

Framework for a Green Economy Transition

TOWARDS A LOW-CARBON, CLIMATE-RESILIENT AND RESOURCE-EFFICIENT CITY



“By 2055, growth and development in Tshwane is driven by an economy that supports a sustainable, vibrant, liveable and prosperous city, through integrated ecological, social, economic and spatial agendas that promote human and environmental well-being.”

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1 LIST OF ACRONYMS

CoT	City of Tshwane
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
DoE	Department of Energy
DWA	Department of Water Affairs
Eskom	South African power utility company
FAO	Food and Agriculture Organisation
GEGDS	Gauteng Employment, Growth and Development Strategy
GHG	Greenhouse gas
ICT	Information and communication technology
IPAP	Industrial Policy Action Plan
IRP	Integrated Resource Plan
kW	Kilowatt, a unit of power (1kW = 1 000 W)
kWh	Kilowatt hour, equal to 1 000 Watt hours or 3,6 Megajoules
MDG	Millennium Development Goal
MW	Megawatt, a unit of power (1MW = 1 000 000 W)
MWh	Megawatt hour, equal to 1 000 000 Watt hours or 3 600 Megajoules
NRE	Natural resources and environment
PV	Photovoltaics
SMMEs	Small, medium and micro enterprises
SWH	Solar water heaters
WWTP	Waste water treatment plant
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

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FOREWORD BY EXECUTIVE MAYOR

The transition to a green economy will require the adoption of a new economic model and a different approach to development, with a reconfiguration of City of Tshwane investments and a change in modus operandi. Municipalities that seek to take a developmental approach to service delivery and address job creation and the economy need to work closely with business and civil society, since the success of a developmental state depends on active community involvement and establishing viable public-private partnerships.

Improved governance with robust policy signals and regulatory drivers that underline the need for the economic system to account for externalities are some of the most powerful mechanisms that could facilitate green investment and enhance the transition to a green economy. The development of capital market and financial service architectures that fully integrate environmental, social and governance considerations into investment policy and decision-making across lines of management will therefore be essential to increase investment in the green economy.

Improved criteria and indicators will be required to assess measure and monitor options that can enhance green economic growth. The economic value associated with social well-being and the provisioning of ecosystem goods and services is an area of intensive research. The City of Tshwane should be at the forefront of this knowledge, by stimulating research on and development in green economy indicators for social and environmental well-being, as well as incorporating defined social and environmental criteria and indicators with municipal planning and decision-making.

The delivery of green public services and infrastructure by the City of Tshwane, and having a supportive institutional and regulatory environment for green procurement will promote the green economy. Human capacity for a green economy can be built by encouraging the creation of centres of excellence for green technology research and development by the research and academic institutions in Tshwane. Innovation hubs and green completion technology can highlight the City of Tshwane's green economy initiative and provide incentives for enterprise creation and development.

The private sector could play a key role in the transition to a green economy through trade in low-carbon products and technologies, management of natural resources with improved efficiency, improvement in working conditions, and investment in cleaner technologies and green technology research and development.

There will also be numerous long-term benefits from investing in Tshwane's social capital and building vibrant, healthy communities. Strategic planning to limit urban sprawl, conserve natural areas, provide public open space and enhance sustainable agriculture can yield multiple benefits, including improved food security, access to green areas for recreation, and improved human mobility and connectivity. It can also enhance the provision of the environmental goods and services upon which all economic activity depends.

Innovation and the application of appropriate technology in the City of Tshwane's spatial planning, such as the integration of transportation with information and communication technology, can improve the mobility and connectivity of people while also reducing the need for investment in transport infrastructure. The building of social capital and ensuring a healthy, educated and skilled workforce will create sustainable communities that contribute to the resilience and long-term sustainability of the city.

Cllr. Kgosientso Ramokgopa
Executive Mayor



OVERVIEW BY CITY MANAGER

The City of Tshwane Green Economy Strategic Framework provides a strategic guide towards a low-carbon, climate-resilient and resource-efficient growth trajectory that creates a maximum number of jobs and stimulates economic activity while ensuring sustainable development. It primarily addresses the first of the six outcomes of the Tshwane 2055 strategy, namely a resilient and resource-efficient city.

The vision of the Green Economy Strategic Framework has been extracted from the Tshwane Vision 2055 and is outlined as follows:

“By 2055, growth and development in Tshwane is driven by an economy that supports a sustainable, vibrant, liveable and prosperous city, through integrated ecological, social, economic and spatial agendas that promote human and environmental well-being.”

A set of thematic intervention areas categorised into low-carbon (mitigation) and climate-resilient (adaptation) action areas were defined and are used as a departure point for targeted action areas. The aspirations, strategic objectives and appropriate actions were developed from an analysis of these themes.

The mitigation actions include: reducing emissions from buildings, improving mobility and providing low-carbon mass transport options; reducing the generation of waste and encouraging product re-use, recycling and material recovery; promoting integrated planning and land use; improving energy efficiency and developing renewable energy supply options; and encouraging the efficient use and management of water and other natural resources.

The adaptation actions include: mainstreaming environmental priorities and carrying out biodiversity assessments to inform development plans; supporting and expanding government public works programmes to incorporate payment for an ecosystem services approach, enhancing the skills and knowledge in agro-ecology, enhancing local urban and peri-urban food production for increased food security; and providing services and facilities that enable a safe and healthy environment while enhancing opportunities for improved connectivity and social cohesion and human well-being.

The means of implementation to establish a green economy were identified as:

- Investing strategically in green innovation and technology;
- Defining a new economic base for a green economy; and
- Building the basis of a partnership between government, business, labour and civil society.

Rapid population growth and urbanisation provide an opportunity for greening the attendant infrastructure. It would be much more difficult to green infrastructure that has been constructed without regard for green principles because of the “committed emissions” and “lock-in” of unsustainable fossil fuel consumption patterns. Strategic and integrated city planning is critical for piloting green economy innovations and changing infrastructure.

Currently, municipalities lack funds for significant infrastructure investment and enterprise creation that are needed for a green economy. Infrastructure-related public enterprises are an excellent opportunity for green investment in the delivery of essential public services to all sectors of society. This opportunity can be unlocked through the establishment of public-private partnerships.

Municipal fiscal policy and municipal incentive schemes can be crafted to catalyse a green economy. Both incentives and disincentives can be used to drive the desired behaviour, for example the differential pricing of water and energy through the use of an inclining block tariff to encourage resource efficiency, and “buy-back” schemes for waste recycling and material recovery. Disincentives can include fines for littering, and taxes and tariffs for inefficient and polluting transportation options.

A transition to a green economy will require the City of Tshwane to increase the scope and diversity of partnerships. Partnerships can be particularly important as mechanisms to help address market failures or failures in governance where neither the market nor government is able, on its own, to deliver public goods or meet crucial social and environmental challenges.

In essence, Tshwane’s transition to a green economy will need systematic and collective investments and contributions from all sections of society. This will require good governance and accountability, robust policy signals and a decision-support system with regulatory drivers that reinforce the need for the economic system to account for social and ecological externalities. The ultimate aim is sustainable development.

The Green Economy Strategic Framework will require internal review and adoption by the City of Tshwane. It is understood that a revised final version will subsequently be submitted to Council for approval, and then disseminated to other stakeholders for broader comment.

Jason Ngobeni
City Manager

2 INTRODUCTION

To date, the world's economy has been resource intensive and economic development has often led to increased poverty and a widening of the gap between the rich and the poor. Traditional economic growth strategies and approaches have undervalued ecological goods and services, which form the basis of all economic activity. A green economy, on the other hand, aims to improve the efficiency of natural resource use so as to improve human well-being and reduce ecological scarcities and environmental risks. This document, the final draft of the Green Economy Strategic Framework for the City of Tshwane (the Strategic Framework) aims to provide a strategic guide for low-carbon, equitable economic development that can enhance Tshwane's transition to a green economy and facilitate a sustainable development path.

This section outlines how the green economy concept developed in response to the world's growing need for sustainable development. It provides a national and provincial perspective to better outline how a green economy can be achieved, and describes a policy that can facilitate the transition to a green economy.

2.1 Background to the Green Economy Strategic Framework for the City of Tshwane

South Africa's New Growth Path (2010) sets out critical markets for employment creation and growth, implying fundamental changes in the structure of production to generate a more inclusive and greener economy. The importance of a green economy was highlighted by President Jacob Zuma at the Green Economy Summit on 19 May 2010: *"In the midst of the global economic crisis, the United Nations Environment Programme called for a global green new deal ... Today, at this summit, we are responding to that call ... We have no choice but to develop a green economy."*

2.2 Why a green economy?

Economic development has put staggering demands on the natural resource base of the earth. It has severely undervalued the environmental goods and services that form the basis for all economic activity. Ecological systems have a limited capacity for self-regulation and self-renewal and are therefore finite. The world is already resource constrained, reaching its limits as a result of a development path reliant on undervalued resources such as water, soil and fossil fuels.

In addition, there are new challenges resulting from climate change that disproportionately affect developing countries. These include unpredictable weather patterns, natural disasters and disrupted ecosystems. Although climate change is often viewed as a largely global phenomenon, it is significant in terms of local economic development – both in terms of impact and options for adaptation. Local economic development, and the development path chosen, may greatly enhance adaptive capacity while having a range of other benefits.

2.3 What is a green economy and how can we get there?

UNEP has defined a green economy as *"one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities"*.¹

The essence of a green economy is therefore to:

- Improve human well-being;
- Improve social equity; and
- Reduce environmental risks and ecological scarcities.

A green economy must ensure that development or growth is decoupled from both natural resource use and impacts.

A green economy, therefore, is one that enables inclusive growth through the more equal distribution of wealth and access to ecological goods and services. It also enables improved human health and well-being, through enhancing the quality and quantity of such goods and services (such as clean air and water), as well as the quantity and quality of traditional public infrastructure and services (such as roads and rail, sanitation, schools, education, policing and fire protection). In this way, a green economy offers a new economic path to sustainable development, where the spheres of technology, economy, society

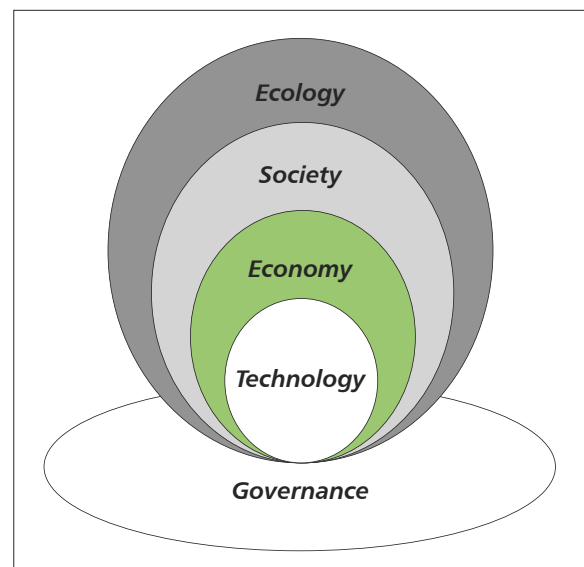


Figure 1: Sustainable development and the green economy (adapted from NSSD)²

¹ UNEP (2011). Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication, p 16. Available at: <http://www.unep.org/>.

² Department of Environmental Affairs (DEA). National Strategy for Sustainable Development and Action Plan (NSSD), 2011–2014. Available at: <http://www.info.gov.za/view/DownloadFileAction?id=175923>.



and ecology are embedded within each other and are underpinned by systems of good governance as illustrated in Figure 1. In other words, a green economy will use appropriate technology and innovation to generate economic growth that brings inclusive benefits to society, while maintaining the ecology and natural resources upon which all life depends. A platform of good governance is required to guide and ensure that developments are sustainable. This is the broad context for the development of the Strategic Framework.

Tshwane's transition to a green economy will challenge the established economic system, which is based on increasing the exploitation of natural resources so as to fulfil the growing demands for material consumption. There is also a need to recognise that the threats of climate change demand long-term government support that extends far beyond a politician's terms of office. Therefore, integrated policy and planning for sustainable development will be essential to ensure low-carbon, inclusive economic growth. Innovation and green technology will play a key role in decoupling material growth from natural resource depletion and in growing the number of green jobs. In addition, current regulatory and fiscal policies will need to change in a way that will increase economic growth while maintaining and enhancing the environment.

The Strategic Framework aims to guide and support a more inclusive and sustainable economic growth path that will include significant investment in natural and social capital.

2.4 National and provincial green economy context

The South African Department of Environmental Affairs states that the green economy refers to two interlinked developmental outcomes for the South African economy, namely:

- Growing economic activity (which leads to investment, jobs and competitiveness) in the green industry sector; and
- A shift in the economy as a whole towards cleaner industries and sectors with a low environmental impact compared to its socio-economic impact.

Central to achieving these outcomes is the creation of green jobs and the decoupling of economic growth from resource consumption. The first of these, namely green jobs, refers to employment in sectors such as agriculture, administration, services and manufacturing, which contribute substantially to preserving or restoring environmental quality. The second concept, namely decoupling, involves "reducing the amount of resources such as water or fossil fuels used to produce economic growth and delinking economic development from environmental deterioration"³.

The implementation of South Africa's transition towards a green economy is significantly decentralised and, therefore, involves all spheres of government. Overseeing this transition is the joint responsibility of the Department of Economic Development and the Department of Trade and Industry. However, many other departments are involved, including the Department of Environmental Affairs, the Department of Energy, the Department of Labour and the National Treasury.

The City of Tshwane's Green Economy Strategic Framework should echo and reinforce national policy and provincial policy, which already have clear commitments to building a green economy and stimulate investment for the green economy. The relevant national policies include:

- Medium-term Strategic Framework;
- National Strategy and Action Plan on Sustainable Development;
- National New Growth Path;
- Industrial Policy Action Plan;
- Second review of the Industrial Policy Action Plan; and
- National Development Plan⁴.

The National New Growth Path identifies viable changes in the structure and character of the country's production sector in order to promote a more inclusive and greener economy in South Africa. The main strategies outlined in the New Growth Path include:


- Comprehensive support for energy efficiency and renewable energy as required by the second Integrated Resources Plan (IRP2), including appropriate pricing policies, combined with programmes to encourage the local production of inputs, starting with solar water heaters;
- Public employment and recycling schemes geared to greening the economy;
- Stronger programmes, institutions and systems to diffuse new technologies to SMMEs and households;
- Greater support for research and development and tertiary education, linked to growth potential and the development of South Africa as the higher education hub of the continent; and
- Continued reduction of the cost of and improved access to broadband internet.

The National New Growth Path also sets targets for employment creation in the green economy⁵, for example "Jobs Driver 3: Seizing the potential of new economies. The New Growth Path targets 300 000 additional direct jobs by 2020 to green the economy, with 80 000 in manufacturing and the rest in construction, operations and maintenance of new

³ UNEP (2011). Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication, p 16. Available at: <http://www.unep.org/>.

⁴ National Planning Commission: Vision 2030. Available at: [http://www.npconline.co.za/medialib/downloads/home/NPC National Development Plan Vision 2030 -lo-res.pdf](http://www.npconline.co.za/medialib/downloads/home/NPC%20National%20Development%20Plan%20Vision%202030%20-%20lo-res.pdf).

⁵ National New Growth Path Framework (2010). Available at: <http://www.info.gov.za/aboutgovt/programmes/new-growth-path>.



environmentally friendly infrastructure. The potential for job creation rises to well over 400 000 by 2030. Additional jobs will be created by expanding the existing public employment schemes to protect the environment, as well as in production of biofuels.”

In addition, the government is intent on adopting a low-carbon economy with a recently announced target of a 34% reduction in carbon emissions by 2020 and a 42% reduction by 2025^{6,7}. These nationally appropriate mitigation actions⁸ are viewed as key building blocks for a green economy in the country.

The Medium Term Strategic Framework Programme of Action⁹ makes a clear commitment to promoting the green economy and sustainable development through:

- Protection and continual enhancement of environmental assets and natural resources;
- Use of renewable energy resources;
- Creation of green jobs and green industries in order to mitigate the impacts of climate change;
- Development of the economy in order to create decent work and reduce income inequality.

The commitments in the Programme of Action were taken up in the Gauteng Employment, Growth and Development Strategy.¹⁰ Subsequently the Green Strategic Programme for Gauteng¹¹ was developed, identifying the following strategic priorities for the province:

- Embed in Gauteng’s development path the underlying principle of a green economy in the traditional economy as well as the non-traditional economic sectors so that the green economy does not become an add-on to unsustainable development paths.
- Prioritise new types of infrastructure configurations in the delivery of basic services such as water, transportation, waste and energy, as well as in industrial production and consumption processes.
- Ensure strategic investments in knowledge and innovation systems to promote growth through innovation and skills in green technologies.
- Address underlying resource constraints, and grow by reducing rather than increasing resource consumption through effective natural resource management that ensures the maintenance and equitable provision of ecosystem goods and services.

⁶ IEA responding to Climate Change. Available at:
<http://www.iea.org/journalists/docs/pledges.pdf>.

⁷ Climate Reaction. Available at:
<http://www.climateaction.org.za/cop17-cmp7/sa-government-position-on-climate-change>.

⁸ Nationally appropriate mitigation actions. Available at:
http://unfccc.int/files/meetings/cop_15/copenhagen_accord/application/pdf/southafricacphaccord_app2.pdf.

⁹ Medium Term Strategic Framework Programme of Action. Available at:
<http://www.info.gov.za/view/DownloadFileAction?id=127120>.

¹⁰ Gauteng Employment Growth and Development Strategy (2011). Available at:
<http://www.gautengonline.gov.za/Business/Documents/GEGDS.pdf>.

¹¹ Green Strategic Programme for Gauteng (2010). Available at:
http://www.gcro.ac.za/sites/default/files/Projects/green_strategic_programme/green_strategic_programme_for_gauteng_august_2011_draft_for_approval.pdf.

3 CITY OF TSHWANE AND THE GREEN ECONOMY

The transition to a green economy requires that the City of Tshwane uses its competitive advantage to develop a resource-efficient, low-carbon and inclusive programme that is appropriate for Tshwane.

3.1 Overview of Tshwane

Tshwane is located to the north of the Gauteng province (Figures 2A and 2B). Gauteng is home to 12,2 million people, almost 25% of the total South African population, and is also the fastest growing province with a population growth of over 33% between 1996 and 2011. Tshwane constitutes over one-third of the area of Gauteng, has a population of 2,92 million and a population density of 4 634 people per km². The City of Tshwane is one of South Africa’s eight metropolitan municipalities and administrates Pretoria, Centurion, Akasia, Soshanguve, Mabopane, Atteridgeville, Ga-Rankuwa, Winterveld, Hammanskraal, Temba, Pienaarsrivier, Crocodile River and Mamelodi. To these should be added Dinokeng tsa Taemane (Cullinan) and Kungwini (Bronkhorstspuit), which were incorporated more recently (see Figure 2C). The fast growth and development in Tshwane have resulted in urban sprawl, which presents a growing challenge in terms of basic services, infrastructure and housing. There is growing disparity in wealth and access to public services in Tshwane, with more adequate public services in the southern and eastern parts than in the far northern parts, with the latter also having limited access to job opportunities.

Tshwane has a diversity of land uses, including residential (rural and urban), agricultural, natural open, industrial and commercial uses. Much of the current Tshwane is urbanised, but it has good potential for agricultural production. This is due to its temperate climate and adequate rainfall, which suit a wide range of agricultural crops and animal husbandry, and also to the recent merger with the Metsweding District, which added a significant rural area with good soils. Good soils are also found in Centurion and Pretoria North, but low agricultural potential, particularly for crops, exists in the Hammanskraal area to the north.

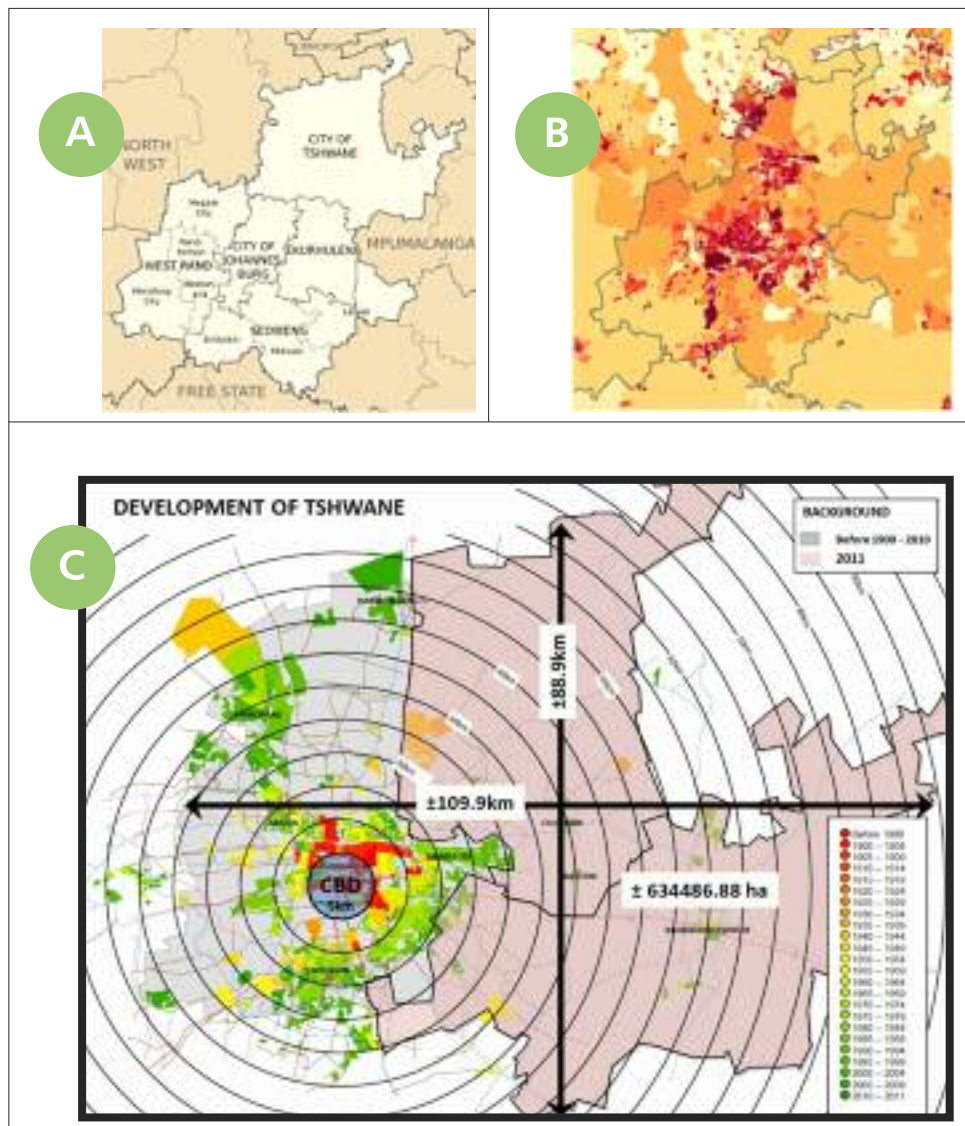



Figure 2: Tshwane’s borders (Map A); Tshwane’s population distribution (Map B); and Tshwane’s expansion and development (Map C). (The maps were reproduced from About Tshwane and Municipal Spatial Development Framework (MSDF, 2012).)



The existing agricultural land parcels are relatively small, often in the range of 5 to 30 hectares, and therefore suitable for mixed and intensive farming^{12,13}. However, despite its low contribution to the GDP, agriculture plays a significant role in food security and livelihoods, particularly in the underserved areas, which are mostly characterised by poverty.

While the appropriate agricultural development of rural areas is vital for the green economy in Tshwane, there is also significant potential for agriculture to be developed in the urban and peri-urban areas. Indeed, the concepts urban agriculture and agro-processing are highly relevant, particularly with the growing challenges the city faces with urban sprawl and land degradation^{14,15}.

The Strategic Framework will assist in the identification of new and existing projects and programmes to be included in the City of Tshwane's Integrated Development Plan (IDP) in the next planning cycle. The IDP¹⁵ for 2011–2016 has made significant improvements in livelihoods by addressing service backlogs and poverty through improving the availability and universal accessibility of essential public services (such as housing, water, sanitation, education and health care). The next IDP will need to continue with service delivery roll-out, but also focus on integrated solutions that reduce resource consumption and the generation of pollution and waste, while opening up new opportunities for green jobs and green economic growth.

The Strategic Framework will help to inform the medium-term to long-term green economy objectives of the City of Tshwane and will form part of the Tshwane 2055 initiative. Tshwane 2055¹⁶ is a long-term strategy for improving the quality of living across the metropolitan area, revitalising the city, boosting economic development and attracting investment. "We need to build sustainable communities, respond to climate change and environmental threats, and provide adequate, quality services and infrastructure for our residents ..." (Clr Kgosi Ramogkopa, Executive Mayor of Tshwane)¹⁷. The Tshwane 2055 initiative aims to articulate the City of Tshwane's vision, game-changing interventions, indicators and outcomes. Tshwane 2055 has six outcomes:

- A resilient and resource-efficient city (which is addressed by the Strategic Framework).
- A growing economy that is inclusive, diversified and competitive.
- Quality infrastructure development that supports liveable communities.
- An equitable city that supports happiness, social cohesion, safety and healthy citizens.
- An African capital city that promotes excellence and innovative governance solutions.
- An activist citizenry that is engaging, aware of their rights and present themselves as partners in tackling societal challenges.

3.2 Process followed to develop the Green Economy Strategic Framework for the City of Tshwane

The development of the Strategic Framework involved workshops with representatives of the City of Tshwane, as well as knowledge support and participation by representatives of UNEP. The overall project progress was reviewed through updates and discussions at progress meetings. However, there were some delays in the planned progress (due to restructuring in the City of Tshwane during 2012).

The first stage of formulating the Strategic Framework was undertaken in a visioning workshop with City of Tshwane representatives. The vision developed in this workshop was presented to City of Tshwane departments at a scoping meeting, where the City of Tshwane context was further discussed and defined. Before the scoping meeting, City of Tshwane heads of department were supplied with a brief questionnaire and interviewed to gain an improved understanding of the existing initiatives and challenges in each department and to develop the green economy aspirations and objectives. The questions posed to the heads of department were:

- What projects and initiatives are currently underway within your department that would already contribute to achieving the City of Tshwane's green economy vision?
- What policies, strategies and/or other documents of your department should the team be aware of to develop the City of Tshwane's green economy strategy?

¹² City of Tshwane Municipal Spatial Development Framework (June 2012). Accessed in February 2013 at: [http://www.tshwane.gov.za/AboutTshwane/CityManagement/CityDepartments/CityPlanning, Development and Regional Services/MSDF 2012/Chapter 1.pdf](http://www.tshwane.gov.za/AboutTshwane/CityManagement/CityDepartments/CityPlanning,DevelopmentandRegionalServices/MSDF2012/Chapter1.pdf).

¹³ Agricultural development models and support mechanisms in the city. Accessed in January 2013 at: [http://www.tshwane.gov.za/AboutTshwane/CityManagement/CityDepartments/EconomicDevelopment/TITIIC/Documents/Japhta Magolela.pdf](http://www.tshwane.gov.za/AboutTshwane/CityManagement/CityDepartments/EconomicDevelopment/TITIIC/Documents/JaphtaMagolela.pdf).

¹⁴ Tshwane Integrated Environmental Policy (January 2005). Accessed in January 2013 at: [http://www.tshwane.gov.za/AboutTshwane/CityManagement/CityDepartments/Agriculture and Environmental Management/Agriculture Environmental Management/tiep_final.pdf](http://www.tshwane.gov.za/AboutTshwane/CityManagement/CityDepartments/AgricultureandEnvironmentalManagement/AgricultureEnvironmentalManagement/tiep_final.pdf).

¹⁵ Integrated Development Plan (2011). Available at: [http://www.tshwane.gov.za/AboutTshwane/CityManagement/OfficeofExecutiveMayor/Integrated Development Planning/Approved IDP 2011 2016/IDP 2011-2016.pdf](http://www.tshwane.gov.za/AboutTshwane/CityManagement/OfficeofExecutiveMayor/IntegratedDevelopmentPlanning/ApprovedIDP20112016/IDP2011-2016.pdf).

¹⁶ Tshwane 2055. Available at: <http://www.tshwane2055.gov.za/>.

¹⁷ Tshwane 2055. Available at: <http://www.tshwane2055.gov.za/images/pdfs/intro.pdf>.

- From your perspective, what are the main issues that need to be taken into account when moving towards the vision presented above (eg what will constrain the achievement of the vision in relation to your department's function and what will enable it)?
- Describe your department's involvement in the 17th Conference of the Parties (COP 17) to the United Nations Framework Convention on Climate Change (UNFCCC), held in Durban in 2011?

These questions formed the basis for fruitful discussion at the scoping workshop, which as to identify the issues and barriers that could prevent the City of Tshwane from achieving its green economy vision. The workshop was also used to discuss and define the drivers of the green economy and the defining aim or purpose of the Strategic Framework. The main drivers of the green economy are a response to the growing economic and environmental crises that demand a new green economic model for:

- Resource efficiency: the efficient use of natural resources to reduce the generation of waste and pollutants;
- Low-carbon development: the use of innovation and increased investment in low-carbon technologies and solutions; and
- Inclusive growth: the creation of green jobs and the greening of service delivery to ensure more equitable and inclusive growth with a pro-poor focus.

It was decided that the focus areas or themes of the Strategic Framework should be "more action based" and "better aligned" with existing green economy initiatives and strategies. The themes were therefore revised and finalised in March 2013, and divided into mitigation and adaptation clusters as follows:

Mitigation

- Pollution and waste management
- Integrated water resource management
- Green buildings and built environment
- Sustainable transport and improved mobility
- Sustainable energy

Adaptation

- Maintenance and provision of ecosystem goods and services
- Sustainable communities (health and social development)
- Sustainable agriculture and food security

In each theme, the status quo and challenges were described to give context and perspective. The known challenges and barriers that may prevent the achievement of the green economy were used to formulate the aspirations, objectives and appropriate actions for each theme. These aspirations, objectives and appropriate actions were incorporated into an initial draft of the Strategic Framework that was reviewed and finalised by the City of Tshwane Sustainability Office.

4 GREEN ECONOMY THEMATIC ACTION AREAS

The City of Tshwane's green economy vision arose from the overall vision of the City, as captured in the 2055 Growth and Development Strategy. It serves to guide the strategic framework:

By 2055, growth and development in Tshwane will be driven by an economy that supports a sustainable, vibrant, liveable and prosperous city, through integrated ecological, social, economic and spatial agendas that promote human and environmental wellbeing.

The strategic framework's focus areas or themes each developed an overall aspiration, strategic objectives and appropriate actions that were identified as being important to achieving the City of Tshwane's green economy vision. There are a range of different mitigation and adaptation approaches that respond to the increasing depletion of natural resources and the growing need for economic development to improve environmental health and human wellbeing. The eight themes are unpacked in terms of aspirations, strategic objectives and appropriate actions in sections 3.1 and 3.2.

4.1 Transitioning to a low-carbon city (mitigation)

Cities use two-thirds of the world's energy and generate over 70% of its carbon emissions¹⁸. Cities therefore carry a huge financial responsibility in mitigating climate change and responding to the social and ecological impacts from resource depletion and natural disasters. The total global cost of cities adapting to climate change is estimated to be \$100 billion per year, with 80% of this cost being borne by cities in developing countries¹⁹.

By 2050, almost 70% of the global population will live in cities²⁰. It is estimated that approximately 62% of South Africans currently live in urban areas. This is predicted to increase to 70% by 2030 and 80% by 2050. The City of Tshwane is part of the Cities Support Programme²¹ which aims to improve service delivery and municipal performance through enhanced environmental management and increased resilience to climate change. The knowledge of the current carbon footprint of Tshwane is essential to identify appropriate interventions with the goal of guiding appropriate low-carbon developments. Effective partnerships between government and the private sector will also be required to secure new green investment opportunities that will reduce Tshwane's carbon footprint through improved efficiency in existing carbon-intensive sectors, and ensure future low-carbon developments.

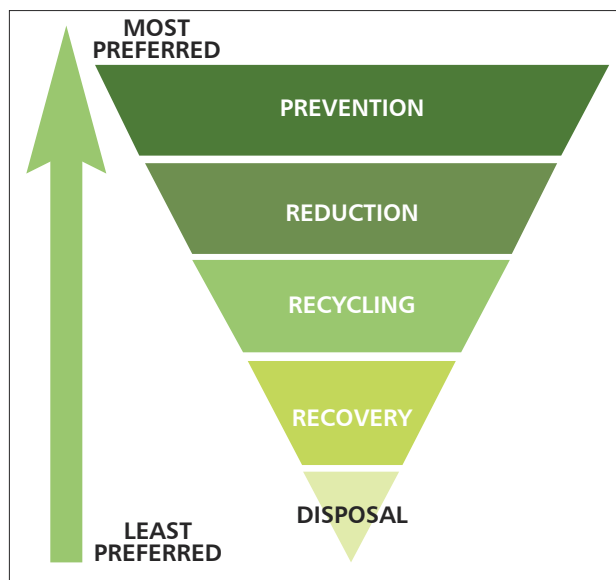
4.1.1 Pollution and waste management

The following sections address the topics of solid waste, wastewater and air pollution within Tshwane from a green economy:

Solid waste management

South Africa, like many other countries, is moving towards the implementation of a 'waste hierarchy' (Figure 5), as set out in and the National Waste Management Strategy (NWMS)²² which has been given legal effect through the National Waste Act²³. The waste hierarchy emphasises a move away from landfilling towards waste minimisation, reuse and recycling. Diverting waste from landfill and extracting useful constituents to feed back into the economy for further processing (e.g. recycling, composting and waste-to-energy) creates opportunities for employment and the development of local enterprises. Such enterprises may relate to waste diversion and beneficiation in activities such as composting of organic waste, energy production through technologies that enable the conversion of waste-to-energy or the recovery of landfill gas, and the development of infrastructure such as integrated waste management facilities or material recovery facilities.

Figure 3: The waste management hierarchy (Adapted from UNEP, 2011²⁴)



¹⁸ Desai, R. 28 July 2011. C40 Cities; City-led, data-driven approach to scaling climate change actions.

¹⁹ Dan Hoornweg, lead urban specialist in the World Bank's central Urban Advisory Unit, 2011.


²⁰ World Bank 2010. Cities and Climate Change: An Urgent Agenda

²¹ Cities Support Programme (2013) http://resilient-cities.iclei.org/fileadmin/sites/resilient_cities/files/Resilient_Cities_2012/Program_Updates/Presentation/A/A2/Resilient_Cities_Presentation_Bonn_-_final.pdf

²² National Waste Management Strategy: Draft for Public Comment (November 2011). Department of Environmental Affairs https://www.environment.gov.za/?q=content/national_waste_management_strategy

²³ National Environmental Management: Waste Act, No. 59 of 2008, The Presidency, Pretoria. Republic of South Africa, 2008 <http://www.info.gov.za/view/DownloadFileAction?id=97351>

²⁴ United Nations Environment Program (UNEP) (2011). Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication, United Nations Environment Program.



In addition to the creation of green job opportunities in the management of waste, extending waste service delivery provides opportunities for localised, labour-intensive implementation. This will also stimulate and broaden the range of employment opportunities more extensively to cooperatives, small medium and micro enterprises (SMMEs), as well as marginalised communities with respect to city cleansing, waste collection and waste sorting. Emphasis should also be placed on improving working conditions, developing appropriate skills and creating new enterprises throughout the waste management hierarchy (ie prevention, reduction, recycling, recovery and disposal).

The main obstacle to the implementation of the waste management hierarchy is the direct financial resources required. Landfilling is the cheapest short-term waste management option. However, this does not take into account the costs of the social and ecological impacts of waste landfilling, maintaining existing landfill space, as well as the difficulties in and the costs of obtaining space for future landfills. Options such as waste minimisation through increased waste recycling at source and energy generation from waste should be explored by the City of Tshwane as alternatives that can contribute to local economic development more directly and sustainably.

Recycling creates more jobs than it displaces so that the net effect on the employment of moving up the waste hierarchy is positive²⁵. However, the challenge is to develop new businesses that can add value to waste without encouraging increased wastage. In addition, compared to the costs of standard waste treatment or no waste treatment, the management of waste is typically not considered within a full-cost accounting model that takes into account the social and ecological value of the benefited waste.

The National Waste Management Strategy and the City's Integrated Waste Management Plan provide clear guidance regarding objectives in this sector that are congruent with the hierarchical approach described above. These objectives inform the aspiration, strategic objectives and actions listed below in relation to promoting a green economy in Tshwane.

Solid waste management

Aspiration

- Maintain and extend municipal waste service delivery (including city cleansing)
- Reduce the City's reliance on landfilling by moving up the waste hierarchy in a way that adds significant value to healthy and prosperous living in the city

Strategic objectives

- To employ innovative solutions, including green technologies, in support of waste minimisation, reuse and recycling
- To strengthen public-private partnerships to enable effective integrated waste management

Appropriate actions

- Effectively implementing the City of Tshwane's commitment to an integrated approach to waste management and its plans to generate energy from waste by converting landfill gas into electricity
- Minimising the waste going to landfills by 25% through recycling or recovering of materials (the City currently has several buy-back centres for recycling and recovery .)
- Increasing awareness-raising and education, across all sectors, on waste prevention, reduction, recycling, recovery and the implementation of waste separation at source
- Supporting value-adding in the local waste sector through the use of, for example, appropriate public-private partnerships such as waste cooperatives and SMMEs


Municipal waste water

Municipal waste water, which requires management by the City of Tshwane, includes both domestic (sewage) and industrial waste water. The waste water is generally considered to be a burden on society and incurs energy costs in processing before it can safely be released into the environment. It has been suggested that no other type of intervention has a greater impact upon a country's development and public health than the provision of clean drinking water and the appropriate disposal of human waste²⁶.

While access to sanitation is improving, municipal waste water treatment plants (WWTP) are suffering from poor operation, servicing and maintenance. This has a particularly negative impact on the City of Tshwane's natural resource base, such as water resources and the provision of a range of other ecosystem goods and services. Many WWTP are not fully compliant with legislation regarding waste water discharge into the environment and the majority of the plants require interventions. It is estimated that over 55% of waste water treatment plants, especially smaller ones, do not meet effluent standards. The government has launched Green Drop Certification for municipal waste water treatment. As of May 2011, 32 of the 1 237 waste water treatment plants were certified with the Green Drop standard. The City of Tshwane had a municipal Green Drop score of 63,8%, ranking 9th out of the 12 Gauteng municipalities. However, the Municipality has experienced a deteriorating Green Drop score with 7 of the 10 plants showing trends of increased risk profiles between 2009 and 2011.

²⁵ Soshanguve & Ga-Rankuwa, Hammanskraal & Stinkwater, Atteridgeville

²⁶



The City of Tshwane is guided by the National Sanitation Strategy and the Free Basic Sanitation Implementation Strategy. These strategies address roles and responsibilities in relation to sanitation delivery, planning for sanitation, funding sanitation, implementation approaches and regulating the sanitation sector.

Municipal waste water

Aspiration

- Sustainable waste water management through cleaner industrial production and improvements in sanitation by increasing the efficiency of municipal waste water treatment plants
- The environmental impacts and costs of established waste water treatments being significantly reduced through the innovative use of waste water as a resource for energy recovery and the production of other valuable products

Strategic objectives

- To enhance the ability of all municipal waste water treatment plants to attain Green Drop Certification and to report on their status
- To reduce the energy demand of the City's waste water treatment plants through waste-to-energy initiatives and the use of renewable energy

Appropriate actions

- Upgrading and installing new waste-to-energy waste water treatment plants²⁷
- Improving waste water monitoring systems to support reporting to the South African waste information services and enhance compliance with waste water legislation

Air pollution

Air quality will influence and be influenced by many activities in Tshwane as well as regional and national air quality, weather conditions and global phenomena such as climate change. Air quality has a range of different impacts on human health, the ecosystem and climate change. In terms of the link between human health, air quality and the green economy, impacts relate generally to the public and specifically to employees in the work place (eg occupational health impacts). These impacts have numerous negative consequences for the economy such as increased illnesses and deaths, increased public health costs and decreased worker performance. Air quality also has impacts on ecosystems via processes such as acid rain. Certain air pollutants also affect the greenhouse gas effect in the atmosphere and thus have implications for climate change. Improving air quality is therefore critical. Most countries regulate both the ambient (outdoor) levels of air pollution as well as emission sources (eg emission regulations for industry and transport, amongst others).

The South African National Environmental Management Air Quality Act (AQA) regulates emissions of air pollutants from listed sources, as well as ambient air quality for criteria pollutants. In addition to enforcing the national standards, the City of Tshwane drafted Municipal Air Quality Management by-laws to provide for stricter local emission standards on specific emitters, as well as local emission standards on some emitters not covered by the AQA. The enforcement of both the AQA and the draft by-laws, once implemented, will aid in the transition to a green economy through the mitigation of air pollution impacts.

To ensure an integrated approach to the green economy in Tshwane, air quality impacts must be considered together with climate change, ecosystem and health impacts. The implementation of innovative solutions, including green technologies to improve air quality, will result in a range of economic and human-health benefits, as well as offering new green job opportunities to assess, implement, monitor and audit air quality management plans and their impacts.

Air pollution

Aspiration

- To secure clean and healthy air quality within Tshwane: Low-carbon initiatives are supported by the continual improvement of effective air quality management and reporting.

Strategic objectives

- To improve the monitoring, evaluation and reporting of Tshwane's cumulative emissions²⁸ to guide green economy initiatives aimed at reducing carbon emissions and improving air quality
- To include air quality management in all sector plans and departmental policies in order to maximise the benefits of improved air quality on human health, ecosystem function and the mitigation of climate change

Appropriate actions

- Implementing improved monitoring systems to measure and monitor cumulative air emissions within Tshwane, as well as ensuring compliance with air quality legislation

²⁷ The biogas generated at WWTP can generate heat and electricity for use on-site so that the wastewater treatment plants are energy independent, or be stored and distributed to be used as a cooking or transport fuel.

²⁸ World Resources Institute http://pdf.wri.org/navigating_numbers_chapter6.pdf



4.1.2 Integrated water resources management

There are difficult decisions to be made regarding water allocation and the apportionment of diminishing supplies between ever-increasing demands. Water availability is one of the most decisive factors that will affect the economic, social and environmental wellbeing of South Africa over the next decade. Its supply is already precariously limited. South Africa is a semi-arid country – rainfall and water availability are unequally distributed. The total available annual surface water resources are estimated at 14 km³. The total annual water withdrawal was estimated at 12,5 km³, of which about 17% was for municipal water use. The Gauteng region is very water-scarce, with both surface water and groundwater resources nearly fully-developed and used. It imports water from the Orange River through the Lesotho Highlands Water Project. Gauteng is also beginning to feel the rebound effects of previously externalising the costs of unsustainable development, such as polluting mining activities, which will affect the Province's economic competitiveness and job creation potential.

Historically, South Africa invested heavily in water infrastructure, but the country is fast approaching full utilisation of available surface water and is running out of suitable sites for new dams. In addition, water quality issues cannot be solved by simply building more dams or creating more infrastructure since water provision relies on maintaining and conserving the natural areas that form the critical catchments for the country. Integrated water resources management (IWRM) provides an approach to the efficient, equitable and sustainable development and management of the limited water resources.

Integrated water resources management (IWRM) promotes the coordinated development and management of water, land and related resources in order to maximise economic and social welfare in an equitable manner, without compromising the sustainability of vital ecosystems and the environment.

Integrated water resources management

Aspiration

- Water resources are managed in an effective and integrated way which maximises economic and social welfare in an equitable manner, without compromising the sustainability of vital ecosystems.

Strategic objectives

- To improve the efficiency of water supply through setting and achieving targets for reducing losses resulting from the system of water storage and distribution
- To enhance the City of Tshwane's ability to report on and attain drinking water quality standards through, for example, attaining 'blue drop' status
- To increase water-use efficiency and access to basic water supply through appropriate water-pricing
- To advocate and provide incentives for improved water resource management in industrial settings, particularly mining and agriculture
- To enhance the quality and quantity of water through effective ecosystem management (eg the conservation of wetlands in order to maintain their natural purification and flood control functions)
- To create green jobs in expanded public works programmes (such as Working for Water and Working for Wetlands) that conserve biodiversity and protect ecosystems to improve water availability

Appropriate actions


- Develop and implement a water demand management strategy which includes initiatives for improved water monitoring and reporting in order to reduce water distribution losses
- Implement a refined water-tariff structure to cross-subsidise free basic water supply
- Improve the conservation status of natural areas, particularly wetlands and water catchment areas, to improve ecosystem services and the provision of fresh water

4.1.3 Green buildings and built environment

The built environment provides society with spaces to work and reside. However, it currently consumes a large portion of the earth's water, energy and other resources. Greater resource efficiency and environmental responsibility is therefore needed, not only within strategic urban planning, but also within each stage of the lifecycle of buildings themselves (ie site planning to design, construction, operation, maintenance, refurbishment and eventually deconstruction)²⁹. The construction of green buildings aims to reduce the overall impacts of the built environment on human welfare and the natural environment. This is achieved through the efficient use of energy, water and other resources, protecting occupant health, improving employee productivity and reducing waste, pollution and environmental degradation.

A green built environment refers to the application of green building principles to the spatial design of the urban landscape in a way that minimises resource consumption and the negative impacts on ecological processes. Greening the built environment includes a range of interventions, such as urban compaction to enhance mobility and reduce a city's carbon

²⁹ ISO 15392:2008 established internationally recognized principles for sustainability in building construction and uses "cradle to grave" for the assessment



footprint, the protection of green spaces to reduce the impacts of waste and pollution on human health and improving societal wellbeing through enhanced opportunities for recreation and social interaction. The most significant perceived obstacles to the construction of green buildings are cost and a lack of integrated spatial planning. Although a green building can raise development costs by 2-3% above those of a standard building, the reduced operational costs over the entire lifespan of the building can significantly reduce the overall cost³⁰. The retrofitting of existing buildings can yield remarkable savings in energy and water use, such that the costs of such retrofitting are returned through long-term operational savings with reasonable payback periods. This also reduces the demand of these public services.

There are several existing national green building policy instruments such as the National Development Plan (zero emission building standards by 2030) and the new building regulations developed by the South African Bureau of Standards (SABS) requiring improvements in the energy efficiency and management performance of buildings³¹. In addition, important City of Tshwane green building instruments include, for example –

- the Tshwane Compaction and Densification Strategy aimed at addressing the need for densification and compaction within the Tshwane metropolitan area;
- the Green Building Development By-law which outlines the legislative status of green buildings;
- the Green Building Development Policy which presents both mandatory green building development standards and those that are promoted, but not required; and
- the Green Building Development Incentive Scheme which has been developed to encourage new buildings to surpass green building development mandatory standards and adopt promoted standards.

Within this context, a green built environment should be developed within Tshwane, in an integrative way, considering spatial planning, transport and other public service infrastructure. The focus should be on increased resource efficiency, while enhancing the connectivity and liveability of the city.

Green buildings and built environment

Aspiration

- Architecture within Tshwane being redirected towards improved liveability and connectivity
- The retrofitting of buildings and construction of new buildings in Tshwane for improved energy and materials efficiency

Strategic objectives

- To develop skills and capacity in green building materials and design
- To ensure that full-cost accounting occurs in relation to building construction, including capital and operational costs (eg material, energy and labour), to demonstrate the significant long-term savings of green buildings
- To integrate green building principles into spatial planning to enable a liveable city that enhances human health and wellbeing
- To improve urban mobility and connectivity through the densification and compaction of the built environment, the development of integrated mass urban transport systems and through increasing the accessibility to information technology

Appropriate actions

- Implement green retrofitting in selected municipal and other buildings to demonstrate the financial savings and other benefits of green buildings
- Monitor the implementation of and ensure compliance with the City of Tshwane's Green Building Development Policy and By-law³²
- Adopt the Green Star Rating System initiated by the Green Buildings Council of South Africa
- Enhance urban compaction and densification from the strategic planning stage to implementation

4.1.4 Sustainable transport and improving mobility

Transport systems have a significant impact on the environment, accounting for 20% to 25% of world energy consumption and carbon dioxide emissions. Greenhouse gas emissions from transport are increasing at a faster rate than any other energy-using sector, affecting air pollution levels both globally and locally³³.

³⁰ Kats, Greg, Leon Alevantis, Adam Berman, Evan Mills, Jeff Perlman. The Cost and Financial Benefits of Green Buildings, November 3rd, 2008. <http://www.dcaia.com/images/firm/Kats-Green-Buildings-Cost.pdf>

³¹ National SANS 10400-XA: Energy Usage in Buildings and SANS 204: Energy Efficiency in buildings

³² Currently draft status: Available on the Internet May 2013
<http://www.tshwane.gov.za/AboutTshwane/CityManagement/CityDepartments/CorporateandSharedServices/legalservices/By-Law-Listing/Draft-ByLaws/Green-Building-Development-Bylaw-%28draft%29.pdf>

³³ United Nations Environment Program (UNEP) (2011). Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication, United Nations Environment Program.

Current trends in the transport sector reveal a rapid increase in both passenger and freight activity, which is predicted to double between 2005 and 2050. This transport activity is increasingly motorised and the global vehicle fleet is set to multiply three to fourfold in the next few decades, leading to increased traffic congestion.

The current approaches in greening the transportation sector are^{34,35}–

- (i) avoiding or reducing the number of journeys taken: This can be accomplished by enhancing mobility with the integration of land use and transport planning. Denser and more compact settlements are needed, as well as localised production and consumption and the harnessing of information and communications technology to improve mobility while reducing transport and hence per capita carbon emissions. Examples include the use of information technology (IT) and a networked infrastructure to develop a smart city³⁶;
- (ii) shifting to more environmentally-friendly transport modes: Public transport systems that are frequent, reliable, affordable and comfortable are needed to enable a shift to the use of mass transport systems. A modal shift from road to rail for some types of commodities will also help in greening transport, since rail is more environment-friendly. Also, shifting some of the freight helps to free space on the roads, thereby reducing congestion;
- (iii) improving the overall efficiency of transport systems through the improvement of vehicle and fuel technology in order to reduce negative environmental effects such as pollution and resource depletion. Currently in South Africa, all new passenger and heavy duty vehicles, whether locally manufactured or imported, must meet or exceed "Euro II" emissions standards. The shift towards low sulphur diesel, electric vehicles and the use of biofuels³⁷ will also help the in the city's transition to a green economy; and
- (iv) creating an enabling environment for green transport initiatives to be effective: In order for this to happen they need to be supported by appropriate enabling conditions in the form of regulatory instruments and policies. There are a number of policies and regulations in place in South Africa that can assist in this regard. The main challenge however lies in enforcing and monitoring compliance to these regulations³⁸.

There are several challenges in the transition to sustainable transport systems and the improvement of mobility. The current global trends of established growth in the petroleum-fuelled transport sector will make transition to another option challenging. Generally, there is a lack of supporting policy and limited investment in transport infrastructure, as well as insufficient infrastructure to keep pace with developments in vehicle purchases and traffic volumes. This leads to congestion on the roads, resulting in delays and lost economic productivity as well as accidents and damage.

Sustainable transport and improving mobility

Aspiration

- Sustainable mobility and connectivity through improvement in the enabling infrastructure and access to greener transportation options in Tshwane

Strategic objectives

- Green urban development through spatial densification, urban compaction, localisation of materials and markets and enhancing access to information and communications technology to increase mobility without the need for additional transportation
- Synchronise transport modalities and improve transport operations with the aim of increasing efficiency
- Provide safe, reliable and affordable mass transport systems to all citizens
- Advocate and enable the use of biofuels and electric transport options that offer low-carbon mobility

Appropriate actions

- Reclaim city space for walking and non-motorised transport
- Expand Tshwane's mass transport systems
- Phase electric vehicles into the City of Tshwane's fleet and encourage the purchase of electric and other renewable energy-based vehicles by private residents and companies

³⁴ Bongardt, D. and Schaltenberg, P., 2011. Transport in A green Economy. giz Transport Advisory Services.

³⁵ Gauteng Department of Roads and Transport, 2012. Transport Air Quality Management Plan. Final Draft Report Rev 1

³⁶ A city can be defined as 'Smart' when investments in human and social capital, traditional (transport) and modern (ICT) communication infrastructure, fuel sustainable economic development and a high quality of life, with a wise management of natural resources, through participatory action and engagement. Caragliu, A., Del Bo, C., and Nijkamp, P. (2009) Smart Cities in Europe. Available on the Internet December 20112. <ftp://zappa.ubvu.vu.nl/20090048.pdf>

³⁷ Plugged in: The end of the oil Age. WWF April 2008
http://awsassets.panda.org/downloads/plugged_in_full_report_final.pdf

³⁸ The National Environmental Management Air Quality Act (AQA) Act 39 of 2004; The Gauteng Noise Control Regulations (General Notice 5479 of 1999) published under Section 25 of the Environment Conservation Act (Act No. 73 of 1989; The National Road Traffic Act and the Road Traffic Act; The Petroleum Products Amendments Act and Periodic Vehicle Inspection (PVI); The National Climate Change White Paper



4.1.5 Sustainable energy

The energy sector has made a significant contribution to the global cumulative greenhouse gas emissions. Nearly two-thirds of the global greenhouse gas emissions from human activity since the beginning of the industrial era has come from the combustion of fossil fuels³⁹. Therefore, energy-efficiency measures such as integrated demand management and renewable energy technologies are being rapidly deployed across the globe in an effort to reduce carbon emissions and develop a more sustainable economy.

South Africa is a rapidly developing country that is energy-intensive. The reliance on petroleum fuels and the generation of electricity from coal has resulted in South Africa ranking as the 13th greatest greenhouse gas emitter in the world on a per capita basis^{40,41}. The growing energy demands (estimated to be at 25 to 40 GW by 2025⁴²) and the urgent need for increased energy generation capacity reached a crisis in 2008 that resulted in unplanned electricity blackouts and subsequent planned load-shedding⁴². In response to the energy challenges facing South Africa, Eskom has established an integrated demand management (IDM) programme through coordinating and consolidating the various initiatives aimed at optimising energy use and balancing electricity supply and demand. The overall aim is to achieve a 15% reduction in energy use by 2015 in support of the National Energy Efficiency Strategy of South Africa⁴³.

A key aspect of the demand side management programme is the promotion and implementation of more energy-efficient technologies, processes and behaviours amongst all consumers.

The renewable energy supply has seen considerable global growth. From the end of 2005 to 2010, the total global capacity of many renewable energy technologies, including solar photovoltaics (PV), wind power, concentrating solar thermal power (CSP), solar water heating systems and biofuels, grew at average rates ranging from around 15% to nearly 50% annually. The renewable energy sector generates sizeable net employment gains as more jobs are created per megawatt of power installed (and per rand of investment) than in the fossil fuel-based energy sector.

South Africa's commitment to reducing its carbon footprint, through adopting renewable energy options, is highlighted in policies such as the Biofuels Industrial Strategy, the White Paper on Renewable Energy, and the Renewable Energy Feed-In Tariff, as well as recent initiatives such as the Green Economy Summit and the looming carbon tax. However, progress in renewable energy deployment in South Africa to date has been relatively slow. To date, South Africa's renewable energy policy has largely been driven by the White Paper on Renewable Energy that defined a target of 10 000 GWh from renewable energy sources by 2013. This policy includes a renewable energy feed in tariff (REFIT) that resulted in great interest by independent power producers (IPPs) to develop renewable energy projects. The IPP procurement process has successfully proceeded and aims to meet the Integrated Resource Plan 2010 target of 42% of all new electricity generation in South Africa over the next 20 years being supplied by renewable energy.

However, the challenges to the widespread deployment of renewable energy technologies and the provision of clean, green energy services include the following:

- The electricity price is a key variable in determining the cost competitiveness of renewable energy technologies compared to the current cost of coal power. The cost of electricity has been kept artificially low through the lack of accounting for earlier government infrastructure investments and the failure to account for the ecological costs and social burdens of coal power stations (eg carbon and sulphur emissions causing air pollution and acid mine drainage causing water pollution).
- Many of these social and ecological externalities are underpriced or not priced at all. This is due to a lack of knowledge of or consensus on the true cost of such externalities. Currently, monetary incentives exist to account for carbon emissions. However, while global carbon markets and carbon tax reductions can help to incentivise innovation to tackle climate change, current carbon prices are low, leaving a considerable gap when comparing energy supply options on a unit cost basis.
- Path dependency and dominance of existing technologies and systems can make it very difficult for new technologies to compete, establish a place in the market and scale up. The dominance of and reliance on coal and oil as an energy resource have stifled innovation and locked out competition from independent power producers wanting to develop and supply renewable energy.
- Investment can have a serious impact on the development and diffusion of renewable energy. There is a distinct advantage in being an early-adopter in terms of entering the rapidly developing renewable energy markets through

³⁹ IPCC Fourth Assessment Report: Climate Change, 2007. Working Group I: Available on the Internet 12 February 2011. http://www.ipcc.ch/publications_and_data/ar4/wg1/en/tssts-2-1-1.html

⁴⁰ Energy outlook for South Africa, 2002. Department of Minerals and Energy (DME) Available on the Internet: http://www.dme.gov.za/energy_statistics.stm Accessed 20 December 2010.

⁴¹ StatsSA, 2008. <http://www.statssa.gov.za/publications/DiscussEnergyAcc/DiscussEnergyAcc.pdf> . Accessed 27 October 2010.

⁴² Bernstein, A (2008) SA's s electricity crisis: How did we get here? And how do we put things right? CDE Round Table no. 10, July 2008 <http://www.eepublishers.co.za/article/sas-s-electricity-crisis-how-did-we-get-here.html>

⁴³ National Energy Efficiency Strategy of South Africa. Available on the Internet Accessed 12 February http://www.energy.gov.za/EEE/Review_of_National_Energy_Efficiency_Strategy_2008.pdf

aggressive investments, but South Africa is set to be left behind through a lack of investment. In addition, the global free trade markets result in imports of renewable energy technologies and materials being cheaper than what could, at present, be manufactured locally. Existing policy and legislation do not provide for a local content requirement to enhance the local manufacture of renewable energy components.

Sustainable energy

Aspirations

- Increased opportunities and investment in energy efficiency and energy management to reduce Tshwane's existing energy demand and carbon footprint
- Renewable energy options being developed and promoted in the City and contributing effectively to a greener and more sustainable energy supply mix
- Energy accessibility and affordability for all Tshwane residents being enhanced in a way that makes cleaner renewable fuels available for cooking, transportation and electrical power

Strategic objectives

- To enhance demand side management through energy-efficiency initiatives⁴⁴, improved metering of electricity⁴⁵ and reduced losses from the transmission and distribution of electricity and fuels
- To assess the financial, institutional and regulatory barriers that prevent the widespread implementation of renewable energy⁴⁶
- To explore the full costs and benefits of decentralised renewable energy power options versus current electric grid expansion
- To develop strategies to increase affordability and access to renewable energy supply options in a way that helps to address inequality and poverty in the Tshwane⁴⁷
- To improve the management and strategic development of Tshwane's energy supply and demand through integrated spatial planning which, for example, locates uses with high energy demands, such as industry, in consolidated areas (eg industrial parks)

Appropriate actions

- Improve demand side management by expanding the City's Solar Water Heater (SWH) Programme, promoting the wide-spread use of low-energy CFL and LED lighting, ensuring improved building insulation and using smart meters with time-of-use tariffs
- Develop municipal hydro-power initiative using Tshwane's water supply system
- Green the coal supply of the two City of Tshwane coal power stations (Pretoria West and Rooiwal) by replacing coal with biomass
- Develop the proposed AFRKO Solar Park in Tshwane to generate 20MW of electricity using photovoltaic (PV) panels
- Generate renewable energy fuels (ie biogas and landfill gas) from sewage and waste at municipal treatment facilities (WWTP and landfill sites)
- Support and promote the use of low-carbon renewable transport such as electricity-powered vehicles and the replacement of petrol and diesel with biofuels

4.2 Building a resilient and resource-efficient city (adaptation)

Humans derive many essential goods from natural ecosystems, including food, fuel wood, timber and medicines. What has been less appreciated to date is that natural ecosystems also perform essential life-support services. Currently, the escalating impacts of human activities, such as mining, forestry and agriculture, on biodiversity and natural ecosystems threaten the delivery of ecosystem goods and services. Human activity has exploited the natural resource base with widespread impacts through the degradation, alteration of processes and transformation of ecosystems. The loss of services from natural ecosystems will require costly alternatives. Therefore, investing in our natural capital is vital for our welfare and long-term survival and will be more cost-effective in the long term.

The maintenance of ecosystem goods and services (eg water and air purification, seed dispersal and nutrient cycling) are fundamental forms of natural capital that underpin the transition to a green economy. Consequently, the quantification and valuation of ecosystem goods and services and the inclusion of their monetary value into development decision-making is

⁴⁴ This includes green building and transportation programs that have low-carbon footprints; such as: increased rollout of:- complex fluorescent lighting, solar water heaters, energy-efficient streetlights and traffic lights; improving energy efficiency in buildings; more efficient industrial processing technologies; and the promotion of energy-efficient appliances

⁴⁵ Smart meters can improve energy efficiency and reduce peak demands through the application of time of use tariffs

⁴⁶ Barriers can include the municipal financial management act, lack of capital investment, the lack of smart metering and other feed-in constraints for small independent power producers

⁴⁷ For example, how to increase the transition from paraffin to LPG or biogas in communities with limited income



pivotal to embarking on a green economic path which is resilient and resource-efficient. However, such ecological goods and services cannot easily be reduced to monetary terms as they are typically part of complex social-ecological systems. Their value is therefore difficult to 'isolate' and quantify. Moreover, they are often considered 'public goods' and therefore the 'property of the commons' so that no single person is held responsible for their maintenance and the resource is typically over-exploited and depleted or degraded.

There is a critical nexus of the need for increased food production, declining integrity of ecosystem services and an increasing human population. A decrease in ecosystem goods and services does not affect all people or economic sectors in the same way. People and economic sectors that rely most directly on ecosystem services, such as farmers and the agriculture sector, face the most serious and immediate risks because they are essential for livelihoods and economic activity. Agriculture relies intimately on the integrity of natural resources, but has a range of significant impacts on the environment with a subsequent cost to the provision of ecosystem goods and services that has severe implications for human health and wellbeing. Therefore, the loss of ecosystem goods and services is likely to increase inequality and the marginalisation of the most vulnerable members of society.

The sustainable use of resources for transition to a green economy will require not only improvements in the efficiency of resource use, but also more inclusive and equitable sharing of the wealth and benefits. For example, promoting sustainable land use and agriculture can contribute to regional economic vitality (not necessarily growth) while enhancing food security for all citizens. As a further example, economic benefit can be gained from preventing urban sprawl and the related inefficiencies in the use of natural resources (eg land) and municipal infrastructure (eg transport systems and delivering public of services). In addition, improving the connectivity of humans with the natural environment and raising awareness on the inter-dependency between ecosystem health and human health can increase the pro-environmental behaviour of citizens to develop resilient and sustainable communities in Tshwane. Knowledge of Tshwane's climate vulnerability will guide targeted resilience and adaptation programmes.

The green economy themes that can facilitate building a resilient and resource-efficient city are maintenance and provision of ecosystem goods and services, sustainable agriculture and food security and sustainable communities: health and social development.

4.2.1 Maintenance and provision of ecosystem goods and services

The global United Nation's Millennium Ecosystem Assessment revealed that 60% of the ecosystem services have been degraded between 2000 and 2005. This is a result of the fact that most of these ecosystem services present public goods that are externalised. Since they are provided at no cost, they are not adequately taken into account when making land-use decisions. Therefore, there needs to be direct, contractual and conditional payments to local landholders and users in return for adopting practices that secure ecosystem conservation and restoration and the provision of ecosystem services^{48,49}.

Ecosystems underpin all human life and activities by providing a range of goods and services, including –

- supporting services necessary for the production of all other ecosystem services (such as plant primary production, nutrient dispersal and cycling and seed dispersal);
- provisioning services which are the products obtained from ecosystems (such as food, water and energy);
- regulating services which include carbon sequestration and climate regulation, waste decomposition and detoxification and the purification of water and air; and
- cultural services which are the non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences.

As the population continues to grow, the demand for natural resources will also grow. Therefore, the loss of habitats and resource over-exploitation will continue unless control measures are implemented and adhered to. Involvement of communities in decision-making and the more equitable sharing of benefits can contribute to helping reduce these ecological risks and scarcities while improving the security of human livelihoods.

South Africa is party to many international conventions that relate to the sustainable management of ecosystem goods and services. For example, the Intergovernmental Forum on Forests of the United Nations Commission for Sustainable Development (UNCSD) recognises the economic benefits as well as the social and environmental costs of plantation forests as important policy issues. South Africa has also ratified the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to combat the smuggling of protected species.

⁴⁸ Wunder, S. Engel, S. and S. Pagiola. (2008). Taking stock: a comparative analysis of payments for environmental services programs in developed and developing countries. *Ecological Economics* 65: 834-852.

⁴⁹ UNEP (2008) Payments for Ecosystem Services: Getting Started. Available on the internet 2011: Available on the internet 2011 http://www.unep.org/pdf/PaymentsForEcosystemServices_en.pdf

Maintenance and provision of ecosystem goods and services

Aspiration

- The protection and enhancement of ecosystem goods and services through respect for the ecological limits and rates of replenishment is recognised as essential for the sustainability of the city.

Strategic objectives

- To ensure that the municipal environmental management framework (EMF) informs the City of Tshwane's integrated development plan (IDP) and all development decisions, and to establish actions to meet existing SANBI targets for the conservation of biodiversity (especially the grasslands target)
- To ensure that biodiversity mapping is undertaken for the City of Tshwane and inform municipal environmental management as well as all development decisions
- To promulgate and enforce by-laws related to the maintenance and enhancement of green servitudes, eg storm water management and the management and maintenance of open green space and biodiversity corridors
- To develop remediation plans for the rehabilitation of degraded and contaminated land within Tshwane

Appropriate actions

- Undertake biodiversity assessments to determine the status of sensitive areas such as wetlands and bio-reserves, and inform their rehabilitation where needed
- Mainstream environmental priorities (eg conservation of sensitive areas) into strategic development plans (eg integrated development plans (IDPs)), as well as into sector-specific policies, plans and projects (eg water, waste and housing)
- Support and enable the expansion of public works programmes, such as Working for Water, Working on Fire and Working for Wetlands within Tshwane

4.2.2 Sustainable agriculture and food security

The agriculture sector forms a critical and often undervalued component of the economy. However, a complex relationship exists between the increased need for food production and the rapidly declining integrity of ecosystem goods and services. Overwhelming evidence exists of the negative impacts of modern agriculture on the environment and the subsequent cost in the loss of ecosystem goods and services^{50,51}. Sustainable agriculture aims to increase the production and nutritional quality of food, while contributing to the creation of food security, sustainable livelihoods and resilient ecosystems⁵². The main constraint to achieving sustainable agriculture and food security is typically a failure to recognise the dependency of farming on the maintenance and enhancement of ecosystem goods and services. Sustainable agricultural practices that can contribute towards developing a green economy include those that can assist in reducing the financial and carbon-intensive costs of key agricultural inputs (ie petroleum-based fertilisers, herbicides and pesticides) and reduce the impacts on human health and the environment.

It should be noted that discussions related to sustainable agriculture seldom include the issue of animal production (livestock), despite the fact that livestock husbandry is estimated to contribute between 18-25% of global greenhouse gas emissions globally⁵³. There are also important market forces in the context of global trade that need to be considered for improving food security. These include the subsidies and trade incentives that have often encouraged inappropriate farming practices and crop choices and favoured large-scale farmers at the potential expense of smaller-scale diverse farming practices.

While the appropriate agricultural development of rural areas is vital for Tshwane's green economy, there is also a significant potential for agriculture to be developed in the urban and peri-urban areas. The concept of urban agriculture and agro-processing is highly relevant, particularly with the growing challenges the city faces with urban sprawl and land degradation^{15,54}.

⁵⁰ Vandermeer, J. 1995. The ecological basis of alternative agriculture. *Annual Review of Ecological Systems* 26: 201-224.

⁵¹ Ecosystem and Human Well-being: Millennium Ecosystem Assessment (2005), p.1

⁵² Gold, M.V. (2009) Sustainable Agriculture: Information Access Tools, <http://www.nal.usda.gov/afsic/pubs/agnic/susag.shtml>, Accessed 24 May 2013

⁵³ Hird, V. 2011. The green food economy doesn't need to cost the earth, Green Economy Coalition. Online at: <http://www.greeneconomycoalition.org/know-how/green-food-economy-doesnt-need-cost-earth>

⁵⁴ Tshwane Integrated Environmental Policy (January 2005). Available on the Internet January 2013 [http://www.tshwane.gov.za/AboutTshwane/CityManagement/CityDepartments/Agriculture and Environmental Management/Agriculture Environmental Management/tiep_final.pdf](http://www.tshwane.gov.za/AboutTshwane/CityManagement/CityDepartments/Agriculture%20and%20Environmental%20Management/Agriculture%20and%20Environmental%20Management/tiep_final.pdf)



Sustainable agriculture and food security

Aspiration

- Food security is ensured through sustainable food supply systems in which agricultural activities are undertaken in a manner which maintains and enhances the ecological integrity of land and other natural resources.

Strategic objectives

- To develop incentives to actively promote sustainable agriculture and agro-ecology
- To rehabilitate currently degraded common lands and promote their sustainable use by communities and small-scale farmers
- To promote small-scale organic farming and farm produce, the establishment of community cooperatives and local food markets, as well as green packing houses and processing facilities that add value to local produce
- To expand existing feeding schemes and establish community nutrition centres or restaurants that serve as educational platforms for good nutrition
- To promote urban agriculture and establish food gardens at public institutions such as clinics, hospitals, schools and state correctional facilities
- To support programmes to ensure protection of agricultural land, sustained food security and local economic development

Appropriate actions

- Enhance skills and knowledge in organic production and agro-ecology practices, for example, through the "Moringa Tree" Project and the National Organic Produce Initiative ⁵⁵
- Develop the infrastructure required for successful local food markets, as well as green packing houses and processing facilities that add value to local produce
- Enhance local food production and establish food gardens at public institutions such as clinics, hospitals, schools and prisons
- Increase awareness of the relationship between ecosystem services, food security and nutrition within Tshwane

4.2.3 Sustainable communities: health and social development

The purpose of sustainable human development is to improve community wellbeing and quality of life (DEA, 2011). The vision for a sustainable community is based on South Africa's aspiration for "a sustainable, economically prosperous and self-reliant nation that safeguards its democracy by meeting the fundamental human needs of its people, by managing its limited ecological resources responsibly for current and future generations, and by advancing efficient and effective integrated planning and governance through national, regional and global collaboration" (NFSD, 2011).

A major challenge to building a sustainable society for improved human wellbeing is the current system of beliefs and values inherent in our consumer-driven society. Greening the economy will need a transition to more pro-environmental behaviour of the citizens using several approaches including, awareness, education, role-models and the prevailing culture and infrastructure.

The current status and trends in social development within Tshwane are revealed, for example, the unemployment statistics increased from 12,5% to 14,8% between 2006 and 2010, the human development index decreased from 0,70 in 2006 to 0,67 in 2010 (City of Tshwane, 2012) and the Gini coefficient that measures income inequality (Gini approximately 0,66). Education levels, however, in terms of the percentage of individuals with matric and higher education in the city, show a 34% increase between 2001 and 2011 (City of Tshwane, 2013). The burden of disease in Tshwane can be used to indicate morbidity and mortality and hence community health. Approximately 90% of premature deaths are caused by HIV/AIDS and TB, violent crime and road traffic accidents, chronic diseases of lifestyle and other infectious diseases (MRC 2000 in City of Tshwane, 2012).

⁵⁵ National Organic Produce Initiative. <http://nopi.co.za/>

Sustainable communities: health and social development

Aspiration

- A vibrant citizenry and a healthy, skilled workforce that contributes to improved human wellbeing and social cohesion

Strategic objectives

- To foster a citizenry that is engaging, aware of its responsibilities and rights, and participates as a partner in the green economy
- To build the social capital and community skills required to improve societal health and wellbeing
- To provide services and facilities that enable a safe and healthy environment and enhance opportunities for improved connectivity and social cohesion,
- Integrated community development initiatives in arts, heritage and culture and the development of community infrastructure (eg parks, community centres, open spaces and recreation areas)
- New public infrastructure that enhances universal access to basic services and inclusivity in order to improve human health within Tshwane

Appropriate actions

- Rehabilitate municipal buildings, parks, wetlands and roadsides in a way which maintains and restores ecological goods and services and provides for shared and lively public spaces
- Enhance the efficiency of service delivery and ensure universal access to public services (especially water, sanitation, electricity, health care and housing)

4.3 Means of implementation

The development of a green economy strategic framework provides a critical lever to bring about transformations needed for a more equitable and inclusive economy with the creation of jobs and the improved management of the environment. However, coordinated activity and appropriate management is required to implement the green economy strategic framework in an appropriate, effective and efficient manner. The various means of implementation that can facilitate a successful green economy transition for the City of Tshwane are described in the sections below.

4.3.1 Strategic investment in green innovation and technology

As a result of population growth and urbanisation, rapidly developing and emerging economies will also be building the bulk of their infrastructure in the next few decades. The greening of infrastructure (including the buildings, energy and transport sectors) is a critical action that should not be delayed, given the substantial inertia and "committed emissions" of infrastructure investments that leads to the "lock-in" of unsustainable fossil fuel consumption patterns. Therefore, strategic and integrated planning in city regions is critical for piloting green economy innovations and delivering infrastructural transitions at an increased scale⁵⁶.


Proposed actions

There are several proposed actions discussed in the preceding sections that can enhance the transition to a green economy. Many of these actions can deliver multiple green economy benefits. It is proposed that these actions be packaged into projects as a means of delivering these green public services in an efficient and effective way. A summary of proposed green economy actions of the Green Economy Strategic Framework for the City of Tshwane is shown in Appendix 1, Tables A and B. This matrix was used to identify synergistic actions that are considered 'low hanging fruit' and that can deliver multiple green economy objectives, thereby facilitating the transition to a green economy in the short to medium term (Figure 6 with 'low hanging fruit' highlighted in yellow).

For a successful transition to a green economy, specific targets should be set to assist in achieving the green economy strategic objectives. Some of these targets should be based on the national and provincial (Gauteng) green economy targets set by relevant policies (see Figure 4 and Appendix 2). However, other targets will need to be identified by an assessment of the most cost-effective options in terms of greenhouse gas abatement potential (as revealed by the carbon footprinting of the City of Tshwane) as well as various other criteria such as the various social and ecological costs and benefits. These targets should be implemented through the comprehensive assessment of Tshwane's capacity and existing initiatives. These criteria should be used in a clear decision-support system so that the green economy investment decisions are transparent and accountable, with an opportunity for monitoring the green economic investment benefits in the future.

Currently, municipalities lack funds for the significant infrastructure investment and enterprise creation needed for a green economy transition. Infrastructure-related public enterprises are an excellent opportunity for green investment help to provide

56 Financing the Green Economy (2010) UNEP
[http://www.unep.ch/etb/publications/Green Economy/GER Preview v2.0.pdf](http://www.unep.ch/etb/publications/Green_Economy/GER_Preview_v2.0.pdf)



adequate delivery of essential public services⁵⁷ to all sectors of society. These opportunities can be unlocked through the establishment of public-private partnerships to implement innovative solutions and green technologies that increase the efficiency of resource-use and deliver public services in an inclusive way to the citizens of Tshwane.

Financing and fiscal instruments

The municipal fiscal policy and municipal incentive schemes can also be effective ways to catalyse a green economy transition. The structuring of tariffs not only affects access to services, but also the demand. National legislation guarantees basic levels of free access to water, waste and electricity services, and afford municipalities considerable flexibility and authority in defining the tariffs for water, waste and energy service provision. However, municipalities generally run water and waste services at a financial loss. They often subsidise the services by revenue from electricity tariffs as well as equitable share allocations and conditional grants. The situation effectively means that the current tariff structure in these sectors tends to subsidise or promote consumption rather than incentivise efficiency or demand management. This can be remedied through the application of certain municipal fiscal incentives or disincentives. Examples include, the differential pricing of water and energy through the use of an inclining block tariff to encourage resource efficiency, as well as "buy-back" schemes for waste recycling and material recovery. Municipal disincentives can also be effective, such as fines for littering and the disposal of wastes, fines, taxes and tariffs for inefficient and polluting transportation options.

Municipalities also have several available financial mechanisms available to them from national government that can facilitate investment in the green economy. These include the 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^{58,59}, as well as opportunities for international finance for low-carbon developments that mitigate climate change⁶⁰.

Regulatory and institutional framework

The City of Tshwane can stimulate the green economy by enhancing the delivery of green public services and infrastructure, and by providing the right institutional and regulatory environment for green procurement. The City of Tshwane can build human capacity for a green economy through encouraging the creation of centres of excellence as nodal points for green technology research and development, facilitating national and international collaborative research on innovation and green technologies, and supporting scientific and engineering institutions to foster their efforts to develop green technologies.

Other approaches such as innovation hubs and green technology completions can highlight the City of Tshwane's green economy initiative and provide incentives to catalyse enterprise creation and development. However, the private sector will play a key role in the transition to a green economy through trade in low-carbon products and technologies, the management of natural resources with improved efficiency, improvement in working conditions, and the investment in cleaner technologies through green technology research and development.

There will also be numerous long-term benefits from investing in the social capital of the city and building vibrant, healthy communities. Strategic planning to limit urban sprawl, conserve natural areas, provide public open-spaces and enhance sustainable agriculture can yield multiple benefits including improved food security, access to green areas for recreation and improved human mobility and connectivity. At the same time, it can also enhance the provision of the environmental goods and services upon which all economic activity depends.

Innovation, the application of appropriate ICT and the integration of transportation with the City of Tshwane's spatial planning can improve the mobility and connectivity of people while also reducing the need for investment in transport infrastructure. The building of social capital and ensuring a healthy, educated and skilled workforce will be an investment that yields long-term benefits in terms of creating sustainable communities who contribute to the resilience and long-term sustainability of Tshwane.

57 Examples of public services include:- the provision of energy, water, and transport, waste management, the access to information and communication technology, education and public safety.

58 Assessment and Design of a Green cities component of the cities support programme
http://resilient-cities.iclei.org/fileadmin/sites/resilient_cities/files/Resilient_Cities_2012/Program_Updates/Presentation/A/A2/Resilient_Cities_Presentation_Bonn_-_final.pdf

59 Division of Revenue Act, DORA. See : <http://www.info.gov.za/view/DownloadFileAction?id=165696>

60 International climate finance, such as the clean development mechanism (CDM) projects

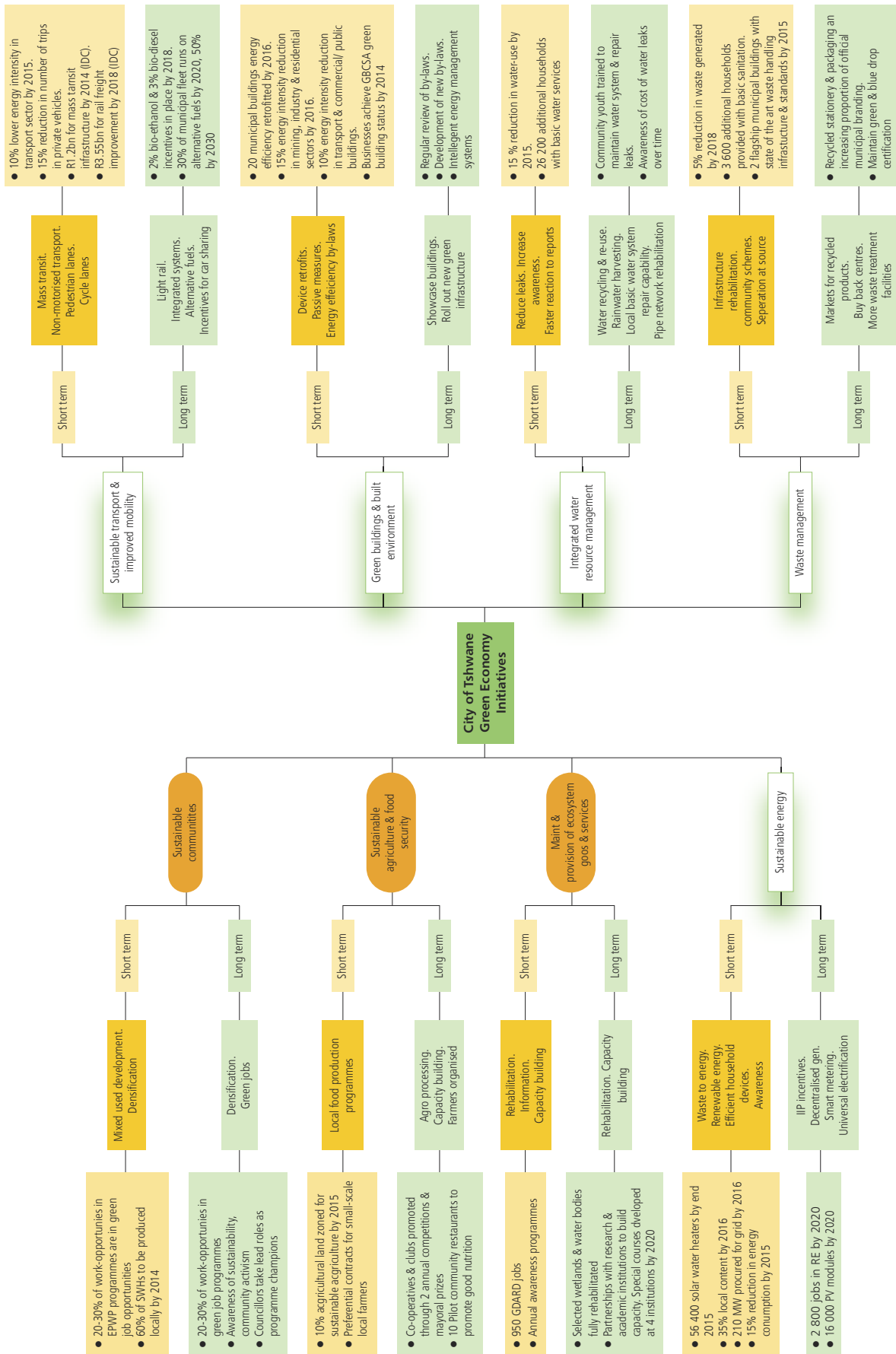


Figure 4: Green economy actions and initiatives that can facilitate Tshwane's transition to a green economy. The "low-hanging fruit" actions are highlighted in yellow.



4.3.2 Defining a new economic base for a green economy

The transition to a green economy will require the adoption of a new economic model and different approach to development, with the reconfiguration of City of Tshwane investments and a change in modus operandi.

The national commitment to job creation and the universal provision of public services places a considerable responsibility and financial burden on municipalities for the required investment and reconfiguration of infrastructure needed to achieve service delivery and the green economy objectives. For municipalities to take a developmental approach to service delivery and to address job creation and the economy, they need to work closely with business and civil society since the success of a developmental state depends on active community involvement and establishing public-private partnerships. They need to build a broad front for development that involves a strong relationship between government, labour, business and civil society.

The transition to a green economy requires a broader understanding of the interplay between environmental and social capital and how this can contribute to green economic growth. Improved governance with robust policy signals and regulatory drivers that reinforce the need for the economic system to account for externalities are some of the most powerful mechanisms that could facilitate green investment and enhance the transition to a green economy. The development of capital market and financial service architectures that fully integrate environmental, social and governance considerations into investment policy and decision-making and across lines of management will therefore be essential to increase investment in the green economy. However, improved criteria and indicators will be required to assess, measure and monitor various options that can enhance green economic growth. The economic value associated with social wellbeing and the provisioning of ecosystem goods and services is an area of intensive research⁶¹. The City of Tshwane should be at the forefront of this knowledge by stimulating research and development in the green economy indicators for social and environmental wellbeing, as well as incorporating defined social and environmental criteria and indicators into municipal planning and decision-making.

4.3.3 Building the basis of a partnership between government, business, labour and civil society

The significant strategic investments needed for the transition to a green economy will only be actualised through the development of effective partnerships between government, state-owned enterprises, development finance institutions, non-governmental organisations and the private sector. Key to these partnerships is the increased education and awareness of the need for a green economy in order to foster social and corporate responsibility and the appropriate pro-environmental behavioural change. Increasing pro-environmental behaviour can increase the efficiency of resource use and make citizens custodians of nature to ensure the sustainable provision of ecosystem goods and services. In addition, increasing pro-environmental behaviour means that green economy developments are democratic and truly respond to the society's needs.

A transition to a green economy will require that the City of Tshwane increase the scope and diversity of partnerships. Partnerships can be particularly important as mechanisms to help address market failures or failures in governance where neither the market nor government is able, on its own, to deliver public goods or meet crucial social and environmental challenges. Many types of cooperation are contract-driven, transaction-based or once-off events – all of which make an important contribution, but tend to be limited in scale and scope. True partnerships are about shared agendas as well as combined resources, risks and rewards. They are voluntary collaborations that build on the respective strengths and core competencies of each partner, optimise the allocation of resources and achieve mutually-beneficial results over a sustained period since they imply linkages that increase resources, scale and impact.

For the development of effective public-private partnerships to increase investment in the green economy, the City of Tshwane should follow the recommendations by the World Economic Forum⁶², which are to –

- ensure good governance and improve enabling frameworks for private investment and partnerships, especially measures to tackle corruption and unnecessary red tape and bureaucracy;
- provide better funding and incentives to encourage business involvement in green economy development through innovative public-private funding mechanisms as well as awards and public recognition;
- engage business in policy dialogue and planning to integrate and combine plans and actions to achieve green economic growth; and
- provide better information and coordination that helps all sectors of society better understand the government's development priorities.

In essence, Tshwane's transition to a green economy will need systematic and collective efforts from all sections of society to invest and contribute to a new model of economic growth. This will require good governance and accountability, robust policy signals, a decision-support system with regulatory drivers that reinforce the need for the economic system to account for social and ecological externalities together with the development of public-private partnerships and broad public participation so that the green economy facilitates a sustainable development path.

⁶¹ For example, see: The Economics of Ecosystems and Biodiversity www.teebweb.org

⁶² World Economic Forum: Public-Private Partnerships <http://www.weforum.org/pdf/ppp.pdf>



5 CONCLUSION

A green economy is characterised by substantially increased investment in economic sectors that build on and enhance the earth's natural capital or reduce ecological scarcities and environmental risks. The transition to a green economy will require a reconfiguration of the City of Tshwane's investments and public services infrastructure so that green initiatives can contribute more to economic growth and green jobs, increased efficiency of resource use with the generation of less waste and pollutants, and significantly lower greenhouse gas emissions. Since the green economy demands a developmental state approach, it will respond to the growing need to reduce persistent poverty through targeted wealth transfers, new employment opportunities and improvements in the flow of ecosystem goods and services and access to them as the basis for the provision of public services and all economic activity.

Tshwane's transition to a green economy will challenge the established economic system, which is based on increasing the exploitation of natural resources to fulfil the growing demands for material consumption. Therefore, integrated policy and planning will be essential to ensure resource-efficient, low-carbon and inclusive economic growth. Although changed consumer behaviour and increased end-user efficiency can reduce the environmental footprint of society, innovation and green technology will play a key role in decoupling material growth from natural resource depletion and the growth in green jobs. This will require new skills and research in innovation and green technologies, as well as a new mindset for doing business that relies on broad participation and good governance to stimulate investor confidence.

A suite of strategies and actions are needed to achieve the goals and objectives of the green economy. The Strategic Framework provides a guide for low-carbon, equitable economic development that can enhance Tshwane's transition to a green economy and facilitate a sustainable development path.



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APPENDICES

Appendix 1: Actions that address multiple thematic areas

	Sustainable agriculture & food security	Maintenance & prov. of ecosystem goods & services	Waste management	Sustainable transport & improving mobility	Sustainable energy	Integrated water resource management	Green buildings & the built environment
Sustainable communities	Food gardens at clinics, schools, etc Local food markets Education and awareness of ecology, agriculture and nutrition	Rehabilitation and greening of municipal buildings, parks, wetlands, road-sides to improve the delivery of ecological goods and services and provide a lively, common space	Waste management public-private partnerships, Local recycling and recovery facilities, Markets for recycled products, Jobs in recycling and recovery Reduce wastes improves quality environment and improved human health and well-being	Percentage use of mass transit and public transport system. Percentage of transit facilities have comprehensive public use facilities Reclaim city space for non-motorised transport Phase-in electric vehicles and e-filling	Connectivity services used by percentage of public. Percentage of commuters use mass transit system.	Water leaks reduced by x% Implement a refined water-tariff structure to cross-subsidise free basic water supply	Multipurpose public spaces to facilitate interaction. Improved efficiency and delivery of public services (water, electricity, sanitation) Green Building Development Policy and By-law Green low-income housing and Industrial Parks Urban densification and compact programmes
Green buildings & the built environment	Urban Agriculture and food gardening Remediation for degraded lands	Biodiversity mapping and conservation measures into spatial plans for the Built Environment	Separation at source, Separate public receptacles for recycling Awareness/ education Minimise packaging Procure recycled office supplies	Percentage of buildings directly accessible to each other via walkways.	Percentage of municipal buildings are retrofitted with energy efficient lights and air conditioners. Percentage of new buildings have passive energy efficiency design features	Percentage of buildings have water conservation features.	
Integrated water resource management	Landscape and soil management for improved water provision and management	Conserve and rehabilitate wetlands and water catchment areas Improved monitoring and management of waste resources and polluting industries	Percentage of industry and commerce has water recovery facilities, Percentage of residential properties have low water sanitation systems Green Drop Certification Blue Drop Certification Expand Public works programmes: Working for Water	Reduced water leakages (reduces pumping energy and costs). Develop and upscale municipal hydro-power			
Sustainable energy	Local production of biomass and biofuels for on-farm use in providing energy	Clean Energy production and the efficient use of energy	Percentage of recovered waste turned into energy at Landfill sites, municipal Wastewater Treatment Plants and other Industrial and residential sites	Percentage of fleet is electric, hybrid, run on renewable fuels. Percentage commute on mass transit system. Percentage of system is integrated.			


	Sustainable agriculture & food security	Maintenance & prov. of ecosystem goods & services	Waste management	Sustainable transport & improving mobility	Sustainable energy	Integrated water resource management	Green buildings & the built environment
Sustainable transport & improving mobility	Localised agriculture production to green the supply chain biofuels for on-farm use in providing transport fuels	Improve mobility and connectivity with reduced need for transport	Recycled components, Separate waste receptacles, Minimise packaging of goods				
Waste management	Waste to energy from waste biomass including crop-wastes, manure, slaughter-house and food processing wastes	Reduced burdens on ecosystem services through reduction in wastes generated, improved waste management and pollution control					
Maint & prov. of ecosystem goods & services	Promote and promulgate Green servitudes Conservation and rehabilitation of conserved and protected areas Greening of public space with urban agriculture and food gardens						



Table B. Examples of categories of actions across thematic areas

	Sustainable agriculture & food security	Maint. & prov. of ecosystem goods & services	Waste management	Sustainable transport & improving mobility	Sustainable energy	Integrated water res management	Green buildings & the built env	Sustainable communities
Regulation, policy and public procurement	Percentage zoned for urban agriculture and agro industry. Preferential access to municipal markets. Catering contracts favour producers.	Protection of existing forests and ecologically sensitive areas with public buy-in and participation.	Residential separation, Commercial separation, Industrial separation guidelines.	Incentives for car sharing Designated non-motorised zones. Congestion tariffs for inner city access.	Percentage renewable energy usage mandated. Efficiency standards for street and other public lighting including traffic lights and sports facilities.	Water recycling minimum standards stipulated for industry, commerce and residential sectors	Energy efficiency building by laws reviewed every 3 years to keep abreast with developments Incentives for green building developments. Rating systems for new and existing (retrofitted) buildings.	Local content requirement Stimulate private-public partnerships Stimulate market for green goods and services
Education and awareness (Different fora tailored for specific audiences)	Communities trained in agriculture and business skills. MECs and Councillors adopt and champion specific community themes (e.g. improved children's diets, value addition). Promote Sustainable agriculture and Agroecology .	Information campaigns held each year on value of ecosystem services. Include in schools curricula.	Labelling and colour coding receptacles Inclusion in school syllabus Proclaim recycled status on municipal stationery and goods.	Publicise routes where public transport becomes a preferred alternative. Show simple calculations of benefits. Use prominent figures (Mayor, MECs) to set example on special days. Incentives for car-pooling (e.g. preferential parking, lanes access)	Annual open days for flagship municipal facilities. Regular seminars for professionals. Community events and seminars. Promotion of safer and more efficient low cost domestic stoves and heaters.	Simple messages on water loss and potential cost savings through reduction of the wastage.	As for Energy	Awareness for sustainability appreciation and community activism. Councillors and civic organisations take lead roles.
Showcase/lead by example, Champions / green profiling and leadership	Flagship municipal plots with suitable crops and processing for local markets. Annual Mayoral awards and publicity for high achievers.	Selected wetlands and water bodies rehabilitated. Regulated public access for recreational and educational purposes.	Flagship programmes in selected Municipal facilities for separation, recycling and re-use.	Part of municipal fleet runs on gas, biodiesel, electricity. Municipal staff have lift clubs. Councillors use public transport to work or constituency visits.	Selected municipal buildings are energy self-sufficient e.g. PV panels on roofs, solar water heaters and heat pumps, skylights, natural ventilation, special window glass PV powered traffic lights	Selected municipal facilities recycle all water used. Rainwater harvesting and grey water utilisation.	Selected municipal buildings have state of the art environment design. Intelligent energy management systems.	Selected municipal facilities have spaces (foyers, halls) for public interactions.
Building Inst capacity/ Organise / Partnering	Cooperatives and clubs sponsored through merit-based annual mayoral prize (funding, mentorship, linkages)	Partnerships with research and academic institutions for capacity building. Special courses developed.	Adopt community groups and promote private-public partnerships to support good waste management. Showcase good examples	Partnerships with research and academic institutions for capacity building	Joint promotions with like-minded companies who have similar flagship buildings and programmes e.g. ESKOM, Nedbank, Vodacom.	Incentives for maintenance teams of local youths. Training for semi-skilled local plumbers. Partner with private sector and academic institutions for competitions on ideas to save water in low income communities.	Partnerships with research and academic institutions for capacity building	Partner with NGOs, religious bodies etc. for needs identification and capacity building in communities.

	Sustainable agriculture & food security	Maint & prov. of ecosystem goods & services	Waste management	Sustainable transport & improving mobility	Sustainable energy	Integrated water res management	Green buildings & the built env	Sustainable communities
Promote markets	Percentage of council catering supplies procured from urban agriculture. Promotion of healthier diets to influence food choices. 10 pilot community restaurants (30-50 for Gauteng).	Localisation of production-consumption and goods-services City compaction, densification and Industrial Parks Promotion and development of markets for green goods and services	Stimulate buy back for recycled and recovered materials. Recycled packaging, stationery, recyclable goods represent percentage of municipal procurement	Stimulate local markets to reduce transport needs Reduce the impacts in the transport of goods and people through a move to rail and mass transport and use of renewable fuels	Percentage of municipal power is green, from renewable IPP suppliers Tariffs and technologies accommodate small household scale generation	Localise markets to reduce the cost of 'hidden' waste (ie virtual water) used in the production of economic goods and services	City compaction and densification Localise markets to reduce the energy and material costs	Localise markets to reduce the cost and improve community sustainability
Infrastructure and public services	Agro-processing facilities, special zones for urban agriculture.	Enhanced the efficiency of public services delivery of high quality: Blue and Green Drop certification Low-carbon mass transport, improved public transport and increased mobility Apply Green Buildings Policy and Bylaw	Enhanced waste management, air quality control and wastewater treatment with additional water treatment works constructed and existing waterworks rehabilitated. Enhanced delivery of public services of high quality. Blue and Green Drop certification	Mass transit including monorail, bus rapid transit Non-motorised transport routes. Densification of settlements to cut transport demand Traffic flow management systems.	Smart grid, time of use smart metering. Energy efficient low cost housing. Universal electrification. Landfill gas.	Targets set with monitoring framework for responding to burst water pipe reports. Upgrade water pipe network. Roll out yard connections in low income areas with communal taps. Rehabilitate water bodies (e.g. Centurion lake)	City compaction and densification Apply Green Buildings Policy and Bylaw Enhanced the efficiency of public services delivery of high quality: Blue and Green Drop certification	Parks, produce markets, youth centres, theme-focussed clubs established.



Appendix 2: Calculation of the per capita proportional share of City of Tshwane targets from national and provincial targets. Shown in red.

*City of Tshwane Metropolitan Municipality, Population=2.921 million (2011)
Gauteng= 12.2 million people (2011 South African National Census),
Therefore City of Tshwane is 23.94% of Gauteng targets*

*South Africa=51 770 560
Therefore City of Tshwane is 5.64% of SA targets*

National Green economy accord targets with City of Tshwane share in red

one million solar water heating systems by 2014/15

CITY OF TSHWANE 56400 SWH by 2015

Industrial Development Corporation to ensure funding of up to R25 billion for investments in Green Economy activities over the next five years

City of Tshwane 1.41 Billion potential available from IDC

Government to invest in mass-transport systems that will make it easier for South Africans to travel using public transport and thus reduce reliance on private car-use. Initial steps have been taken on the bus rapid transport systems as well as commuter rail systems. Government has committed to improve investment in infrastructure and rolling stock: to this end, PRASA plans to invest R20 billion by 2014 and R130 billion beyond the period

City of Tshwane 1.21 Billion potential available from IDC by 2014 and 6.8 bn beyond

Government to reviewing the investment in rail infrastructure and rolling stock in order to ensure a greater shift of freight transport to rail instead of road transport. Transnet plans to invest about R63 billion in the freight rail system over the next five years

City of Tshwane 3.55 Billion potential available from IDC

Government to procure 3 725 Megawatts of renewable energy for use in the grid by 2016

City of Tshwane 210 MW by 2016

Business to develop benchmarks for sector and subsector energy efficiency and company energy-management plans in support of the National Energy Efficiency Strategy, which includes a transition to the following sectoral energy intensity targets by 2015:

Commercial and public buildings: 10%

Residential: 15%

Transport: 10%

Industry: 15%

Mining: 15%


50 000 green jobs in renewable energy activities by 2020, of which about 6 500 will be engineers and technicians, develop a 'roof-top' programme, that aims to install 300 000 solar PV power generation units on or at residential, commercial and industrial buildings by 2020 and to work with government to create local industrial capacity, **with an initial minimum target of 35% localisation by 2016 as a first part of an aspirational target of 75% local content City of Tshwane 2820 jobs in RE by 2020 with installation of 16920 solar PV by 2020**

Government to provide a supportive regulatory environment to facilitate the development of a local biofuels industry, finalise the recently-published mandatory blending regulations that set targets of **2% bio-ethanol and 5% bio-diesel standards to be applicable in the South African market and introduce an incentive system to kick-start the development of a local biofuels industry**

5% reduction of waste generated in next 5 years (paper and packaging, post consumer wastes)

Gauteng strategy targets with City of Tshwane share in red

A 15% reduction in energy consumption, water use and number of trips in private vehicles by 2015 (Gauteng integrated energy strategy)



Ensure that between **20-30% of work opportunities created in provincial government EPWP programme are in green jobs programmes** (note: percentage will be re-determined when clarity is reached on how many EPWP job-opportunities will be forthcoming vs how many are required to make up more than 300 000 – it may be necessary to expand the current EPWP programme to make up the difference)

In collaboration with the private sector, work towards ensuring that **all businesses achieve green building status by 2014 using the Green Building Council of SA standards.**

Engage with national government on possible provincial and municipal support to help meet national targets for local manufacturing of green products **(e.g. 60% of solar water heaters to be rolled out by 2014 produced locally)**

30% of government vehicles to be converted to alternative fuels by 2020, 50% by 2030

Increased access to basic water and sanitation, as well as the associated supporting infrastructure. The targets include: supplying addition to the existing, 110 000 households with access to basic water; additional 15 000 households with basic sanitation or alternative “green strategy” sanitation options as mentioned in the sustainable land use sector; providing free basic services to indigent households (which implies a database to be established that lists indigent households); upgrade or refurbish in line with sustainable principles, at least 5 of the waste water treatment works in Gauteng; and all municipalities in the province to implementing waste water management systems and projects

City of Tshwane: 26224 households with basic water and 3576 basic sanitation

Nationally, a target is set of 80% of schools to implementing waste awareness

The following individual targets are relevant to GDARD programmes: 400 jobs to be generated, 1000 training days to accumulate, 8,100 ha of alien vegetation to be removed in Gauteng, 1 major wetland rehabilitated, 80km of firebreaks burned, and 30 tons of waste removed from rivers. In regards to the last target, it is critical to note the need for education and awareness programmes to at the same time reduce the amount of waste that accumulates or is discarded in rivers and wetlands
IDP

City of Tshwane: 954 jobs GDARD (Gauteng department of agriculture and rural Development)