Dube TradePort Corporation
Carbon Footprint Analysis Report 2015

Final Report

March 2016

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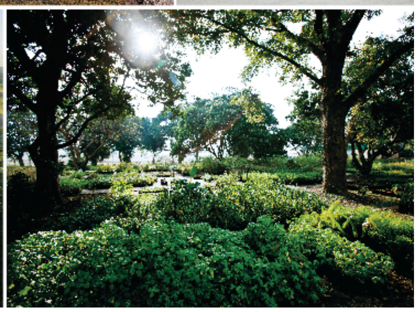

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PART ONE: CARBON FOOTPRINT ANALYSIS

EXECUTIVE SUMMARY

This report presents the results of the Dube TradePort Corporation's (DTPC) carbon footprint assessment for the year 2015. The objectives of this undertaking were to:

- Identify sources and sinks of emissions under the control of DTPC;
- Quantify emissions from the direct (Scope 1 and 2) and indirect (Scope 3) operations of DTPC for the period December 2014 to November 2015 (inclusive);
- Develop a carbon footprint tool that has a user-friendly format with accurate, verifiable and automatic calculations;
- Provide internal capacity building and knowledge transfer in order to manage and update the calculation tool;
- Make sound and credible recommendations for DTPC overall business strategy. DTPC intends to be carbon neutral by 2025 and this requires credible calculation and measurement on carbon inventory;
- Provide expert advice and direction to influence DTPC's sustainability approach and green projects strategy in pursuit of becoming carbon neutral; and
- Evaluate the data quality in preparation for an external audit.

Besides the stated objectives, the report also aims to benchmark and compare DTPC carbon emissions to the previous analysis undertaken and thereby update the baseline for emissions. To ensure that the assessment is relevant and provides context for mitigation and adaptation, the report also provides an assessment of risks and opportunities to DTPC, associated with its GHG emissions and its broader carbon management. To facilitate this assessment, the independent service provider (SP) elaborates on the current green initiatives. Lastly, this study covers carbon emissions that arose as a result of activities under the direct operational control of DTPC, for the period December 2014 – November 2015 (inclusive). A summary of the results is shown in Table 0.1. The breakdown of Scope 1 and 2 emissions is provided in Table 0.2.

Table 0.1 Summary results

Scope 1 (t CO_2e)	173 t CO_2e: Diesel, petrol, oils and lubricants and refrigerants

Scope 2 (t CO_2e)	*5 233* t CO_2e: Purchased Electricity
Emissions intensity(Scope 1 & 2)	*30.4 t CO_2e / FTE (Full Time Employees)*
Scope 3 (t CO_2e)	*1 057* t CO_2e
Scope 3: categories	*Reported emissions associated with three Scope 3 categories, namely* business travel (air), employee commuting, leased goods and services and waste emissions (agri-waste).

Table 0.2 Scope 1 + 2 emissions breakdown by business category

	Support Zone	**AgriZone**	**Cargo Terminal**	**TradeZone**	***Total***
Scope 1 (t CO_2e)	22.83	100.71	15.72	33.78	***173***
Scope 2 (t CO2e)	1 784.36	1 023.82	1 883.36	541.84	***5 233***
Total Scope 1 + 2 (t CO_2e)	1 807	1 125	1 899	576	**5 406**

Table 0.3 Reporting parameters

Reporting parameter	**Details**
Methodology	ISO 14064-1 (2006) and GHG Protocol: Corporate Accounting Standard (the GHG Protocol Value Chain (Scope 3) Accounting and Reporting Standard was used to inform the accounting and reporting of Scope 3 emissions
Organisational Boundary	Dube TradePort: operational control approach

Reporting parameter	Details
Operational Boundary	• Scope 1: Direct emissions associated with diesel, petrol, oils and lubricants and refrigerants. Please note that land clearing was left out of this analysis as this was not natural vegetation that was removed. • Scope 2: indirect emissions associated with purchased electricity • Scope 3: indirect emissions due to DTPC's activities specially associated with business travel (air – including cargo flights), leased goods and services, employee commuting and waste emissions (agri-waste).
Offsets	In partnership with the Aeon Nexus team, DTPC is currently evaluating potential of the rehabilitation and restoration project, recycling programme and solar panel projects implemented by DTPC. The emissions avoided from these projects will be quantified and recorded.
Reporting period	1 December 2014 to 30 November 2015
Base year	2014
Data quality	This will be assessed during evaluation in March 2016.

Lastly, the results of the carbon footprint assessment are followed by a set of high level recommendations. In summary, these are:

- The development of an appropriate monitoring, reporting and verification (MRV) framework for data collection;
- Identify and implement energy saving measures in addition to those green initiatives currently being undertaken;
- Communicate results through the Carbon Disclosure Project (CDP);
- Set GHG emissions reduction targets and track progress over time using Key Performance Indicators;
- Establish governance and management structures; and
- Enhanced engagement with stakeholders (including employees, service providers and tenants).

1 INTRODUCTION

1.1 PROJECT BACKGROUND AND OBJECTIVES

Aeon Nexus (Pty) Ltd. in partnership with Triplo4 Sustainable Solutions (Pty) Ltd. was commissioned by the Dube TradePort Corporation (‘DTPC’) to measure and develop its organisational carbon footprint for the period of December 2014 to November 2015. This report presents and discusses the results of the carbon footprint.

A carbon footprint can be described as the total amount of carbon dioxide and other Greenhouse Gas (GHG) emissions (expressed as carbon dioxide equivalents, or CO_2e) for which an organisation or site is responsible, or over which it has control. The six key greenhouse gases listed in the Kyoto Protocol are: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and three groups of fluorinated gases (sulphur hexafluoride (SF_6), Hydrofluro Carbons (HFCs), and Perfluoro Carbons (PFCs). This study covers carbon emissions that arose as a result of activities under the direct operational control of DTPC, for the period 1 December 2014 – 30 November 2015 (inclusive).

The objectives of this engagement were the following:

- Identify sources and sinks of emissions under the control of DTPC;
- Quantify emissions from the direct (Scope 1 and 2) and indirect (Scope 3) operations of DTPC;
- Develop a carbon footprint tool that has a user-friendly format with accurate, verifiable and automatic calculations;
- Provide internal capacity building and knowledge transfer in order to manage and update the calculation tool;
- Make sound and credible recommendations for DTPC overall business strategy. DTPC intends to be carbon neutral by 2025 and this requires credible calculation and measurement on carbon inventory;
- Provide expert advice and direction to influence DTPC’s sustainability approach and green projects strategy in pursuit of becoming carbon neutral; and
- Evaluate the data quality in preparation for an external audit.

It is with this understanding that DTPC has opted to calculate its carbon footprint for the purposes of internal stakeholder disclosure initially, identifying highest impact activities in order to prioritise abatement measures, and developing best practice approaches to energy management and monitoring. This initial phase aims to begin the process for external disclosure to DTPC stakeholders and its shareholder (government) while understanding the financial implications of the carbon tax, which is expected to be initiated from January 2017.

1.2 REPORT STRUCTURE

The remainder of the report is structured as follows:

- *Section 2* summarises the methodology used for determining the boundaries of the footprint, the collection of GHG data from the various business categories, and the analysis of this data in the footprint calculator;

- *Section 3* presents the results of the carbon footprint with a comparative analysis to the baseline and other companies;

- *Section 4* evaluates the opportunities for DTPC in relation to its current management of GHG emissions and green initiatives; and

- *Section 5* provides conclusions from the report, in addition to recommendations on how to enhance the quality and accuracy of the carbon footprint and carbon management going forward.

2 CARBON FOOTPRINT METHODOLOGY

2.1 INTRODUCTION

The Dube TradePort Corporation's 2015 carbon footprint has been measured and developed in accordance with the *Greenhouse Gas Protocol – A Corporate Accounting and Reporting Standard, Revised Edition* ('The GHG Protocol'), developed by the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI). The GHG Protocol provides comprehensive guidance on accounting and reporting of corporate GHG emissions. It is the most widely used standard for mandatory and voluntary GHG programmes and makes use of the Intergovernmental Panel on Climate Change (IPCC) GHG Inventory guidelines for specific heating values, carbon content, densities and emission factors.

Key to calculating an organisation's carbon footprint is the establishment of the boundaries for the footprint. As it has been introduced above, the period over which the footprint has been calculated is from the 1st December 2014 – 30th November 2015. The definition of DTPC's organisational and operational boundaries is also important to note, as the parameters within which emissions are reported. These boundaries have been set according to the GHG Protocol, as discussed in more detail in the sections to follow.

2.2 GHG INVENTORY BOUNDARY

2.2.1 Organisational Boundary

Organisational boundaries within which emissions are reported can be set according to the 'equity share approach', reflecting varying economic interests of companies that are wholly owned, incorporated or non-incorporated joint ventures or subsidiaries, or the 'control approach', where emissions are accounted for from operations under the direct operational control of the parent company.

DTPC carbon footprint will be reported using a 'control approach'. Reporting under this methodology allows for the reporting entity to understand emissions under their direct control. It also allows for a greater understanding of the emissions that can be reduced by mitigation actions. Under this approach, the following business categories are included in DTPC's footprint:

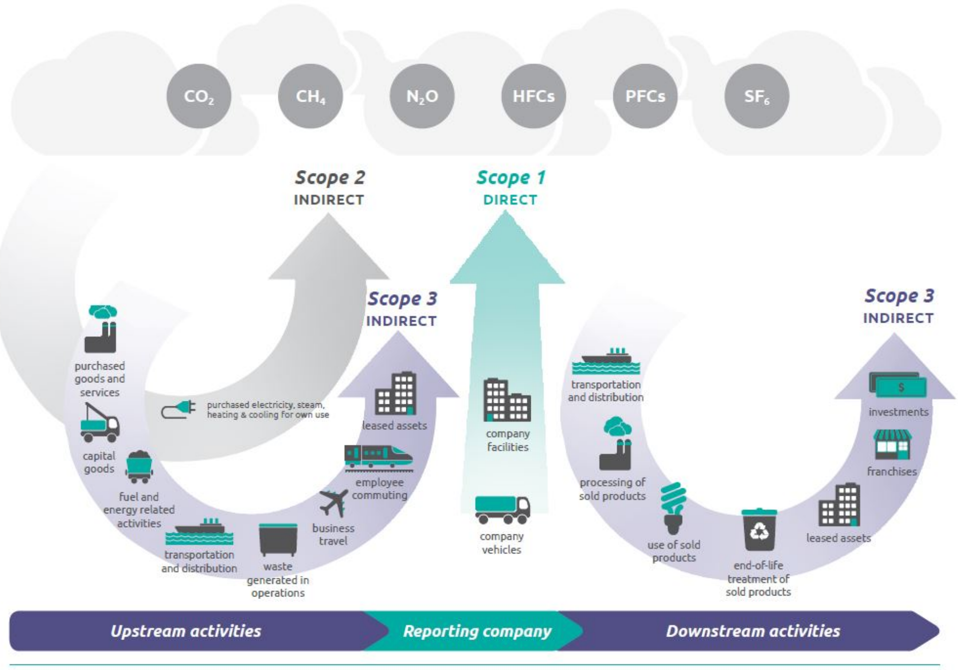
- Support Zone (29° South, SCB, Street Lights);
- AgriZone (AgriHouse, AgriLab, Nursery, Reverse Osmosis Plant, Street Lights);
- Cargo Zone (Cargo Terminal (including cargo flights)); and
- TradeZone (Trade House, TCB, Maintenance Buildings, TradeZone 1B, and Street Lights).

Please note that the electricity consumption and stationary and mobile combustion for tenants were reported under Scope 3 (leased goods and services) owing to the usage being out of the control of DTPC.

2.2.2 Operating Boundary

The operating boundary indicates which emission causing activities (for all entities falling within the above organisational boundary) will be included in the carbon footprint. The GHG Protocol divides emissions into three categories:

- *Scope 1 – direct emissions* from sources owned or under the operational control of the company;
- *Scope 2 – indirect emissions* from the consumption of purchased electricity; and
- *Scope 3 – indirect (value chain) emissions*: an optional reporting category allowing for other indirect emissions associated *but not controlled* by the company to be included.



Source: GHG Protocol – Corporate Value Chain Accounting and Reporting Standard

Figure 2.1 Overview of GHG Protocol Emission Scopes

Table 2.1 below summarises the emission sources ('operational activities') included in DTPC carbon footprint.

Table 2.1 Emission sources included in DTPC carbon footprint

Emissions Scope	Activities included
Scope 1 – Direct emissions (direct emissions from sources under operational control of the company)	• Diesel (stationary & mobile); • Petrol (stationary & mobile); • Oils and lubricants; • Fugitive emissions (refrigerants and air-conditioning refilling); • Land clearing (please note that for the purposes of this reporting year, land clearing was removed as it is not considered as non-natural vegetation).

Emissions Scope	Activities included
Scope 2 – Indirect emissions (indirect emissions resulting from electricity consumption)	• Consumption of purchased electricity at DTPC facilities
Scope 3 – Indirect emissions (activities associated but not controlled by DTPC)	• Waste generated from agri-waste; • Business travel (air – including cargo flights); • Employee commuting; and • Leased Goods and Services (tenants) inclusive of electricity and fuel consumption.

2.3 *METHOD FOR DATA COLLECTION AND CARBON FOOTPRINT CALCULATION*

The carbon footprint developed by Aeon Nexus and Triplo4 Sustainable Solutions has the ability to integrate quantitative information recorded during the data collection phase and calculate emissions broken down by scope, activity and facility within DTPC. Prior to developing the actual footprint tool, site visits were conducted at DTP to better the team's understanding of the business practices and the "ownership" and responsibility of emissions. Furthermore, the team was able to identify potential sources of emissions and current and potential green initiatives.

Data input worksheets are divided into three specific sections for each scope. These data input worksheets were provided to DTPC carbon advisors at individual sites within each business unit/category for data collection. After data had been collected by sites, input worksheets were returned to Aeon Nexus and Triplo4 Sustainable Solutions. Worksheets with activity data from each zone were summed together to provide total inputs per facility; these values were then entered into the final Carbon Footprint Calculator. Prior to undertaking the calculations of emissions, data quality was initially interrogated by reviewing monthly totals and checking for any outliers or missing information. Any gaps or issues identified are reported in the supplementary Excel® document provided to DTPC for comment. These comments will be taken into consideration and the footprint will be revised for the final report.

Values from input worksheets were linked to the calculation worksheets for the appropriate scope. These worksheets are designed to calculate estimated GHG emissions by using emission conversion factors and a range of other parameters such as fuel type, volume/weight of fuel consumed, carbon content of the fuel being used, the type of technology being employed, etc.

The following GHG Protocol worksheets form the basis of the calculator tool:

- CO_2, CH_4 and N_2O from stationary combustion;
- CO_2 CH_4 and N_2O emissions from mobile combustion;
- CH4 and N_2O emissions from refrigerant use;
- CO_2 emissions from fugitive emissions;
- CO_2 emissions from electricity consumption;
- CO_2 emissions from business travel;
- CO_2 emissions from leased goods and services; and
- CO_2 emissions from employee commuting.

Lastly, carbon emissions were summarized according to scope, scope sub-categories and facility and the relevant graphs generated. The customised carbon footprint tool can be used to track and manage emission trends by month (or annually in the interim), and allow DTPC to make decisions and implement solutions that should result in emission reductions going forward.

2.4 CAPACITY BUILDING

The intention is for DTPC to be able to manage internally the collection of data and calculation of its carbon footprint. To facilitate this, we have developed the carbon footprint calculator tool in a way that DTPC personal can amend it to suit evolving needs. In addition, we have facilitated a workshop to build capacity within the organisation.

The workshop aimed to address the following:

- Overview of the concept and science around climate change and the current global and local regulatory developments;
- Define sources of emissions;
- Delineate the overall boundary (organisational and operational) for calculating the footprint;
- Discuss the manner in which data is stored and the people responsible for data management;
- Confirm data collection responsibilities;
- Discuss relevant reports and footprint work conducted to date and associated documentation;

- Discuss appropriate benchmark indicators that can be used in the future to monitor and report progress; and
- Discuss the assumptions and methodologies used in calculating the footprint.

Initially, carbon advisors were selected internally from each sector of DTPC, and basic training was provided by Aeon Nexus and Triplo4 on how to collect data (2 hours presentation). Thereafter, upon consultation with DTPC, it was decided that a single point of contact at DTPC would streamline the data collection process (The Environmental Officer- Policy and Strategy). This individual was responsible for the data collection and collation internally from the relevant staff members. Despite the change in approach thereafter, the specialist team believes this initial workshop allowed for other members of DTPC staff to understand the benefits of the carbon mitigation. The preliminary results will be presented to the key DPTC officials and the Executive management during the month of March prior to finalisation of the report.

3 *DTPC – CARBON FOOTPRINT RESULTS AND DISCUSSION*

3.1 *SUMMARY OF DUBE TRADEPORT CORPORATION CARBON FOOTPRINT*

DTPC's total Scope 1 + 2 carbon footprint is estimated to be ***5 406 tonnes CO_2e***. The total Scope 3 indirect emissions are estimated to be ***1 057 tonnes CO_2e.*** A majority of DTPC's direct emissions were evolved from purchased electricity (97%, 5 233 tonnes CO_2e). There were several data gaps and issues identified during the data collection phase including the following:

- Data for diesel and petrol consumption (obtained from DTPC Fleet Manager), used to determine Scope 1 emissions, were incomplete. Therefore, the specialist team had to extrapolate annual Scope 1 diesel and petrol consumption based on the September, October and November 2015 data provided. Ideally, a complete set of data would be required if under or over-estimation is to be avoided.
- It must be stated explicitly that there is a difference between green and climate change mitigation projects. This can be seen in the case of the agri-waste project undertaken by DTPC where waste may result in methane emissions despite the benefits to soil fertilization and food security.
- Leased goods and services (tenants) for Scope 3 is not a comprehensive list as this was a voluntary process.

It is important to note that the annual footprint calculation is an iterative process: over time, as data collection and reporting procedures and processes improve across the business, the footprint calculation will increase in accuracy. As a result of this, there are likely to be limitations to the full year-on-year comparisons that are undertaken in the initial years of an organisation's reporting; however, future comparisons (based on more accurate data) are likely to be more robust.

In this chapter, Scope 1 and 2 emissions are presented and discussed separately to Scope 3 emissions. This is for the following reasons:

- Scope 1 and 2 emissions represent DTPC's most significant sources of impact and are the emissions over which they have a greater degree of control;

- From a South African carbon tax perspective, for the initial phase of the carbon tax that is from 2017 – 2020, only Scope 1 and 2 emissions will be taxed;
- Scope 3 emissions are those over which the company has less control but which can present a risk to the organisation. Mitigating Scope 3 emissions usually requires different approaches to mitigating Scope 1 and 2;
- According to the *GHG Protocol*, disclosure of Scope 1 and 2 emissions is required, whereas disclosure of Scope 3 emissions ('value chain' emissions) is optional – and this is the case in the South African context as well;
- Reporting programs such as the Carbon Disclosure Project tend to split out the reporting of Scope 1 and 2 emissions from the reporting of Scope 3 emissions;
- Within each Scope 3 category, the scope (how much is measured) could differ greatly between organizations and within an organization, from year to year. This makes comparisons very difficult. Including Scope 3 in the total can therefore distort DTPC's carbon footprint; and
- There are 15 reporting categories for Scope 3 emissions, ranging from emissions relating to business travel and employee commuting to emissions associated with the use and disposal of products that have been sold. As a company increases its reporting on Scope 3 emissions, the Scope 3 footprint can increase significantly and it can therefore be helpful to track changes in Scope 1 + 2 emissions separately to changes in Scope 3 emissions.

3.1.1 Scope 1 and 2 emissions

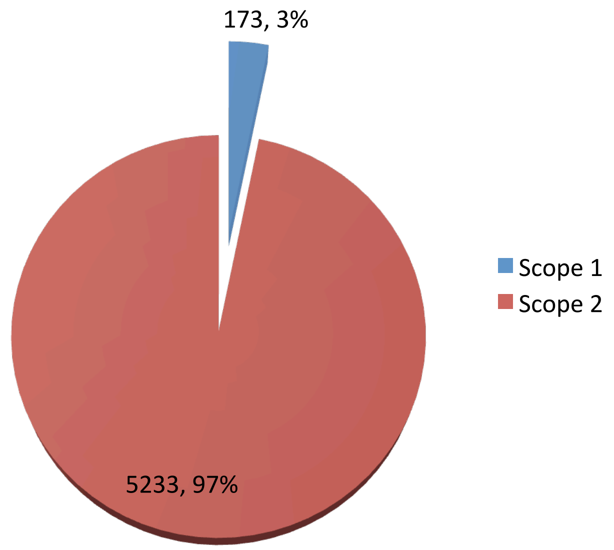


Figure 3.1 DTPC Scope 1 + 2 Carbon Footprint (t CO_2e)

- **Scope 1 emissions** (direct emissions from the combustion of diesel and petrol in company controlled vehicles and diesel and petrol combustion through stationary processes) account for 3 % DTPC's total Scope 1 and 2 emissions; and
- **Scope 2 emissions** (indirect emissions associated with the use of purchased electricity at DTPC controlled facilities) account for 97 % of DTPC's Scope 1 and 2 emissions.

Error! Reference source not found. below shows the relative contribution of the different DTPC zones/precincts' categories to DTPC's overall Scope 1 and 2 footprint, whilst *Figure* 3.2 ***DTPC's Scope 1 + 2 emissions (t CO2e) by zone***

Table 3.1 shows a breakdown of Scope 1 and Scope 2 emissions within each of the business categories.

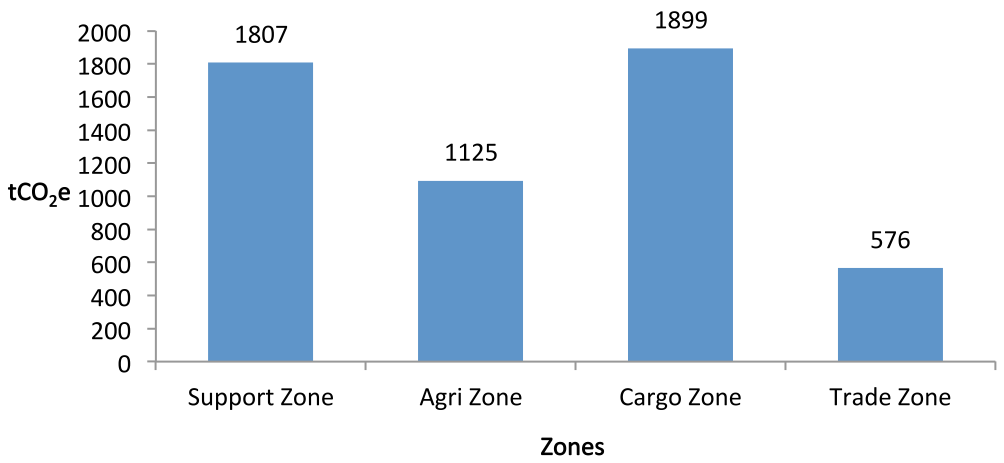


Figure 3.2 DTPC's Scope 1 + 2 emissions (t CO_2e) by zone

Table 3.1 DTPC Scope 1 + 2 emissions breakdown by zone

	Support Zone	AgriZone	Cargo Zone	TradeZone	Total
Scope 1 (t CO_2e	22.83	100.71	15.72	33.78	173
Scope 2 (t CO2e)	1 784.36	1 023.82	1 883.36	541.84	5 233
Total Scope 1 + 2 (t CO_2e)	1 807	1 125	1 899	576	5 406

Notes on **Error! Reference source not found.** and *Figure* 3.2 ***DTPC's Scope 1 + 2 emissions (t CO_2e) by zone***

Table 3.1 above:

- **The Cargo Terminal** accounts for the largest portion of DTPC's Scope 1 + 2 emissions (35%, 1 899 t CO_2e). Most of the emissions within the Cargo terminal emanate from purchased electricity (99 %, 1 883.36 t CO_2e).

- **The Support Zone** accounts for the second most substantial portion of DTPC's Scope 1 + 2 emissions (33.7 % or 1 784.36 t CO_2e). As with the Cargo Zone, most emissions result from purchased electricity which is estimated to be 99% of the total Scope 1 and 2 emissions for the Support Zone.

- Electricity consumption for the **AgriZone** and **TradeZone** (excluding Cargo Terminal) are substantially less than the **Support**

Zone and Cargo Zone. This is possibly owing to the fact that the solar panel project of the AgriZone results in a lower demand for electricity from the grid. The TradeZone's Scope 2 emissions could be lower owing to the exclusion of the electricity consumption of DTPC tenants which falls under the Scope 3 category of leased goods and services.

- It must be noted that the petrol and diesel consumption values have been extrapolated from three months of data rather than 12. Consequently, there may under or over estimations for the Scope 1 emissions.

3.1.2 Scope 3 (Value Chain) Emissions

Error! Reference source not found. below illustrates DTPC's emissions for the four Scope 3 activities for which data was collected in 2015 (***business travel (air and cargo flights); employee commuting and leased goods and services (electricity and fuel consumption for tenants***).

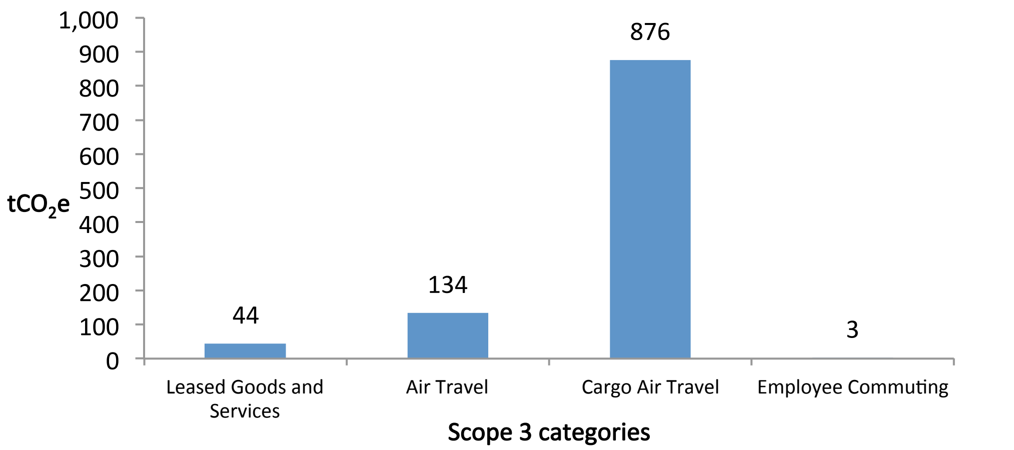


Figure 3.3 DTPC Scope 3 emissions (t CO_2e) broken down by activity

Scope 3 emissions (indirect emissions associated with business activities *but not controlled* by DTPC) were estimated to be **1 057 t CO_2e** in 2015. These emissions resulted from the following four Scope 3 activities:

- **Business Travel (Freight – Cargo Travel):** This constitutes the highest percentage (83 %) of DTPC's total Scope 3 emissions. It is possible that this category could be moved to the direct emissions of the Cargo Zone however considering that the aircraft is not owned by DTPC, we have categorized the air travel as 876.

- **Business Travel (Flights – Support Zone)**: The 2nd highest category is business (air) travel – mostly undertaken by the Support Zone (13 %).
- **Leased Goods and Services:** This refers to the leased properties of DTPC's trade zone and their electricity consumption and their mobile and stationary combustion. The specialist team acknowledges that this could be going far beyond the expectations that is usual in carbon footprinting studies however; it is advisable that should DTPC's ambition of carbon neutrality be pursued and realized, then the value chain associated carbon emissions needs to be assessed in detail.
- **Employee commuting:** Less than 1% of DTPC's Scope 3 emissions were generated from staff commuting claims.

These categories represent some of the most material Scope 3 emissions. It should be noted that there are a large number of Scope 3 emissions activities that can be reported by a company (15 value chain categories in total), so these results do not reflect an absolute representation of Scope 3 emissions. As part of the iterative process to improve the footprint over time, DTPC may consider including data on additional categories in the future.

3.1.3 Emissions Intensity

In addition to reporting absolute numbers relating to GHG emissions, it can be helpful to track GHG intensity metrics or GHG KPIs over time. Frequently used KPIs include *t* CO_2e per full-time employee (FTE), *t* CO_2e per unit of product sold (in this case litres of fuel), and *t* CO_2e per unit revenue.

Considering the wide variety of activities under DTPC, it is difficult to use a specific KPI to benchmark emissions. In this case, we have selected full-time employees (FTE) as the KPI, owing to data availability. According to the 2013/2014 DTPC integrated report, there are 178 full-time individuals employed at DTPC.

Table 3.2 Emissions intensity KPI calculations for DTPC

Total Scope 1 + 2 emissions (t CO_2 e)	5 406
Full-time Employees (FTE)	178
t CO2e per ton per FTE	30.37

3.1.4 *Emission Intensity comparative analysis to other companies*

One of the most important components when undertaking a carbon footprint analysis is the comparative analysis of the emissions profile across different years. A comparative analysis allows us to:

- Identify what progress has been made in terms of emissions reductions;
- Ascertain which areas or facilities have high emissions and are therefore of priority concern; and
- Identify and investigate new mitigation projects that can deliver emission reductions.

To understand the relevance of this metric, it is useful to compare emission intensities of companies with similar profiles. In the case of DTPC, it is difficult to find an entity that is completely similar owing the multi-sector nature of the organisation. The specialist team has selected the Bidvest Group Ltd. The primary reason for the selection of this company was the wide business area focus including freight, industrial, logistics, office and financial services. From Figure 3.4., it can be seen that DTPC's emission intensity is much higher than the Bidvest Group. Despite the fact that the Bidvest Group operates in multiple jurisdictions and is a much larger organisation (106 371 FTE in 2013), it does offer some indication of the emission intensities of a business with a multi-sector focus.

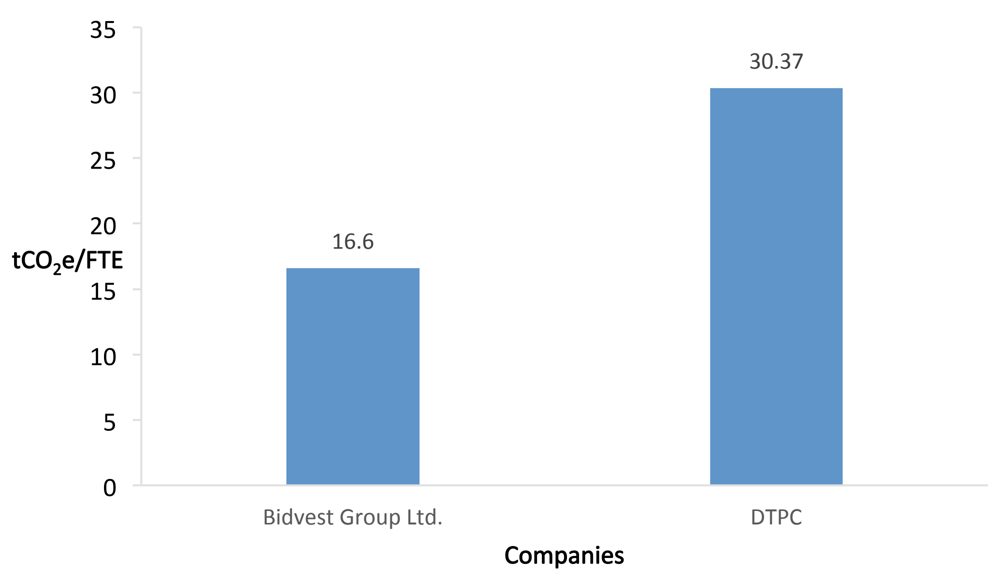


Figure 3.4 Emission intensity comparative analysis by company

3.1.5 Emission Intensity comparative analysis to the baseline

For the purposes of study, the AeonNexus & Triplo4 team compared the calculated emissions to the 2011 baseline, as conducted by Tricorona for DTPC, for activities within DTP and the King Shaka International Airport (KSIA). Specifically, we investigated the changes in material emissions (Scope 1 and 2) and the reasons for the changes. The second part of this report focuses on possible green projects and the specialist team selection of green projects was informed from this comparative analysis.

The 2011 study calculated carbon footprint for the following parts of the organisation: Cyber Port, Support Zone (including Dube City), AgriZone, TradeZone and KSIA airport. Facilities included under DTP were simply named as "Cargo". The 2011 report does not provide calculated footprint for each facility within the DTP (e.g. Support Zone, AgriZone), as does the current report, thus comparison is limited.

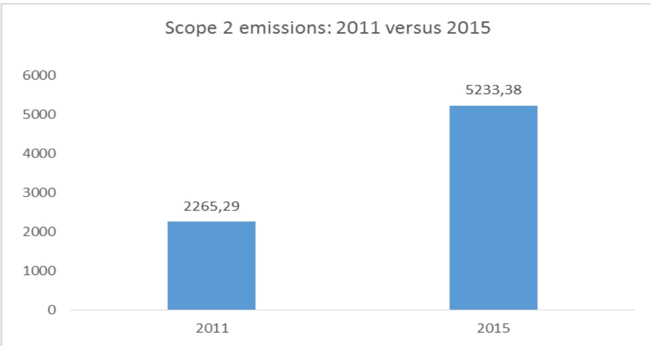
According to the comparative analysis depicted in Figure 3.5., showing the results of both the 2011 study and this current one, there is a dramatic increase in the Scope 1 + 2 emissions from 2332,56 tCO_2e to 5406,38 tCO_2e (56,8% increase). Specifically, the increase of emissions lies in the increase of Scope 2 emissions (electricity consumption) (2265,29 tCO_2e versus 5233,38 tCO_2e). The most likely reason for the increase could be attributed to the fact that the first DTPC carbon inventory was undertaken in 2010/2011: Hence, an expansion in the organisational boundary over the past five to six years would equate to an increase in the emissions being reported. Considering that electricity (Scope 2) is the primary contributing factor to the 56,8% increase from 2011 to 2015, a major portion of part 2 of this report (green projects) will focus on energy efficiency, energy management and renewable energy implementation.

2011 Baseline

Category	***Location***	***Unit***	***Emission Factor***	***Quantity***	***tCO_2e***	Notes
Scope 1 - Diesel	All	Litres	2,69	25000,00	67,27	
Scope 2 - Electricity	Cargo Terminal	kWh	1,04	1462995,00	1518,15	
Scope 2 - Electricity	TradeHouse	kWh	1,04	720000,00	747,14	
Total					***2332,56***	

2015 Analysis

Category	***Location***	***Unit***	***Emission Factor***	***Quantity***	***tCO_2e***	Notes
All Scope 1	All				173,00	
Scope 2 - Electricity	CargoZone	kWh	0,99	1902381,57	1883,36	Cargo Terminal
Scope 2 - Electricity	TradeZone	kWh	0,99	547313,41	541,84	Trade House, TCB, Maintenance Building and Trade Zone(1B), Street Lights
Scope 2 - Electricity	Support Zone	KWh	0,99	1802387,59	1784,36	(Support Zone (29 South, SCB, Street Lights))
Scope 2 - Electricity	AgriZone	kWh	0,99	1034157,16	1023,82	AgriZone(AgriHouse, Nursery, AgriLab, RO Plant, Street Lights)
Total					***5406,38***	



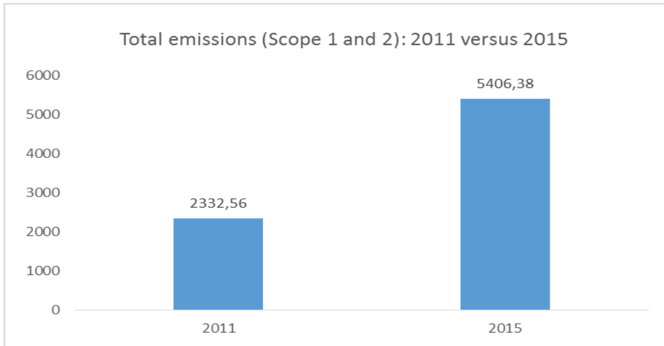


Figure 3.5 Comparative analysis of 2015 results to the baseline (2011)

4 ASSESSMENT OF CARBON MITIGATION AND REDUCTION OPPORTUNITIES AND RISKS

4.1 INTRODUCTION

Developing a carbon footprint represents the first, important step in managing any risks associated with climate change mitigation. As the majority of DTPC's emissions are the result of energy consumption, the rising energy prices and energy security concerns in the country represent a risk. Key to managing the risk is to identify priority areas for energy reduction interventions and to ensure that energy consumption and energy spend are correlated so that interventions result in cost savings (in many instances bills or leasing arrangements create a disconnection between consumption and spend).

Reducing emissions in the South African context, is important given the evolving climate change mitigation regulations. This has direct and indirect impacts on the organisation. The remainder of this section presents more detail on the climate change regulatory risks facing DTPC and possibly the DTP precinct and therefore summarises some of the key mitigation measures that should be considered as GHG mitigation requirements come into being.

4.2 IMPLICATIONS OF THE EVOLVING CLIMATE CHANGE MITIGATION REGULATORY ENVIRONMENT IN SOUTH AFRICA

South Africa is developing a range of measures to transit to a lower carbon economy. These include:

1. A carbon tax – a price on carbon designed to shift behaviour away from emissions-intensive activities.
2. Carbon budgets – a GHG limit imposed on entities / companies above a certain emissions threshold.
3. Carbon offsets – a mechanism to support least cost mitigation (e.g. domestic emissions trading).
4. Other measures – other government incentives (e.g. Section 12L allowances for energy efficiency).

The Carbon Tax

The publication of the Draft Carbon Tax Bill provides an opportunity for further comments on the design and technical details of the carbon tax policy and administration. It should be noted that the final tax rate, exemptions, and the actual date of implementation will be determined by the Minister of Finance through the annual Budget process.

The revised carbon tax design, as contained in the Draft Carbon Tax Bill, includes the following features:

- A basic 60 per cent tax-free threshold during the first phase of the carbon tax, from implementation date up to 2020;
- An additional 10 per cent tax-free allowance for process emissions;
- Additional tax-free allowance for trade exposed sectors of up to 10 per cent;
- Recognition for early actions and /or efforts to reduce emissions that beat the industry average in the form of a tax-free allowance of up to 5 per cent;
- A carbon offsets tax-free allowance of 5 to 10 per cent;
- To recognize to role of carbon budgets, an additional 5 per cent tax free allowance for companies participating in phase 1 (up to 2020) of the carbon budgeting system;
- The combined effect of all of the above tax-free thresholds will be capped at 95 per cent; and
- An initial marginal carbon tax rate of R120 per ton CO_2e (CO_2 equivalent) will apply. However taking into account all of the above tax-free thresholds, the effective carbon tax rate will vary between R6 and R48 per ton CO_2e.

Carbon Budgets

The budgets are being developed by the Department of Environmental Affairs (DEA) (development began in 2013). DEA is developing short (2015 – 2020), medium (2020 – 2030) and long (2030 – 2050) term Desired Emission Reduction Outcomes (DEROs) for sectors, subsectors and some companies in South Africa. DEROs represent the plan for achieving South Africa's long term GHG emissions trajectory. Companies emitting more than 0.1 $MtCO_2$e direct (Scope 1) emissions will be allocated a budget in line with the DERO (in early 2015). A budget will be an absolute GHG emissions cap each year for the next 5 years.

Carbon Offsets

The National Treasury is developing an offset mechanism as part of the carbon tax (development began in 2014). This is an attempt to create a least cost mitigation mechanism for a company to reduce its own carbon tax liability by funding GHG-reduction measures implemented by other entities or undertaken outside of the company's boundary. A list of approved and local potential carbon offsets investments will be advertised by Treasury to encourage investment into eligible projects. Some limitations exist: e.g. companies in the tax net cannot generate credits (this should change). This is in the early design stage and it is not clear how offsets will be considered in the combined carbon budget and carbon tax space. Offsets may present an opportunity, however too much uncertainty exists regarding the design of a potential scheme. Initial assessments suggest the market will be significant.

4.3 MITIGATION OPTIONS

The broader options for reducing emissions can be grouped in the following two categories:

- **Engineered mitigation solutions** that involve the installation of equipment to improve energy efficiency, the installation of renewable energies and reduce personal and organisational energy use and resulting carbon emissions.

- **Behavioural changes** which involves the use of education, including training and outreach, to encourage people to modify their personal actions to reduce energy use and resulting carbon emissions. Policy changes can aid the changes of behaviour within an organisation.

4.3.1 Engineered Solutions

A common misconception with regard to mitigation strategies is that they are costlier than the "business-as-usual" scenarios. If consideration is given to the rising cost of energy and input fuels, the payback on energy efficiency practices is becoming shorter, which improves the economic feasibility of projects. Developing a carbon footprint represents the first important step in managing any risks associated with climate change mitigation.

4.3.2 Behavioural and Policy Change

Technology tends to be the first course of action when looking to implement mitigation strategies and energy efficiency projects. However, behaviour of the occupants of a plant can have as much of an impact on energy consumption as new technology and efficiency of equipment. Energy consumption is governed by information or awareness of the full costs associated with energy use.

Persuading employees to change the way they work can be difficult and not necessarily achieved in the short term. It requires widespread changes in habits and information exchange though education and awareness is key to encouraging action. Some activities which could reduce energy consumption and help change the culture with regards to energy saving include turning off machinery and appliances when not in use and switching off lights when facilities are unoccupied.

Expert advice from professionals, energy audits, training and information exchange may be necessary to help people become aware of possible energy savings and measures. Conveying the plant’s energy consumption figures on a regular basis in comparison to benchmarks may kick-start a change in behavioural pattern. Breaking consumption data down by team would allow competitions to be run between teams to incentivise energy reductions, and rewarding staff in the winning teams may be considered as an incentive mechanism for changing behaviour.

5 CONCLUSION AND RECOMMENDATIONS

5.1 CARBON FOOTPRINT STUDY CONCLUSIONS

DTPC's Scope 1 + 2 carbon footprint (including direct emissions and indirect emissions associated with the consumption of purchased electricity) is estimated to be **5 406 t CO_2e**. Scope 2 emissions from the use of purchased electricity account for 99% of Total's Scope 1+ 2 emissions. Scope 1 and 2 emissions represent DTPC's most significant liability and are the emissions over which the organisation has most control.

The main contributors to DTPC's Scope 1 + 2 footprint was the Support Zone (1 807 t CO_2e) and the Cargo Terminal (1 899 t CO_2e). Emissions from the AgriZone and the Trade Zone together accounted for the remaining 30.9 % of DTPC's Scope 1 + 2 emissions (1700 t CO2e in total). Emission reduction and energy efficiency activities should therefore be prioritised at the Support and Cargo Zone. It may be difficult to change the practices within the Trade Zone as a number of the properties have been leased to external parties. The Scope 3 (value chain) emissions in 2015 were estimated to be 1 057 t CO_2e. Four categories of Scope 3 emissions were included in this footprint: emissions from business travel (air), waste emissions (from Agri-waste), leased goods and services (tenant energy consumption) and employee commuting.

5.2 DATA GAPS AND UNCERTAINTY

There were two significant data gaps identified in the 2015 footprint.

- Data for diesel and petrol consumption (obtained from DTPC fleet manager) used to determine Scope 1 emissions were incomplete. Therefore, we had to extrapolate annual Scope 1 diesel and petrol consumption based on the September, October and December data provided. Ideally, a complete set of data would be required if under or over-estimation is to be avoided;
- It must be stated explicitly that there is a difference between green and climate mitigation projects. This can be seen in the case of the agri-waste project undertaken by DTPC where

waste may result in methane emissions despite the benefits to soil fertilization and food security; and

- Leased goods and services (tenants) for Scope 3 is not a comprehensive list as this was a voluntary process.

5.3 *RECOMMENDATIONS – CARBON MANAGEMENT*

1. The development of an appropriate monitoring, reporting and verification (MRV) framework for data collection

To ensure that DTPC manages to maintain and improve on their carbon management strategy, it is recommended that the development of a comprehensive MRV system for tracking of emissions in a robust manner is undertaken. The carbon footprinting tool that has been provided can aid in this; however data collection processes will need to be refined for an accurate, verifiable and complete emissions inventory. The following recommendation with regards to data collection amendments are suggested:

- From a procedural point of view, it is suggested that the Environmental Manager sign off on reviewed monthly figures. As a result, data gaps can be avoided and ensures accountability from personnel undertaking data collection processes;
- A log of fugitive emission re-filling activities for fire extinguishers and air-conditioning recording the quantity and type of gas;
- Documenting Scope 3 business travel (air) when bookings are made, recording categories such as routes (in airport-code format), one-way or return, class of flight (business, economy or first-class), (international or domestic);
- Tenants (Scope 3) keep records of the fuel and electricity consumption such that tier 2 emissions in the value chain can be established; and
- Electricity schedules for tenant readings should only contain readings for a period of 12 months (starting a new schedule each year).

2. Identify and implement energy saving measures

Energy efficiency opportunities can be identified through energy audits where site specific measures are recommended. There are a number of support programmes and incentives that could be leveraged to enable the implementation of the above measures. Even though programmes such as the Private Sector Energy Efficiency Programme (PSEE) (managed by the National Business Initiative (NBI)) are aimed at the private sector, methodologies and strategies can be identified for energy efficiency. Other programmes and incentives include the Industrial Energy Efficiency Project (IEE) managed by the National Cleaner Production Centre (NCPC) and incentives such as the National Income Act, Section 12l.

Please note that energy efficiency and renewable energy projects will be discussed in Part 2 with other possible green projects.

3. Communicate results

DTPC should communicate the results of this carbon footprint, as well as the findings of any energy efficiency audits and subsequent cost and carbon savings following the implementation of energy efficiency measures. These results should be communicated both internally and externally to build capacity and raise the profile of both climate change and the broader energy efficiency agenda to DTPC employees and external stakeholders. Information relating to energy consumption, costs and potential or achieved savings should be communicated to the relevant DTPC business category managers to raise awareness at each facility. Achievements resulting from the implementation of energy efficiency measures should be shared within business categories such that similar opportunities can be identified across the group.

One other increasingly popular way of disclosing emissions is through the Carbon Disclosure Project (CDP) where many of South Africa's top companies disclose their own Scope 1, 2 and 3 emissions. Points are allocated according to disclosure and performance; these points are then collated and ranked against other companies to understand the companies who are performing highly with regards to carbon mitigation initiatives and emission reductions.

4. Set GHG emissions reduction targets and track progress over time using Key Performance Indicators

We recommend that DTPC looks to set GHG emissions reduction targets to help reduce emissions and to provide a focus or goal for its energy efficiency activities. Targets can be either absolute (expressed as a total net reduction in absolute emissions from a defined baseline year to an agreed target year) or intensity based (based on reducing the emissions intensity of the business, for example targeting a percentage reduction in tonnes of CO_2e per litre of product per year).

Targets must make sense in the context of DTPC's strategic objectives and must be aligned to DTPC ambitions and goals around GHG emission reductions. When setting targets, we would recommend that:

- Targets are Specific, Measurable, Achievable, Realistic, and Time-related (SMART);
- The cost implications of setting GHG reduction targets are fully understood and appropriate budgets set aside;
- Targets are accompanied by specific management programs capable of delivering the necessary savings; and
- Targets are aligned with DTPC's strategic objectives.

5. Establish governance and management structures

An energy and climate change strategy cannot be effective unless sufficient resources are dedicated to its implementation throughout all levels of the organisation. If energy management responsibilities are to be integrated into existing roles, care needs to be taken to ensure that staff have sufficient time to undertake the required activities. The introduction of a group energy officer is considered a good starting point; however senior level commitment to energy management is critical if a climate strategy is to be successfully implemented. We recommend that DTPC maps out the roles and responsibilities for energy efficiency throughout the organisation.

6. Engage with stakeholders

Engagement with DTPC's stakeholders - including employees, investors, shareholders, NGOs, government and customers - is a vital component to an effective climate change strategy. As a start, it is recommended that DTPC identifies and maps its major stakeholders, and subsequently engages with key stakeholders in order to inform the development of a climate change strategy.

PART TWO: OFFSETS AND GREEN PROJECTS

6 *CARBON OFFSETS AND GREEN PROJECTS*

6.1 INTRODUCTION

To reduce the effects of climate change regulatory policy on the business case, it is important that organisations invest in projects that demonstrate responsibility with regards to mitigation and environmental protection. These projects could also reduce the financial implications of the carbon tax as offsets could contribute towards the compliance obligation of an organisation within South Africa's carbon tax scheme. From an internal perspective, the DTPC has an Annual Performance Plan (APP) target of a 7% reduction from the baseline.

At this juncture, it is critical to distinguish between "green" and "offset" projects. Green projects can be described as projects that have some environmental integrity; however, these projects do not need to demonstrate any emission reduction potential. An example of a green project could be a rainwater-harvesting project where the project promotes water recycling however there is no impact on emission reductions. It is possible that green projects could contribute towards emissions as is the case of the DTPC's agriwaste project: The breakdown of waste could release emissions even though the project is classified as environmentally friendly. Carbon offset projects refer to projects that can demonstrate "additionality"; where GHG emissions after the implementation of a project activity are lower than those that would have occurred in the most likely scenario. For example, a solar project lowers the demand for electricity generated from fossil fuel combustion which results in less GHG emissions.

The implementation of possible offset projects will be investigated in the context of the calculated emissions profile. Key criteria and results that need to be considered include:

- DTPC direct emissions (Scope 1 and 2) that constitute the majority of their emissions;
- DTPC direct emissions that constitute the majority of emissions by zone;
- Operations and jurisdiction within the zones of the DTPC to establish the ease of implementing projects; and,

- Current green and offset activities of the DTPC.

Figure 6.1 provides an overview of a proposed offset management plan for DTPC. The specialist team has identified energy diversification as being critical to reducing emissions in all zones of DTPC. Furthermore, tailored mitigation actions are also suggested for the different zones of DTPC.

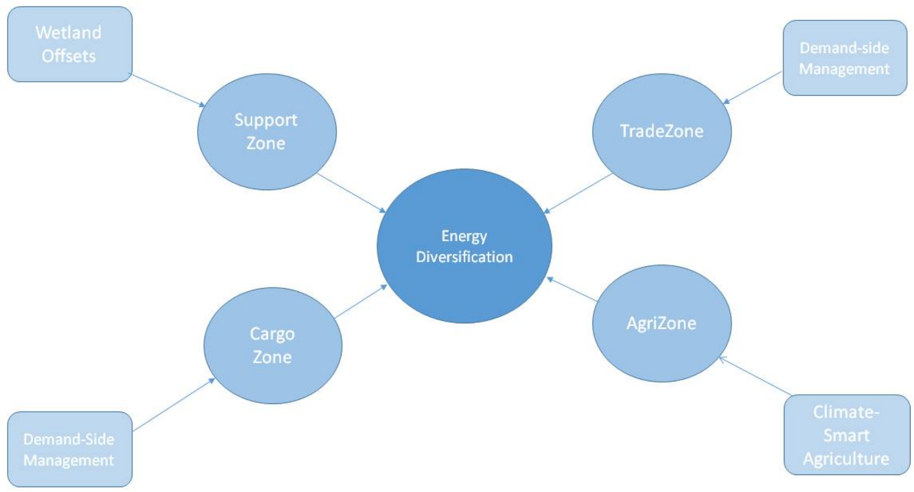


Figure 6.1 Schematic Representation of the DTPC Offset Management Plan

Scope 2 emissions (purchased electricity) constitute a sizeable majority (97%) the total Scope 1 + 2 emissions (5 233 out of 5 406 tCO_2e). Consequently, electricity consumption dominates the emission profile when broken down by zone. Considering this fact, energy diversification to renewable energy sources holds the greatest potential for mitigation through offsets. Evidence from the carbon footprinting analyses suggests that the AgriZone (1 023 tCO_2e), which possesses a solar power initiative, consumes substantially less electricity consumption than the Support Zone (1 784 tCO_2e) and Cargo Terminal (1 883 tCO_2e). This is possibly owing to a lower demand for electricity from the grid. The specialist team looked to extend the concept of solar power initiatives to other zones of DTPC. This will be illuminated further in Section 6.3.

One of the green initiatives that the DTPC is involved in is wetland rehabilitation. Wetland rehabilitation has environmental integrity as a project type; however, activities within the rehabilitation process can be refined such that wetlands are also able to sequester the maximum amount of carbon and thereby deliver carbon credits. By using the experiences of the International Blue Carbon Initiative — a partnership among CI (Conservation International), IUCN (International Union for Conversation of Nature) and IOC-UNESCO (Intergovernmental Oceanographic Commission-UNESCO) — the specialist team will discuss how an integrated program can be created focussed on mitigating climate change by rehabilitating and restoring wetlands (Section 6.4.).

Considering that the DTPC possesses an AgriZone, it could be useful to investigate mitigation options specific to the agriculture sector (Section 6.5). These options could be implemented by the AgriZone plots operated by DTPC or by new tenants to the AgriZone. Despite the TradeZone being comprised primarily of tenants, it is possible that demand-side management (DSM) strategies be implemented to reduce the electricity consumption, as discussed in Section 5.3. These DSM measures can also be implemented within the Cargo Terminal.

6.2 *APP TARGET ANALYSIS*

According to the analysis conducted in Section 3.1.5, the baseline for DTPC (excluding King Shaka Airport), as done in 2011, is estimated to be 2 332,56 tCO_2e. A 7% reduction target from the baseline would equate to 163, 27 tCO2e. The solar power initiative undertaken within the AgriZone has yielded 900.7 tCO_2e of avoided emissions. Consequently, the DTPC has far **exceeded** their reduction target. The 900.7 tCO2e equates to a 38.6 % reduction from the baseline. If the emission reduction target of 7 % is maintained, and the current initiatives are measured against the updated baseline (5 406 tCO_2e), **then an emission reduction percentage of 16.6 % has been achieved**.

6.3 *SOLAR PANEL OFFSETS*

Upon consultation with specialists who install solar systems, the following assessment was made on the potential of expanding the current solar initiatives of DTPC. The 29° South and Cargo buildings currently consume about 185 000 kWh per month, thus annual electricity usage is approximately 2 220 mWh (2 220 000 kWh /

annum). To be able to reduce the electricity consumption by 50%, DTPC will require a solar initiative that is able to produce 1 110 mWh during the course of the year, which requires a 900 KW solar plant with roughly 2 900 solar modules. This is equal to about 6 700 m^2 of roof space.

A 50% reduction in electricity consumption for the 29° South and Cargo Buildings would equate to approximately 1 098 tCO2e being avoided. If this is added to the current solar initiatives of the AgriZone (900.7 t CO_2e), then the total emissions offset would equate to 1 998.7 tCO_2e. If these reductions are compared to the updated baseline of 5 406 tCO_2e, then this equates to a 37% reduction in the total emissions of the DTPC. When assessing the potential for expanding solar initiatives, it is important that potential feasibility be caveat with an understanding of what is technically feasible. There are various factors that influence the installation of solar panels. These factors include: the positioning of the panel; the direction of the roof; angle of the solar panel; and, the direct access to sunlight. In the case of the Cargo Terminal, the angle of the roof may not be suitable for the installation of the solar panels on the entire roof, however portions of the roof may be suitable. The addition of solar panels for the Tradehouse roof depends on the slope and angle at which the solar panels are installed at. Both the Cargo Terminal and the Tradehouse are located in close proximity to the runway and ATNS tower, which will impact the direction at which solar panels are installed at (as it may cause excessive reflection onto runway areas). As roof space may be limited on the DTPC buildings, an innovative solution can the use of parking spaces fitted with roofing for solar panels (refer to Figure 6.3 below which illustrates the idea).

Both the Tradehouse and the Cargo Terminal has open parking spaces that can potentially be fitted with solar panels installed on the roof; however the parking area is very limited. The 29° South also has open parking spaces; however as the parking area is located behind the office building, and with consideration of future buildings' development around the area, it is anticipated that the parking area will not obtain the required sunlight for optimum utilisation of the solar panels. Investigating further, it appeared that the long term parking of the airport (refer to Figure 6.4 below for the exact location) has approximately to 40 000 m^2 of available roof space. Should this entire roof space be fitted in with solar panels, approximately 6 626 mWh of electricity can be produced, which will equate to 6 560.6 tCO_2e avoided (of which a percentage would belong to DTPC). The long term parking spaces belong to the Airports Company South Africa (ACSA), and therefore the solar parking installation project may be implemented as a joint venture project, and the subsequent sharing of emission reductions for both entities.

The specialist team recognizes that solar initiatives proposed may be in the planning phases for several years prior to their implementation. Consequently, it is important that DTPC consider short-term initiatives that can be implemented in the interim period. Demand-side management can be an ideal way to reduce the consumption of electricity (and the subsequent emissions) in a cost-effective manner. As seen in Figure 6.2, lighting (-US$ 43/tCO_2e abatement) and building management systems (-US$ 15/tCO_2e abatement) are the most cost effective solutions in terms of the emission reductions they deliver. These options are able to deliver energy savings after their initial payback period. Demand side management initiatives include the use of occupancy sensors, lighting zoning, lighting densities and others. Occupancy sensors are lighting control devices that detect the occupancy of space by people and turns the lights on or off automatically, using either infrared, ultrasonic or microwave technology. A study conducted by the Environmental Protection Agency (EPA) indicated that occupancy sensors could reduce energy wastage by as much as 68%. In the case of DTPC, if occupancy sensors were installed in the Support Zone, this would equate to a reduction of approximately 1 213 tCO_2e.

Light zoning is the creation of several lighting control zones that can be independently controlled to turn on/off or dim all the luminaires within each zone. Zoning is an essential lighting control prerequisite that does not result in energy savings by itself, but that enables other control strategies to be effective. It is particularly important for larger spaces where tasks, occupancy, access to daylight, and the need for artificial light at different times may vary. Optimized control strategies include occupancy-based dimming, tuning and scheduling, which saves an additional 15-30 percent as compared to spaces that did not utilize these adaptive lighting control systems.

Another small-scale solar project could be the powering of street lighting using solar panels within the support zone. These panels are mounted on the lighting structure or integrated within the pole itself. These photovoltaic panels charge a rechargeable battery, which powers an LED or fluorescent lamp during the night. In the case of DTPC, annual electricity consumption from streetlights and the Agri-Canteen for 2015 was 36 078 kWh. Assuming that 50% of this electricity consumption can be attributed to the streetlights, it is possible that a solar street light initiative would yield 18 tCO_2e of avoided emissions.

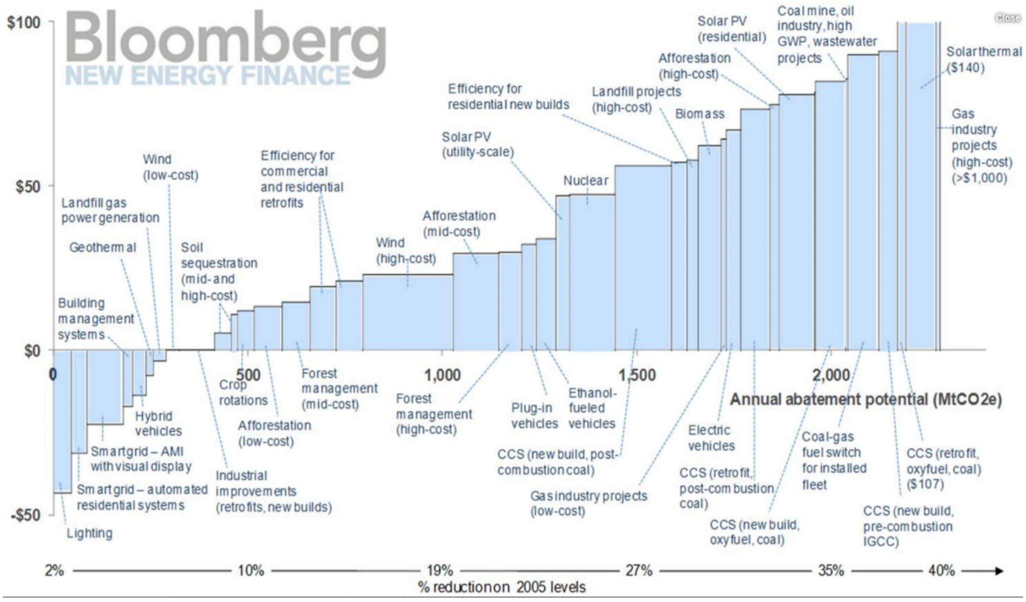


Figure 6.2 Marginal abatement cost curve (Supply and Demand Options).

Figure 6.3 Photograph of solar panel installations for parking roofs

Figure 6.4 Location of ACSA long term parking

6.4 WETLAND CARBON OFFSETS

Wetlands play an integral role in promoting overall landscape functioning which includes the cycling of carbon, water and nutrients; water purification; and, the regulation of water flow amongst others. It is estimated that wetlands cover six to nine percent of the Earth's surface and contains 35 % of terrestrial carbon. All wetlands have the ability to store and sequester carbon through photosynthesis and the accumulation of organic matter. The periodic waterlogging nature of wetlands allows for oxygen diffusion into the sediment profile to be limited, creating anaerobic conditions. These anaerobic conditions slow decomposition rates creating large stores of carbon. Under anaerobic conditions, wetlands can also produce other GHGs such as methane and nitrous oxide, while improper clearing and drainage of wetlands can lead to large losses of stored organic carbon to atmosphere. Wetlands may therefore be either sources or sinks of carbon, depending on their type, and can switch between being sinks of carbon to becoming net sources. This switching can be a natural process due to seasonal or other factors or can be affected by human management.

From the draft carbon offsets paper released from the Department of Environmental Affairs (DEA) in 2013, wetland rehabilitation would be considered as a *legitimate offset* under the Agriculture, forestry and other land uses (AFOLU) category. Therefore, it is integral that wetland rehabilitation undertaken by the DTPC consider their actions within a climate mitigation context as there is a possibility that current wetland activities can deliver co-benefits: The process for establishing a wetland carbon offsets is described by Figure 6.5.

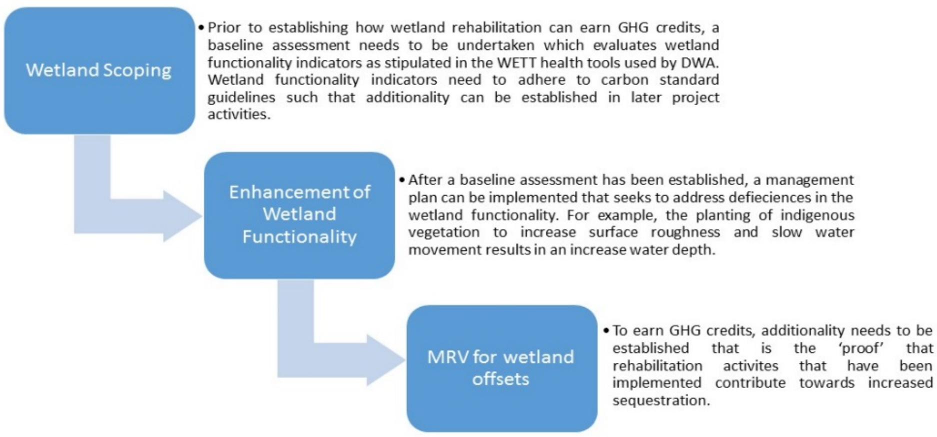


Figure 6.5 A diagrammatic representation of the wetland offset process

The rehabilitation of wetlands in the coastal zone have the greatest potential to act as a carbon offset project. In these systems, biomass production is high but methane emissions are restricted owing to the salinity profile. Carbon storage within vegetated freshwater wetlands is estimated to be approximately 240 tonnes C per ha while the rehabilitation of mangrove swamps could yield approximately 550 tonnes C per ha of emissions reductions. A total area of 27 hectares of wetland has been rehabilitated by DTPC would equate 6 480 tCO_2e, if a blue carbon MRV framework was enforced. The most critical wetland types in terms of wetland carbon storage include forested wetlands, temperate and tropical peatlands, and vegetated inter-tidal wetlands (including saltmarshes and mangroves).

The restoration of wetlands to a pristine state can inherently enhance the carbon mitigation benefits of these environments (Verified Carbon Standard (VCS) methodology for the AFOLU sector). However, a wetland rehabilitation project that has the focus of earning offset credits needs to create an MRV framework where key wetland functioning criteria are recorded such that they can be compared against a baseline (initial conditions). For example, the VCS methodology suggests that wetland rehabilitation projects that are eligible to earn GHG credits need to have activities implemented where the environment has a baseline of the average water table depth being lower than natural average annual water table depth. Common wetland restoration activities include the revegetation by indigenous planting, alien invasive control programmes, and site management.

Re-vegetation / Indigenous planting

The re-establishment of a mixed community of indigenous hydrophytic species across the wetlands is important for a number of reasons. The most obvious is the increase in habitat and biodiversity value of the wetlands. Secondly, a well-established vegetation covering across the wetland greatly increases the roughness of the system, helping slow water movement through the wetland, trapping sediment and improving water quality. Re-establishment of the wetness regime will promote the return of hydrophytic species and wetland communities.

Limited planting of locally occurring species such as *Phragmites australis, Cyperus latifolius*/*Cyperus* dives, *Cyperus prolifer, Cyperus textilis* and *Cyperus sphaerospermus* must occur in areas of significant disturbance, especially areas exposed once alien plants are removed. Much of the material required can be selectively harvested from the site itself. Tubers and rhizomes of wetland species can be collected and replanted where required.

In addition the growth of species such as *Leersia hexandra, Imperata cylindrica, Ischaemum fasciculatum, Dissotis canescens* and *Ludwigia octovalvis* should be encouraged (but not limited to) within the wetland areas.

Alien invasive plants control programme

Removal and subsequent management of these species is very important in maintaining the biodiversity value and integrity of the wetland. Common alien invasive species include *Arundo donax*, *Melia azedarach*, *Litsea glutinosa*, *Solanum mauritianum*, *Ricinus communis*, *Lantana camara* and *Chromolaena odorata*.

Three basic methods of controlling alien plant species exist:

- Mechanical control (hand pulling, slashing and felling);
- Biological control (introduction of natural predators to control the plants); and
- Chemical control (spraying and painting of poisons onto the plant to kill them).

In a wetland environment the use of chemical poisons is not ideal. Careless application and the non-specific nature of the toxins means that in a dynamic system, residual poison can be carried in the water to other parts of the wetland and into adjacent water courses. Nevertheless, careful application of poisons (e.g. Garlon) onto the cut stumps of the *M. azedarach, R. communis* and *S. mauritianum* is considered the most effective way of eradicating larger individuals. Biological control of alien plants in South Africa has had great success with a variety of species. However, limited success has thus far been achieved in the control of *Chromolaena odorata* and *Lantana camara* with bio-agents. As such, relying on natural predators to control infestations on the site will have very limited results and is more likely to fail.

Site management

Despite the following site management recommendations being general, the specialist team hopes to illustrate that activities undertaken need to have a wetland rehabilitation focus thereby optimizing ecosystem functionality.

Disturbance minimization measures

The site currently faces a variety of pressures from direct anthropogenic disturbances during the construction phase and shortly after construction.

In order to mitigate and manage these threats the following steps should be followed:

- Pedestrian and vehicle access to the wetland and buffer must be prohibited. Site security staff should be aware of these requirements and if people are seen accessing the site they should be directed to leave immediately.
- Areas of illegal dumping and soil stockpiles must be removed from the wetlands and these areas must be rehabilitated and re-planted as per the specifications listed above.

Stormwater management

Management of stormwater runoff from the development is critical to maintaining the integrity of the rehabilitated system. An increase in hardened surfaces will not only increase the potential volume of water entering the wetland but also decrease the time taken for this accumulated flow to reach the system. The increase velocity and volume of water has a far greater capacity to erode and damage the wetland. The stormwater management plan for the site has addressed most of these issues and runoff is reticulated to discharge points for controlled release. These require strict monitoring by the project site manager to ensure that scouring and erosion damage at the point of discharge is minimized.

Discharge Points

Some runoff, from the road access and site edges may nevertheless end up in the wetland.

These release points must:

- Be located outside of the wetland boundary and buffer;
- Have suitable scour protection (gabion or Reno mattress) to dissipate water energy and prevent erosion; and,
- Should be monitored regularly (particularly after large rain events) to ensure no scour has occurred.
- In the event of scour, the project site manager and engineer must assess the damage and adopt appropriate restoration of the damage.

Pollution

Given the nature of the products likely to be stored in the construction warehouse, brought in by vehicles, as well as the necessary logistical equipment kept on site, there is a risk of contamination of runoff from the site. Stormwater emanating from this operations area must be conveyed through an oil/water filter and sediment trap to remove potential contaminants. The trap should be located in close proximity to the operations site. The trap should be cleaned of contaminated sediment and other material and safely removed to a landfill or waste management site. The wetland will be able to treat and process a certain level of contamination that may incidentally reach it, however the quality of runoff must be closely monitored to ensure no pollution is entering the wetland or stormwater drainage system as a whole.

Next steps to earn Wetland Offsets

The specialist team has recommended the following steps be taken by DTPC should the management deem wetland offsets to be a viable option. Initially, it may be useful to understand the amount of emission reductions that could be yielded from a specific project. Each wetland rehabilitation will differ slightly and is dependent on the type of wetland being restored; the baseline level from which the rehabilitation will be implemented; and, the effectiveness of the wetland rehabilitation activities.

After a wetland rehabilitation area has been identified, the status of the wetland needs to be assessed. This can be undertaken using the WETT health tool where, specific parameters that capture the current functioning of the wetland ecosystem will be identified. Thereafter, a wetland rehabilitation plan needs to be devised that includes: strategies to promote the rehabilitation of the wetland and an MRV programme illuminating on the methodologies for rehabilitation with emphasis on key metrics denoting wetland functionality. Thereafter, after a defined period of wetland rehabilitation, the extent to which the wetland rehabilitation has influenced the carbon sequestration capacity of the wetland can be assessed and verified, after which the carbon credits can be earned.

6.5 OFFSETS FOR THE AGRICULTURE ZONE

Table 6.2 provides a list of the possible mitigation agriculture projects that could be implemented by the DTPC tenants within the AgriZone. The agriculture sector has largely been excluded as a project type within international carbon markets, even though the sector accounts for approximately 10 – 14 % of the total GHG emissions released into the atmosphere. Thus, the specialist team considers it important that agriculture mitigation options be included within this report.

Currently, the only land use land use change and forestry (LULUCF) practices accepted within regulatory markets are from afforestation and reforestation (CDM). However, soil carbon sequestration projects are not included currently. Some of the voluntary carbon markets (the Chicago Climate Exchange (CCX), for example) have promoted agriculture soil projects which constitutes 15 % of the projects undertaken (Hamilton *et al.*, 2009).The specialist team suggests that agriculture mitigation projects be part of a set of voluntary guidelines that could be adopted by existing or new tenants. Despite the issues related to MRV and permanence of emission reductions, agriculture projects could deliver appreciable emission reductions. In the case of four selected agriculture CCX projects for methane capture, carbon credits earned were equivalent to between 800 and 1 700 tCO_2e. It is important to note that the implementation of agriculture mitigation projects by DTPC tenants will reduce the DTPC's Scope 3 emissions, which could reduce the financial implications of the carbon tax in the future, should scope 3 being taxable. Lastly, listed in Table 6.1 are some of the other barriers that need to be considered if small-scale agriculture project types are to be included.

Table 6.1 Barrier descriptions of small-scale agriculture projects

Barrier Type	Description
Permanence	There is a maximum amount of carbon that ecosystems can

	hold. Therefore, carbon sequestration removes carbon only until that maximum capacity is reached. Changes in management practices can reverse the gains in carbon sequestration (in contrast, N_2O and CH_4 emission reductions are non-saturating).
Uncertainty	Measurement uncertainty: variability between seasons and locations of agricultural systems can translate into high variability in offset quantities at farm level (increasing the geographical extent and duration of the accounting unit can reduce variability).

Table 6.2 Potential Mitigation Options for Small Scale Agriculture

Mitigation Opportunity	Category	Examples	Mitigative Effects	Problems
Cropland management	Improved agronomic practices	- Improved crop varieties - Extending crop rotation - Avoiding or reducing use of bare (unplanted) fallow - Adding more nutrients (fertilizers) when deficient - Less intensive cropping systems (reduced reliance on pesticides and other inputs) - Temporary vegetative cover between agricultural crops	- Increased soil C storage	Benefits from adding N fertilizer can be offset by higher emissions of N_2O from soils and CO_2 from fertilizer manufacture
	(higher N use efficiency)	- Precision farming - Using slow-release fertilizer forms or nitrification inhibitors - Avoiding time delays between N application and plant N uptake - Placing the N more	- Reduced emissions of N_2O - Indirectly reduced emissions of CO_2 from N fertilizer manufacture	

		precisely into the soil to make it more accessible to crop's roots - Avoiding excess N applications or eliminating N applications where possible		
	Tillage/residue management	- Reduced tillage - No-till farming - Systems that retain crop residues - Avoiding the burning of residues	- Soil C gain	- Reduced or no till may affect N_2O emissions but net effects are
	Water management	- Expanding irrigation areas - Using more effective irrigation measures	- C storage in soils	- CO_2 from energy used to deliver water may offset gains -N_2O emissions might increase as a result of higher moisture and fertilizer N inputs
	Species introduction	-Introducing grass species with higher productivity or C allocation to deeper roots	-Increased storage of C	
Management of Organic		- Avoiding row crops and tubers	- Reduced emissions of CO_2 and N_2O	

Soils		- Avoiding deep plowing - Maintaining a shallower water table - Avoiding the drainage of these soils or re-establishing a high water table where GHG emissions are still high		
Manure Management		-Cooling or covering the sources of manure stored in lagoons or tanks -Manures digested anaerobically -Storing and handling manures in solid rather liquid form	Reduced emissions of CH_4	Storing solid manure may increase N_2O formation.

PART THREE: DATA QUALITY ASSESSMENT AND INTERNAL AUDIT

7 DATA QUALITY ASSESSMENT AND INTERNAL AUDIT

7.1 INTRODUCTION

The carbon footprint process and the subsequent auditing of the results must adhere to standard principles and norms to ensure that the carbon accounting is legitimate and true. These principles include relevance, completeness, consistency, transparency and accuracy. These principles are elaborated upon within the Greenhouse Gas Protocol (GHGP), which is the prominent international standard for measuring emissions by business entities. Table 7.1 seeks to provide a summary of the performance of DTPC in terms of accepted principles of carbon accounting.

Table 7.1. Summary of data results against principles

Principle	**Assessment**
Relevance	• The principle of relevance is important in the context of the selection of the operational boundary and the activity data. It is believed that the selected boundaries provide the most amount of coverage of emission causing activities from important facilities.
Completeness	• Despite the carbon tax having no impact on the DTPC as it is a state-owned entity and total emissions are below the threshold of 100 000 tonnes CO_2e: For the carbon footprint undertaken, Scope 1, 2 **and** 3 sources were assessed. • Even though some activities contribute an insignificant portion of the total DTPC emissions such as employee commuting (3 tCO_2e out of 5 406 tCO_2e), the reporting of these activities contributes to the completeness of the carbon footprint. • It is recommended that the next carbon footprint undertaking will include more activities such as waste emissions, fugitive emissions and others. • Furthermore, incomplete data was extrapolated to ensure that the carbon footprint is as complete as possible.
Consistency	• To ensure consistency, a "review – comment" approach was implemented, where consistent reviews of the data and results were undertaken internally by Aeon Nexus and Triplo4, as well as by the DTPC.
Transparency	• It is recommended that the DTPC publically disclose the results of their carbon footprint using the Carbon Disclosure Project (CDP) of South Africa.

	• If this carbon footprint is externally audited, it may add to the credibility of the results.
Accuracy	• To ensure that the accuracy of this carbon footprint is maintained, methodologies approved by the Intergovernmental Panel on Climate Change (IPCC) and emission factors approved by DEFRA were used. • Despite the extrapolation of data for the completeness, it is acknowledged that the best practice is the use of true data, hence a robust MRV framework for the DTPC is recommended, so that the next footprint will possess complete and accurate data.

7.2 *AUDIT CALCULATIONS OF 2015 CARBON FOOTPRINT*

The calculations presented below are based on an internal audit of the DTPC carbon footprint analysis undertaken. This includes both a qualitative and quantitative approach, where the calculations were assessed as well as the methodology, emission factors, and the activity categories and facilities selected.

7.3 *ANALYSIS OF CALCULATIONS*

Generally, the calculations are of a good quality however there may be areas where the accuracy of the footprint may be improved. Below is an overview of the findings:

- There may be slight differences between DEFRA emission factors 2012 and DEFRA 2015, therefore the footprint may be overestimated and underestimated.
- The emission factors cover the calculation of CO_2, NH_4 and N_2O which builds on the previous baseline undertaken, that only covered CO_2 emissions. This provides a more comprehensive inventory.
- The carbon footprint seeks to distinguish between emissions that are owned and not owned by the DTPC. Consequently, the emissions from the King Shaka International Airport (KSIA) are not included as these emissions are owned by the operations of ACSA. This approach was adopted as it is believed that the focussing on “owned” emissions will allow for a more effective carbon management in terms of offsets.
- It is recommended that the upstream emissions be focussed on in future carbon footprints. This will add to the principle of accuracy as “contractors” would represent an additional Scope 3 category. Furthermore, contractor data can be used to calculate Scope 3 waste emissions.
- The formulae were reviewed in the carbon footprint and no errors were found with regards to the linking of cells to the emission factors.

Table 7.2. Deviation from calculated emissions (tCO_2e)

Total Deviation	***+19.802***
Contribution of the Calculations	***0***
No errors were detected through an inspection of the carbon footprint.	0
Choice of Emissions and other conversion factors	***+4***
Refrigerants	+4
Improved data quality (using average of existing data)	***+15.802***
Oils and Lubricants	+0.262
Refrigerants	+15.54

Table 7.2. illustrates the potential deviation away from the actual calculations. This illustrates that the calculations are relatively accurate. However, it must be acknowledged that the deviation analysis excludes the over and under estimation of electricity owing to the extrapolation undertaken as a result of incomplete data. Moreover, it excludes the waste emissions data as contractor mileage was not recorded and therefore no estimation of this contribution could be made.

7.4 SUMMARY

From the internal data audit undertaken, there is generally a good level of data quality. In terms of relevance, the expansion of the operating boundary (additional facilities) must be considered in future carbon footprints. One of the shortcomings of the data audit was level of completeness concerning key emission sources (Scope 2: Electricity). It is recommended that future footprints concentrate on data capturing prior to the undertaking of calculations. Lastly, accuracy of the carbon footprint can be maintained by a regular updating of emission factors from reputable sources such as DEFRA and the IPCC.