives. From a municipal point of view, these funds have been perhaps the most influential to date, apart from IDP budget allocations.

iv. **Budgets** – Funding from the National fiscus for the green economy has not impacted the local government level as significantly as on the national scale. The RE procurement programme is one such example of the success of a budget funding programme though the state agency responsible for the project rests with Eskom. Municipalities, through their IDP and SDP projects can identify key projects they would initiate in coming years. These are then providing funding through yearly budget allocations whose disbursement, implementation and achievement is then measured against the targets set. Given the multitude of priorities in municipal IDPs, green energy and energy efficiency projects find themselves competing with sanitation, roads, housing, health and social services. As such the ability of IDP funding alone to drive a green economy transition is not enough.

v. **Other sources** – As is commonly known, municipalities derive a large portion of their budget from electricity sales revenue. These funds in turn are directed towards municipal capital and operational budgets. A portion of these also fund IDP projects. To a certain degree, this source is tapped out then for green energy funding if not competing with other service delivery priorities. The degree to which a

decline in revenue sales from electricity as a result from more green energy and energy efficiency initiatives can impact the municipality's financial health will be looked at more concretely.

5.2 Job creation

Greening the cities can create jobs on a number of forms:

a) Urban and peri-urban green agriculture;

b) Public transport;

c) Renewable energy;

d) Waste management and recycling; and

e) Green construction.

Green services will generally be more urban-orientated than green manufacturing or primary industry, although there will be some high-tech green manufacturing clusters in or close to urban cores, drawing on knowledge spillovers from universities and research labs (Brookings and Battelle, 2011). The United Nations urges the development of incentives for investment in a programme geared at creating a large number of green jobs. About 300 000 jobs could be created in South Africa's renewable energy sector over the next 10 years, of which 20 000 is achievable within 2 years (Borel-Saladin and Turok, 2013).

At the same time, specific sectors and firms may combine remote or off-shored production with highly urbanized consumer/service/support markets. This means that there is potential for cities to grow both green tradable activity (high value, exportable) and develop greener non-tradable activities (lower value, goods and services for local consumption) (UNEP, 2011). Overall, a green economy cannot be expected to create or destroy net jobs in the long run; the supply and demand for labour tend to equate in accordance with labour market conditions.

5.3 Socio economic development

The case for greening cities can be made in terms of inter-linked economic, social, and environmental development:

Social development, the benefits include employment creation, poverty reduction and improved equity, and quality of life including improved road safety and community.

Economical development, the benefits include agglomeration economies, lower infrastructure costs and reduced congestion while reducing carbon emissions and other environmental pressure.

Environmental development, are embedded in most of the economic and social benefits. Additional environmental benefits include reduced pollution, which helps improve public health. Another environmental benefit is the potential for improving ecosystems within urban areas.

6. Recommendations

Unless the financial merits of any green economy undertaking are tracked throughout the life cycle of the project being implemented, it will be difficult to see the real costs and implications of the transition to the green economy. Especially for green energy and energy efficiency projects, it is critical that at project conception phase the ***net financial gain or loss is properly accounted for during the life of the project*** (operational cost savings, revenue generation etc) and ring fenced within municipal budgets.

Most if not all municipal owned renewable energy generation projects are for own use purposes. In these instances using this power internally has resulted in some measureable reduction in external supply sources. The financial implications of these self generation projects in terms of reduced purchases from Eskom are marginal at this stage due to their small installed capacities versus what is procured. As these initiatives increase with expected cost reductions in the clean technology sector, the financial impact will extend beyond operational cost savings to considerable reductions in procured power. So long as the clean generated power can meet the shortfall, electricity sales to customers within a municipality's boundaries can remain neutral.

A review of municipal renewable energy and energy efficiency activities has shown that projects that generate revenue and impact on a city's balance sheet are still in the planning and design phases and have yet to be implemented. This gives municipalities some time to study best practices from other developed and developing world cities. It is anticipated that most of these revenue generation driven projects will involve the private sector in a Public Private Partnership model. The hurdles to successful take off of this model in a power generation scenario appear to stem from Municipal Systems and Municipal Finance Acts which are stringent in prescribing the nature of such arrangements. These acts emerged to apportion risk appropriately, give a level of transparency to appointment processes as well as protect consumers of municipal services from adverse effects of municipal financial obligations.

Other national regulatory considerations also deserve mention. The National Energy Regulator prohibits a municipality from purchasing electricity that is more expensive than Eskom's and then passing these costs on to all of its consumers unless a portion of the consumer base is willing to pay for such power. Renewable energy technologies are still currently more expensive than Eskom and it will take some time for them to reach grid parity. As such the buyers of municipal self generated clean energy power will be a limited pool. To what degree this will stymie these revenue generation driven projects remains to be seen. This brings to mind the City of Joburg's approach to complement its projects in such a way that ongoing revenue from electricity sales are protected and in fact enhanced. The merit of Joburg's approach is the understanding that besides the potential for emissions reductions and poverty alleviation, the choice of technology can impact on a city's operations in other ways. The lesson learnt here is that project concept and design should see the synergies offered by ***implementing certain technologies in tandem which can help to dispel the myth that green energy and energy efficiency projects will affect electricity revenue adversely***.

This leads on to the need for ***proper coordination of projects, policies and support mechanisms through the various implementing agencies.*** At both the local, provincial and national level, there are a myriad of agencies responsible for various initiatives often with conflicting coexisting and complementary mandates. A review of the various targets, policy objectives technical and funding support mechanisms shows little or not

enough coordination of the various public and private sector actors. At times these can impact negatively on ambitious and far reaching objectives. A case in point is the energy efficiency agenda being driven at all levels of government with considerable involvement by the private sector. Custom duties and import tariffs for advanced technologies, equipment and machinery that are more efficient remain higher than more energy intensive ones. The bottom line is that it is cheaper to import goods which are more energy intensive than those which are more efficient. The actors involved here are not just the Department of Energy (setting standards for energy efficiency) but South African Revenue Services through Customs and the Department of Trade and Industry through its IPAP. The level of coordination called for here is on a national scale.

As long as objectives at the national level are conflicting and are not coordinated, good intentions by local government actors will continue to face hurdles out of their control. This can in turn lead to little uptake by the private sector due to its perception of the high costs of transitioning to the green economy. There are a number of state institutional actors with enough capacity to carry out Government policy objectives. What is needed is strong leadership with a mandate to direct the orchestra. From a city perspective, ***city energy and finance departments need to formulate mechanisms to allow for cost savings or income generated to be accounted for and allocated to either reinvest in green activities or into the general budget.***

7. Conclusion

Apart from providing direct economic incentives, city governments also provide public services – such as workforce education and training, business spaces and green infrastructure. Such services not only reduce the costs to business of going green, but also shift the business environment towards one in which low-carbon activity is the norm. Many cities in the USA have recently introduced impact fees to recover the cost spend on new infrastructure, such as roads, telecommunication, or schools, necessitated by new development (Brueckner, 2000).

The local municipalities (Tshwane, Joburg and Ekurhuleni) reviewed have so far relied mainly on grant funds (Department of Energy) and IDP budget allocations for most of their green energy and energy efficiency projects. This highlights to some extent, the early stages of the cycle in the green economy transition. It further highlights though a lack of cohesiveness in policy objectives and financial support mechanisms which create the perception of the high risk and hurdle rate for these projects. Proper risk mitigation in the methods mentioned in the *Recommendations section - Financial Life Cycle Accounting, Complementary Technology Implementation, Coordination of Projects and Support Mechanisms amongst Public and Private Sector Actors* – can assist in seeing that the cost of transitioning to the green economy is not burdensome and that the financial implication of such a transition is a managed process where the net outcome is not only a financial but socio-economic gain.

The multitude of financial support mechanisms available to marshal in the transition to the green economy warrant that careful planning is needed to match the funding source to the initiative for an overall positive outcome, else the benefits might accrue to unintended participants. The usefulness of these financial instruments with clear measureable indicators for their effectiveness needs to be continuously reviewed with flexibility to amend the mechanisms. The exemplary leadership shown in the renewable energy IPP

procurement program shows that with correct planning and implementation, these more complicated green economy projects can see the light of day.

The overarching lesson from the research shows that there are numerous mechanisms and funding models to create a green economy. Some of these mechanisms operate well in free market conditions while some require a certain level of government policy determination and implementation to drive them. What is key though, particularly for South Africa is that all require a concerted level of coordination to see tangible outcomes in the form of positive impact on city finances.

The financial implication for the transition to the green economy can be controlled to result in a positive cost benefit. This then calls for the institutional frameworks and actors to be properly reviewed to see if in fact the different institutions do create the necessary environment to foster this green economy transition. It makes little sense to have a carbon tax penalizing the fossil fuel industry if duties for energy efficient and clean technologies are still higher than other energy intensive equipments. What is needed is a careful analysis of the prescriptive remedies available to government. For South Africa in the near future at least, whether from a local, provincial or national standpoint, the driver for this transition will be government. Better coordination on policies and support mechanisms amongst these various actors and referees, the better the outcome for the green economy transition.

Information alone is insufficient to change behavior patterns; it needs to be supplemented by incentives to bring about lasting change. For example, firms and workers in brown industries may face higher prices as cities shift their industrial structures towards greener models. Incentives may be in the form of subsidies like a Feed-In tariff or other methods such as waiving certain duties and taxes.

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