# MEASURING DEA'S CARBON FOOTPRINT

## 2012/2013 CARBON FOOTPRINT REPORT


environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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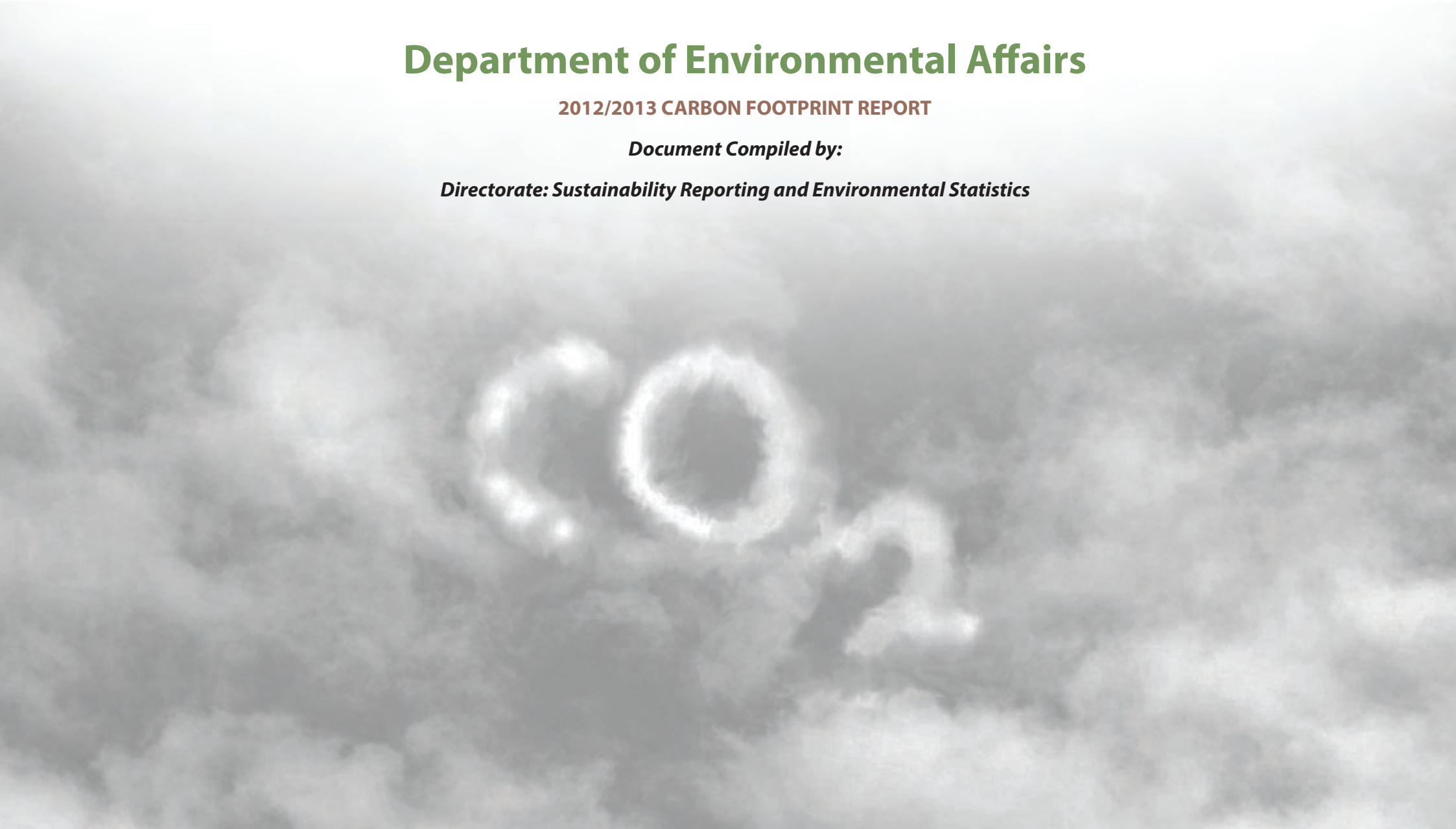
# MEASURING DEA'S CARBON FOOTPRINT

## Department of Environmental Affairs

**2012/2013 CARBON FOOTPRINT REPORT**

***Document Compiled by:***

***Directorate: Sustainability Reporting and Environmental Statistics***



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| | |
|---|---|
| CF | Carbon Footprint |
| $CH_4$ | Methane |
| CO | Carbon Monoxide |
| COO | Chief Operating Officer |
| $CO_2$ | Carbon Dioxide |
| $CO_2e$ | Carbon Dioxide equivalent |
| DEA | Department of Environmental Affairs (South Africa) |
| DEFRA | Department of Environment, Food and Rural Affairs (United Kingdom) |
| DWA | Department of Water Affairs (South Africa) |
| EP | Environmental Programmes Branch |
| GHG | Greenhouse gas |
| GWP | Global Warming Potential |
| Kg | Kilogram |
| Km | Kilometre |
| kWh | Kilo-Watt hour |
| NCCRP | National Climate Change Response Policy |
| $N_2O$ | Nitrous Oxide |
| O&C | Oceans and Coasts |
| $O_3$ | Ozone |
| SANAE | South African National Antarctic Expedition |
| SMS | Senior Management Services |
| VRV | Variable refrigerant volume |

# FOREWORD BY THE DIRECTOR-GENERAL

The Department of Environmental Affairs, as custodian of the environment, has taken the lead to publish it's carbon footprint disclosure report, thereby setting an example for similar disclosure efforts by other national departments.

It is our responsibility to maintain the integrity of the environment, a role that is undertaken within the broader socio-economic context of the country with the ideal to lead by example. It is well understood that South Africa is amongst the highest emitters of global greenhouse gases, largely due to our fossil fuel driven economy, the Department, as a responsible institution, seeks to minimize its impact on the environment.

South Africa has developed the National Climate Change Response Policy which represents the country's vision in both responding to climate change and transitioning to a low carbon future.

In implementing the policy objectives, the Department of Environmental Affairs has piloted a Zero Emission Electric Vehicle Programme, and become the first government department to acquire eight such vehicles in South Africa which are charged through renewable energy. In addition, we have also acquired hybrid vehicles and encourage other government departments, corporate and private citizens to make use of cleaner sources of fuel and other modes of transport.

We have taken occupation of Environment House, the first purpose built green building for a government department which has been awarded a six green star rating by the Green Building Council of South Africa. Twenty percent (20%) of the building's energy requirements is being provided through solar energy with low energy consumption. The installation of rainwater harvesting system guarantees a saving on water consumption.

The reporting and quantification of our carbon emissions bears testament to the seriousness with which the government of South Africa regards the global threat of climate change. This current report identifies the main emission sources for the

department in the past financial years, as such will serve as a baseline to bench mark future efficiency improvements. Furthermore, this report quantifies these emissions and ultimately discusses and proposes the action steps to be taken to further reduce the Department's negative impacts on the environment

It must be noted that similar reporting by companies in the private sector are far more advanced with 83% of companies under South Africa's Carbon Disclosure Project (SA CDP), which constitutes the top 100 companies in the country, have reported in 2013.

In presenting this report, the Department encourages all sectors within the country to become aware of the impact that their daily activities have on the environment and put measures in place to reduce the potential detrimental consequences.

Ms Nosipho Ngcaba

Director-General

Department of Environmental Affairs

# EXECUTIVE SUMMARY

This report presents the carbon footprint of DEA in tons of carbon dioxide equivalent ($CO_2e$) emissions for the financial year 2012/13. In the current 2012/13 carbon footprint report, 16 different emission sources (categorised under three scopes) were taken into account, calculated and verified. The 16 emission sources have been identified as the most carbon intensive aspects of the Department's activities. These identified emission sources together with their associated emissions profiles can be seen in Table 1. The first carbon footprint report for the Department was compiled during the 2010/2011 financial year and thereafter repeated for the following years[1]. The total emissions for 2012/13 was calculated at 26 572.30 tons equating to a 17.98% increase year on year since 2011/2012 and a total increase of 36.34% from the baseline year (2010/2011)[2]. On a per capita[3] basis the total emissions for the baseline year (2010/2011) equalled 23.68 tons $CO_2e$ (total emissions = 19 488.23 tons). This per capita emission was significantly reduced in the following reporting year to 18.06 tons $CO_2e$ per capita and has remained fairly stable during the current reporting period (19.65 tons $CO_2e$ per capita).

In order to effectively measure progress towards the reduction in the Department's carbon footprint, it is imperative that the Department sets clear fixed targets in relation to reducing its carbon footprint. Only then will it be possible to see what measurable impact current initiatives have on the Carbon Footprint of the Department as it stands.

*Table 1: Summary results for 2012/2013 emission sources and contribution to the total carbon footprint*

| Scope | Category | Emissions(tons) | Contributions to total emissions |
|---|---|---|---|
| Scope 1 | Antarctic | 11 660.72 | 43.88 |
| | Departmental vehicles | 74.15 | 0.28 |
| | Refrigeration | 17.23 | 0.06 |
| | Air-conditioning (Owned by the Department) | 31.72 | 0.12 |
| Scope 2 | Electricity | 9 909.05 | 37.29 |
| Scope 3 | Generators | 0.29 | 0.00 |
| | Air travel | 2 354.51 | 8.86 |
| | Computers | 172.90 | 0.65 |
| | Lease vehicles | 15.29 | 0.06 |
| | Paper | 33.01 | 0.12 |
| | Rented vehicles | 318.05 | 1.20 |
| | Shuttle | 207.30 | 0.78 |
| | SMS vehicles | 94.68 | 0.36 |
| | Subsidised vehicle | 123.85 | 0.47 |
| | Air-conditioning (Owned by the Landlord) | 161.29 | 0.61 |
| | Staff commuting | 1 398.29 | 5.26 |
| **Total** | | **26 572.30** | **100** |
| **Total per capita** | | **19.65** | |

[1]For a comprehensive account of the emissions profile of the Department across all three reporting years please refer to Table 13 under Summary of Activity Results (Pg 45).
[2]The increase in the emissions profile between 2010/2011 and 2012/2013 can predominantly be ascribed to both fuel usage for the SA Aghulhas II grouped under the Antarctic category as well as an increase in emissions from electricity.
[3]Per capita values calculated based on the total number of active filled post during January of the reporting year (2010/2011 = 823; 2011/2012 = 1 247; 2012/2013 = 1 352).

During the previous reporting cycle (2011/2012) electricity was found to be the single highest contributing emission source, however the increased activity relating to the use of the SA Agulhas II has resulted in the Antarctic programme surpassing electricity as the highest contributor at 43.88% for the current reporting period. The current analysis has shown that approximately 93% of the entire emissions profile comes from the Antarctic programme (43.88%), Business travel (12.00%) and Electricity (37.29%) (Figure 1).

## Contributions to emissions by groupings of emission sources for three reporting years

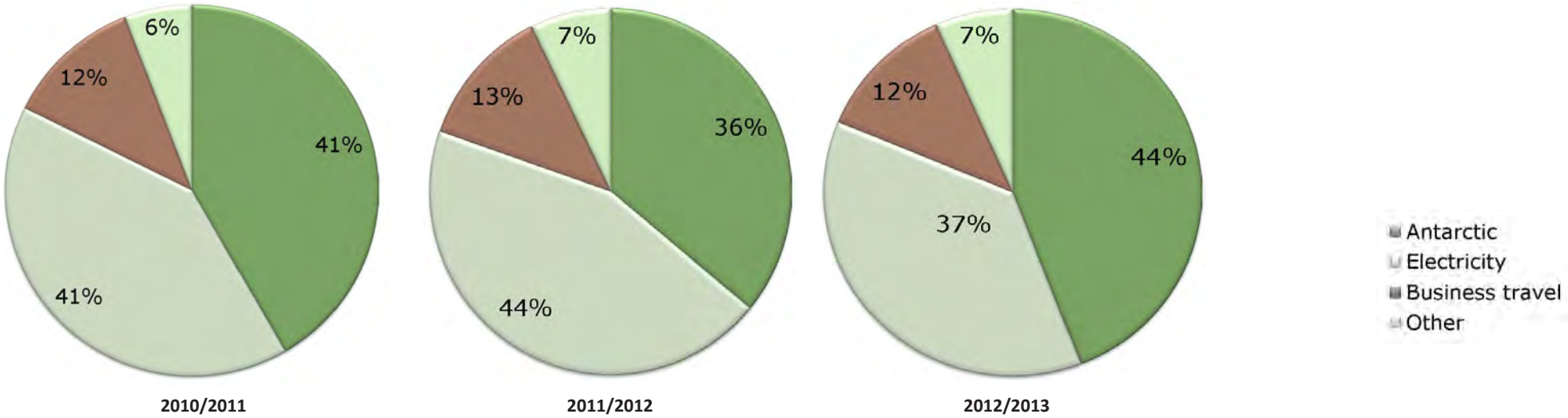


*Figure 1: Emissions source grouping contribution to the total carbon footprint for 2012/2013*[4]

[4]The Category "Other" includes emissions such as Employee Commuting, Air Conditioning, Refrigeration, Computers, Paper and Generators; Business travel is defined as emissions relating to: Departmental vehicles, rental vehicles, SMS own vehicle claims, subsidized vehicles, shuttle service and air travel; Antarctic includes emissions from the SA Aghulhas II as well as fuel usage at the three bases (Marion, Gough and the Antarctic base)

# INTRODUCTION

As the custodian of the South African environment, the Department of Environmental Affairs is obligated to identify, measure and act on the impacts that its activities may have on the country's environment. One available tool is the annual Carbon Footprint study. A carbon footprint can be defined as a calculation of the total greenhouse gas emissions caused both directly and indirectly by an organisation's activities and is typically measured and reported over a period of 12 months. The current report constitutes the third Carbon Footprint report commissioned by the Department and can be compared with the previous consecutively released reports (2010/11 and 2011/12).

The carbon footprint study aims to do a comprehensive audit analysis of the emission sources which are linked to the Departmental daily activities and the extent of carbon dioxide emissions as a result of these activities. The information obtained through this study ultimately supports decision making and the implementation of relevant programmes and actions that contribute to a reduction in the current emissions profile of the Department. The structure of the report focusses largely on identified emission sources, associated activity data and the ultimate calculation of emissions. Identified emission sources are grouped according to one of three scopes as guided by the Corporate Accounting and Reporting Standards developed under the Greenhouse Gas Protocol Initiative:

- *Scope 1* - Generated from activities or sources which the Department owns or controls;
- *Scope 2* - Electricity; and
- *Scope 3* - Emissions related to the department's activities that emanate from sources owned or controlled by a third party company.

The results obtained from the study allow the Department to investigate mechanisms and actions that would contribute to reducing the Department's Carbon Footprint. A discussion on these measures is presented at the end of this report.

The main objectives of the Carbon Footprint Initiative are:

- To improve the Departmental understanding of its emissions profile;
- To utilise the instrument as a planning tool for the Department as it develops long term cost effective strategies for reducing the institution's environmental impacts; and
- To apply the system as a model for government to account for its total emissions in order for all departments to collectively tackle the global climate change issue.

The Department of Environmental Affairs as a public organisation is aligned to the objectives of the National Climate Change Response Policy (NCCRP). The Department therefore has a responsibility to make a fair contribution to the global effort to stabilise GHG concentrations in the atmosphere so as to avoid dangerous anthropogenic interference with the climate system within a timeframe that enables economic, social and environmental development to proceed in a sustainable manner. The process of carbon footprint reporting is a tool to perform a much needed quantification and therefore provide an indication and measure of the amount of carbon dioxide equivalent ($CO_2e$) given off by burning fossil fuels such as petrol and natural gas by an individual or business as part of their operational activities. The main gases taken into account in carbon footprint assessments are:

- Carbon dioxide ($CO_2$) - burning fossil fuels;
- Carbon monoxide (CO) - burning fossil fuels;
- Methane ($CH_4$) - natural gas extractions;
- Nitrous Oxide ($N_2O$) - burning fossil fuels; and
- Ozone ($O_3$) in the lower atmosphere - reactions in pollutants released by transport and industry.

Climate change is a significant and lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. It is caused by radiation from the sun that heats the Earth's surface. When the surface is heated it gives off radiation to the atmosphere and space, some of which (infra-red radiation) is absorbed and held in the earth's atmosphere by Greenhouse Gases (GHGs) (Figure 2). Greenhouse Gases are trace gases comprising much less than 1% of the atmosphere and they arise from both natural processes and human-based activities.

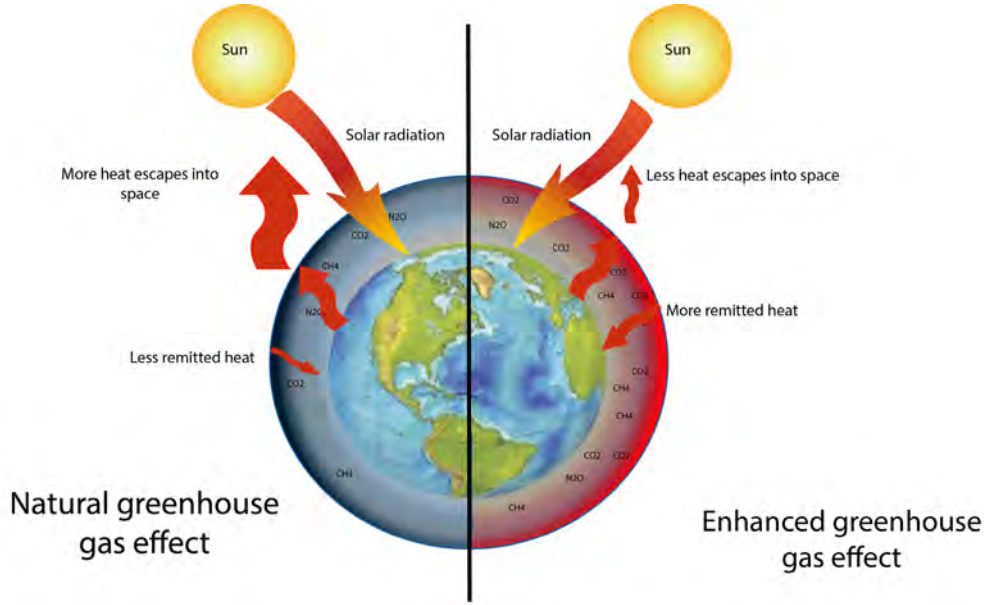


*Figure 2: Greenhouse gas effect*

A great number of private companies regularly report on their carbon footprint as part of their sustainability reporting initiatives. Unfortunately this is not the case in government. The Department of Environmental Affairs therefore hosted a carbon footprint information session in March 2013 to introduce selected sector departments to the concept of carbon footprint reporting and to capacitate departments in the methodology to be followed.

# GREENHOUSE GAS REPORTING PRINCIPLES

The Carbon Footprint audit is conducted on an annual basis and complies with the Corporate Accounting and Reporting Standard developed under the GHG Protocol Initiative. Compliance with this international standards ensures that the Department implements both international recognised methodology as well as that reporting is done on a set of recognised emission sources.

The following reporting principles were taken into account when conducting the current carbon footprint audit:

1. ***Relevance***: The current inventory appropriately reflects the GHG emissions of the Department, effort has been made to ensure that all main emission sources are included in the current analysis.
2. ***Completeness*:** All emission sources identified are accounted and reported for as defined by the boundaries and all exclusions are clearly defined.
3. ***Consistency*:** Consistent methodologies and sources for emission factors are used allowing for comparisons over time. Where changes in data, methodology, emission factors and boundary scopes occurred these are clearly stated and documented in the report.
4. ***Transparency*:** Where assumptions were made or values were substituted, clear direction of the changes and implications are listed in the report.
5. ***Accuracy*:** All relevant steps were taken to ensure that the quantification of emissions are neither over nor under actual emission values and all calculations performed in the study were verified.

# SCOPE AND METHODOLOGY

## Reporting period and base year

The reporting period for the current study is the 2012/2013 financial year starting on 1 April 2012 and ending on 31 March 2013. Two previous reports have been drafted for the preceding financial years. The initial report compiled in 2010/2011 is termed the baseline report[5].

## Organisational boundaries

The Department of Environmental Affairs takes full responsibility and owns all its operations and activities and therefore it has no subsidiaries. The application of either the control or equity share approach would thus yield the same result. The Minister and Deputy Minister of Water and Environmental Affairs oversee the work of Department of Environmental Affairs and Water Affairs. The offices for both the Minister and Deputy Minister are based at the Department of Water Affairs and will therefore not form part of the current analysis. Some administrative staff members affiliated to these offices are based at the Department of Environmental Affairs and have therefore been included in part in the current assessment.

[5]A base year is the historical year against which an institution's emissions are tracked and compared to over time.

## Structure and location

The mandate and core business of the Department of Environmental Affairs is underpinned by the Constitution and all other relevant environmental legislation such as the National Environmental Management Acts and policies. The Department of Environmental Affairs is mandated to ensure the protection of the environment and conservation of natural resources, balanced with sustainable development and the equitable distribution of the benefits derived from natural resources. In its quest for better use and management of the natural environment, the Department of Environmental Affairs is guided by its constitutional mandate, as contained in section 24 of the Constitution[6]. To achieve this mandate, various organisational structures have been established to deliver the mandate, vision and the mission of the Department as indicated in Figure 3.

Furthermore it is important to note that the extent of the current assessment covers all buildings leased by the Department[7]. Where DEA officials co-inhabit an office with another government Department (and that Department is the main lessee of the premises) emission sources have only been included in part as some emission sources would contribute to the footprint of the lead department. The Department occupies both National and Regional offices. The majority of DEA officials are based in Pretoria together with the Institutional Head (Director General). Some officials in the branches Environmental Programmes and Oceans and Coasts are based in Cape Town. Officials in the branch Oceans and Coast are based at one of two buildings in Cape Town. One of these building is leased by the Department whilst the other is leased by the Department of Agriculture, Forestry and Fisheries. It should also be noted that the DEA public entities (South African National Biodiversity Institute, South African National Parks, South African Weather Service, iSimangaliso Wetland Park) have not been included under the assessments. The Carbon Footprint audit for 2012/2013 on the various branches and their regional offices as shown below (Figure 3), a description of the reasons for partial inclusion of some components are provided in Table 2.

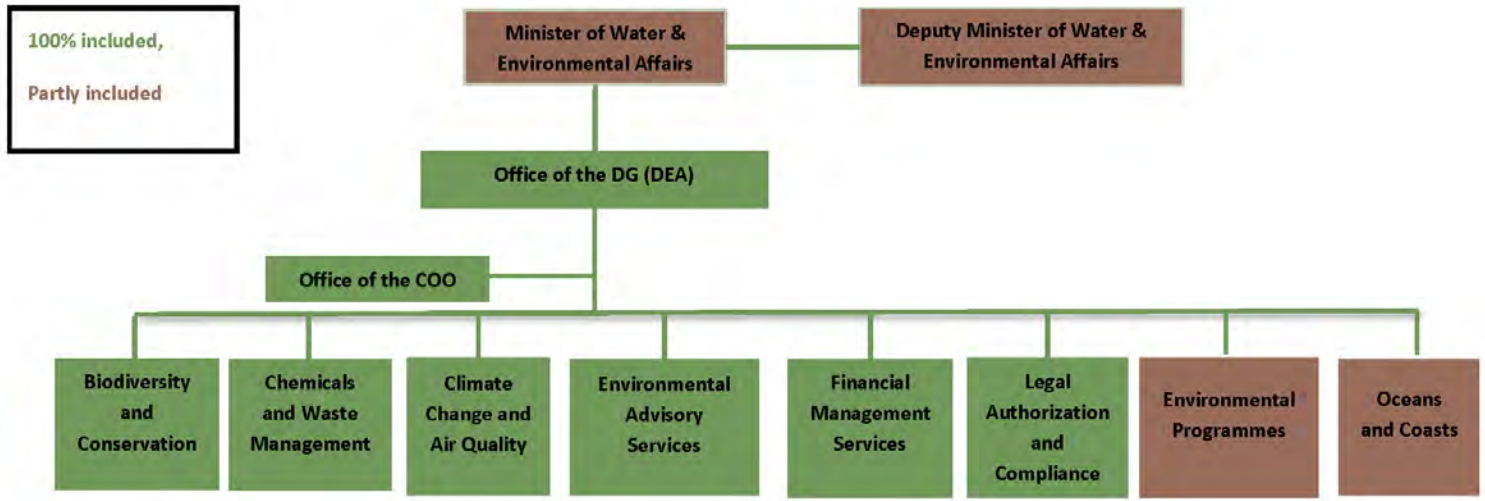


*Figure 3: Organisational structure and reporting boundaries*

[6]Section 24 of the Constitution states: Everyone has the right-(a) to an environment that is not harmful to their health or well-being; and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that-(i) prevent pollution and ecological degradation;(ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

[7]Lease offices include: DEA Pretoria office, the office occupied by the Environmental Programmes branch at 14 Loop Street in Cape Town, the office occupied by the branch Oceans and Coasts at East Pier in Cape Town and various regional offices.

## Operational boundaries

To adhere to the principle of accuracy under the GHG reporting principles, the Department of Environmental Affairs had set actual boundaries of the organisation that generate emissions from a variety of activities and sources which need to be included for the calculations (Table 2).

According to the Greenhouse Gas protocol, all emissions emanating from Departmental activities and operations were divided into three scopes. Scope 1 includes all direct emissions sources that are owned by the Department. Scope 2 includes emissions related to electricity usage. Scope 3 includes all indirect emission sources (emission sources that are linked to activities that are not owned by the Department). The GHG protocol requires that all direct emissions be accounted for and reported under scope 1.

According to the GHG protocol and reporting it is imperative to note that scope 1 and scope 2 emissions are compulsory and all other emission sources are reported on a voluntary basis and included in scope 3.

*Table 2: Emission sources identified and reported on*

| Scope and Emission sources | Reported on in 2010/2011 report | Reported on in 2011/2012 report | Reported on in current (2012/2013) report |
|---|---|---|---|
| Departmental vehicles | ✓ | ✓ | ✓ |
| Air Conditioning units | ✓ | ✓ (Oceans and Coasts excluded) | ✓ |
| Refrigeration units | ✓ | ✓ | ✓ |
| Antarctic programme | ✓ | ✓ | ✓ |
| Generators | ✓ | ✓ | ✓ |
| Electricity | ✓ | ✓ (EP regional offices excluded) | ✓(EP regional offices excluded, contribution to electricity usage for Foretrust building in Cape Town for Oceans and Coasts excluded) |
| Rental vehicles | ✓ | ✓ | ✓ |
| Subsidised vehicles | ✓ | ✓ | ✓ |
| Lease vehicles | x (no lease vehicles in Department) | ✓ | ✓ |
| Shuttle transport | ✓ | ✓ | ✓ |
| Paper | ✓ | ✓ (Oceans and Coasts and EP regional offices excluded) | ✓ |
| Computers | ✓ | ✓ | ✓ |
| SMS own vehicle claims | ✓ | ✓ | ✓ |
| Air travel | ✓ | ✓(Minister and Deputy Minister excluded) | ✓ (Minister and Deputy Minister excluded) |
| Employee commuting[8] | ✓ | ✓ (Estimated values from baseline study used)[9] | ✓ (Estimated values from baseline study used) |

[8]During the 2010/2011 study a total of 823 employees were calculated to emit 851.18 tons $CO_2$e during their daily commute, looking at a per capita emission rate this would translate to 1.034 tons $CO_2$e. Using the per capita rate it can therefore be calculated that the estimated emissions related to staff commuting for 2011/2012 for 1 247 staff members would be 1 289.69 tons $CO_2$e and for the 2012/2013 reporting period for 1 352 staff members would be 1 398.29 tons $CO_2$e.

[9]Previous employee commuting studies have shown that emissions linked to this source remained fairly constant over time, due to this fact the employee commuting study was not replicated for the current study and the value obtained for the baseline year was used as an estimate for the following years.

## Calculation methodology

To determine which emission sources need to be included in the Carbon Footprint calculation, a comprehensive analysis of all business activities of the Department was undertaken. A selection of the identified emission sources for inclusion was then subsequently made based on the principle of completeness and relevance as per the guiding Greenhouse gas reporting principles. For each emission source the appropriate activity data[10] was sourced and placed in a format where calculations could be performed. As there is no central data repository within the Department activity data was sourced from various business units within the Department and external service providers (Table 3).

*Table 3: Activity data and data providers for each emission source reported on*

| Emission source | Activity data |
|---|---|
| Air travel | Routing details of all flights |
| SMS own vehicle claims | Km and vehicle details |
| Subsidised vehicles | |
| Departmental vehicles | |
| Lease vehicles | |
| Rental vehicles | |
| Shuttle | |
| Antarctic programme | Km or Litres and type of fuel used |
| Paper | Number of reams used and recycled |
| Computers | Number of systems |
| Refrigeration | Number of units, refrigerant type and charge |
| Air conditioning | Number of units, refrigerant type and charge, whether system is owned by the Department or Landlord |
| Generators | Litres fuel used |
| Electricity | Expenditure or kWh used |
| Employee Commuting | Km and method of travel |

*Final calculations are made by multiplying the activity data by the appropriate emissions factor i.e.:*

***Activity data X emission factor = total emissions***

Total emissions are reported on in terms of tons Carbon Dioxide equivalent[11]

[10]Quantification of data for a particular emission source i.e. km travelled, kWh electricity consumed.
[11]A Carbon dioxide equivalent ($CO_2e$) is a unit of measure which allows different greenhouse gases to be compared on a like for like basis relative to one unit of $CO_2$ Assessment results

## Emission Factors

Emission factors convert activity data into a value indicating carbon dioxide equivalent emissions, generated by that particular activity. Most emission factors are revised on an annual basis. Emission factors used in the calculation process are updated on an annual basis. Table 4 shows emission factors used in the 2012/2013 assessment and where they were obtained from.

*Table 4: Emission Factors 2012/2013*

| | Unit | Emission Factor 2010/2011 | Emission factor 2011/2012 | Emission Factor 2012/2013 | Source |
|---|---|---|---|---|---|
| **Vehicle travel** | | | | | |
| Small Petrol (≥ 1.4) | Kg $CO_2$e/Km | 0.14 | 0.15 | 0.16 | DEFRA 2013 |
| Medium Petrol (1.4 < X ≥ 2.0) | Kg $CO_2$e/Km | 0.18 | 0.18 | 0.20 | DEFRA 2013 |
| Large Petrol (2.0<) | Kg $CO_2$e/Km | 0.24 | 0.24 | 0.30 | DEFRA 2013 |
| Small Diesel (> 1.7) | Kg $CO_2$e/Km | 0.17 | 0.17 | 0.14 | DEFRA 2013 |
| Medium Diesel (1.7 =< X ≥ 2.0) | Kg $CO_2$e/Km | 0.21 | 0.21 | 0.17 | DEFRA 2013 |
| Large Diesel (2.0 <) | Kg $CO_2$e/Km | 0.30 | 0.30 | 0.23 | DEFRA 2013 |
| | | | | | |
| **Air travel** | | | | | |
| Short (<463km) | Kg $CO_2$e/Km | 0.15 | 0.16 | 0.17 | DEFRA 2013 |
| Medium (463<x<3 700km) | Kg $CO_2$e/Km | 0.12 | 0.10 | 0.10 | DEFRA 2013 |
| Long (>3 700km) | Kg $CO_2$e/Km | 0.11 | 0.11 | 0.12 | DEFRA 2013 |
| | | | | | |
| Paper | Kg $CO_2$e/Ton | 1.03 | 1.03 | 0.93 | MONDI 2010 |
| | | | | | |
| Air conditioning and refrigeration | See DEFRA tables (Annexure 1) | See DEFRA tables (Annexure 1) | See DEFRA tables (Annexure 1) | See DEFRA tables (Annexure 1) | DEFRA 2013 |
| | | | | | |
| **Fuel usage** | | | | | |
| Petrol | Kg $CO_2$e/litre | | | 2.31 | DEFRA 2013 |
| Diesel | Kg $CO_2$e/litre | | | 2.67 | DEFRA 2013 |
| Aviation fuel | Kg $CO_2$e/litre | | | 2.54 | DEFRA 2013 |
| **Computers** | | | | | |
| Computers | Kg/Unit/year | 65 | 65 | 65 | Williams 2003 |
| **Electricity** | | | | | |
| Electricity | Kg/kWh | 1.03 | 0.99 | 1.00 | ESKOM 2013 |

# ASSESSMENT RESULTS

## Scope 1

***(Total emissions = 11 783.82 tons $CO_2e$, 8.72 tons $CO_2e$ per capita , 44.35% of total Carbon Footprint)***

Scope 1 emission sources are termed "direct" emission sources as they comprise all activities which lead to the emission of greenhouse gasses which are owned by the entity being assessed. To this end the following activities were included under this scope:

- Departmental vehicles
- Antarctic program
- Refrigeration
- Air Conditioning units (Owned by the Department).

### Departmental vehicles

***(Total emissions = 74.15 tons $CO_2e$, 0.05 tons $CO_2e$ per capita, contribution to total emissions = 0.28%)***

Departmental vehicles are vehicles which are owned by the Department (hence grouped under scope 1). These vehicles are available for use by all Departmental officials to attend meetings and other business related activities. During the 2012/2013 reporting year 325 720km were travelled resulting in an emission of 74.15 tons $CO_2e$.

Emissions related to the use of Departmental vehicles have continued to increase during the three reporting periods nearly doubling in extent from the initial calculation of 40 tons $CO_2e$ in the baseline year to the current value of 74.15 tons $CO_2e$. On a per capita basis the total emissions marginally increased from 0.049 tons $CO_2e$ in the baseline year to 0.051 tons $CO_2e$ in the following year (2011/2012) and finally reaching 0.055 tons $CO_2e$ tons for the current reporting year. Throughout the three reporting periods, medium petrol vehicles continue to contribute the majority of the distance (and associated emissions) to the Departmental vehicles' emissions profile (Figure 4). Vehicles in this category contributed 56% (184 008km) of the total distance and 50% (37.70 tons) of the total $CO_2e$ emissions for this emission source.

With increased usage of the newly acquired DEA green vehicles a dramatic change in Departmental vehicle emissions are expected. For the forthcoming report (2013/2014 financial year) emissions related to the use of these green vehicles will be captured (included) under emissions related to electricity usage as these vehicles will be powered off the national grid, however once occupation of the DEA green building takes place these vehicles will be powered from electricity provided by solar panels.

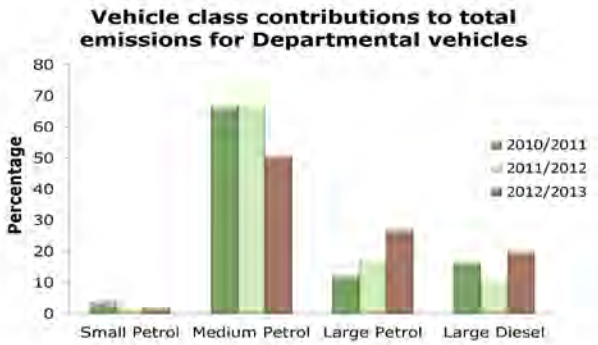


*Figure 4: Contribution of vehicle categories to the emissions profile of Departmental vehicles*

Although medium petrol vehicles still remain the highest contributor to Departmental vehicle emissions there has been an increase in the emissions associated with the use of both large petrol and large diesel vehicles, both of which has shown approximately a 100% increase compared to the previous reporting year (2011/2012) (Figure 4). Summary trends have shown that the Departmental vehicle emissions have been on a steady increase for the three reported periods (Figure 5).

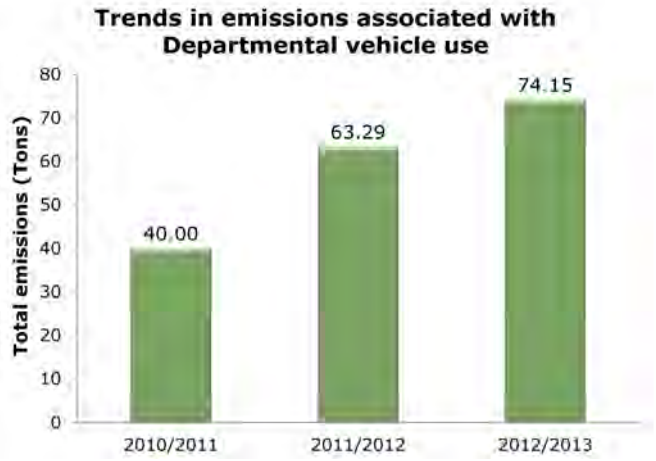


*Figure 5: Trends in emissions linked to Departmental vehicle use for three reporting periods*


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086 111 2468
Zero Emission

## Refrigeration

***(Total emissions = 17.23 tons $CO_2e$, 0.01 tons $CO_2e$ per capita, contribution to total emissions = 0.06%)***

The asset register of the Department shows that during the 2012/2013 financial year the Department owned a total of 306 refrigeration units. These comprise of both units used for domestic purposes as well as industrial purposes. For units where specific details were available such as the refrigerant type, and charge of the refrigerant the DEFRA calculation tables were used to determine the annual leakage rates. Together with the global warming potential (GWP)[12] of the specific refrigerant used, the total emissions of the unit could be calculated. In those instances (majority of refrigeration units used for domestic purposes) where detailed specifics were not available the assumption was made that the unit was filled with R22 gas at a charge of 0.47kg[13]. Industrial units contribute a total of 96% of the total emissions linked to refrigeration. These units contain a substantial refrigerant change with increased global warming potentials. The number of units within the Department has been on a steady increase since 2010/2011 (178, 286 and 306 respectively). Figure 6 shows that although there has been a considerable increase in the number of units between the last two reporting years (286 versus 306), the total emissions have only increased slightly (17.21 tons $CO_2e$ versus 17.23 tons $CO_2e$). The reasons for this finding can be attributed to the fact that the increase in refrigeration numbers were for domestic units and as these units only contribute about 4% of the total emissions, this increase in number will not have a parallel increase in emissions.

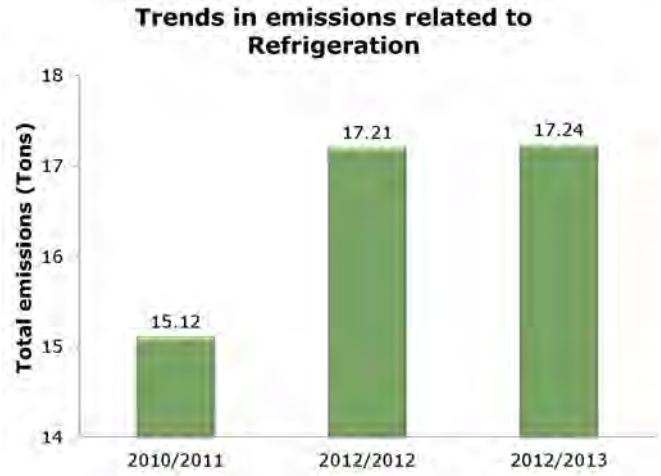



*Figure 6: Trends in emissions related to Refrigeration equipment*

[12] The Global Warming Potential is the same impact one molecule of a gas would have as x molecules of $CO_2$.

[13] It should be noted that these assumptions would have an impact on the accuracy of the calculations but in the absence of specific information this method would give the best indication of emissions linked to these units.

## Air conditioning

***(Total emissions = 31.72 tons $CO_2e$, 0.02 tons $CO_2e$ per capita, contribution to total emissions = 0.12%)***

Air conditioning systems in the Department can be divided into the following two categories.

1. Units which are owned by the Department
2. Units which are owned by the landlord

According to the greenhouse gas reporting principles only the values for units owned by the Department are reported on under this scope. Those units belonging to the landlord are reported on under scope 3 (indirect emission scope). Calculation methodologies for both types of groupings are however the same.

All units owned by the department were filled with R22 gas and charged with 3.54kg refrigerant.

During 2012/2013 the department owned a total of 165 units[14]. This is a considerable increase in the number of units from 64 in 2010/2011 and 56 in 2011/2013. Together with the increase in number of units, emissions related to these units increased to 31.72 tons $CO_2e$ (Table 5).

*Table 5: Summary statistics for Air conditioning units (Owned by the Department)*

| Year | Number of units | Emissions (Tons) |
|---|---|---|
| 2010/2011 | 64 | 10.43 |
| 2011/2012 | 56 | 6.84 |
| 2012/2013 | 165 | 31.72 |

[14]All air conditioning units in the Branch: Oceans and Coasts are the property of the landlord and therefore reported on under scope 3.

## Antarctic programme

***(Total emissions = 11 660.71 tons $CO_2e$ , 8.62 tons $CO_2e$ per capita, contribution to total emissions = 43.88%)***

Activity data for this emission source is not captured on an annual basis and therefore necessitates the repeated use of values for those years where information is not available. To this end the following activity data sourced for preceding years have been used to do calculations for the 2012/2013 financial year[15].

- Generators at the Antarctic base
- Generators at Marion island
- Generators at Gough island

Calculations for the Antarctic emission source include fuel usage for generators, vehicles and helicopters as well as fuel used to power the SA Agulhas II vessel. The SA Agulhas II is an icebreaking polar supply and research vessel which is owned by the Department. During April 2012 this vessel replaced the ageing SA Agulhas I ship which was used since 1978. The SA Agulhas I was subsequently re-commissioned as a training ship operated by the South African Maritime Safety Authority. The new SA Agulhas II vessel was specifically designed to carry out both scientific research and also supply the South African research stations.

The emissions associated with the use of the SA Agulhas II vessel contribute the majority of the emissions for the Antarctic emission source and amounted to 9 400 tons $CO_2e$ resulting in a 58% increase year on year.

An estimated total of 54 100 litres of aviation fuel was used by the department in 2012/2013 whilst conducting its mandated duties. This is only a marginal increase in the amount of fuel used in the 2010/2011 financial year[16].

Total emissions linked to the Antarctic programme amounted to 11 660.71 tons $CO_2e$ (8.62 tons $CO_2e$ per capita) compared to 8 102.06 (6.50 tons $CO_2e$ per capita) tons for the previous reporting year (Table 6). On a percentage basis emissions associated with this emission source has increased by 44%.

South Africa is the only African country to be one of the founding members of the Antarctic Treaty[17]. Signatories to the Antarctic Treaty agree that the Antarctic continent will be used for peaceful and scientific purposes only[18]. South Africa also maintains bases at Gough and Marion islands. Research expeditions are undertaken by the South African National Antarctic Expedition (SANAE) with important scientific research taking place under the auspices of the SANAP[19]. The mission of the SANAP is to increase the understanding of the natural environment and life in the Antarctic and Southern Ocean through science and technology[20]. Research undertaken at the three bases includes upper air research (cosmic rays) and earth sciences at the Antarctic base (SANAE IV) whereas meteorological observations are made at both Gough and Marion Islands. Currently Marion Island also supports research programmes in the fields of oceanography, biology and geology.

[15]Due to the fact that emission factors are updated on a yearly basis the repeated use of activity data across varying years will have different emissions.
[16]No values for aviation fuel provided for the 2011/2012 financial year and thus values for 2010/2013 used as estimated values.
[17]Signed in 1959 with 11 other countries.
[18]Information from the National Research Foundation available form http://www.nrf.ac.za/projects.php?pid=39 accessed on 6 August 2013 at 13:00.
[19]Information from https://www.comnap.aq/Members/SANAP/SitePages/Home.aspx accessed on 6 August 2013 at 13:10.
[20]Accessed from http://www.sanap.ac.za/ 6 August 2013.


S. A. AGULHAS II
CAPE TOWN

The SA Aghulhas II is considerably larger when compared to its predecessor with a gross tonnage of 12 897 tons compared to the SA Agulhas I's gross tonnage of 6 123 tons. Besides the difference in tonnage the time spent at sea has also increased with the SA Agulhas II spending an estimated 175 days at sea during 2012/2013 compared to 152 days spent by the SA Agulhas I during the 2011/2012 reporting period. Fuel consumption data has shown a considerable increase in fuel usage since the previous reporting period from an estimated 2 230 800 litres[21] to 3 520 000 litres. On a tonnage basis the fuel usage amounts to 272.93 litres per ton for the SA Agulhas II compared to 364.33 litres per ton for the SA Agulhas I vessel.

*Table 6: Summary statistics related to the Antarctic programme*

| Type | | 2010/2011 | | 2011/2012 | | 2012/2013 | |
|---|---|---|---|---|---|---|---|
| | | Consumption (litres) | Emissions (tons) | Consumption (litres) | Emissions (tons) | Consumption (litres) | Emissions (tons) |
| **Aviation gasoline** | Aviation gasoline | 53 827 | 137.14 | 53 827 | 137.3 | 54 100 | 137.51 |
| **SA Agulhas** | Arctic diesel | 2 230 800 | 5 960.70 | 2 230 800 | 5 950.88 | 3 520 000 | 9 400.16 |
| **Antarctic base** | Polar diesel (generators) | 275 000 | 734.80 | 275 000 | 733.59 | 275 000 | 734.39 |
| | Polar diesel (vehicles) | 80 000 | 213.76 | 80 000 | 213.41 | 120 000 | 320.46 |
| **Marion** | Polar diesel (generators) | 300 000 | 801.60 | 300 000 | 800.28 | 300 000 | 801.15 |
| **Gough** | Polar diesel - generators | 100 000 | 267.20 | 100 000 | 266.76 | 100 000 | 267.05 |
| **GRAND TOTAL** | | **3 039 627** | **8 115.20** | **3 039 627** | **8 102.06** | **4 369 100** | **11 660.72** |
| **Total per capita** | | | **9.86** | | **6.50** | | **8.62** |

[21]Fuel usage for the SA Agulhas I for the 2011/2012 reporting year.

## Scope 2

The sole emission source reported on under scope 2 is purchased electricity. This emission source has historically been found to be one of the major contributors to an institution's carbon footprint and therefore provides the greatest reduction opportunity.

## Electricity

***(Total emissions = 9 909.05 tons $CO_2e$, 7.33 tons $CO_2e$ per capita, contribution to total emissions = 37.29%)***

Information regarding electricity usage within the DEA in Pretoria is obtained through payment records. No electricity usage data is included in the billing information received by the Department and thus it is not possible to extract actual primary electricity usage information. Payment records are used together with the electricity tariffs to calculate the electricity usage in kWh. Electricity usage information as well as the electricity emissions profile for the last three reporting periods are reflected in Table 7.

*Table 7: Electricity consumption and associated emissions for all offices*

| Office | 2010/2011 | | | 2011/2012 | | | 2012/2013 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Consumption (kWh) | Emissions (Tons) | % Contribution | Consumption (kWh) | Emissions (Tons) | % Contribution | Consumption (kWh) | Emissions (Tons) | % Contribution |
| Pretoria | 5 916 648 | 6 094.15 | 76.85 | 7 832 057 | 7 753.74 | 77.64 | 8 337 345 | 8 337.34 | 84.14 |
| V & A Waterfront, Cape Town | 640 621 | 659.84 | 8.32 | 1 856 549 | 1 837.98 | 18.40 | 1 143 111 | 1 143.11 | 11.54 |
| 14 Loop Street, Cape Town | Not part of Department | | | 187 140 | 185.27 | 1.86 | 210 558 | 210.56 | 2.12 |
| Durban | 58 654 | 604.14 | 7.62 | 78 416 | 77.63 | 0.78 | 79 837 | 79.84 | 0.81 |
| Nelspruit | Not part of Department | | | | | | 57 687 | 57.69 | 0.58 |
| Mmabatho | 29 012 | 298.82 | 3.77 | 37 868 | 37.49 | 0.38 | 35 067 | 35.07 | 0.35 |
| Upington | 9 538 | 98.24 | 1.24 | 24 021 | 23.78 | 0.24 | 12 518 | 12.52 | 0.13 |
| Rondebosch | 1 909 | 19.66 | 0.25 | 10 513 | 10.41 | 0.10 | 10 189 | 10.19 | 0.10 |
| Bloemfontein | 3 745 | 38.58 | 0.49 | 16 234 | 16.07 | 0.16 | 8 231 | 8.23 | 0.08 |
| Umtata | No information available | | | 28 875 | 28.59 | 0.29 | 7 898 | 7.90 | 0.08 |
| Springbok | 2 597 | 26.75 | 0.34 | 4 315 | 4.27 | 0.04 | 6 607 | 6.61 | 0.07 |
| East London | 7 827 | 80.62 | 1.02 | 12 274 | 12.15 | 0.12 | No information available | | |
| Grahamstown | 873 | 8.99 | 0.11 | No longer part of Department | | | | | |
| **Total** | **6 671 424** | **7 929.79** | **100.00** | **10 088 26** | **9 987.38** | **100.00** | **9 909 05** | **9 909.05** | **100.00** |
| **Total per capita** | | **9.64** | | | **8.01** | | | **7.33** | |

The Pretoria office remained the office with the highest electricity consumption and contributed 84% to the total electricity emissions profile for 2012/2013. This office has shown an increase in electricity consumption for the last three reporting years (5 916 648 in 2010/2011, 7 832 057 in 2011/2012 and 8 337 345 in 2012/2013).

Emissions related to electricity usage have been found to be one of the top two contributors to the Department's Carbon Footprint[22] for the past three years. Observations have shown a dramatic increase in electricity consumed between 2010/2011 and 2011/2012, however this consumption pattern has decreased between the years 2011/2012 and 2012/2013[23] (Table 7). Electricity contributed a total of 9 909.05 tons $CO_2$e to the DEA's carbon footprint (Figure 7). Even though there has been an increase in the absolute emissions related to electricity usage it is evident that on a per capita basis emissions have been on a decline from 9.64 tons $CO_2$e (2010/2011) to 8.01 tons $CO_2$e (2011/2012) to a final value of 7.33 tons $CO_2$e for the current reporting period.

Electricity usage is calculated from billing accounts received by the Department for all offices except for 14 Loop Street, Cape Town which is occupied by some officials in the Branch: Environmental Programmes since their billing accounts have primary electricity usage information that could not be extracted for calculation purposes[24]. The consumption values used for the office at 14 Loop Street, Cape Town is thus more accurate than the calculated values used for the remainder of the DEA offices. It is recommended that concerted efforts be made to obtain the actual consumption values for all DEA offices which will contribute to the accuracy of the electricity emission calculations.

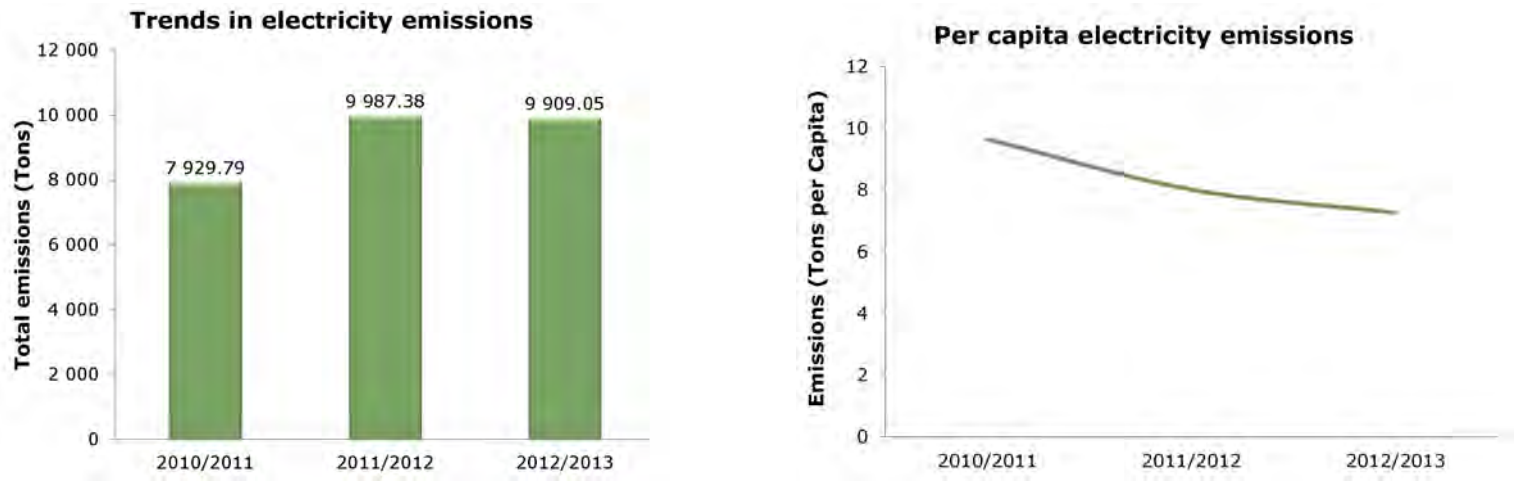



*Figure 7: Electricity emissions (Total and per capita)*

[22]Highest contributor amounting to 44.98% of the Department's total carbon footprint for 2011/2012 followed by the Antarctic programme.
[23]Decrease of 179 211kWh from 10 088 260 to 9 909 049 in 2012/2013 reporting year.
[24]No information could be provided for the months of April 2012, May 2012 and March 2013, however it was noted that the monthly electricity usage remained fairly constant over the reporting period and thus average consumption values were imputed for these months to allow for an annual calculation.

## Scope 3

***(Total emissions = 4 879.47 tons $CO_2$e, 3.61 tons $CO_2$e per capita, contribution to total emissions = 18.36%)***

Scope 3 emission sources pertain to all those sources which are not directly owned by the Department, however the usage of which contributes to the Department's carbon footprint. This scope is thus referred to as the "indirect" scope and comprises of the following emission sources.

Emission sources discussed under scope 3 include:

- Air travel
- Rental vehicles
- Lease vehicles
- SMS own vehicle claims
- Shuttle service
- Paper
- Air conditioning (Owned by the landlord)
- Generators
- Computers
- Subsidized vehicles
- Employee commuting

## Air travel

***(Total emissions = 2 354.51 tons $CO_2$e, 1.74 tons $CO_2$ e per capita, contribution to total emissions = 8.86%)***

*Calculations only include flights which were paid for by the Department and therefore exclude sponsored flights, calculations further do not take into account the travel class of officials.*

The majority of emissions linked to business travel are contributed by air travel. The nature of the functions of the Department necessitates the attendance of both domestic and international meetings, conferences and workshops. Emission factors for air travel have been edited as per updated emission factors from DEFRA. One important change is the new categorisation of emission factors for Short, Medium and Long trips[25]. Due to this revision in flight categories it is not advisable to do a direct comparison for emissions per category per year.

Department of Environmental Affairs employees travelled a total of 20 917 830km during the reporting period resulting in the emission of 2 354.51 tons $CO_2e$ (Table 8).

*Table 8: Summary statistics for air travel*

| Category | 2010/2011 | | | | 2011/2012 | | | | 2012/2013 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Distance (Total) | Emission (Total) | % Contribution Distance | % Contribution Emissions | Distance (Total) | Emission (Total) | % Contribution Distance | % Contribution Emissions | Distance (Total) | Emission (Total) | % Contribution Distance | % Contribution Emissions |
| Long | 12 271 470 | 1 511.48 | 81.96 | 82.09 | 13 113 696 | 1 593.20 | 78.90 | 79.15 | 8 051 016 | 964.37 | 38.49 | 8.34 |
| Medium | 2 154 867 | 227.83 | 14.39 | 12.37 | 2 840 027 | 299.78 | 17.09 | 14.89 | 11 730 003 | 1 193.74 | 56.08 | 50.70 |
| Short | 545 392 | 101.95 | 3.64 | 5.54 | 667 382 | 119.91 | 4.02 | 5.96 | 1 136 811 | 196.39 | 5.43 | 40.96 |
| **Total** | **14 971 729** | **1 841.26** | **100.00** | **100.00** | **16 621 105** | **2 012.89** | **100.00** | **100.00** | **20 917 830** | **2 354.51** | **100.00** | **100.00** |
| **Total per capita** | | **2.24** | | | | **1.61** | | | | **1.74** | | |

Due to the restructuring of the distance categories (see footnote 25) the emissions profile linked to the three categories of air travel has changed significantly in the current assessment compared to the previous assessment years (Figure 8).

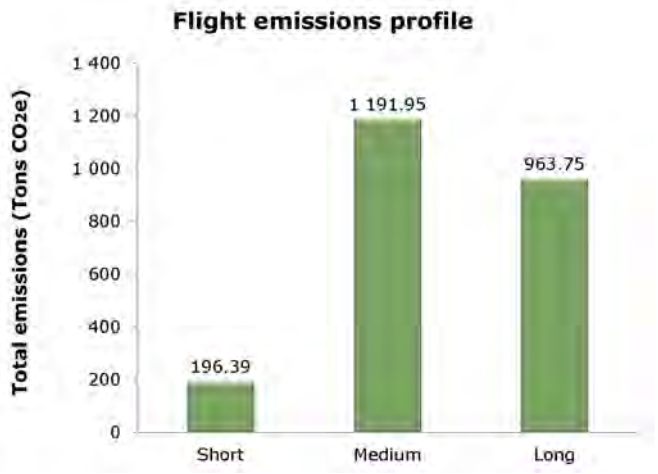



*Figure 8: Total emissions disaggregated by flight category*

[25]During the 2011/2012 reporting cycle short transfers were less than 463km, medium transfers more than 463km but less than 1 108km and long transfers more than 1 108km. These categories have been revised to short transfers less than 463km, medium transfers more than 463km but less than 3 700km and long transfers above 3 700km. The impact of the new categories amounts to a 6% decrease in the total $CO_2e$ as a result of air travel.

Domestic travel contributed the majority of air travel related emissions (Table 9). New regulations and guidelines adopted in December 2013 that detail retrictions on air travel (with specific focus on domestic travel) together with the continued implementation and usage of electronic communcation tools such as Skype and video conferencing will inevitably have an impact on the current incidences of air travel in the Department.

*Table 9: Summary statistics of domestic versus international travel for 2012/2013*[26]

| Route | Distance | Emissions | Percentage emissions |
|---|---|---|---|
| Domestic | 12 103 107 | 1 307.58 | 55.54 |
| International | 8 814 723 | 1 046.93 | 44.46 |
| **Total** | **20 917 830** | **2 354.51** | **100** |

## Rental vehicles

***(Total emissions = 318.05 tons $CO_2e$, 0.24 tons $CO_2e$ per capita, contribution to total emissions = 1.20%)***

The total distance covered by rental vehicles during the reporting period amounts to 1 833 053km resulting in the emission of 318 tons $CO_2e$ contributing 9.2% to the total emissions under scope 3 (Figure 10). The Department has a strict transport policy which provides guidelines on the usage of various methods of travel. The policy further provides very clear rules on the vehicle classes that may be rented by officials on different levels within the Department. It is therefore not surprising that small petrol vehicles contributed 76% to the total distance covered (increased from 630 371km travelled in 2010/2011 to 1 387 481km in 2012/2013) which ultimately translates to a 71% of the total emissions related to rental vehicle usage (Figure 9). Looking at the contribution of vehicle categories to the total emissions of rental vehicles, small and medium vehicles have continually contributed the majority of the share to the total emissions. There has been a significant increase in the distance covered from 2010/2011 to 2012/2013 (total distance covered 2010/2011 = 846 084km versus total distance covered 2012/2013 1 833 035km). Despite the total increase in distance travelled there has been a decrease in the distance travelled by large petrol vehicles from 42 700km in 2010/2011 to 12 343km in 2012/2013 translating to a decrease in emissions from 12.77 tons $CO_2e$ to 3.66 tons $CO_2e$.

[26]Domestic travel refers to all travel activities within the boundaries of South Africa whereas international travel includes all travel activities that extend beyond the borders of the country

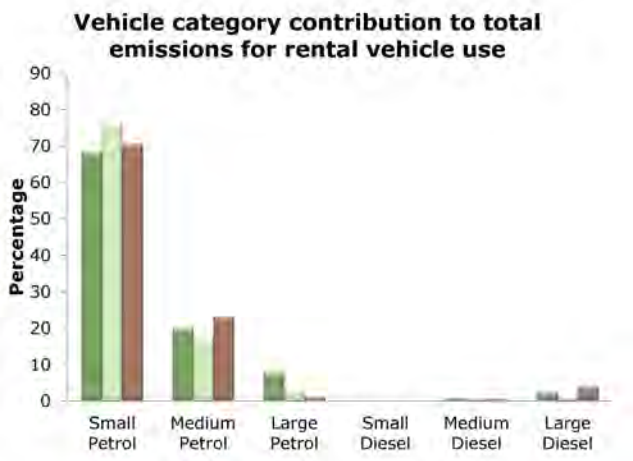
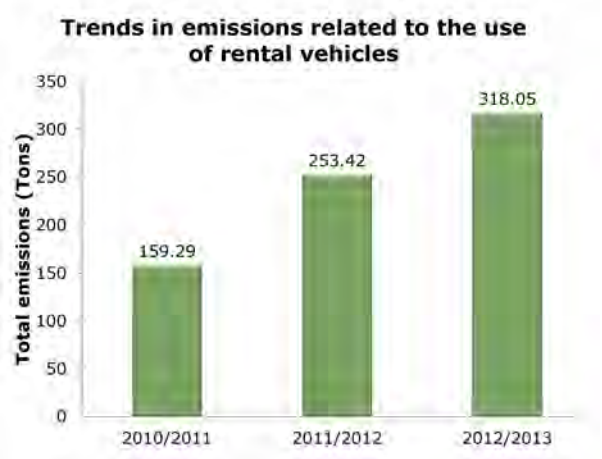



*Figure 9: Contribution of different vehicle categories to the total emissions for rental vehicles over three reporting periods*



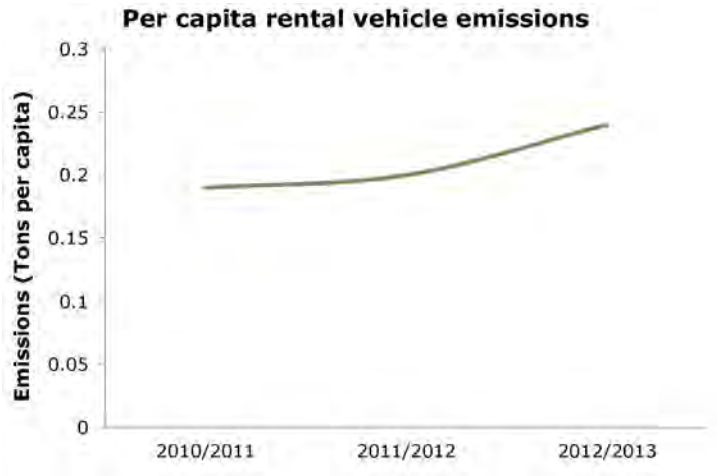




*Figure 10: Trends in emissions related to rental vehicle usage for three reporting periods (Total and per capita)*

## SMS own vehicle claims

***(Total emissions = 94.69 tons $CO_2e$, 0.07 tons $CO_2e$ per capita, contribution to total emissions = 0.36%)***

Senior Management Services (SMS) in the Department are allowed to use their personal vehicles when attending business related meetings and workshops. Monthly claim forms completed by all SMS' who used personal transportation are captured and used in the calculation process. A total of 422 416km were travelled resulting in a total emission of 94.69 tons $CO_2e$ (Figure 12). Due to a revision in the emission factors, the total emissions for the current reporting period show a decline compared to the emissions for 2011/2012 although there has been a slight increase in the distance travelled. Another contributing aspect might be that smaller vehicle categories (with relative smaller emissions factors) are being used (Figure 11). Figure 11 clearly indicates that there has been a decline in the total contributions that the large petrol vehicle category has made to the total emissions over the last three reporting periods. Whilst the contribution to the total emissions in the small petrol, medium petrol and medium diesel categories show an increasing trend. Medium petrol vehicles were found to be the main contributor to the total distance covered (41.54%, 175 477km) as well as the total emissions (37.97%, 35.96 tons $CO_2e$). It should be noted that the calculations performed here only include travel by SMS members and therefore there might be a few instances where non-SMS members used their personal vehicles during the execution of their duties, these instances are very rare though and were not included in the calculations.

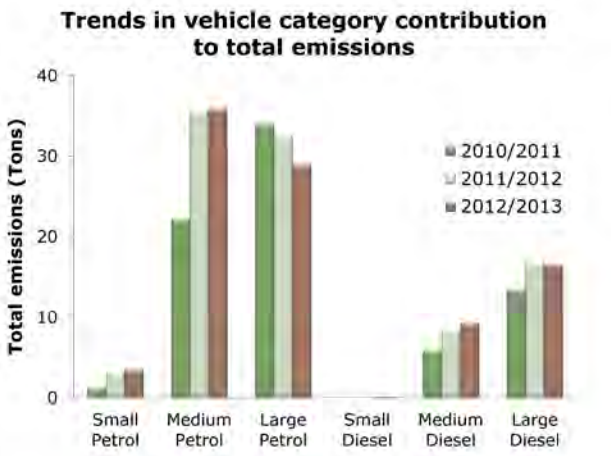



*Figure 11: Contribution of each vehicle category to total emissions*


*Figure 12: Summary of total emissions related to SMS own vehicle usage for three reporting years*

## Subsidised vehicles

***(Total emissions = 123.85 tons $CO_2e$, 0.09 tons $CO_2e$ per capita, contribution to total emissions = 0.47%)***

A total of 43 officials in the Department used subsidised vehicles and travelled a total of 553 769km during the reporting period resulting in a total emission of 123.85 tons $CO_2e$ (Figure 14). There has been a considerable decrease in both distance covered and total emissions, 965 779km travelled in 2011/2012 to 553 769km in the current reporting period equating to a reduction of 412 010km. The majority of vehicles used fall within the large diesel category (44%) with only two vehicles in the small petrol category (5%). Large diesel vehicles have contributed nearly 50% of all emissions for the 2012/2013 financial year (Figure 13). Data trends over the past three reporting periods show that there has been a notable decline in the contribution made by the use of medium and small petrol vehicles whilst large Diesel vehicle usage has been on a steady increase (Figure 13).

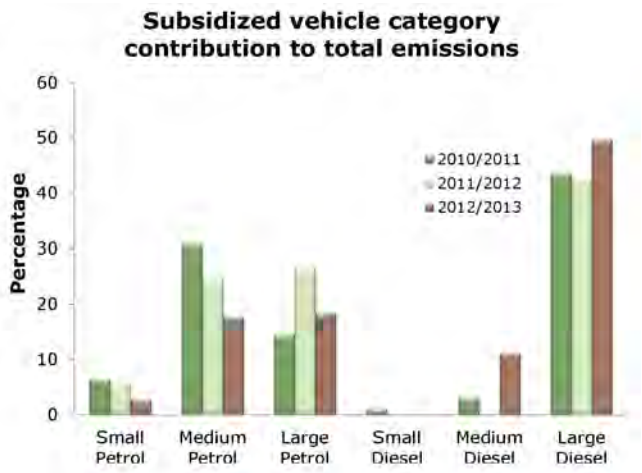



*Figure 13: Contribution to the total emissions profile by various vehicle categories*

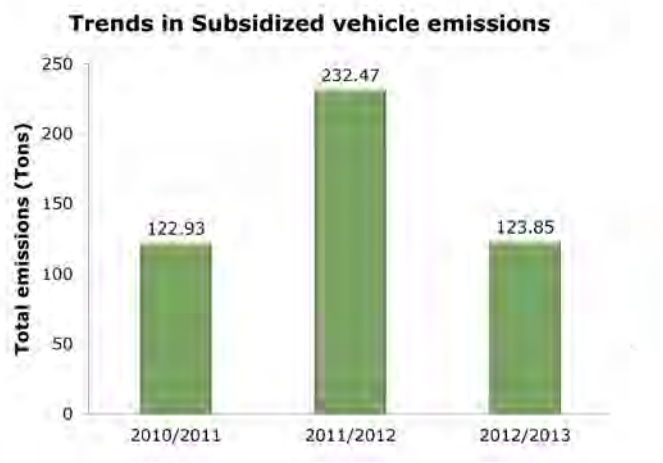



*Figure 14: Trends in subsidised vehicle emissions for three reporting periods*

## Shuttle service

***(Total emissions = 207.30 tons $CO_2e$, 0.15 tons $CO_2e$ per capita, contribution to total emissions = 0.78%)***

Besides the use of rental vehicles, departmental vehicles, subsidised vehicles or SMS personal vehicles, DEA officials may also use a shuttle service. Shuttles are most often used to transport officials to the airport or to meetings held a distance from the department (those officials who do not qualify for SMS own vehicle claims or in those instances where Departmental vehicles are not available for use). A total of 1 000 177km have been travelled resulting in the emission of 207.30 tons $CO_2e$ (Figure 16). Medium petrol vehicles remain the category which is most often used for shuttle travel purposes contributing 92% of distance travelled (increased from 243 743km in 2010/2011 to 920 522km in 2012/2013) and 91% (increase from 52.40 tons $CO_2e$ in 2010/2011 to 188.61 tons $CO_2e$ in 2012/2013) of total emissions. Although a significant increase in the contribution of large petrol vehicles to the emissions profile was noted during the first two reporting periods (10.75% to 28.99%), the usage and subsequent contribution of this vehicle class has dramatically decreased to only 4.35% (Figure 15). Looking at the emissions profile over the last three reporting periods it is notable that the emissions related to shuttle usage have shown a dramatic increase (62.06 tons in 2010/2011 vs. 207.30 tons in 2012/2013) (Figure 16).

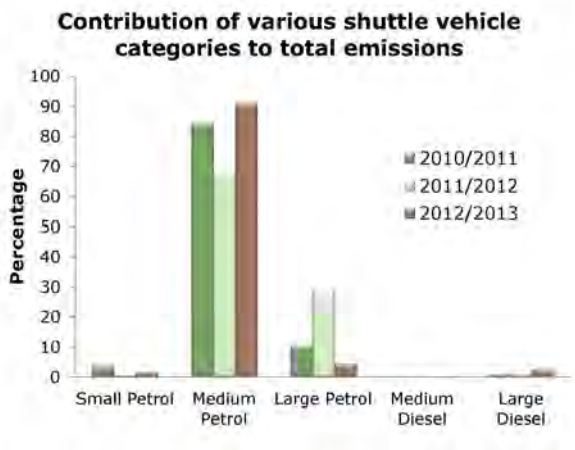



*Figure 15: Contribution to total emissions by various shuttle vehicle categories for three reporting periods*

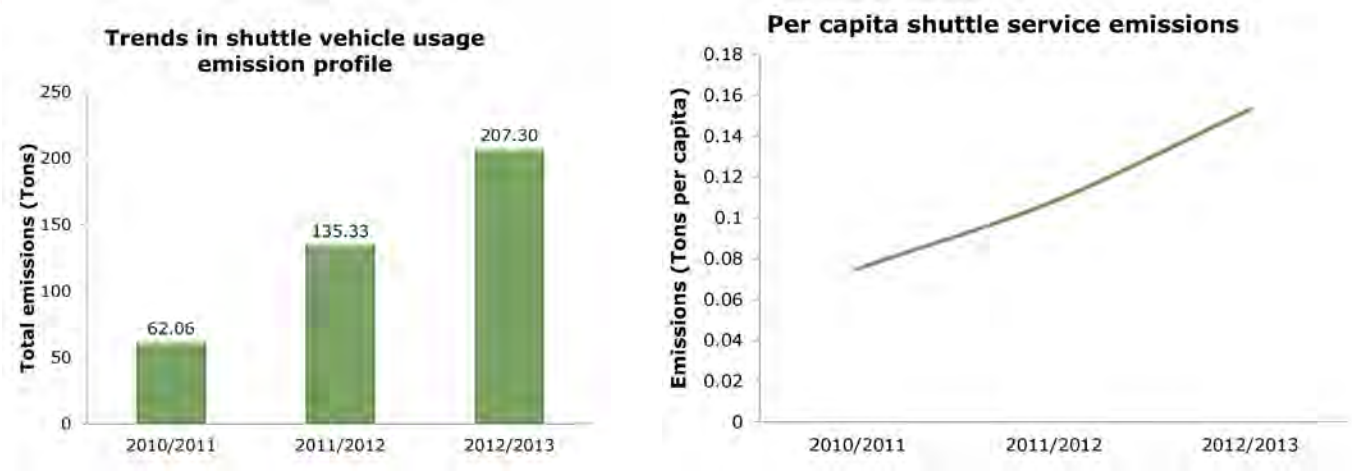



*Figure 16: Trends in emissions linked to shuttle usage for the last three reporting years (Total and per capita)*

## Lease vehicles

***(Total emissions = 15.29 tons $CO_2e$, 0.01 tons $CO_2e$ per capita, contribution to total emissions = 0.06%)***

The Department leases a total of nine vehicles, six of which fall into the categories of small and medium petrol. A total distance of 67 872km were covered resulting in a total emission of 15.29 tons $CO_2e$ (Table 10). Distance covered by lease vehicles in the current reporting period has increased by approximately 40% when compared to the distance covered in 2011/2012. Although the large petrol category of vehicles only contributed 37% to the total distance covered, the emissions linked to the use of large petrol vehicles contributed 50% to the total emissions. When comparing activity data trends across the previous and current reporting periods, it is notable that small petrol vehicle usage has increased by 87% (Figure 17).

*Table 10: Contribution of each vehicle category to distance covered and total emissions for 2012/2013*

| | 2011/2012 | | 2012/2013 | |
|---|---|---|---|---|
| **Category** | **Distance covered (km)** | **Emission (tons)** | **Distance covered (km)** | **Emission (tons)** |
| Small petrol | 12 275 | 2.10 | 23 027 | 3.73 |
| Medium petrol | 16 894 | 3.58 | 18 309 | 3.75 |
| Large petrol | 19 172 | 5.73 | 25 627 | 7.61 |
| Large diesel | 0 | 0 | 909 | 0.21 |
| **Total** | **48 341** | **11.42** | **67 872** | **15.29** |
| **Total per capita** | | **0.01** | | **0.01** |

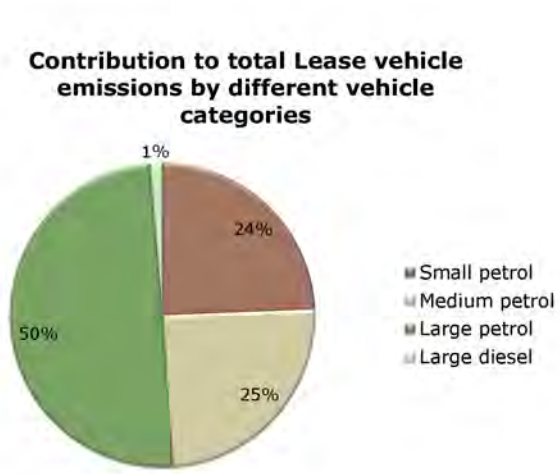



*Figure 17: Proportional contribution of each vehicle category to total lease vehicle emissions*

## Computers

***(Total emissions = 172.9 tons $CO_2e$, 0.13 tons $CO_2e$ per capita, contribution to total emissions = 0.65%)***

Emission calculations relating to the use of computers within the Department has revealed a number of constraints that would impact on the accuracy of the data. The first issue that needs to be highlighted is the fact that there is no available updated emission factor for computer usage that does not take the Life Cycle Accounting[27] approach. The emission factor used in the current calculation process is not recent. However, the absence of a more recent emission factor necessitated the use thereof. The second aspect that needs to be noted is the fact that the department has recently acquired notepads for use by senior management services, due to the unavailability of emission factors for these notepads they have been excluded from the current calculation. Computers and laptops use considered in the current calculation process were identified using the Department of Environmental Affairs' asset register. Although the lifecycle of a computer system within the Department is considered to be four years, a number of systems that have exceeded the suggested lifespan are still included on the asset register. To be accurate these systems have to be excluded in the calculations, however for comparative reasons they have been retained[28]. A total of 2 660 systems have been included in the calculation process which amounts to a total emission of 172.9 tons $CO_2e$ (Figure 18).

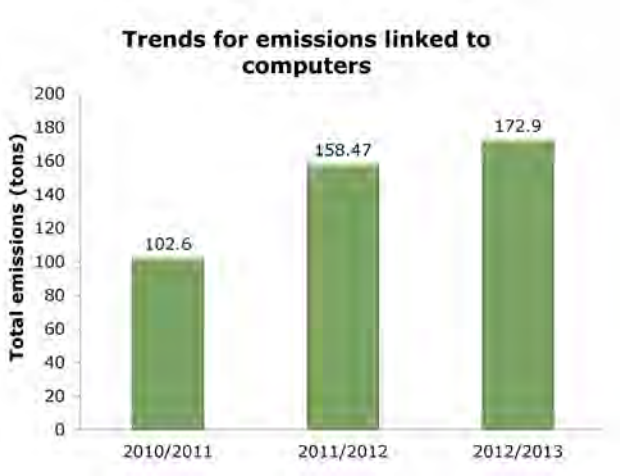



*Figure 18: Annual emissions linked to Departmental computers*

[27]LCA take into account emissions related to the entire life cycle of the product, including emissions during the manufacture, usage (including electricity usage) and disposal of the product. Due to the fact that the current report has a section dedicated to the calculation of emissions relating to electricity usage the use of a life cycle approach would result in double accounting and is therefore not deemed feasible for this process.
[28]Emission factor is divided by 4 as the life span of a computer system in the Department is 4 years.

## Paper

***(Total emissions = 33.01 tons, 0.02 tons $CO_2$ per capita, contribution to total emissions = 0.12%)***

The total number of reams of paper used during the 2012/2013 amounted to 15 678 which account for 36.4 tons $CO_2$e. The total weight of paper recycled were 3.71 tons translating to a 3.45 tons $CO_2$e reduction in paper emissions. The final emission[29] associated with paper usage therefore was 33.01 tons $CO_2$e (Table 11).

There has been an increase in the amount of paper used (Figure 19), however this can be ascribed to the inclusion of paper usage data from the Environmental Programmes branch which was previously not available. In an effort to promote the recycling of waste paper products, the Department has implemented an Office Paper Minimisation and Recycling Policy. The purpose of which is to implement green procurement initiatives, and minimise the generation of office waste. Waste paper recycling bins for different grades of paper are placed on each floor and regular inspections of the use thereof are conducted. Training on the usage of the bins and implementation of the policy was also conducted. Despite various policy promotion efforts, there are still challenges being faced with non-compliance where only a fraction of the total paper used is recycled.

*Table 11: Summary statistics for paper usage*

| Year | Sheets used | Reams used | Weight in tons | Emissions in tons | Recycled (Tons) |
|---|---|---|---|---|---|
| 2010/2011 | 6 295 000 | 12 590 | 31.457 | 27.68 | 1.28 |
| 2011/2012 | 5 790 000 | 11 580 | 28.95 | 23.57 | 3.61 |
| 2012/2013 | 7 839 000 | 15 678 | 39.195 | 33.01 | 3.71 |
| **Total** | **19 924 000** | **39 848** | **99.602** | **84.26** | **8.60** |

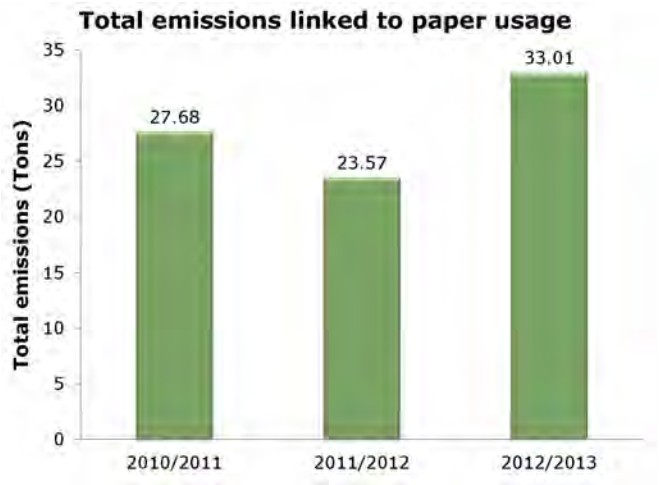



*Figure 19: Total emissions linked to paper usage for three reporting years*

[29] Final emissions = total emissions – emissions saved due to recycling efforts.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## Generators

***(Total emissions = 0.29 tons $CO_2e$, 0.0002 tons $CO_2e$ per capita, contribution to total emissions = 0.001%)***

During the event of a power outage the Department relies on generators to provide power to continue with its business activities. These generators are maintained and serviced by contracted service providers. For the Pretoria office, the service provider estimated that the amount of diesel used in the refill of the generators at DEA in Pretoria amounted to 107.5 litres[30] leading to the emission of 0.287 tons $CO_2e$ (Figure 20).

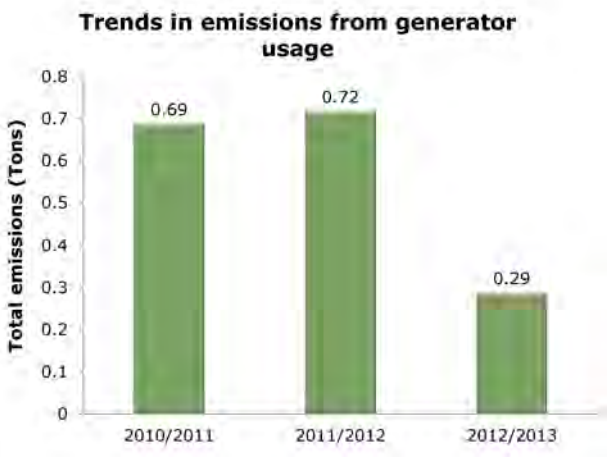


*Figure 20: Trends in emissions from generator usage for the last three reporting periods*

## Air conditioning (Owned by the Landlord)

***(Total emissions = 161.29 tons $CO_2e$, 0.12 tons $CO_2e$ per capita, contribution to total emission = 0.61%)***

The calculation for air-conditioning units under scopes 1 and 3 are exactly the same. All air-conditioning units that belong to the landlord are reported on under scope 3. A total of 239 air conditioning units are reported on under Scope 3. A total of 87 units are installed in buildings occupied by the Oceans and Coasts branch, as information regarding the type of refrigerant used and charge is not available the assumption was made that each unit was filled with R22 gas at a charge of 6kg. Eight of the units reside in the Environmental Programmes' Cape Town office, these units are filled with R410 gas which has a lower global warming potential than R22 gas. The instillation of ducted variable refrigerant volume (VRV) per flow for air-conditioning has resulted in a power saving of 30%.

[30] Generators at the Branch Oceans and Coasts were not used, fuel usage for these generators were only as a result of monthly mandatory testing and therefor the consumption is negligible and thus not included in the calculation.

The total emissions linked to the usage of these units amount to 161.29 tons $CO_2e$. Although there has been an increase in the number of units from 144 to 239, the total emissions related to the usage have increased by only 28.3 tons $CO_2e$ due to a revision of the classification of the units (Table 12).

*Table 12: Summary statistics for Air Conditioning (Owned by the Landlord)*

| Year | Number of units | Emissions (Tons) |
|---|---|---|
| 2010/2011 | 144 | 132.93 |
| 2011/2012 | 144 | 132.93 |
| 2012/2013 | 239 | 161.29 |

## Employee Commuting

***(Total emissions = 1 398.29 tons, 1.03 tons $CO_2e$ contribution to total emissions = 5.26%)***

Employee Commuting relates to the method and distance travelled by employees of an organisation to work and back home. In order to do a comprehensive assessment of employee commuting patterns, an employee commuting survey needs to be conducted. This survey has not been conducted for the past two reporting periods, however for comparative reasons (to allow for comparison with the baseline year where the results from the Employee commuting survey was included) the values contained in the baseline year were used as estimates for the years where this survey was not implemented. It should be noted however that the use of these estimated values are in all likelihood an under estimation of the actual emissions profile linked to employee commuting. During the employee commuting study conducted during the 2010/2011 Carbon Footprint report it was calculated that employees commuted a total of 7 107 866.19km which ultimately has led to a total emission of 851.18 tons $CO_2e$. During the study it was noted that employees used various methods of travel including private motor vehicles, busses, taxi's, trains etc.

# SUMMARY OF ACTIVITY RESULTS

The total $CO_2e$ emissions for the 2012/2013 reporting year amount to 26 572.30 tons $CO_2e$ (Table 13). This is an increase of 4 047.37 tons year on year equating to 17.97%. Between the 2010/2011 baseline reporting period and the current reporting period, the increase in emissions amounted to 36.35%. The majority of emissions (more than 83%) emanated from emission sources grouped under scopes 1 and 2 (Figure 21 and Figure 22).

*Table 13: Total emissions and relative contribution to the total Departmental carbon footprint*

| Emission sources | Units | 2010/2011 | | | 2011/2012 | | | 2012/2013 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Consumption | Emissions (tons) | % of total emissions | Consumption | Emissions (tons) | % of total emissions | Consumption | Emissions (tons) | % of total emissions |
| **Direct emissions (scope 1)** | | | **8 180.74** | **41.98** | | **8 189.4** | **36.36** | | **11 783.82** | **44.35** |
| Departmental vehicles | Km | 167 848 | 39.99 | 0.21 | 28 0772 | 63.29 | 0.28 | 325 720 | 74.15 | 0.28 |
| Air conditioning (Owned by the Department) | Number | 64 | 10.43 | 0.05 | 56 | 6.84 | 0.03 | 165 | 31.72 | 0.12 |
| Refrigeration units | Number | 178 | 15.12 | 0.08 | 286 | 17.21 | 0.08 | 306 | 17.23 | 0.06 |
| ***Antarctic*** | | | 8 115.2 | 41.64 | | 8 102.06 | 36.47 | | 11 660.72 | **43.88** |
| Helicopters-aviation gasoline | Litres | 53 827 | 137.14 | 0.70 | 53 827 | 137.14 | 0.61 | 54 100 | 137.51 | 0.52 |
| SA Agulhas-arctic diesel | Litres | 2 230 800 | 5 960.70 | 30.59 | 2 230 800 | 5 950.88 | 26.42 | 3 520 000 | 9 400.16 | 35.38 |
| Polar diesel-generators (Antarctic Base) | Litres | 275 000 | 734.80 | 3.77 | 275 000 | 733.59 | 3.26 | 275 000 | 734.39 | 2.76 |
| Polar diesel-vehicles (Antarctic Base) | Litres | 80 000 | 213.76 | 1.10 | 80 000 | 213.41 | 0.95 | 120 000 | 320.46 | 1.21 |
| Polar diesel-generators (Marion) | Litres | 300 000 | 801.60 | 4.11 | 300 000 | 800.28 | 3.55 | 300 000 | 801.15 | 3.02 |
| Polar diesel-generals (Gough) | Litres | 100 000 | 267.20 | 1.37 | 100 000 | 266.76 | 1.18 | 100 000 | 267.05 | 1.01 |
| **Indirect emissions (scope 2)** | | | **7 929.79** | **40.69** | | **9 987.38** | **44.34** | | **9 909.05** | **37.29** |
| Electricity consumption | KWh | 6 671 423.85 | 7 929.79 | 40.69 | 10 088 260.57 | 9 987.38 | 44.34 | 9 909 048.49 | 9 909.05 | 37.29 |
| **Indirect emissions (scope 3)** | | | **3 493.53** | **17.33** | | **4 348.15** | **19.30** | | **4 879.47** | **18.36** |
| Domestic and international flights | Km | 14 971 729 | 1 841.26 | 9.45 | 16 621 105 | 2 012.89 | 8.94 | 20 917 830 | 2 354.51 | 8.86 |
| Rental vehicles | Km | 846 084 | 159.30 | 0.82 | 1 401 123 | 253.42 | 1.13 | 1 833 035 | 318.05 | 1.20 |
| Shuttle service | Km | 282 442.50 | 62.07 | 0.32 | 584 580.83 | 135.33 | 0.60 | 1 000 177 | 207.30 | 0.78 |
| SMS own vehicle | Km | 312 760.20 | 77.06 | 0.40 | 414 178.16 | 97.26 | 0.43 | 422 415.84 | 94.68 | 0.36 |
| Subsidised vehicles | Km | 532 638 | 122.93 | 0.63 | 965 779 | 232.45 | 1.05 | 553 769 | 123.85 | 0.47 |
| Lease vehicles | Km | 0 | 0 | 0.00 | 48 341 | 11.42 | 0.05 | 67 872 | 15.29 | 0.06 |
| Paper | Number | 6 295 000 | 27.68 | 0.14 | 5 790 000 | 23.57 | 0.10 | 7 839 000 | 33.01 | 0.12 |
| Generators | Number | 260 | 0.69 | 0.00 | 270 | 0.72 | 0.00 | 107.5 | 0.29 | 0.00 |
| Computers | Number | 1 487 | 102.60 | 0.53 | 2 438 | 158.47 | 0.70 | 2 660 | 172.90 | 0.65 |
| Air conditioning (Owned by the Landlord) | Number | 144 | 132.93 | 0.68 | 144 | 132.93 | 0.59 | 239 | 161.29 | 0.61 |
| Staff Commuting | Km | 7 107 866.19 | 851.18 | 4.37 | 10 769 755.94 | 1 289.69 | 5.71 | 11 676 591.84 | 1 398.29 | 5.26 |
| **Total** | | | **19 488.23** | **100.00** | | **22 524.93** | **100.00** | | **26 572.30** | **100.00** |
| **Offset (Solar plant)** | **KWh** | - | **-** | - | - | **-** | - | **2 325** | **2.32** | |
| **Total emissions per capita** | | | **23.68** | | | **18.06** | | | **19.65** | |

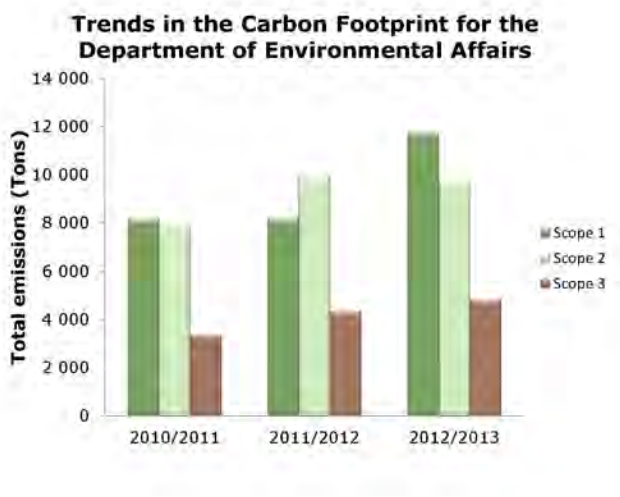


*Figure 21: Carbon footprint results for three reporting periods*

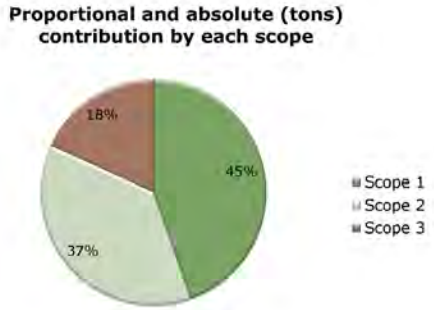


*Figure 22: Scope contribution to the emissions profile for the 2012/2013 carbon footprint*

*Table 14: Summary statistics of emission source contribution to the total emissions profile of the Department*

| Scope | Category | Emissions(tons) | Percentage contribution |
|---|---|---|---|
| **Scope 1** | Antarctic | 11 660.72 | 43.88 |
| | Departmental vehicles | 74.15 | 0.28 |
| | Refrigeration | 17.23 | 0.06 |
| | Air con (Owned by the Department) | 31.72 | 0.12 |
| **Scope 2** | Electricity | 9 909.05 | 37.29 |
| **Scope 3** | Generators | 0.29 | 0.00 |
| | Air travel | 2 354.51 | 8.86 |
| | Computers | 172.90 | 0.65 |
| | Lease vehicles | 15.29 | 0.06 |
| | Paper | 33.01 | 0.12 |
| | Rented vehicles | 318.05 | 1.20 |
| | Shuttle | 207.30 | 0.78 |
| | SMS vehicles | 94.68 | 0.36 |
| | Subsidised vehicle | 123.85 | 0.47 |
| | Air con (Owned by the Landlord) | 161.29 | 0.61 |
| | Staff commuting | 1 398.29 | 5.26 |
| **Total** | | **26 572.30** | **100.00** |

Table 14 provides a summary of the total emissions linked to each emissions source. The Antarctic program (specifically the emissions linked to the SA Agulhas II vessel[31]) contributes approximately 44% to the total emissions of the Department. This is followed by electricity which contributed 37% and business travel[32] at 12%. The remaining (labelled as "other" in figure 23) 5% is made up of emissions from emission sources which are mostly grouped under scope 3[33].

[31] Emissions linked to the SA Agulhas II vessel contributes 81% to the total Antarctic programme footprint.
[32] The business travel grouping is made up of the following emission sources: Air travel, Departmental vehicles, Lease vehicles, Rental Vehicles, SMS own vehicle claims, Subsidized vehicles and Shuttle service.
[33] Other emission sources included: Air conditioning units, Refrigeration, Generators, Paper usage and Computers.

***Contributions to emissions by groupings of emission sources for three reporting periods***

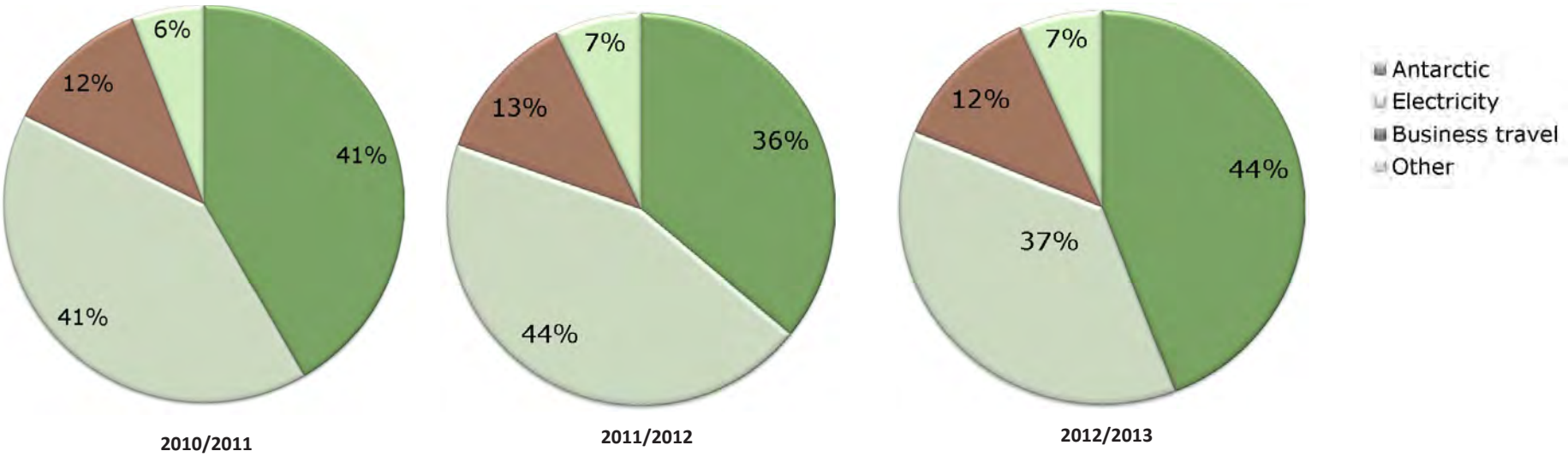


*Figure 23: Contributions by emission source groupings to the total emissions*

# IMPLEMENTED AND PROPOSED INTERVENTIONS

In an effort to address the impacts that the Department's activities have on the environment a number of initiatives have been implemented. These include the acquisition of the DEA Zero Emission Electric Vehicles, the construction of the new Green building and the implementation of organisational policies such as the Energy Efficiency Policy, Transport and Travel Policy etc.

Aside from the above mentioned initiatives there are also a number of cost effective behavioural mechanisms that could be implemented that would greatly contribute to the reduction in $CO_2e$ emissions. A key factor to successfully implement any behavioural mechanism is education and awareness raising campaigns amongst employees.

The following section focusses on the interventions implemented by the Department that would lead to a reduction of the carbon footprint. Interventions include aspects such as structural changes, the use of technology and behavioural changes.

## Implemented initiatives and expected improvements

### Green building

The new head office of the Department of Environmental Affairs is currently under construction and it is envisaged that occupation will take place on 1 August 2014. This is the first purpose built (not retrofitted) green building for a government department and has recently been awarded a 6 green star rating (highest award by the Green Buildings Council of South Africa). In addition to the 6 star rating for the upcoming building, it has also recorded the highest score to date for a large commercial space. High performance low energy technologies will be adopted. Some mechanisms implemented in the new building that would contribute to a sustainable functioning is the incorporation of a rainwater harvesting system linked with water wise gardens and irrigation systems which will ultimately contribute to a 30% saving of water used. Energy consumption in the building will not exceed 115kWh per square meter per year. Photovoltaic panels will be installed which are expected to provide about 20% of the energy requirements.

### DEA green cars

In an effort to promote the use of cleaner sources of fuel by the automotive industry, the Department has acquired four electric vehicles in February 2013. These vehicles are available for use by DEA officials to attend business related engagements. Currently the vehicles will be charged off the national grid, but upon occupation of the new building the vehicles will be charged by power supplied from a photovoltaic panel supplying energy to a charging station.

## 14 Loop Street

The Environmental Programmes office in Cape Town has recently received an award for excellence in energy efficiency at the Energy Efficiency Forum for Commercial Buildings Awards. The building which is leased by the Department displays various resource saving interventions such as:

- Dual flush toilets
- Waterless urinals
- Double glazed, tinted windows
- Promoting the use of natural light
- Open plan offices to allow for the free-flow of air and thus reducing the need for cooling or heating
- Ducted VRV air conditioning

Taking all these interventions into consideration statistics suggest a total saving of R15m$^2$. This saving calculated with the total floor area of 2 232m$^2$ translates to a saving of R418 140.00 per year (totalling just under R3 million for the seven year lease period). Future plans for 14 Loop street include the deployment of additional data loggers and the display of daily energy usage on a screen in the reception area. One key aspect to success is the buy-in by staff members and therefore emphasis is also placed on those measures that would educate and sensitise staff members on how electricity usage can be reduced.

## DEA solar plant

The DEA has an active solar plant that has been in opperation since November 2012. It is estimated that on a monthly basis 465kWh is pumped back into the national grid. This equates to an estimated 2 325kWh for the remainder of the reporting period which totals 2.30 tons $CO_2e$ which is offset.

# Other Interventions (proposed and currently implemented)

## Business travel

Business travel[34] (including both scope 1 and scope 3 emission sources) has been calculated to contribute approximately 12% to the total DEA carbon footprint. The implementation of the DEA green cars will no doubt have an impact on the emissions associated with Departmental vehicle usage[35]. The majority of emissions linked to business travel are due to air travel. Analysis of air travel patterns have shown that the majority (55%) of emissions linked to this method of travel was due to travel within the borders of South Africa. The total distance travelled within the country amounted to 12 103 107km which resulted in a subsequent emission of 1 207.58 tons $CO_2e$. Concerted efforts to reduce incidences of travel within the country can have a remarkable impact on the air travel emissions profile and resultant emissions of the Department.

[34] Business travel includes: Departmental vehicles, SMS own vehicle claims, Lease vehicles, Rental vehicles, Shuttle service, Air travel and Subsidized vehicles.
[35] It should be noted though that the reduction in emissions from Departmental vehicles will now be taken up under the electricity emission source as electric power from the national grid will be used to power the vehicles until occupation of the new green building takes place.

In combination with the rules and guidelines provided in the latest Departmental Transport and Travel Policy (policy signed and adopted in March 2013), the recognition for reducing the Carbon Footprint of the Department is clearly outlined in section 14 where officials are urged to positively contribute to the reduction of the Departmental footprint. Alternative mechanisms that can be utilised/explored to reduce travel related emissions include:

- The use of video conferencing equipment (the Department has recently improved its video conferencing facilities and equiptment to promote the use thereof)
- Correspondence through e-mail, telephone, Skype and the use of IPADs contribute to a reduction in the Department's carbon footprint as the need for both physical travel and paper usage is impacted upon
- Planning and scheduling of meetings so as to maximise each trip to the fullest (meetings such as working group and cluster meetings are already held within the same week to allow officials to attend multiple meetings with one trip undertaken)
- Critical evaluation of the importance of attendance (and attendees) of the meetings (are the right people attending the meeting and is it critical for them to attend)
- Sharing of resources amongst officials i.e. sharing of the same shuttle vehicle for trips to the airport etc
- A transport and travel circular released in December 2013 details strict guidelines on business travel
- Due to the frequent travel of DEA employees based in Pretoria to Cape Town consideration should also be given to deploy a zero emission departmental vehicle to Cape Town which can be used as a shuttle service between the airport and Cape Town offices.

## Electricity

As mentioned electricity is one of the major contributors to the Department's annual carbon footprint. The total contribution of electricity during the 2012/2013 reporting period amounted to 37.29%. There has been a slight decline in both the amount of electricity used and the associated emissions when compared to the previous reporting period. These reductions can be attributed to the implementation of newer technologies such as the replacement of light bulbs with newer low energy intensive bulbs, as well as a change in behaviour amongst officials.

The Department has further had an active solar plant which was functioning during the period November 2012 to March 2013. Electricity generated through this plant has been directed back to the national grid to offset the Departments carbon footprint. During the functional period the average amount of electricity generated is estimated at 465 kWh per month which equates to 2 325kWh. To ensure accurate calculations of electricity usage for the Pretoria office it is recommended that the DEA receives and pays for it's own electricity account and not through a third party, this will ensure that the actual electricity usage amounts are readily available for analysis and eliminate the need to calculate the estimated usage based on expenditure as is currently done.

### General

Further recommendations for consideration include the setting up of clear emission reduction targets which would provide a clear indication on whether implemented reduction efforts are having the desired results or not.  Another consideration that should be given is the drafting and implementation of a green procurement policy within the Department to promote the use of service providers that are environmentally responsible in the rendering of their services.

## CONCLUSION

Although the absolute Carbon Footprint of the Department has been on an increase for the past three reporting periods the Department has already implemented drastic measures that would ultimately support efforts in reducing its carbon footprint. The impact of two of the measures (Green building with improved energy and water consumption technologies and the electric vehicles) implemented are expected to only have a notable impact during the 2014/2015 reporting period after occupation of the new Green building takes place.  It should be noted though that all these actions currently implemented, in the process of being implemented as well as the recommended actions are constrained by the heavy reliance on coal as the primary energy source.  Despite this the Department remains committed to reducing its footprint and together with carbon reduction efforts employees are urged to bring their part through changing their behaviour and becoming aware of the impact that their actions have on the environment.

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